http://www.bbc.co.uk/news/health-15238610

Vitamins linked with higher death risk in older women

When it comes to vitamins, it appears you could have too much of a good thing, say researchers who report a link between their use and higher death rates among older women.

By Michelle Roberts Health reporter, BBC News

Experts have suspected for some time that supplements may only be beneficial if a person is deficient in a nutrient. And excess may even harm, as the study in Archives of Internal Medicine finds.

All of the women, in their 50s and 60s, were generally well nourished yet many had decided to take supplements. Multivitamins, folic acid, vitamin B6, magnesium, zinc, copper and iron in particular appeared to increase mortality risk. The researchers believe consumers are buying supplements with no evidence that they will provide any benefit.

Harms v gains

They are quick to stress that their study relied on the 38,000 US women who took part in it recalling what vitamins and minerals they had taken over the previous two decades. And it is difficult to control for all other factors, like general physical health, that might have influenced the findings. But they say their findings suggest that supplements should only be used if there is a strong medically-based cause for doing so because of the potential to cause harm.

"Based on existing evidence, we see little justification for the general and widespread use of dietary supplements," Dr Jaakko Mursu of the University of Eastern Finland and his research colleagues said.

Less is more

In the study, iron tablets were strongly linked with a small (2.4%) increased death risk, as were many other supplements. The link with iron was dose-dependent, meaning the more of it the individual took, the higher their risk was. Conversely, calcium supplements appeared to reduce death risk. However, the researchers say this finding needs more investigation and they do not recommend that people take calcium unless advised to by a doctor in order to treat a deficiency.

Drs Christian Gluud and Goran Bjelakovic, who review research for the Cochrane Database of Systematic Reviews to evaluate best evidence, said: "We think the paradigm 'The more the better' is wrong."

They say dietary supplementation has shifted from preventing deficiency to trying to promote wellness and prevent diseases, and caution: "We believe that for all micronutrients, risks are associated with insufficient and too-large intake."

Helen Bond of the British Dietetic Association said some people, like the elderly, might need to take certain supplements. For example, vitamin D is recommended for people over the age of 65. But she said that generally, people should be able to get all the vitamins and minerals they needed from a healthy, balanced diet. She said some took supplements as an insurance policy, wrongly assuming that they could do no harm. "But too much can be toxic and it is easy to inadvertently take more than the recommended daily amount."

http://www.nytimes.com/2009/12/15/health/15case.html?partner=rss&emc=rss

Cases - Exam-Room Rules: What's in a Name?

It is helpful for me to think about the doctor-patient relationship from time to time, especially in terms of how my patients and I communicate.

By ANNE MARIE VALINOTI, M.D.

A patient of mine is a dental hygienist in her late 50s who works in her son's dental practice. On her first day of work, she told me, her son asked her to call him "Doctor." And, he asked, "Is it O.K. if I call you 'Barbara'?"

Sure, she told him. They set to work on the first patient, and after she handed her son an instrument he needed, he graciously said, "Thanks, Mom."

This got me thinking of how, in my own career, I have always been addressed as "Dr. Valinoti." Freshly minted M.D.'s, some as young as 25, get a title of respect while seasoned nurses in the hospital are Betty, Kaye or Nancy.

I remembered the absurdity of this situation when, as an intern, I was addressing critical care nurses with decades of experience by their first names while they deferentially called me "Doctor." These were women who had started their careers when I was still playing with Barbie dolls, yet where were their professional titles? Like most things in medical training, I got used to it, and it became second nature.

One thing I am still getting used to, though, is when patients call me by my first name. There seems to be a void in this area of etiquette: How does one address one's physician? It is almost always an older patient who will use my first name, in a friendly, offhand way. And, I have observed, these patients are usually men. It might seem natural if I have had a long-term relationship with these people, caring for them over the years, but

often these patients seem to make a decision at the outset to be on a first-name basis with me. I wonder about these people. Are they trying to be chummy? Is it a power thing, making them feel less vulnerable while they sit half naked on the exam table? Do they just call everyone by their first names?

At first I thought that perhaps this was a phenomenon particular to female physicians. For example, a colleague with whom I worked was a distinguished physician in the community, yet, she said with a sigh, "All my patients call me 'Sally.' " Clearly, she did not insist on this with her patients; it had just evolved.

But the male physicians in my practice have described the same situation. I remember being on call for the practice one night and speaking to a patient of another physician in my group. She went on in detail about the tests and treatment she was receiving from Adam, her doctor. After the conversation, I assumed that she was his personal friend. "No," he told me the next day. "I really just only met her."

Regardless of whether I am "Anne Marie" or "Dr. Valinoti" to a patient, I rarely call a patient by his or her first name. As a rule, patients who are my senior are always "Mr./Ms./Dr." Patients I meet for the first time are always addressed by their title, even teenagers (it seems silly, I know). Although many patients introduce themselves by their first name, I would never presume to address them as such without their specific permission. And even then, frankly, I find it hard to call a man old enough to be my father "Frank" or "Jim." It is akin to my habit of still addressing old friends of my parents by their formal titles.

A study published in The British Medical Journal looked at the question of patient preferences regarding how doctors address them. Interestingly, most patients surveyed, particularly those younger than 65, preferred that their physicians call them by their first name.

But doctors do this at their own peril. A physician friend of mine experienced this firsthand when he made the mistake of calling a woman of a certain age by her first name during a visit. "That's Mrs. White, thank you," she told him, icily. "I never forgot that one," he said, remembering how he sheepishly finished her exam.

It is helpful for me to think about the doctor-patient relationship from time to time, especially in terms of how my patients and I communicate. The importance of effective communication in that setting cannot be overemphasized. Accurate diagnosis and treatment of medical ailments depend on the doctor's clear understanding of the entire person who sits before her. A good internist will recognize dozens of subtleties during a simple face-to-face interview - subtleties that cannot be detected by the most sophisticated and expensive scans.

As medical costs climb skyward in our country, there is growing recognition that excellent primary care might be the foundation of a more accessible, affordable health care system. Great primary care doctors are, by necessity, great communicators. And, let's face it: all communication starts with what we call one another.

Dr. Anne Marie Valinoti is an internist in northern New Jersey.

http://www.eurekalert.org/pub_releases/2011-10/uoc - ssb100611.php

Sexual selection by sugar molecule helped determine human origins

Researchers at the University of California, San Diego School of Medicine say that losing the ability to make a particular kind of sugar molecule boosted disease protection in early hominids, and may have directed the evolutionary emergence of our ancestors, the genus Homo.

The findings, published in this week's early online edition of the Proceedings of the National Academy of Sciences, are among the first evidence of a novel link between cell surface sugars, Darwinian sexual selection, and immune function in the context of human origins

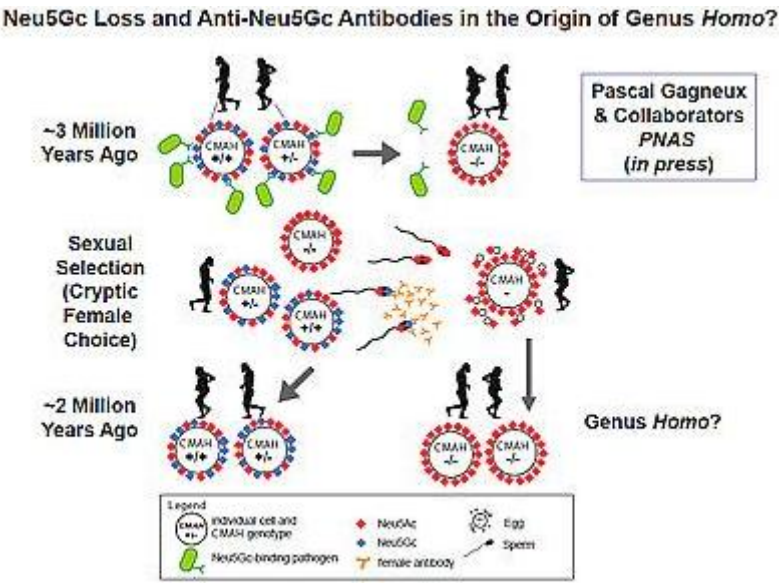
Sialic acids are sugar molecules found on the surfaces of all animal cells, where they serve as vital contact points for interaction with other cells and with the surrounding environment, including as targets for invasive pathogens. For millions of years, the common ancestors of humans and other apes shared a particular kind of sialic acid known as N-glycolylneuraminic acid or Neu5Gc. Then, for reasons possibly linked to a malarial parasite (http://health.ucsd.edu/news/2005/Pages/09_08_Varki.aspx) that bound Neu5Gc, a gene mutation three million or so years ago inactivated the human enzyme involved in making the molecule. Instead, humans began producing more of a slightly different form of sialic acid called Neu5Ac, the precursor of Neu5Gc.

"This occurred at about the same time as early humans were apparently becoming major predators in their environment," said Pascal Gagneux, PhD, an evolutionary biologist and associate professor of cellular and molecular medicine at UC San Diego. "It's hard to be sure exactly what happened because evolution works on so many things simultaneously, but the change in sialic acid meant that early humans developed an immune response to Neu5Gc. It became viewed by their immune systems as foreign, something to be destroyed. At about the same time, they started eating red meat, a major source of Neu5Gc, which may have further stimulated the immune response."

Gagneux and colleagues say this strong immune reaction to Neu5Gc likely had a profound effect upon early human reproduction. In all mammals, the biological costs of pregnancy for the female can be huge, sometimes even life-threatening, and so it behooves females to ensure only the best-matching sperm successfully fertilize an egg. The scientists hypothesized that anti-Neu5Gc antibodies would target Neu5Gc-positive sperm or fetal tissues in early humans, kill them and thus reduce the chances of reproductive success.

The researchers tested the idea by exposing chimpanzee sperm, whose cell surface sugars are more than half non-human sialic acids, to human anti-Neu5Gc antibodies. The antibodies bound and killed the ape sperm in vitro. The scientists then mated female mice genetically altered to lack Neu5Gc and immunized to produce anti-Neu5Gc antibodies with Neu5Gc-positive males. The fertility rate for the females was measurably lower due to pre-zygotic incompatibility – the anti-sperm effects of female antibodies.

"Over time, this incompatibility would reduce and then eliminate individuals with Neu5Gc," said Gagneux. "Oddly enough, based on our theoretical model, the process works faster when the fertility rate is only slightly decreased, rather than producing 100 percent infertility."



This is a sialic acid cartoon **Image courtesy of UC San Diego School of Medicine**

Gagneux noted that the findings add further weight to the concept of "speciation by infection," in which a combination of infectious diseases suffered by a particular population could predispose that population to diverge from other populations due to reproductive incompatibility. In the case of early humans, one driver may have been female immunity to Neu5Gc.

Previous studies (http://ucsdnews.ucsd.edu/newsrel/health/Varki%208%2022.htm) have shown that the loss of Neu5Gc occurred about two to three million years ago, which happens to be about the time of emergence of Homo ergaster/erectus, the likely ancestor of humans.

"We suggest that the immune mechanism described here was involved in the origin of the genus Homo," said study co-author Ajit Varki, MD, professor of medicine and cellular and molecular medicine and director of the Center for Academic Research and Training in Anthropogeny at UC San Diego.

Co-authors of the paper are Darius Ghaderi, Fang Ma, Miriam Cohen, Patrick Secrest and Rachel E. Taylor, all of the Center for Academic Research and Training in Anthropogeny, Glycobiology Research and Training Center and departments of Medicine and Cellular and Molecular Medicine, UC San Diego; and Stevan Springer, Department of Biology, University of Washington, Seattle.

http://www.eurekalert.org/pub_releases/2011-10/nu-pat101011.php

Peanut allergy turned off by tricking immune system

New approach makes allergen appear safe and prevents life-threatening reaction

CHICAGO - Researchers have turned off a life-threatening allergic response to peanuts by tricking the immune system into thinking the nut proteins aren't a threat to the body, according to a new preclinical study from Northwestern Medicine. The peanut tolerance was achieved by attaching peanut proteins onto blood cells and reintroducing them to the body - an approach that ultimately may be able to target more than one food allergy at a time. "We think we've found a way to safely and rapidly turn off the allergic response to food allergies," said Paul Bryce, an assistant professor of medicine in the division of allergy-immunology at Northwestern University Feinberg School of Medicine. Bryce and Stephen Miller, professor of microbiology-immunology at Feinberg, are co-senior authors of a paper published in the Journal of Immunology.

It's the first time this method for creating tolerance in the immune system has been used in allergic diseases. It has previously been used in autoimmune diseases.

The approach also has a second benefit. It creates a more normal, balanced immune system by increasing the number of regulatory T cells, immune cells important for recognizing the peanut proteins as normal.

"T cells come in different 'flavors'," Bryce said. "This method turns off the dangerous Th2 T cell that causes the allergy and expands the good, calming regulatory T cells. We are supposed to be able to eat peanuts. We've restored this tolerance to the immune system."

Peanut allergies often cause life-threatening allergic reactions, called anaphylaxis. Each year there are between 15,000 and 30,000 episodes of food-induced anaphylaxis and 100 to 200 related deaths in the United States, according to the National Institutes of Health. There is no safe treatment to protect people from a severe allergic reaction to food. When an allergic person eats a peanut, the proteins are absorbed through the intestine and can activate a life-threatening, full-body immune response. This includes constriction of the airways, low blood pressure and/or shock and can lead to loss of consciousness and death.

Using a mouse model that mimics a life-threatening peanut allergy (which the Northwestern team developed several years ago), researchers attached peanut proteins onto white blood cells called leukocytes and infused those back into the mice. After two treatments, the mice were fed a peanut extract. They did not have the life-threatening allergic reaction because their immune system now recognized the protein as safe.

"Their immune system saw the peanut protein as perfectly normal because it was already presented on the white blood cells," Bryce said. "Without the treatment, these animals would have gone into anaphylactic shock." Bryce thinks more than one protein can be attached to the surface of the cell and, thus, target multiple food allergies at one time.

In the second part of the study, Northwestern researchers used the same approach with an egg protein, which was to provoke an immune response –- similar to an asthma attack - in the lungs. They attached the proteins to white blood cells and infused the cells back into the mice. When the mice inhaled the asthma-provoking egg protein, their lungs didn't become inflamed.

"This is an exciting new way in which we can regulate specific allergic diseases and may eventually be used in a clinical setting for patients," said Miller, the Judy Gugenheim Research Professor at the Feinberg School. Miller also has used the same approach in autoimmune diseases. His previous published research has shown the same technique to stop the progression of multiple sclerosis and type 1 diabetes, both autoimmune diseases, in animal models. This approach is currently being tested in multiple sclerosis patients in a phase I/IIa clinical trial.

For autoimmune diseases and allergic airway diseases, Miller also is working with microparticles rather than white cells to induce tolerance, because the microparticles are more easily standardizd for manufacturing.

The paper's co-lead authors are Charles B. Smarr and Chia-Lin Hsu, both graduate students.

The research was funded by the National Institutes of Health and the Food Allergy Initiative.

http://www.eurekalert.org/pub_releases/2011-10/aaon-cla100411.php

Crossing legs after severe stroke may be a good sign of recovery

People who are able to cross their legs soon after having a severe stroke appear to be more likely to have a good recovery compared to people who can't cross their legs.

ST. PAUL, Minn. - That's according to new research published in the October 11, 2011, print issue of Neurology, the medical journal of the American Academy of Neurology.

"Despite having severe strokes that left them with slight loss of movement and even reduced consciousness, we noticed that some people were still able to cross their legs, which is not as easy as it seems," said study author Berend Feddersen, MD, PhD, of the University of Munich, Germany. "If this finding is confirmed, leg crossing may be an easy way to help doctors determine who may have a better chance of recovery."

People who were able to cross their legs within the first 15 days after a severe stroke were more likely to have better independence in daily life, fewer neurologic problems and lower death rates.

The study involved 68 people who had experienced a severe stroke with need of intensive care treatment including need of ventilation or need of circulatory support. Two groups of 34 were formed; one group with leg-crossers and one with non-leg-crossers. Participants were followed for one year and were tested using several scales to measure disability and independence.

After one year, the study found that one person, or nine percent, died among those who were able to cross their legs after stroke compared to 18 people, or 53 percent, who died among those who couldn't cross their legs.

In addition, both groups were given a score using the NIH Stroke Scale, which predicts outcome and severity of stroke. The leg crossing group had fewer neurologic problems at discharge from the hospital, scoring an average of 6.5 on the stroke scale, notably lower than the non-crossers who had an average score of 10.6.

One year after discharge, the leg-crossers scored an average of 2.9 on the Rankin Scale, indicating they were only moderately disabled and capable of walking unassisted compared to non-crossers, who scored an average of five on the Rankin Scale, indicating they were severely disabled and required constant attention.

As for daily independence, people who were able to cross their legs also fared better. They scored an average of 34 out of 100 on the Barthel Index test, compared to a score of 21 at discharge, and then received a score of 71 one year later compared to 49 for those who couldn't cross their legs. A score of zero indicates full dependence, while a score of 100 indicates full independence.

http://www.bbc.co.uk/news/health-15238613

UK doctors advised gonorrhoea has turned drug resistant

UK doctors are being told the antibiotic normally used to treat gonorrhoea is no longer effective because the sexually transmitted disease is now largely resistant to it.

By Michelle Roberts Health reporter, BBC News

The Health Protection Agency says we may be heading to a point when the disease is incurable unless new treatments can be found. For now, doctors must stop using the usual treatment cefixime and instead use two more powerful antibiotics. One is a pill and the other a jab.

The HPA say the change is necessary because of increasing resistance.

Untreatable strains

Tests on samples taken from patients and grown in the laboratory showed reduced susceptibility to the usual antibiotic cefixime in nearly 20% of cases in 2010, compared with just 10% of cases in 2009. As recently as 2005, no gonorrhoea bacteria with reduced susceptibility to cefixime could be found in the UK.

The bacterium that causes the infection - Neisseria gonorrhoeae - has an unusual ability to adapt itself and has gained resistance, or reduced susceptibility, to a growing list of antibiotics - first penicillin itself, then tetracyclines, ciprofloxacin and now cefixime. The World Health Organization recommends that the first-line antibiotic used is changed when treatment failure in patients reaches 5%. But for cefixime, the change is being made preemptively, owing to the alarming rise in resistance that is emerging.

Prof Cathy Ison, a gonorrhoea expert at England's HPA, said: "Our lab tests have shown a dramatic reduction in the sensitivity of the drug we were using as the main treatment for gonorrhoea. This presents the very real threat of untreatable gonorrhoea in the future.

"We were so worried by the results we were seeing that we recommended that guidelines on the treatment of gonorrhoea were revised in May this year, to recommend a more effective drug.

"But this won't solve the problem, as history tells us that resistance to this therapy will develop too. In the absence of any new alternative treatments for when this happens, we will face a situation where gonorrhoea cannot be cured." She said patients who refuse the jab will be offered oral antibiotics instead.

She added: "This highlights the importance of practising safe sex, as, if new antibiotic treatments can't be found, this will be only way of controlling this infection in the future."

After genital chlamydia, gonorrhoea is the second most common bacterial sexually transmitted infection in the UK. According to HPA figures, there were 16,145 new diagnoses of gonorrhoea in 2010, a 3% increase on 2009 when there were 15,606.

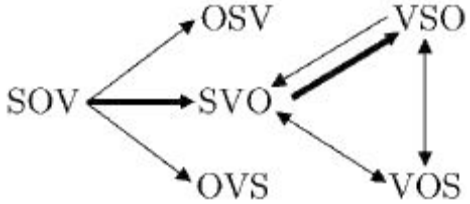
http://www.physorg.com/news/2011-10-physicist-teams-anthropologist-ancient-linguistic.html

Noted physicist teams with anthropologist to create ancient linguistic tree

With the thousands of languages in the world today, it's hard to imagine just one of them being spoken by all of the existing humans on Earth.

PhysOrg.com - And while there is really no way to prove that such was the case some fifty thousand years ago when the human race apparently shifted into behavior patterns that are more consistent with modern behavior than that which had come before, many believe it to be the case.

It was during this time period that early humans began to use more sophisticated tools, to paint and to create engravings and sculpture. Many historians have attributed this "sudden" leap to the development of language. And if that was the case, then it's likely all the people of that time were all speaking the same language, seeing as how there were still so few of them.



Evolution of word order. **Image: (c) PNAS, doi:10.1073/pnas.1113716108**

Now, well-known physicist Murray Gell-Mann and anthropologist Merritt Ruhlen argue that most languages descended from a common ancestor which likely came much later as the result of a possible bottleneck.

They describe in their paper published in the Proceedings of the National Academy of Sciences, how they believe that rather than following the more modern language construct of subject-verb-object (SVO), the ancient base language instead used subject-object-verb (SOV), such as is the case with old so-called dead languages, like Latin.

Murray Gell-Mann, currently a distinguished fellow with the Santa Fe Institute in New Mexico, received the Nobel Prize in Physics back in the late sixties for work he did on the theory of elementary particles. In addition to his numerous achievements in the field of physics, Gell-Mann has apparently always had an interest in

linguistics as well. Now in his eighties, he has embarked on what some may deem a controversial idea; to develop a linguistics tree going all the way back to the first human language.

Thus far he and partner Ruhlen have come up with some 2200 nodes comprised of eight distinct branches, and twenty two sub or sub-sub branches. For each branch or sub, the two describe its most modern state and then work backwards to show how it might have developed from an older form. Using this method to go all the way back in time to the single earlier language, the two propose it must have been of the subject-object-verb variety. It should be noted that thus far, the work is still just theory, and not all historians or linguistics experts for that matter, agree on its validity.

More information: The origin and evolution of word order, PNAS, Published online before print October 10, 2011, doi:10.1073/pnas.1113716108

Abstract

Recent work in comparative linguistics suggests that all, or almost all, attested human languages may derive from a single earlier language. If that is so, then this language - like nearly all extant languages - most likely had a basic ordering of the subject (S), verb (V), and object (O) in a declarative sentence of the type "the man (S) killed (V) the bear (O)." When one compares the distribution of the existing structural types with the putative phylogenetic tree of human languages, four conclusions may be drawn. (i) The word order in the ancestral language was SOV. (ii) Except for cases of diffusion, the direction of syntactic change, when it occurs, has been for the most part SOV > SVO and, beyond that, SVO > VSO/VOS with a subsequent reversion to SVO occurring occasionally. Reversion to SOV occurs only through diffusion. (iii) Diffusion, although important, is not the dominant process in the evolution of word order. (iv) The two extremely rare word orders (OVS and OSV) derive directly from SOV.

http://arstechnica.com/science/news/2011/10/giant-viruses-may-have-evolved-from-cellular-organisms-not-the-other-way-around.ars

Giant viruses may have evolved from cellular organisms, not the other way around

The unusual size and gene content of the virus led one scientist to suggest that viruses could explain the origin of DNA-based life.

By John Timmer | Published 4 days ago

About five years ago, biologists were surprised by the first discovery of an extremely large virus. Viruses are generally stripped down, efficient predators, only carrying as much DNA or RNA necessary to hijack their host and make extra copies of themselves. The newly discovered virus, called Mimivirus, was anything but stripped down; it carried a genome nearly the size of some bacterial species. And, instead of simply hijacking its host, the viral genome carried a lot of genes that replaced basic cellular functions, including some involved in DNA repair and the manufacturing of proteins.

The unusual size and gene content of the virus led one scientist to suggest that viruses could explain the origin of DNA-based life. If viruses carried all these genes, then it's possible to imagine that one could set up shop in a cell and simply never leave, gradually taking over the remaining functions once performed by its host's genetic material. This would explain the origin of DNA, which would distinguish the virus from its host's genetic material, a holdover from the RNA world. It could also explain the existence of a distinct nucleus within Eukaryotic cells.

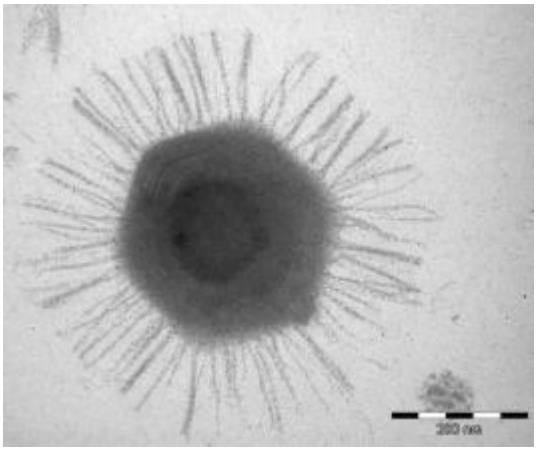


Image courtesy of Stanford University

A paper is being released today, however, that argues that this scenario has things exactly backwards. Giant viruses, its authors argue, have all these genes normally associated with cells because, in their distant evolutionary past, they were once cells.

Mimivirus was discovered in an amoeba, so the authors of the new paper used a simple technique to look for its relatives: take three different species of amoeba, expose them to a variety of environmental samples, and see if anything big starts growing in them. They hit pay dirt with a sample obtained from an ocean monitoring station just off the coast of Chile. Despite the oceanic source, the virus grew nicely in fresh water amoebae. The site also gave the virus its name: Megavirus chilensis.

The authors followed its lifestyle, showing that it behaved much like Mimivirus, forming similar structures within its host cell that could only be distinguished using electron microscopy. They also sequenced its entire genome, which turned out to be the largest virus genome yet completed: 1.26 million base pairs of DNA (megabases). Based on this sequence, Megavirus is a distant cousin of Mimivirus. Of its 1,120 protein-coding genes, over 250 have no equivalent in Mimivirus. But, of the genes that are shared, the sequences average about

50 percent identity on the protein level. This means that Megavirus is similar enough that it can be compared to Mimivirus, but different enough that it's possible to make some inferences about the viruses' evolutionary history.

And what they find supports the view that the virus started out with a much larger complement of genes. For example, Mimivirus has a suite of genes that can help repair DNA. Megavirus has those plus one other that is specialized for the repair of DNA damaged by UV light. The additional gene appears to be functional: Megavirus was able to grow following an exposure to UV that was sufficient to disable Mimivirus.

Both viruses share an identical set of genes involved in transcribing their DNA into RNA, and use an identical set of signals to indicate where the transcripts should start and stop. Mimivirus also contains a number of genes used in the translation of RNA into protein. Megavirus has those plus a few more, including additional genes that attach amino acids (components of proteins) onto RNAs for use in translation.

Clearly, the common genes suggest that the viruses share a common ancestor. This leaves two possibilities for the novel ones: either the ancestral virus had a larger collection and its descendants have lost different ones, or each virus picked up different genes from its hosts through a process called horizontal gene transfer. The authors favor the former explanation, because most of the genes specific to one of the two viruses don't look like any gene present in their hosts (or any other gene we've ever seen, for that matter). This implies that horizontal gene transfer doesn't seem to have done much to shape the viruses' genomes.

So, when did the common ancestor exist? The authors line up a few of the conserved megavirus genes (including those of a more distantly related giant virus, CroV) with the equivalents in other eukaryotic species, and find that they branch off right at the base of the the eukaryotic lineage. In other words, the viruses seem to have had a common ancestor with eukaryotes, but it split off right after the eukaryotes diverged from bacteria and archaea. (This also argues against the horizontal gene transfer idea, since there doesn't seem to be a species out there that the genes could have been transferred from.)

To the authors, this suggests that the viruses are the evolutionary descendants of an ancient, free-living eukaryotic cell. Various genes and structures from that organism have gradually been lost over its long history as a parasite, leaving something that propagates like a virus, but belongs to a distinct lineage from all other viruses that we're aware of.

The authors make a reasonably compelling case against the megaviruses getting their complex genomes via horizontal gene transfer, although it would be good to see a similar analysis for a lot more of the shared genes. What they don't do, however, is rule out the initial alternative: it's still technically possible that the megaviruses and eukaryotes share an ancient common ancestor because all eukaryotes are descendants of the virus' genome. At the moment, I'm not sure it's possible to distinguish between these alternative explanations.

PNAS, 2011. DOI: 10.1073/pnas.1110889108 (About DOIs).

http://www.eurekalert.org/pub_releases/2011-10/cmaj-cac100411.php

Common antibiotic can have serious adverse reactions

A commonly prescribed antimicrobial can cause serious adverse reactions and physicians need to be aware of these

A commonly prescribed antimicrobial – trimethoprim-sulfamethoxazole – that has been used since 1968 can cause serious adverse reactions and physicians need to be aware of these in prescribing, states a review in CMAJ (Canadian Medical Association Journal) (pre-embargo link only).

Trimethoprim–sulfamethoxazole is the most commonly prescribed antibiotic for urinary tract infections in Canada, and is used to treat community-acquired methicillin-resistant Staphylococcus aureus (MRSA) and other bacterial infections. The drug, which is low-cost and effective, is used by hundreds of thousands of Canadians each year, with about 4000 prescriptions each week in Ontario alone.

However, it can cause adverse reactions, some that can be life-threatening, as well as kidney effects (hyperkalemia) and hypoglycemia, which are common results of drug interactions.

"Although trimethoprim-sulfamethoxazole has numerous benefits, particularly in the care of patients with HIV and methicillin-resistant S. aureus, it is associated with multiple toxicities," write the authors. "However, all drugs carry adverse effects. When considering other antimicrobials, clinicians should remember that areas of uncertainty remain, particularly with newer agents."

To help physicians to remember the various possible toxic reactions, the authors propose the NOT RISKY acronym as an aid. They also suggest ways to reduce the risk of trimethoprim–sulfamethoxazole, such as using an alternative antibiotic, especially in pregnant women, and monitoring for kidney issues and hypoglycemia in patients on the drug.

"Clinicians should be cognizant of the potential consequences of prescribing trimethoprim–sulfamethoxazole, monitor patients for adverse events during therapy or use an alternate antibiotic when appropriate," the authors conclude.

http://www.eurekalert.org/pub_releases/2011-10/aafc-grs100411.php

Ginger root supplement reduced colon inflammation markers

Ginger supplements reduced markers of colon inflammation in a select group of patients, suggesting that this supplement may have potential as a colon cancer prevention agent, according to a study published in Cancer Prevention Research, a journal of the American Association for Cancer Research.

PHILADELPHIA - and colleagues enrolled 30 patients and randomly assigned them to two grams of ginger root supplements per day or placebo for 28 days.

After 28 days, the researchers measured standard levels of colon inflammation and found statistically significant reductions in most of these markers, and trends toward significant reductions in others.

Inflammation has been implicated in prior studies as a precursor to colon cancer, but another trial would be needed to see how ginger root affects that risk, Zick said.

"We need to apply the same rigor to the sorts of questions about the effect of ginger root that we apply to other clinical trial research," she said. "Interest in this is only going to increase as people look for ways to prevent cancer that are nontoxic, and improve their quality of life in a cost-effective way."

Zick is a naturopathic doctor (N.D.), which is a four-year degree that supplements a traditional medical education with instruction on the proper use of natural therapies, diet, nutrition and other alternative treatments. Her program is one of eight in the country, compared with about 135 traditional medical schools.

The study was funded by a National Cancer Institute grant.

http://www.eurekalert.org/pub_releases/2011-10/w-reu101111.php

Regenerating eyes using cells from hair: Stem Cells awards research into stem cell deficiency

Dr. Ewa Meyer-Blazejewska wins annual Young Investigator Award in Serbia

Durham, NC & Serbia – A young scientist who led research into the use of stem cells from hair follicles to treat the ocular surface disease has been named the winner of the Young Investigator Award by the journal Stem Cells. Dr. Ewa Meyer-Blazejewska will be presented with her award at The Stem Cell Symposium, hosted by the University of Kragujevac in Serbia on October 15, 2011. The $10,000 prize is awarded annually to a young scientist whose paper has been judged to be of worldwide significance by a global jury.

Dr. Meyer-Blazejewska, from the University of Erlangen-Nürnberg, in Germany, won the award for her research into Limbal stem cell deficiency (LSCD), a condition which causes the cornea to become cloudy and develop a rough surface causing pain and leading to blindness.

Currently, treatments focus on harvesting limbal cells from a patient's healthy eye or from cadaveric tissue. In her pioneering research, Dr. Meyer-Blazejewska considered the potential use of stem cells harvested from hair follicles to reconstruct damaged tissue for patients who suffer from LSCD in both eyes.

"Tissue engineering has become a rapidly growing field of research and it is expected to reveal the potential for the application of adult stem cells in clinical practice," said Dr. Meyer-Blazejewska. "I hope the results in our paper will be instrumental for the advancement of research in the areas of stem cell niche, stemness and differentiation, which will aid in the treatment of LSCD as well as other ocular and non-ocular diseases."

Dr. Meyer-Blazejewska's team demonstrated that in the right microenvironment stem cells from hair follicles do have the capacity for cellular differentiation, the process whereby a less specialized cell becomes a more specialized cell type, in this case the cells of the corneal epithelial phenotype.

The team's results showed an 80% rate of differentiation in mouse eyes following a cell transplant highlighting the promising therapeutic potential of these cells.

"Young scientists are vital for advancing stem cell science, providing exciting and essential new insights, and propelling the field of regenerative medicine with new discoveries that impact many kinds of malignant or degenerative disorders," said Dr. Miodrag Stojković, Editor, Stem Cells. "As demonstrated in this year's Young Investigator Award-winning paper, which focuses on the use of stem cells harvested from hair follicles to reconstruct damaged tissue for patients who suffer from LSCD, these promising new scientists are the life-force for stem cell research."

The winning paper is available free here: http://onlinelibrary.wiley.com/doi/10.1002/stem.550/abstract

http://www.eurekalert.org/pub_releases/2011-10/ci-nfo101111.php

New form of superhard carbon observed

Scientists have discovered a new form of carbon, which is capable of withstanding extreme pressure stresses that were previously observed only in diamond

Washington, D.C. - Carbon is the fourth-most-abundant element in the universe and takes on a wide variety of forms, called allotropes, including diamond and graphite. Scientists at Carnegie's Geophysical Laboratory are part of a team that has discovered a new form of carbon, which is capable of withstanding extreme pressure stresses that were previously observed only in diamond. This breakthrough discovery will be published in Physical Review Letters.

The team was led by Stanford's Wendy L. Mao and her graduate student Yu Lin and includes Carnegie's Ho-kwang (Dave) Mao, Li Zhang, Paul Chow, Yuming Xiao, Maria Baldini, and Jinfu Shu. The experiment started with a form of carbon called glassy carbon, which was first synthesized in the 1950s, and was found to combine desirable properties of glasses and ceramics with those of graphite. The team created the new carbon allotrope by compressing glassy carbon to above 400,000 times normal atmospheric pressure.

This new carbon form was capable of withstanding 1.3 million times normal atmospheric pressure in one direction while confined under a pressure of 600,000 times atmospheric levels in other directions. No substance other than diamond has been observed to withstand this type of pressure stress, indicating that the new carbon allotrope must indeed be very strong.

However, unlike diamond and other crystalline forms of carbon, the structure of this new material is not organized in repeating atomic units. It is an amorphous material, meaning that its structure lacks the long-range order of crystals. This amorphous, superhard carbon allotrope would have a potential advantage over diamond if its hardness turns out to be isotropic - that is, having hardness that is equally strong in all directions. In contrast, diamond's hardness is highly dependent upon the direction in which the crystal is oriented.

"These findings open up possibilities for potential applications, including super hard anvils for high-pressure research and could lead to new classes of ultradense and strong materials," said Russell Hemley, director of Carnegie's Geophysical Laboratory.

This research was funded, in part, by the Department of Energy's Office of Basic Energy Sciences Division of Materials Sciences and Engineering, EFree, HPCAT, where some of the experiments were performed, is funded by DOE-BES, DOE-NNSA, NSF, and the W.M. Keck Foundation. APS, where some of the experiments were performed, is supported by DOE-BES.

http://www.eurekalert.org/pub_releases/2011-10/cu-mv101111.php

Most vertebrates - including humans - descended from ancestor with sixth sense

A study finds that the majority of vertebrates descended from a common ancestor that had a well-developed electroreceptive system

ITHACA, N.Y. - People experience the world through five senses but sharks, paddlefishes and certain other aquatic vertebrates have a sixth sense: They can detect weak electrical fields in the water and use this information to detect prey, communicate and orient themselves. A study in the Oct. 11 issue of Nature Communications that caps more than 25 years of work finds that the vast majority of vertebrates – some 30,000 species of land animals (including humans) and a roughly equal number of ray-finned fishes – descended from a common ancestor that had a well-developed electroreceptive system.

This ancestor was probably a predatory marine fish with good eyesight, jaws and teeth and a lateral line system for detecting water movements, visible as a stripe along the flank of most fishes. It lived around 500 million years ago. The vast majority of the approximately 65,000 living vertebrate species are its descendants.

"This study caps questions in developmental and evolutionary biology, popularly called 'evo-devo,' that I've been interested in for 35 years," said Willy Bemis, Cornell professor of ecology and evolutionary biology and a senior author of the paper. Melinda Modrell, a neuroscientist at the University of Cambridge who did the molecular analysis, is the paper's lead author.

Hundreds of millions of years ago, there was a major split in the evolutionary tree of vertebrates. One lineage led to the ray-finned fishes, or actinopterygians, and the other to lobe-finned fishes, or sarcopterygians; the latter gave rise to land vertebrates, Bemis explained. Some land vertebrates, including such salamanders as the Mexican axolotl, have electroreception and, until now, offered the best-studied model for early development of this sensory system. As part of changes related to terrestrial life, the lineage leading to reptiles, birds and mammals lost electrosense as well as the lateral line.

Some ray-finned fishes – including paddlefishes and sturgeons – retained these receptors in the skin of their heads. With as many as 70,000 electroreceptors in its paddle-shaped snout and skin of the head, the North

American paddlefish has the most extensive electrosensory array of any living animal, Bemis said. Until now, it was unclear whether these organs in different groups were evolutionarily and developmentally the same.

Using the Mexican axolotl as a model to represent the evolutionary lineage leading to land animals, and paddlefish as a model for the branch leading to ray-finned fishes, the researchers found that electrosensors develop in precisely the same pattern from the same embryonic tissue in the developing skin, confirming that this is an ancient sensory system.

The researchers also found that the electrosensory organs develop immediately adjacent to the lateral line, providing compelling evidence "that these two sensory systems share a common evolutionary heritage," said Bemis. Researchers can now build a picture of what the common ancestor of these two lineages looked like and better link the sensory worlds of living and fossil animals, Bemis said.

Co-authors include Glenn Northcutt, a world expert on vertebrate neuroanatomy based at the Scripps Institution of Oceanography; and Claire Baker at the University of Cambridge, whose lab contributed molecular analyses.

The study was funded by the Biotechnology and Biological Sciences Research Council in the United Kingdom, National Institutes of Health, National Science Foundation, Whitehall Foundation and Tontogany Creek Fund.

http://www.bbc.co.uk/news/health-15263365

'First ever' fall in global TB

The number of people falling ill with tuberculosis has declined for the first time, according to the World Health Organization.

By Matt McGrath Science reporter, BBC World Service

New figures show the global death toll has also fallen, to its lowest level in a decade, with major headway made in China, Brazil, Kenya and Tanzania. But the WHO warns that a lack of funds threatens progress, especially in relation to multi-drug resistant TB. UN Secretary-General Ban Ki-moon said there was no cause for complacency.

According to the WHO, the figures represent a significant milestone in the battle against a disease that infects one third of the world's population, although only a small proportion become sick as a result.

The number of people who died from tuberculosis peaked at 1.8 million people in 2003; by 2010 this had declined to 1.4 million.

Challenges ahead

Spectacular progress was made in China, said the WHO, where the death rate fell by almost 80% between 1990 and 2010. In Kenya and Tanzania there has also been a substantial decline in the last decade after a peak linked to the HIV epidemic. "This is major progress. But it is no cause for complacency," the UN Secretary-General said in a statement. "Too many millions still develop TB each year, and too many die. I urge serious and sustained support for TB prevention and care, especially for the world's poorest and most vulnerable people."

Money is the key to the current progress, said the WHO, particularly domestic funding in larger countries like Brazil. But the organisation warned that substantial challenges lie ahead, with a projected gap in funding of $1bn for 2012. Another problem is the multi-drug resistant form of the disease. A new rapid test is revolutionising diagnosis but there is a concern that only a small percentage of the people diagnosed with multi-drug resistant TB are receiving treatment.

http://news.discovery.com/human/women-chocolate-strokes-111011.html

Another Reason To Eat More Chocolate

Women who have a couple of small chocolate bars every week may be 20 percent less prone to strokes than those who eat none.

Have a sweet tooth? It could protect you from a stroke, according to a large Swedish study published Tuesday on women chocolate-lovers. "We followed 33,000 women over the course of 10 years, and we found that those who ate most chocolate had a much lower risk - 20 percent lower - of suffering a stroke," said Susanna Larsson, one of three researchers at the Karolinska Institute in Stockholm who carried out the study.

The study, published this week in the Journal of the American College of Cardiology, began in 1997 when the researchers asked 33,372 women in Sweden between the ages of 49 and 83 to fill out a questionnaire on their eating habits. The women were asked to indicate how often they on average had consumed chocolate and 95 other foods during the previous year. Over the following decade, a total of about 1,600 strokes were registered in the group.

After taking into account all the known risk factors for stroke, the researchers discovered that the women who ate the least chocolate - between eight grammes (0.3 ounces) a week and none - "were the ones who suffered most strokes," Larsson told AFP. The women who ate the most chocolate - on average 66 grammes (2.3 ounces) per week - were the least likely to suffer a stroke, she said.

While the women were not asked to distinguish between light and dark chocolate, she points out that in the 1990s, about 90 percent of all chocolate eaten in Sweden was milk chocolate.

"If we had been able to separate light and dark chocolate we think that the connection would have been clearer with dark, since it's cocoa that is the protective substance," Larsson said. She said she and her colleagues had found what they had expected to find. "We weren't really surprised, because our hypothesis was that chocolate would help protect against strokes," she said, pointing out that it had already been shown that "chocolate reduces blood pressure, and high blood pressure is a high risk factor."

Other studies have also shown that antioxidants in chocolate "can reduce oxidation of the bad (low-density lipoprotein) cholesterol, and has been shown to improve insulin resistance," she pointed out. A few smaller studies have previously hinted that eating chocolate could help protect against strokes, but the Karolinska Institute team's decade-long study of such a large number of test subjects is the first to reach a clear connection.

Larsson said she and her colleagues now planned to check if they could find the same connection in men.

"We expect we will see the same connection," she said.

http://www.newscientist.com/article/mg21128333.400-cops-on-the-trail-of-crimes-that-havent-happened.html

Cops on the trail of crimes that haven't happened

Software that the Santa Cruz police department has recently started field-testing looks at where crime might be committed

12 October 2011 by Melissae Fellet, Santa Cruz, California

THE patrol car comes to a stop in a sleepy neighbourhood of small, earth-coloured homes. A woman saunters past pushing a stroller. It is daytime in the artsy beach town of Santa Cruz but I am still a little spooked. Futuristic crime prediction software sent me here with my companion, deputy chief of police Steve Clark. And it's just possible that the tranquility is due to our presence.

Rather than predicting who will commit crimes, like the fictitious "precrime" system from the 2002 film Minority Report, the software that the Santa Cruz police department has recently started field-testing looks at where crime might be committed.

It uses the locations of past incidents to flag up likely future crime scenes. Police can then target their patrols on these areas, in the hope that their presence might stop the predicted crimes from happening at all. At the very least, they will be on the spot to help victims and make arrests.

The program has been built by mathematician George Mohler, at Santa Clara University in California, and his colleagues. They noted that some crimes follow potentially predictable patterns. One burglary, for example, tends to trigger others nearby in the next few days, rather like aftershocks from an earthquake (see graph). In 2010, Mohler's team turned equations used to predict aftershocks into the basis for a program that uses the dates and times of reported crimes to predict when and where the "aftercrimes" will occur.

On average the program predicted the location and time of 25 per cent of actual burglaries that occurred on any particular day in an area of Los Angeles in 2004 and 2005, using just the data on burglaries that had occurred before that day (Journal of the American Statistical Association, DOI: 10.1198/jasa.2011.ap09546).

Now the program is undergoing its first field test in Santa Cruz. Every day. it flags up 10 areas, each 150 metres square, for each of three types of crime - residential burglary, auto burglary and auto theft. Clark updates the program each night with new data and calculates the location probabilities for the next day.

A small town like Santa Cruz may seem like a strange place to test a crime-prediction program, when larger cities like Chicago, Baltimore or Los Angeles may have much more going on. But Clark argues that, while certainly not a hotbed of violent crime, Santa Cruz is a challenging place to patrol, mainly because of an ever-changing population of tourists and students. "It's a very difficult demographic to game plan," Clark says, and that means it is a good place to test whether the algorithm works.

It's too early to tell if it does. But Mohler and his colleagues will conduct a controlled experiment with the Los Angeles police department later this year. Officers will run the prediction algorithms as they do in Santa Cruz, but patrol only half of the locations it flags. They will then compare crime levels in the two groups.

So far, Clark likes the program because it shakes police out of their usual habits. Officers tend to fall into patterns in terms of where they patrol, he says, that are based on intuition. "Something like this either confirms that or breaks us out of it."

Should the program prove effective, it can quickly be applied in other cities, says Jeffrey Brantingham, an anthropologist at the University of California, Los Angeles, and a collaborator on the algorithm.

Chris Calabrese of the American Civil Liberties Union says using algorithms isn't a problem per se, but cautions that some of the information fed into them could be prejudicial. For example, a large number of arrests

in a particular neighbourhood could raise the chances of that area being flagged by the program even if crime levels are no higher than elsewhere. Clark acknowledges this: "You can screw this up by not getting a piece of data right."

As our patrol comes to an end, the car's computer display shows an officer taking a stolen car report - another data point that could drive tomorrow's patrol locations, and perhaps those further into the future.

http://www.eurekalert.org/pub_releases/2011-10/bmj-cmb101111.php

Certain mouth bacteria signal pancreatic cancer

Particular types of mouth bacteria, some of which are found in gum disease, are associated with the development of pancreatic cancer, indicates a small study published online in the journal Gut.

The finding opens up the possibility of curbing the progress of one of the most difficult cancers to treat, by altering the balance of bacteria, say the authors. Pancreatic cancer usually spreads very quickly, and only around one in 20 patients is still alive five years after diagnosis.

The authors base their findings on an initial comparison of the bacteria found in the spit of 10 patients with pancreatic cancer, which had not yet spread, and 10 healthy people, matched for age and sex.

They found significant differences between the bacterial colonies in the two groups, with 31 additional species and 25 fewer species in the spit of the cancer patients. They then checked spit samples from a further 28 pancreatic cancer patients and 28 healthy people to verify their findings.

And they checked tissue samples from 28 patients with chronic inflammation of the pancreas (chronic pancreatitis), which is associated with an increased risk of developing pancreatic cancer. Among six suspicious species, two - Neisseria elongata and Streptococcus mitis - showed up significantly less often in the mouths of the cancer patients than in those of their healthy peers, while levels of another species - Granulicatella adjacens - were significantly higher.

The combination of N Elongata and S mitis accurately differentiated between healthy patients and those with cancer in more than 80% cases. Furthermore, they found similar differences in the prevalence of S mitis and G adjacens between the chronic pancreatitis samples and the spit of healthy people.

It is as yet unclear whether the presence of particular types of bacteria are a cause or effect of pancreatic cancer, say the authors. But their findings back previous research, which has implicated bacteria in the development of pancreatic diseases. They go on to suggest that levels of certain bacteria could be used as a non-invasive and credible screen for pancreatic cancer, with the promise of earlier detection for a disease that has no clear symptoms in its early stages.

http://blogs.scientificamerican.com/cocktail-party-physics/2011/10/12/burn-baby-burn-understanding-the-wick-effect/

Cocktail Party Physics, Physics With a Twist –
Burn, Baby, Burn: Understanding the Wick Effect

Last month a BBC news story made the Internet rounds, with a somewhat sensational headline declaring the "first Irish case of death" by spontaneous human combustion (SHC).

By Jennifer Ouellette | October 12, 2011

The badly burnt body of a 76-year-old man was found in his Galway home on December 22, 2010, lying on his back with his head close to an open fireplace.

There was no trace of accelerant, no evidence of foul play, and "forensic experts" concluded that the fire in the fireplace hadn't caused the blaze. Only the body, the ceiling immediately above it, and the floor underneath it showed any fire damage. What could the West Galway coroner do but reach a verdict of death by the "unexplained" phenomenon of SHC?

Color Jen-Luc Piquant trés skeptical about this ruling, a sentiment she shares with retired professor of pathology Mike Green, quoted in the BBC article as saying, "I go for the practical, the mundane explanation." As Green points out, the combustion is unlikely to be "spontaneous." Something set the body to burning, "but because the body is so badly destroyed, the source [of ignition] can't be found."

According to the BBC article, the coroner had "consulted medical textbooks and carried out [unspecified] other research in an attempt to find an explanation." But apparently he didn't consult the Oracle of Google, whereby he might have learned that the general consensus is that most cases of supposed SHC are due to something called " the wick effect," in which a body starts to burn, but the fat turns liquid, seeps into the clothing, and turns the body into a gruesome kind of human candle; it burns things in the immediate vicinity, but because it's a slow burn, nothing else is affected.

Heck, that coroner could have just watched an episode of Bones called "The Foot in the Foreclosure" (I caught a rerun last night on TNT), in which Booth and Brennan investigate badly burned human remains found

in a foreclosed house that was for sale and conclude the wick effect is to blame. Perhaps it's worth revisiting a post I wrote about SHC back in 2008, inspired by a rerun of the original forensic detective show, C.S.I.

In a subplot of "Face Lift," an elderly woman is found burned almost to ashes in her living room, dressed in what is left of her nightgown, save for her ankles and feet, which remained unburnt - along with the rest of the room. The investigating CSIs assume there was an ignition source of some kind, most likely a cigarette, but Sarah Sidle finds herself suspecting it might be SHC, in part because she can't quite believe that anything else could reduce the body to that level of ash without burning down the entire building.

The human body isn't especially flammable, she reasons, and has high water content. Surely the fire would be doused rather quickly even if the body did manage to catch fire. That's why it takes flames of around 1600 degrees Fahrenheit over two hours or more to cremate human remains. A cigarette tip, in contrast, only burns at around 700 degrees Celsius. With the help of her colleague, Warrick, she performs an experiment with a dead pig in their headquarters parking lot, wrapped in an identical nightgown, with a single lit cigarette placed in the nightgown. The nightgown catches, and begins a slow, steady burn. Hours later, the pig, too, has been reduced to ash, save for its hoof-y extremities.

Sarah bows to the science and abandons her SHC theory, just as Grissom stops by and informs them that the phenomenon is known as the wick effect. (Yes, he'd known all along it wasn't SHC; he just wanted Sarah to do the experiment and see for herself. Science in action!)

The old woman's body fat served as a fuel source for the slow burn from the cigarette, with the nightgown serving as the wick. As the body burned, the melting fat seeped into the clothing, and the long chains of hydrocarbons that make up human fat provided the energy to consume the body - locally, without damaging (much) the surroundings. Eventually the "candle" burns out.

Sarah and Warrick's impromptu experiment mimics a 1998 experiment conducted by Dr. John de Haan of the California Criminalistic Institute for the BBC TV science program QED. De Haan took a dead pig, wrapped it in a blanket and placed it in a furnished room, then set fire to the blanket with nothing but a match and a bit of gasoline. (Pig flesh is the closest to human flesh, so pigs are frequently used in these sorts of experiments.)

It took awhile for the pig body to catch fire - Sarah was correct that the body isn't highly flammable – but once it caught, it burned at a high temperature and low flame, burning for several hours until de Haan extinguished the fire. The flesh and bones in the burned part of the body were reduced to ashes, but there was almost no damage to the rest of the room - except for a melted TV set. De Haan reported that the heat from the burning body collected at the top of the room, making it hot enough to melt the appliance.

There has never been a definitively proven case of SHC, although - as with any such mysterious phenomenon - there are a handful of "true believers" out there, along with the usual skeptics. There have been some odd occurrences which initially seemed to point to SHC. For instance, in 1965, there was a case of an 85-year-old woman who died of a heart attack in her home, landing head-first in the hearth of an open coal fire. Both arms and her left leg were burned to ashes, but her right foot was intact. Internally, there was far less damage, enough for the autopsy to reveal that she had died from a heart attack, not from the burns.

Perhaps the most famous case is that of Helen Conway, an elderly woman, overweight, and an inveterate smoker who burned while sitting in an upholstered chair in her bedroom. The fire chief who responded believed it only took 21 minutes for the body to burn, convinced it was SHC.

The wick effect doesn't work that fast, of course, but others have speculated that the woman's body fat may have given rise to a much more intense fire, akin to a grease fire common to commercial kitchens. Apparently, while one of the firemen was searching for the victim's remains in the smoky bedroom, he stuck his hand in "something greasy" that turned out to be the remains. So who knows? The grease fire effect might be plausible.

De Haan himself encountered an interesting case in 1991, when two hikers near Medford, Oregon, found the still-burning body of a "well-nourished" (i.e., overweight) dead woman face down in the leaves. Cause of death was multiple stab wounds; apparently her killer had set fire to the body using barbecue starter fluid, hoping it would destroy the evidence. The woman's pelvis and spine were reduced to ash, as was most of the torso. Police caught the murderer, who confessed and said he'd set the body on fire 13 hours before the hikers discovered it.

De Haan reasoned that the combination of "an immobile clothed body with a high fat-to-muscle ratio, accelerant, and artificial ignition" created perfect conditions for the wick effect - hence the slow burn.

There's plenty of other documented cases of strangely burnt (or partially burnt) bodies, which is why belief in SHC prevails even today. Heck, Charles Dickens attributed the death of a heavy drinking character in Bleak House to SHC, because at the time, it was believed that heavy drinking could cause self-combustion. It was a moral thing, not founded in solid science, but Dickens drew on two actual cases he'd encountered in a collection of stories by Jonas Dupont published in 1763, under the title De Incendis Corporis Humani Spontaneis. The tales include one of a drunken German who supposedly self-ignited after drinking a great deal of brandy.

Alternative theories can sometimes be a bit, um, far-fetched. A man named John Heymer wrote a book called The Entrancing Flame in 1996, in which he advanced his hypothesis that SHC victims are loners who fall into a strange kind of trance that triggers a chain reaction of "mitochrondrial explosions" by "freeing hydrogen and oxygen within the body." That hypothesis might make sense if hydrogen and oxygen actually existed in gas form inside a mitochrondrial cell, but they don't - and a good thing, too, otherwise the very act of inhaling could cause spontaneous ignition.

Even more far-fetched is the take of a man named Larry Arnold, who thinks that occasionally human cells get hit by a mysterious particle - he calls it a "pyrotron" - that causes a nuclear chain reaction inside the body. We give Arnold points for creativity and coming up with a really cool moniker for his imaginary new particle. A "pyrotron" sounds really cool, much cooler than his alternative hypothesis that too much stress causes folks to burst into flame. Alas, it does not exist.

A slightly more plausible alternative explanation is that clothing in these cases catches fire because of a discharge of a large amount of accumulated static electricity. This is the pet theory of Robin Beach, founder of a scientific detective agency in Brooklyn, New York. (We like the idea of a scientific detective agency, in principle - talk about a great TV series concept!)

One of Beach's early cases involved a young woman working at a factory, plagued by as many as eight small fires every day - caused by the fact that she retained more electric charge than the average person.

Walking on carpets during dry winter weather can cause anyone to build up an electrostatic charge as high as 20,000 volts - usually discharged the minute we touch a doorknob or other metal surface. Beach's take is that certain people retain even higher electrostatic charges and sometimes these could give rise to small fires.

The problem with applying Beach's theory to SHC is that alleged SHC cases claim the victims are burned from within - and no electrical discharge has been shown to cause anything remotely like that effect. Also, while the bodies are consumed, the surroundings are not in claimed SHC cases; a fire caused by electrostatic charge would cause damage to surrounding objects.

So I'll stick with the Wick Effect for the time being as my preferred rational explanation, even though the jury's still out on some of the stranger cases, where the Wick Effect really doesn't apply. I'm willing to bet scientists will figure it out one day. They won't convince the diehard True Believers, but perhaps the answer will supply an interesting plot line for a TV show of the future.

http://www.bbc.co.uk/news/health-15278366

Black Death genetic code 'built'

The genetic code of the germ that caused the Black Death has been reconstructed by scientists for the first time.

By Matt McGrath Science reporter, BBC World Service

The researchers extracted DNA fragments of the ancient bacterium from the teeth of medieval corpses found in London. They say the pathogen is the ancestor of all modern plagues. The research, published in the journal Nature, suggests the 14th Century outbreak was also the first plague pandemic in history.

Humans have rarely encountered an enemy as devastating as the bacterium, Yersinia pestis. Between 1347 and 1351 it sparked the Black Death, an infection carried by fleas that spread rapidly across Europe killing around 50 million people. Now scientists have uncovered some of the genetic secrets of the plague, thanks to DNA fragments drilled from the teeth of victims buried in a graveyard in London's East Smithfield.

Professor Johannes Krause from the University of Tubingen, Germany, was a member of the research team. He said all current strains circulating in the world are directly related to the medieval bacterium.

"It turns out that this ancient Yersinia pestis strain is very close to the common ancestor of all modern strains that can infect humans," he said. "It's the grandmother of all plague that's around today."

Previously researchers had assumed the Black Death was another in a long line of plague outbreaks dating back to ancient Greece and Rome. The Justinian Plague that broke out in the 6th Century was estimated to have

killed 100 million people. But the new research indicates that plagues like the Justinian weren't caused by the same agent as the medieval epidemic.

"It suggests they were either caused by a Yersinia pestis strain that is completely extinct and it didn't leave any descendants which are still around today or it was caused by a different pathogen that we have no information about yet," said Professor Krause.

Tooth power

Globally the infection still kills 2,000 people a year. But it presents much less of a threat now than in the 14th Century.

According to another member of the research team, Dr Hendrik Poinar, a combination of factors enhanced the virulence of the medieval outbreak. "We are looking at many different factors that affected this pandemic, the virulence of the pathogen, co-circulating pathogens, and the climate which we know was beginning to dip - it got very cold very wet very quickly - this constellation resulted in the ultimate Black Death."

Rebuilding the genetic code of the bacterium from DNA fragments was not easy, say the scientists. They removed teeth from skeletons found in an ancient graveyard in London located under what is now the Royal Mint.

Dr Kirsten Bos from McMaster University explained how the process worked. "If you actually crack open an ancient tooth you see this dark black powdery material and that's very likely to be dried up blood and other biological tissues. "So what I did was I opened the tooth and opened the pulp chamber and with a drill bit made one pass through and I took out only about 30 milligrams of material, a very very small amount and that's the material I used to do the DNA work."

From the dental pulp the researchers were able to purify and enrich the pathogen's DNA, and exclude material from human and fungal sources. The researchers believe the techniques they have developed in this work can be used to study the genomes of many other ancient pathogens.

http://medicalxpress.com/news/2011-10-natural-products-dementia.html

Natural products for dementia

Kew pharmacist, Melanie-Jayne Howes, has been collaborating in research and reviews assessing the role of natural products in the treatment and prevention of dementia.

Dementia is an epidemic of unprecedented proportions, causing a crisis in modern medicine, and with cost estimates exceeding a billion euros in Europe alone. However, effective symptomatic treatments or preventive strategies for dementia, including Alzheimer's disease (AD), are limited. The few drugs available to alleviate cognitive symptoms include two acetylcholinesterase inhibitors derived from plants. A range of other drugs is often prescribed incidentally to alleviate behavioural and psychological symptoms of dementia, including agitation.

Clinical trail using lemon balm

A recent double-blind, placebo-controlled, randomised trial sponsored by the Alzheimer's Society, investigated whether Melissa officinalis (lemon balm) oil could treat agitation in AD.

Kew scientists collaborated by performing gas chromatography-mass spectrometry analyses to investigate the authenticity and quality of different M. officinalis oils, and to monitor the chemical stability of the chosen trial formulation throughout the 12-week trial period.

Although there was no evidence that M. officinalis oil was superior to placebo, a positive trend of improved quality of life was reported, but compliance was less than in previous trials (Burns et al., 2011).

Analysis of Withania

Kew scientists have also worked with colleagues from Newcastle University to investigate Withania somnifera root extract for pharmacological activities relevant to dementia. Using liquid chromatography-mass spectrometry, numerous withanolide derivatives were detected in this extract which were neuroprotective against hydrogen peroxide- and β-amyloid-induced toxicity in vitro (Kumar et al., 2010).

Reviews on natural products for dementia

The potential for natural products to provide drug leads for AD has recently been reviewed by Melanie-Jayne Howes (Kew) and colleagues at the University of Hawaii. The review covers a diverse array of compounds, organised according to their mechanism of action, with the focus primarily on the major hypotheses for drug targets. More than 180 compounds, including those currently in clinical use for symptomatic treatment in AD (e.g. galantamine, originally from Galanthus sp.) are discussed, in addition to the status of natural products in drug development programs (Williams et al., 2011).

Melanie-Jayne Howes and Elaine Perry (Newcastle University) have also reviewed the role of natural products in the treatment and prevention of dementia, with an emphasis on clinical trial evidence, and from the perspective of available epidemiological data (Howes and Perry, 2011; Perry and Howes, 2011).

The investigation of plants with traditional uses that might alleviate symptoms in AD has also been recently reviewed by Kew scientists. The authors discussed those plants with relevant mechanistic and clinical effects that could be pursued as treatment strategies for AD (Howes and Houghton, 2011).

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http://www.eurekalert.org/pub_releases/2011-10/smh-trf101311.php

Toronto researchers find first physical evidence bilingualism delays onset of Alzheimer's symptoms

Researchers at St. Michael's Hospital have found that people who speak more than one language have twice as much brain damage as unilingual people before they exhibit symptoms of Alzheimer's disease

TORONTO, Ont. - Researchers at St. Michael's Hospital have found that people who speak more than one language have twice as much brain damage as unilingual people before they exhibit symptoms of Alzheimer's disease. It's the first physical evidence that bilingualism delays the onset of the disease. "This is unheard of – no medicine comes close to delaying the onset of symptoms and now we have the evidence to prove this at the neuroanatomical level," said Dr. Tom Schweizer, a neuroscientist who headed the research.

Dr. Schweizer's team studied CT scans of patients who had been diagnosed with probable Alzheimer's disease and who had similar levels of education and cognitive skills, such as attention, memory, planning and organization. Half were fluently bilingual; the other half unilingual.

Despite the fact that both groups performed equivalently on all measures of cognitive performance, the scans of the bilingual patients showed twice as much atrophy in areas of the brain known to be affected by Alzheimer's. The findings have been published on-line in the journal Cortex: http://www.cortexjournal.net/article/S0010-9452(11)00104-3/abstract.

Dr. Schweizer said that bilingual people are constantly using their brain and keeping it active, which may contribute to overall brain health. That's why many physicians encourage older people to do crossword puzzles or Sudoku.

Dr. Schweizer said that because bilingual people constantly switch from one language to another or suppress one language to speak in the other, their brains may be better prepared to compensate through enhanced brain networks or pathways when Alzheimer's sets in.

Previous observational studies have found that bilingualism delays the onset of Alzheimer's symptoms by up to five years, but this is the first to find physical proof through CT scans.

Dr. Schweizer said the results are especially important in Canada, which is officially bilingual and has large numbers of immigrants for whom French and English are at least second languages. His study was conducted in Toronto, where the second language of many study participants was French, English or Chinese.

Dr. Schweizer noted that bilingualism does not prevent Alzheimer's. Once Alzheimer's symptoms appear in bilingual people, it is not clear whether the disease progresses at an accelerated rate.

He said the next steps would be to repeat the study in a larger sample of patients followed over time using more sophisticated MRIs. He said it wasn't clear from this study whether a second language had to be learned early in life to provide maximum benefit.

http://www.bbc.co.uk/news/science-environment-15257259

Ancient 'paint factory' unearthed

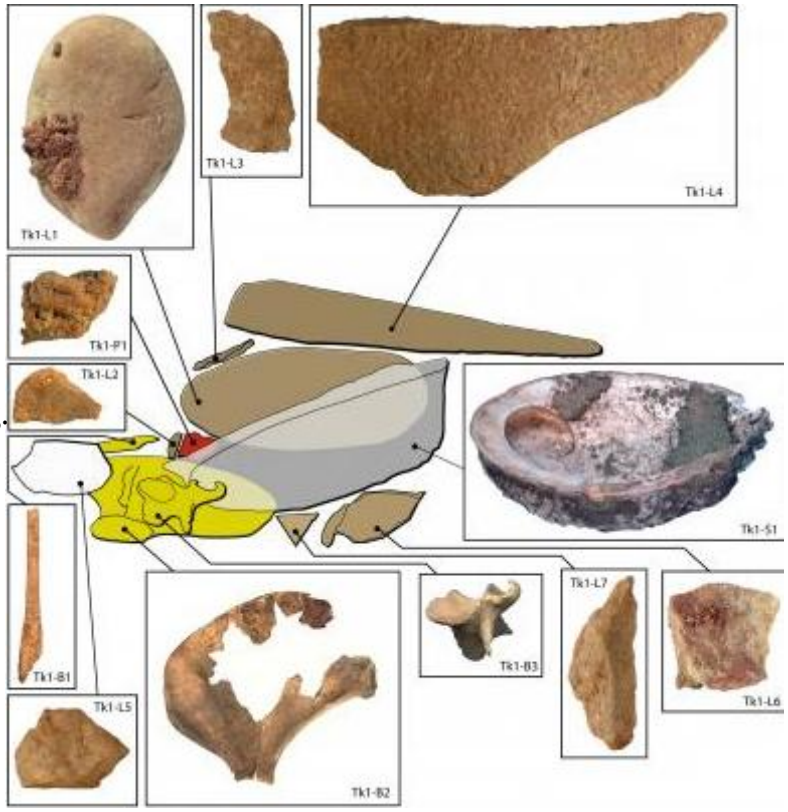
The kits used by humans 100,000 years ago to make paint have been found at the famous archaeological site of Blombos Cave in South Africa.

By Jonathan Amos Science correspondent, BBC News

The hoard includes red and yellow pigments, shell containers, and the grinding cobbles and bone spatulas to work up a paste - everything an ancient artist might need in their workshop. This extraordinary discovery is reported in the journal Science. It is proof, say researchers, of our early ancestors' complexity of thought.

"This is significant because it is pushing back the boundaries of our understanding of when Homo sapiens - people like us - first became modern," said Prof Christopher Henshilwood from the University of the Witwatersrand, Johannesburg. "These finds indicate that humans were certainly thinking in a modern way, in a way that is cognitively advanced, at least 100,000 years ago," he told BBC News.

Blombos Cave on the southern Cape Coast, 300km east of Cape Town, has been giving up remarkable archaeological treasures for more than 20 years. Scientists have been scraping down through its sandy sediments to find all manner of artefacts left by the Middle Stone Age people who occupied the limestone cavity.



An ochre-rich mixture, possibly used for decoration, painting and skin protection 100,000 years ago, and stored in two abalone shells, was discovered at Blombos Cave in Cape Town, South Africa. Prof. **Christopher Henshilwood, University of the Witwatersrand, Johannesburg**

In 2002, researchers described 70,000-year-old blocks of ochre. This soft stone contains iron oxides that can be used as a pigment, or colouring agent. But apart from some engravings on the blocks, there was little hard evidence to determine the precise purpose of the Blombos ochre. The new items seem to have had a much more obvious use - as the equipment to process paints.

The finds include abalone shells with ochre residues inside. There are tools made of quartzite that were presumably employed to hammer and grind ochre into a powder in the shells. And there is evidence that charcoal and oil from seal bones were being added to the mix. It seems bone implements were also being used to turn and lift the paint pastes. All these artefacts were found together, almost as if someone had put them down intending to retrieve them at a later time, but then never coming back. Sands blown in through the cave entrance subsequently buried the kits and locked them away until they were excavated in 2008.

In the intervening three years, the finds have been subjected to a series of tests and assessments.

Ochre can have non-artistic applications such as an additive in glues, but co-researcher Francesco d'Errico from the University of Bordeaux says the analysis of the residues in the shells points strongly to the production of paints. "The absence of a resin or a wax suggests the ochre was not used to make a glue or a mastic. We think it may have been used to make a paint or a design," he explained.

Prof Henshilwood added: "It's possible the paint was used to paint bodies, human skin. It could have been used to paint designs on leather or other objects. It could have been used for paintings on walls, although the surfaces of southern African caves are not ideal for the long-term preservation of rock art."

The mere fact though that paints are being manufactured in a systematic way is indicative of a level of advanced thinking. It would have required a high degree of planning to bring together all of the elements of the kits; and if art really was the purpose, it suggests the cave dwellers of Blombos were capable of symbolic thought - the ability to let one thing represent another in the mind. This ability has been posited as the giant leap in human evolution that set our species apart from the rest of the animal world. Understanding when and where this behaviour first emerged is a key quest for scientists studying human origins. Until now, arguably the

earliest examples of conceptual thinking were the pieces of shell jewellery discovered at Skhul Cave in Israel and from Oued Djebbana in Algeria. These artefacts have been dated to 90,000-100,000 years ago. The Blombos paint kits now sit alongside these other finds.

Prof Chris Stringer from London's Natural History Museum commented: "Twenty or 30 years ago, there was a view that Europe was really the place where all the big action was taking place - wonderful painted caves 30,000-35,000 years ago, and people decorating their bodies. "We now know that this behaviour goes back far further in Africa; it goes back to 100,000 years, perhaps even more than 100,000 years. "People were starting to express social identity in completely new ways. And there is a view that this behaviour is linked with complex language. So, it may indicate these people were communicating in a fully modern way," he told BBC News.

http://www.eurekalert.org/pub_releases/2011-10/uond-rea101311.php

Researchers engineer a new way to inhibit allergic reactions without side effects

Researchers from the University of Notre Dame have announced a breakthrough approach to allergy treatment that inhibits food allergies, drug allergies, and asthmatic reactions without suppressing a sufferer's entire immunological system.

The therapy centers on a special molecule the researchers designed, a heterobivalent ligand (HBL), which when introduced into a person's bloodstream can, in essence, out-compete allergens like egg or peanut proteins in their race to attach to mast cells, a type of white blood cell that is the source of type-I hypersensitivity (that is, allergy). "Unlike most current treatments, this approach prevents allergic reactions from occurring in the first place" says Basar Bilgicer, assistant professor of Chemical and Biomolecular Engineering and Chemistry and Biochemistry and principal investigator in Notre Dame's Advanced Diagnostics & Therapeutics initiative.

Michael Handlogten, lead scientist on the paper and a graduate student in Dr. Bilgicer's group, explained that among the various chemical functionalities he analyzed to be used as the scaffold HBL synthesis, ethylene glycol, an FDA-approved molecule, proved to be the most promising.

Mast cells are part the human body's defense against parasites (such as tapeworms), and when working normally they are attracted to, attach to, and annihilate these pathogens. But type-I hypersensitivity occurs when the cells react to non-threatening substances. More common allergies are due to ambient stimulants, and an allergic response may range from a mild itch to life-threatening anaphylactic shock.

Tanyel Kiziltepe, a research professor in Advanced Diagnostics & Therapeutics, adds that "anaphylaxis can be caused by certain food allergens, insect stings, antibiotics, and some medicines, and we believe HBL has a very high potential to be developed as a preventative medication".

While many medicines treat allergies by weakening a person's entire immune system, this approach only disrupts the process whereby white blood cells bond with allergens in the first place. "It also does not leave patients open to an increased risk for infections or the development of cancers," explains Bilgicer. "HBLs may be most useful in situations where it's not possible to speak to or gauge someone's sensitivity."

"For example, in an emergency, on a battlefield, or in a remote location, doctors may not be able to ask a patient about an allergy before administering penicillin. An engineered HBL could be given along with the medicine and perhaps prevent a deadly reaction from occurring."

In a normal allergic reaction, allergens bind to a white blood cell, or "mast" cell, and cause the release of inflammatory molecules. Researchers at Notre Dame have shown how non-allergenic molecules, known as heterobivalent ligands, can be designed to attach to mast cells first, preventing the allergic reaction in the first place.

http://www.eurekalert.org/pub_releases/2011-10/nu-e-a101311.php

Emulating - and surpassing - nature

Design rules will enable scientists to use DNA to build nanomaterials with desired properties

Nature is a master builder. Using a bottom-up approach, nature takes tiny atoms and, through chemical bonding, makes crystalline materials, like diamonds, silicon and even table salt. In all of them, the properties of the crystals depend upon the type and arrangement of atoms within the crystalline lattice.

Now, a team of Northwestern University scientists has learned how to top nature by building crystalline materials from nanoparticles and DNA, the same material that defines the genetic code for all living organisms.

Using nanoparticles as "atoms" and DNA as "bonds," the scientists have learned how to create crystals with the particles arranged in the same types of atomic lattice configurations as some found in nature, but they also have built completely new structures that have no naturally occurring mineral counterpart.

The basic design rules the Northwestern scientists have established for this approach to nanoparticle assembly promise the possibility of creating a variety of new materials that could be useful in catalysis, electronics, optics, biomedicine and energy generation, storage and conversion technologies.

The new method and design rules for making crystalline materials from nanostructures and DNA will be published Oct. 14 by the journal Science.

"We are building a new periodic table of sorts," said Professor Chad A. Mirkin, who led the research. "Using these new design rules and nanoparticles as 'artificial atoms,' we have developed modes of controlled crystallization that are, in many respects, more powerful than the way nature and chemists make crystalline materials from atoms. By controlling the size, shape, type and location of nanoparticles within a given lattice, we can make completely new materials and arrangements of particles, not just what nature dictates."

Mirkin is the George B. Rathmann Professor of Chemistry in the Weinberg College of Arts and Sciences and professor of medicine, chemical and biological engineering, biomedical engineering and materials science and engineering and director of Northwestern's International Institute for Nanotechnology (IIN).

"Once we have a certain type of lattice," Mirkin said, "the particles can be moved closer together or farther apart by changing the length of the interconnecting DNA, thereby providing near-infinite tunability."

"This work resulted from an interdisciplinary collaboration that coupled synthetic chemistry with theoretical model building," said coauthor George C. Schatz, a world-renowned theoretician and the Charles E. and Emma H. Morrison Professor of Chemistry at Northwestern. "It was the back and forth between synthesis and theory that was crucial to the development of the design rules. Collaboration is a special aspect of research at Northwestern, and it worked very effectively for this project."

In the study, the researchers start with two solutions of nanoparticles coated with single-stranded DNA. They then add DNA strands that bind to these DNA-functionalized particles, which then present a large number of DNA "sticky ends" at a controlled distance from the particle surface; these sticky ends then bind to the sticky ends of adjacent particles, forming a macroscopic arrangement of nanoparticles.

Different crystal structures are achieved by using different combinations of nanoparticles (with varying sizes) and DNA linker strands (with controllable lengths). After a process of mixing and heating, the assembled particles transition from an initially disordered state to one where every particle is precisely located according to a crystal lattice structure. The process is analogous to how ordered atomic crystals are formed.

The researchers report six design rules that can be used to predict the relative stability of different structures for a given set of nanoparticle sizes and DNA lengths. In the paper, they use these rules to prepare 41 different crystal structures with nine distinct crystal symmetries. However, the design rules outline a strategy to independently adjust each of the relevant crystallographic parameters, including particle size (varied from 5 to 60 nanometers), crystal symmetry and lattice parameters (which can range from 20 to 150 nanometers). This means that these 41 crystals are just a small example of the near infinite number of lattices that could be created using different nanoparticles and DNA strands.

Mirkin and his team used gold nanoparticles in their work but note that their method also can be applied to nanoparticles of other chemical compositions. Both the type of nanoparticle assembled and the symmetry of the assembled structure contribute to the properties of a lattice, making this method an ideal means to create materials with predictable and controllable physical properties.

Mirkin believes that, one day soon, software will be created that allows scientists to pick the particle and DNA pairs required to make almost any structure on demand.

The Air Force Office of Scientific Research, the U.S. Department of Energy Office of Basic Energy Sciences and the National Science Foundation supported the research. The Science paper is titled "Nanoparticle Superlattice Engineering with DNA." In addition to Mirkin and Schatz, other authors are Robert J. Macfarlane, Matthew R. Jones and Nadine Harris, all from Northwestern, and Byeongdu Lee, from Argonne National Laboratory. A video interview of Chad Mirkin discussing the research is available upon request. Contact Lisa-Joy Zgorski at the National Science Foundation, 703-292-8311 or lisajoy@nsf.gov.

http://medicalxpress.com/news/2011-10-surgery-epilepsy-patients-seizure-free-years.html

Surgery for epilepsy leads to around half of patients being seizure-free after 10 years

Around half of patients remain seizure free 10 years after undergoing surgery for epilepsy.

However, there is scope for further improvement in presurgical assessment and surgical treatment of people with chronic epilepsy. The findings are reported in an Article published in this week's surgery special issue of The Lancet, written by Jane de Tisi, Dr Gail S Bel, and Professor John Duncan, National Hospital for Neurosurgery, and Imperial College London, and colleagues.

In this new work, the authors identified long-term outcome of epilepsy surgery in adults by establishing patterns of seizure remission and relapse after surgery. Long-term outcome of surgery for epilepsy in 615 adults was analysed (497 anterior temporal resections, 40 temporal lesionectomies, 40 extratemporal lesionectomies,

20 extratemporal resections, 11 hemispherectomies, and seven palliative procedures [corpus callosotomy, subpial transection]), with a median annual follow-up of 8 years.

The authors estimated that 52% of patients remained seizure free (apart from simple partial seizures [SPS]) at 5 years after surgery, and 47% at 10 years. Patients who had extratemporal resections were twice as likely to have seizure recurrence than were those who had anterior temporal resections. For those having temporal lesionectomies, no difference from anterior temporal lobe resection was recorded. Those with SPS in the first 2 years after temporal lobe surgery had a two-and-a-half times greater chance of subsequent seizures with impaired awareness than did those with no SPS. Relapse was less likely the longer a person was seizure free and, conversely, remission was less likely the longer seizures continued. In 18 (19%) of 93 people, late remission was associated with introduction of a previously untried antiepileptic drug. 104 of 365 (28%) seizure-free individuals had discontinued drugs at latest follow-up.

Drilling deeper into the data, the authors reveal that 40% of patients have long-term complete seizure freedom after epilepsy surgery, with a further 11% having only SPS. Although 82% had at least 1 year with no seizures or only SPS, this does not indicate cure. No patient had substantial worsening of epilepsy. The authors say that clinical practice should change to sooner refer appropriate patients for possible surgery. At the moment, best practice is to consider surgery for focal epilepsy only if drugs have not been effective for controlling seizures for over 2-3 years. Selection process and surgical methods need improvement to increase success rates and to more accurately identify those who will not benefit from surgery. Some previous studies could, say the authors, have implied overoptimistic expectations.

The fact that SPS continuing in the first 2 years after surgery increases the chances of seizures recurring compared with those entirely seizure free is a new finding has not been previously reported. Such important information might affect the decision to taper or continue antiepileptic drugs. Interestingly, most people who are seizure free after surgery choose to remain on an antiepileptic drug. No prospective randomised trial is available of cessation or continuation of antiepileptic drugs after surgery, and consideration of either pregnancy or obtaining a driving licence seem to be major factors in an individual's decision making. Elaborating, the authors explain that taking antiepileptic drugs is not a bar to driving. The key is to be free of seizures for 12 months, and to remain seizure free. Taking a single antiepileptic drug through pregnancy carries a 2-3% risk of major congenital malformation, so if a female is seizure free following surgery and is contemplating pregnancy, she may well consider seriously stopping medication prior to conception.

The authors conclude: "For seizure outcome, surgery is successful for many individuals in whom antiepileptic drugs have not been effective, but further improvements need to be made to presurgical assessment to further increase rates of success."

In a linked Comment, Dr Ahmed-Ramadan Sadek, and Professor William Peter Gray, Wessex Neurological Centre, Southampton University Hospitals NHS Trust and University of Southampton, UK, say the new data will be useful for counseling epilepsy patients and guiding their physicians. They conclude: "This study validates the long-term effectiveness of epilepsy surgery showing that over 50% of all patients are rendered continuously long-term seizure free; it also raises important questions and challenges. Are the benefits of seizure freedom apportioned equally to the continuous and later remission groups? Can selection and reselection strategies be further improved to optimise long-term seizure control? Finally, the median duration of epilepsy before surgery in this study was 20 years. In view of the long-term results of surgery shown, clinical practice needs to change with the early referral of appropriate patients."

More information: Paper online: http://www.thelanc … 0140-6736(11)60890-8/abstract Provided by Lancet

http://www.sciencenews.org/view/generic/id/335168/title/Columbus_blamed_for_Little_Ice_Age

Columbus blamed for Little Ice Age

Depopulation of Americas may have cooled climate

By Devin Powell

MINNEAPOLIS — By sailing to the New World, Christopher Columbus and the other explorers who followed may have set off a chain of events that cooled Europe's climate for centuries.

The European conquest of the Americas decimated the people living there, leaving large areas of cleared land untended. Trees that filled in this territory pulled billions of tons of carbon dioxide from the atmosphere, diminishing the heat-trapping capacity of the atmosphere and cooling climate, says Richard Nevle, a geochemist at Stanford University.

"We have a massive reforestation event that's sequestering carbon … coincident with the European arrival," says Nevle, who described the consequences of this change October 11 at the Geological Society of America annual meeting.

Tying together many different lines of evidence, Nevle estimated how much carbon all those new trees would have consumed. He says it was enough to account for most or all of the sudden drop in atmospheric carbon dioxide recorded in Antarctic ice during the 16th and 17th centuries. This depletion of a key greenhouse gas, in turn, may have kicked off Europe's so-called Little Ice Age, centuries of cooler temperatures that followed the Middle Ages.

By the end of the 15th century, between 40 million and 80 million people are thought to have been living in the Americas. Many of them burned trees to make room for crops, leaving behind charcoal deposits that have been found in the soils of Mexico, Nicaragua and other countries.

About 500 years ago, this charcoal accumulation plummeted as the people themselves disappeared. Smallpox, diphtheria and other diseases from Europe ultimately wiped out as much as 90 percent of the indigenous population. Trees returned, reforesting an area at least the size of California, Nevle estimated. This new growth could have soaked up between 2 billion and 17 billion tons of carbon dioxide from the air.

Ice cores from Antarctica contain air bubbles that show a drop in carbon dioxide around this time. These bubbles suggest that levels of the greenhouse gas decreased by 6 to 10 parts per million between 1525 and the early 1600s.

"There's nothing else happening in the rest of the world at this time, in terms of human land use, that could explain this rapid carbon uptake," says Jed Kaplan, an earth systems scientist at the Federal Polytechnic School of Lausanne in Switzerland.

Natural processes may have also played a role in cooling off Europe: a decrease in solar activity, an increase in volcanic activity or colder oceans capable of absorbing more carbon dioxide. These phenomena better explain regional climate patterns during the Little Ice Age, says Michael Mann, a climate researcher at Pennsylvania State University in State College.

But reforestation fits with another clue hidden in Antarctic ice, says Nevle. As the population declined in the Americas, carbon dioxide in the atmosphere got heavier. Increasingly, molecules of the gas tended to be made of carbon-13, a naturally occurring isotope with an extra neutron. That could be because tree leaves prefer to take in gas made of carbon-12, leaving the heavier version in the air.

Kaplan points out that there's a lot of uncertainty in such isotope measurements, so this evidence isn't conclusive. But he agrees that the New World pandemics were a major event that can't be ignored — a tragedy that highlighted mankind's ability to influence the climate long before the industrial revolution.

http://arstechnica.com/science/news/2011/10/oxygen-kept-out-of-atmosphere-until-volcanoes-rose-above-the-ocean-surface.ars

Oxygen kept out of atmosphere until volcanoes rose above the ocean surface

The early Earth would be inhospitable to any time-traveling animal for a number of reasons, not least of which would be the harsh, alien atmosphere.

By Scott K. Johnson

Without any oxygen, respiration is out of the question, and the subsequent lack of an ozone layer would allow dangerously high levels of UV radiation from the Sun to reach the surface. Fortunately for us, oxygen began to build up in the atmosphere about 2.5 billion years ago, during what is referred to as the Great Oxygenation Event. We've long understood this to be tied to the onset of photosynthesis performed by cyanobacteria ("blue-green algae" in the vernacular), a process that liberates oxygen. But photosynthesis doesn't tell the whole story—there seem to be other factors in play.

Geochemists have long puzzled over the possibilities. Knowing that photosynthesis predated the Great Oxygenation Event by some amount, research has focused on potential buffers that could have locked up oxygen and prevented it from accumulating in the atmosphere. Several mineral reactions have been identified as plausible culprits, but measurements of sulfur isotopes have provided some of the most tantalizing evidence.

Sulfur isotopes record what may be a major shift in the ratio of SO_2 to H_2S in volcanic gas around the time of the Great Oxygenation Event. This is not an effect of the presence of atmospheric oxygen—the chemistry suggests that it's a change in the volcanic emissions themselves. This is another head-scratcher, because there's no evidence for a change in the lava that erupted from these volcanoes. In other words, the composition of the magma didn't change, but the gas that was released did.

As it happens, another noteworthy event in Earth history took place around the same time. A large portion of continental crust formed rapidly while global ocean volume was decreasing. As a result, the area of crust exposed to the atmosphere increased quite a bit over a (geologically) short period of time. A paper published

this week in Nature bolsters an argument that was proposed several years ago—that the sulfur emissions changed simply because volcanoes were increasingly exposed to the atmosphere.

The new work uses chemical models to show that the ratio of SO2 to H2S in volcanic gas depends primarily on the pressure of the fluid above the volcano. A volcano beneath the surface of the ocean will produce much more H2S than an identical volcano on land. This means that, as more volcanoes found themselves up on dry land, the emission of H2S dropped significantly.

This is important because H2S readily reacts with oxygen, scavenging it from the atmosphere. With much lower concentrations of H2S in the atmosphere, the oxygen produced by photosynthesis could finally begin to accumulate.

This hypothesis is still in the exploration stage, and there's room for debate. The timeline of continental crust exposure is too vague for the correlation to be a home run. The idea does offer a tempting explanation for several major pieces of evidence, though, so it will continue to attract the attention of the research community.
Nature, 2011. DOI: 10.1038/nature10460 (About DOIs).

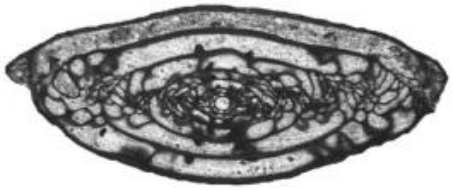
http://www.sciencenews.org/view/generic/id/335195/title/Oxygen_blew_up_ancient_amoebas

Oxygen blew up ancient amoebas

Single-celled creatures' size spiked as oxygen levels rose

By Devin Powell

MINNEAPOLIS — Giant armor-clad amoebas that once swam Paleozoic seas may have owed their monstrous size to something in the water: oxygen.



A new look at the fossil record suggests that a spike in oxygen levels supersized many species of these fusulinids, a now-extinct type of single-celled microbe called foraminifera. About 300 million years ago, when the atmosphere contained almost enough oxygen to spontaneously combust, some of these critters grew to be 10 centimeters long. They would have been visible to the naked eye.

Got oxygen?Fossil shells of Paleozoic amoebas, like the one shown here, grew to giant proportions as oxygen levels rose, suggesting that the gas fueled the creatures' evolution. **John Groves**

"Their average volume increased by at least factor of 100, maybe up to a factor of 1,000," says Jonathan Payne, a paleobiologist at Stanford University who presented his team's research October 12 at the Geological Society of America annual meeting.

Searching for evidence of oxygen's influence, Payne and his colleagues recruited undergraduates and high school students to compare the intricate, multilayered shells left behind by more than 1,800 foraminifera that lived between 250 million and 325 million years ago. At first, the biggest species grew increasingly larger as atmospheric oxygen rose. After oxygen peaked at levels 66 percent higher than today and began to fall, the size of the creatures also declined.

The shapes of new, giant species fit with the idea that oxygen controlled their growth. Instead of ballooning like beach balls, the amoebas elongated. They grew no wider than about 2 millimeters — limited by how far oxygen could penetrate into cells after being absorbed, according to Payne's calculations.

Some scientists believe that oxygen also boosted the size of insects (SN: 10/21/06, p. 270) and animals during the Paleozoic era. Fossils have revealed species of millipedes longer than a meter, amphibians longer than 2 meters and dragonflies with wingspans of more than 70 centimeters.

But tracing the evolution of size in larger organisms — and linking it to oxygen — has proven difficult because fewer of these species evolved into giants, says Phil Novack-Gottshall, a paleobiologist at Benedictine University in Lisle, Ill.

"You might have one or two species of giant centipedes from this time," he says. "The advantage of foraminifera is that you have many giant species to work with."

Payne also sees signs of oxygen influencing the size of modern amoebas. Among species living in waters off the coast of Australia, those that evolved to live close to the surface are bigger than those living at a depth of 500 meters, where oxygen concentrations are halved. "The trends we see in these modern species are quite similar to patterns we see in the fossil species," says Payne.

These microscopic modern species are pretty puny compared to their ancestors. But some day, if a pulse of oxygen revs up their evolution, they might be giants once again.

http://www.sciencenews.org/view/generic/id/335119/title/Fossil_moth_reveals_colorful_hue

Fossil moth reveals colorful hue

Paleontologists deduce how ridges on the creature's wings reflected light

By Devin Powell

MINNEAPOLIS — Ancient moths have for the first time shown their true colors to modern humans.

By piecing together clues from a fossil unearthed in a former German quarry, a team of scientists has figured out how light bounced off a moth that lived 47 million years ago. Today, the insect's remains are bluish. But before time alchemized its wings, the creature was mostly yellow-green, with only a fringe of blue.

"The original colors aren't preserved, but they can be reconstructed," said Yale paleontologist Maria McNamara, who presented the new findings October 9 at the Geological Society of America annual meeting.

Like beetles and dragonflies, modern moths and butterflies owe their brilliant hues not only to chemical pigments but also to the shape of tiny structures on their wing scales. Parallel ridges redirect incoming waves of light, which bounce around and interfere with each other like ocean waves crashing together. Depending on how the peaks and troughs of the light line up, this interaction boosts some colors at the expense of others. Ridges with different shapes, sizes and spacings can give rise to a variety of colors, including iridescent colors that seem to shift and shimmer.

McNamara's fossilized moth relied on structure to produce color, which became obvious when she cleaned off its glycerin preservative and it changed color. Using a microscope, the scientists found that the shape of the moth's ridges had survived the transformation from chitin to fossil without shrinking or swelling. Further analysis showed that, when the moth was alive, these chitin structures would have favored a wavelength of about 565 nanometers, turning the moth's wings yellow-green. Small holes in the layers of these ridges suppressed iridescence, giving the creature a hue that looked the same from all directions.

This consistent color probably protected the moth. Seen at rest against a leaf, the creature would have been well concealed from any point of view. But when feeding on a flower, it stuck out — just like the insect's most likely descendants, Pollanisus moths, which use color to warn predators that the toxic chemicals in their bodies are a dangerous snack.

"This is bloody brilliant work," says Phil Manning, a paleontologist at the University of Manchester in England who studies pigments. "This group is the first to work out structural color in insect fossils." McNamara's team had already revealed the color of beetles dug up from the same German quarry, as described online September 28 in Proceedings of the Royal Society B. Flies and dragonflies are next, as the scientists continue to explore the evolutionary history that gave today's insects such a brilliant palette to play with.

http://www.washingtonpost.com/national/health-science/vitamin-e-boosts-prostate-cancer-risk-study-finds/2011/10/07/gIQABON9cL_story.html

Vitamin E boosts prostate cancer risk, study finds

Large daily doses of Vitamin E actually increase the risk for prostate cancer among middle-aged men, according to a large federal study released Tuesday.

By Rob Stein, Published: October 12

Large daily doses of Vitamin E, long touted as a virtual wonder drug that could protect against cancer, heart disease, dementia and other ailments, actually increase the risk for prostate cancer among middle-aged men, according to a large federal study released Tuesday.

The analysis of data from more than 35,000 healthy men concluded that those who took Vitamin E every day at the large dose levels commonly sold in drug, grocery and health food stores were 17 percent more likely to develop prostate cancer.

"You really have to question now how taking Vitamin E will help someone," said Eric A. Klein, a Cleveland Clinic prostate cancer expert who led what had been hoped to be a cancer-prevention study. "Not only is it unlikely to help them, it apparently could hurt them."

The findings, published in the Journal of the American Medical Association, are the latest in a series of carefully designed experiments that have found that for most healthy people who eat a balanced diet, vitamins and other dietary supplements are unnecessary and, at high doses, possibly sometimes dangerous.

"Just because it's 'only a vitamin' or 'it's natural,' we assume it must be safe. But over and over again, we see that's not necessarily the case," said Howard Parnes of the National Cancer Institute, which funded the prostate cancer study. "Not only isn't it the fountain of youth that some people said, it can be harmful."

The National Institutes of Health launched the $122 million project to study prostate cancer in 2001 after laboratory studies and some clinical data indicated that the anti-oxidant Vitamin E and selenium might protect against prostate cancer, the second most common cancer and cancer killer in men.

The study followed more than 35,533 men 50 or older at 427 sites in the United States, Canada and Puerto Rico. The men were divided into four groups who took daily doses of 400 international units of Vitamin E and 200 micrograms of selenium; Vitamin E and a placebo that looked like selenium; selenium and a placebo that looked like Vitamin E; or two placebos. The recommended daily intake of Vitamin E is about 22 international units. An independent panel monitoring the experiment halted the study in 2008 when it became clear there was no benefit and indications emerged that the high-dose supplements might be increasing the risk for prostate cancer and diabetes.

The new analysis, based on additional data collected from the same men since 2008, found that the diabetes risk disappeared but that the prostate cancer risk reached statistical significance. There were 620 cases of prostate cancer among the men taking Vitamin E alone, compared with 555 among those taking selenium and Vitamin E, 575 among those taking selenium, and 529 among men taking a placebo. Based on the findings, the researchers calculated that for every 1,000 men taking Vitamin E alone, about 76 developed prostate cancer compared with 65 taking the placebo.

"The public and consumer tend to believe vitamins are innocuous substances and you can take them with impunity," Klein said. "Clearly that is not the case."

The new analysis came less than a week after an influential federal panel concluded that the risks of routine PSA screening for prostate cancer outweighed the benefits, touching off an intense debate over how best to protect men from the disease.

Researchers are unclear how Vitamin E would increase the risk for prostate cancer but are exploring several theories, in part by analyzing blood and other samples collected from the study participants.

"There is speculation that maybe at very high doses antioxidants become pro-oxidants," the NCI's Parnes said. "Another idea is that when you have very high doses of one nutrient, there can be negative effects on others. Everything is a balance in biology. But we really don't know."

About half of U.S. adults regularly take some kind of supplement, according to the latest federal data. Overall, Americans spend more than $28 billion a year on vitamins, minerals and other substances that companies claim can reduce the risk for cancer, heart attack, stroke, diabetes and Alzheimer's disease, among others, including about $340 million alone in 2010 for Vitamin E, according to the Nutrition Business Journal. One supplement, beta carotene, might help slow a common form of blindness known as macular degeneration, but even it was found to increase the risk for lung cancer among smokers.

Several other studies are underway to examine possible benefits of other vitamins, including one testing Vitamin D and fish oil to reduce the risk for heart disease and cancer.

Some scientists and the dietary supplement industry questioned the Vitamin E findings, saying the new study and previous ones were flawed for trying to evaluate individual vitamins alone, noting the combination of Vitamin E and selenium did not prove risky.

"This reinforces the theory that vitamins work synergistically and that drug-like trials of nutrients, when used in isolation from other nutrients, may not be the most appropriate way to study them," said Duffy MacKay, vice president, scientific and regulatory affairs, at the Council for Responsible Nutrition, an industry group.

Parnes, Klein and others stressed that Vitamin E does not appear to pose a risk at lower doses and that there is plenty of evidence that consuming a diet rich in fruits and vegetables, which contain large amounts of vitamins and other nutrients that have antioxidant and other properties, is healthy.

"Bottom line, eat your vegetables and be active," Benjamin Caballero, director of the Center for Human Nutrition at Johns Hopkins University, said in an e-mail. "You cannot get those health benefits from any pill created by man."

http://www.eurekalert.org/pub_releases/2011-10/uobc-uri101311.php

UBC researchers invent tiny artificial muscles with the strength, flexibility of elephant trunk

An international team of researchers has invented new artificial muscles strong enough to rotate objects a thousand times their own weight, but with the same flexibility of an elephant's trunk or octopus limbs.

In a paper published online today on Science Express, the scientists and engineers from the University of British Columbia, the University of Wollongong in Australia, the University of Texas at Dallas and Hanyang University in Korea detail their innovation. The study elaborates on a discovery made by research fellow Javad Foroughi at the University of Wollongong.

Using yarns of carbon nanotubes that are enormously strong, tough and highly flexible, the researchers developed artificial muscles that can rotate 250 degrees per millimetre of muscle length. This is more than a

thousand times that of available artificial muscles composed of shape memory alloys, conducting organic polymers or ferroelectrics, a class of materials that can hold both positive and negative electric charges, even in the absence of voltage.

"What's amazing is that these barely visible yarns composed of fibres 10,000 times thinner than a human hair can move and rapidly rotate objects two thousand times their own weight," says UBC Assoc. Prof. John Madden, Dept. of Electrical and Computer Engineering. Madden says, "While not large enough to drive an arm or power a car, this new generation of artificial muscles – which are simple and inexpensive to make – could be used to make tiny valves, positioners, pumps, stirrers and flagella for use in drug discovery, precision assembly and perhaps even to propel tiny objects inside the bloodstream."

Central to the team's success are nanotubes that are spun into helical yarns, which means that they have left and right handed versions, which allows the yearn to be controlled by applying an electrochemical charge, and to twist and untwist.

The new material was devised at the University of Texas at Dallas and then tested as an artificial muscle in Madden's lab at UBC. A chance discovery by collaborators from Wollongong showed the enormous twist developed by the device. Guided by theory at UBC and further experiments in Wollongong and Texas, the team was able to extract considerable torsion and power from the yarns.

The torsional rotation of helically wound muscles, such as those in the flagella of bacteria, has existed in nature for hundreds of millions of years. Many other natural appendages -- from the trunk of an elephant to octopus's powerful and limber tentacles – also show how helically wound muscle fibers cause rotation by contracting against a boneless core.

The nanotube yarns are activated by charging them in a salt solution, much as a battery is charged. A breakthrough discovery came from former UBC PhD student Tissaphern Mirfakhrai – now at Stanford – who found that the deformation of the yarns is proportional to the size and number of ions inserted. A similar effect is seen in lithium ion battery electrodes used in portable electronic devices, but in yarns it is put to good use. The helical structure of the yarns makes them unwind as they accept charge and swell. They twist back up again when discharged.

"The discovery, characterization, and understanding of these high performance torsional motors show the power of international collaborations," says corresponding author Ray Baughman, Robert A. Welch Professor of Chemistry and director of the University of Texas at Dallas Alan G. MacDiarmid NanoTech Institute.

Support for this research includes a Discovery Grant from the Natural Sciences and Engineering Research Council of Canada.

To see animation of a potential application of the twisting actuator, visit: http://electromaterials.edu.au/news/UOW112032

http://news.discovery.com/tech/increase-space-hard-drive-salt.html

Salty Hard Drives Have More Bytes

Scientists in Singapore discover adding common table salt increases hard drive capacity.

Fri Oct 14, 2011 04:34 PM ET | content provided by Odd Andersen, AFP

Scientists in Singapore proved they are worth their salt by sextupling hard drive space with no equipment upgrades. Scientists at the Agency for Science, Technology and Research (A*STAR) in collaboration with National University of Singapore and the Data Storage Institute discovered that simply adding table salt to a solution used when creating hard drives increased the capacity by almost six times.

This advance means a hard drives holding 1 Terabyte (TB) of data today, in the future, could hold 6 TB of data within the same size and form factor. The salt causes this increase because it forces the bits (pieces of information on your hard drive) into predictable, organized patterns on your hard drive. A*STAR likens the system to packing your clothes in your suitcase when you travel. The neater you pack them the more you can carry." Current methods use clusters of data without such a specific organizational system.

The secret to their research lies in their salty solution. Using an existing production method the scientists discovered adding table salt would produce highly defined nanostructures without the need for expensive equipment upgrades.This ‘salty developer solution’ method was invented by Dr. Yang when he was a graduate student at the Massachusetts Institute of Technology.

Dr. Joel Yang, the Singapore scientist who heads up the project told AFP, "It can give you a very high contrast. We are now able to see fine lines that would normally be blurred out."

This method is still, solidly, in the development stages. Dr. Yang hinted the salty bit-patterning process will be adopted by the industry by 2016 "when the current techniques run out of fuel and (hard drive manufacturers) need to find alternate methods" of increasing data storage space. So, don't go dipping your hard drives in salt to increase their storage capacity.

http://www.bbc.co.uk/news/health-15278823

DNA sequenced of woman who lived to 115

The entire DNA sequence of a woman who lived to 115 has been pieced together by scientists.

By Helen Briggs Health editor, BBC News website

The woman, who was the oldest in the world at the time of her death, had the mind of someone decades younger and no signs of dementia, say Dutch experts. The study, reported at a scientific conference in Canada, suggests she had genes that protected against dementia. Further work could give clues to why some people are born with genes for a long life, says a UK scientist.

It is more than 10 years since the first draft of the human genetic code was revealed. Since then, perhaps a few hundred individuals have had their genes mapped in full, as the technology to "read" DNA gets better and cheaper.

The woman, whose identity is being kept secret, and is known only as W115, is the oldest person to have her genes mapped. She donated her body to medical science, allowing doctors to study her brain and other organs, as well as her entire genetic code.

Dr Henne Holstege, of the Department of Clinical Genetics at the VU University Medical Center in Amsterdam, says she appeared to have some rare genetic changes in her DNA. It is not yet clear what role they carry out, but it appears there is something in her genes that protects against dementia and other diseases of later life. Dr Holstege told the BBC: "We know that she's special, we know that her brain had absolutely no signs of Alzheimer's. "There must be something in her body that is protective against dementia. "We think that there are genes that may ensure a long life and be protective against Alzheimer's."

Proof of principle

W115 was born prematurely and was not expected to survive. But she lived a long and healthy life, and entered a care home at the age of 105. She eventually died from a stomach tumour, having been treated for breast cancer at the age of 100.

A test of her mental skills at the age of 113 showed she had the performance of a woman aged 60-75 years.

At post-mortem examination, doctors found no evidence of dementia or the furring of the arteries seen in heart disease. They are making her gene sequence available to other researchers, to further the cause of science.

The work, which has yet to be published, was presented at the American Society of Human Genetics annual meeting in Montreal, Canada.

Commenting on the study, Dr Jeffrey Barrett, of the Sanger Centre in Cambridge, UK, said it was an important proof of principle. He told the BBC: "Sequencing the genome of the world's oldest woman is an important starting point to understand how DNA variation relates to the process of having a long, healthy life.

"But in order to really understand the underlying biology of living a long, healthy life, we will need to look at the DNA sequence of hundreds or thousands of people."

http://singularityhub.com/2011/10/15/sprites---the-computer-chip-sized-spacecraft-that-will-send-you-a-text-message-for-300/

Sprites – The Computer Chip-Sized Spacecraft That Will Send You a Text Message (for $300)

Sprites, computer chip-sized spacecraft that travel through space and explore as a swarm

by Peter Murray October 15th, 2011

This past August we reported on Sprites, computer chip-sized spacecraft that travel through space and explore as a swarm. Now a member of the research team has launched his own effort to harness the power of the swarm with a Kickstarter pledge campaign to raise $30,000 and send the Sprites into orbit.

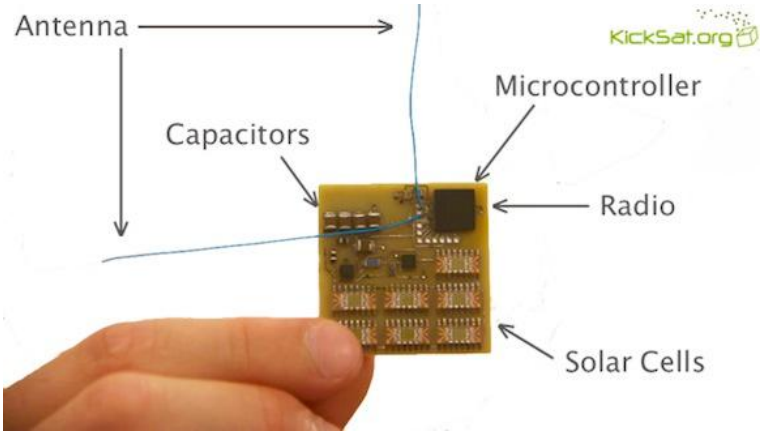
In case you missed it, each Sprite measures less than four centimeters on a side and weighs less than 10 grams. Because their size makes it impossible to carry propulsion fuel, these very unconventional satellites will travel through space by being pushed along by photons shot from the sun, pulled along the gravitational currents and eddies known as the Interplanetary Transport Network, or by gravity assist upon nearing a planet.

Eventually they will be equipped with sensors such as CMOS cameras – the kind found in common digital cameras – as well as chemical sensors and sensors that measure impacts made by space particles. Each Sprite will operate individually to record and transmit data back to the Earth. When taken together, data from an entire swarm of Sprites will provide a 3D picture of space impossible to achieve with single satellites. Another advantage is cost. While a typical satellite costs between $50 million and $400 million to launch into orbit, the 100 kilograms that 10,000 Sprites weigh would be a negligible add-on to any vehicle already scheduled for orbit.

The wafer-sized spacecraft already have one space mission under their microscopic belts. Last May three Sprites were flown to the International Space Station aboard the space shuttle Endeavour. They were fixed to the outside of the ISS for a two year test to see how they stand up to the harsh elements of space. But their ability to perform as a swarm, however, remains untested – a shortcoming that Zachary Manchester, a graduate student in Aerospace Engineering at Cornell University and part of the team that built the Sprites, would like to remedy. To this end, Zachary has placed the Sprites on the project fundraising website kickstarter.com called "KickSat – Your personal spacecraft in space!" You can find it by going to kicksat.org.

KickSat is the team's modified version of a CubeSat – a standardized, cube-shaped satellite that can cost-effectively bring payloads to orbit. CubeSat's are small themselves, typically measuring 10x10x10 cm. But that's plenty of space to house an eager swarm of Sprites. And people like you and me can personalize the mission through a series of donation incentives. For a $25 pledge you get your name printed on one of the KickSat panels. For $75 you get your name printed and a non-functioning Sprite replica. Those who pledge $300 or more will be able to name the Sprite and, when "Chipper" reaches space it'll actually send the donor a short (up to 4 characters), personalized text message such as their initials. For developers with the means, $1000 will get them a Sprite development kit that includes a fully functioning Sprite, schematics, source code, and programming tools that will enable them to write their own flight code. Within certain limitations that developers would have to work out with Zachary before the launch, the flight code will be run during the test to control their Sprite. These donors will also receive instructions on how to set up a receiving station so they can directly listen to the signals as the Sprites send them from space.

Anyone pledging $5,000 or more will get all I've mentioned plus a VIP tour of Mission Control in Ithaca, NY where they'll learn how the KickSat and the Sprites are built, and they get to be present when "The Big Red Button" is pushed to deploy the Sprites from the KickSat. And for $10,000 you get everything, and you get to push The Big Red Button yourself. Of course, there can only be one Big Red Button pusher, so hurry up and pledge your $10,000 before it's too late!



A Sprite.

KickSat is a CubeSat, a standardized way to deploy small payloads to orbit.

I myself pledged $75 because I want to be a part of this space revolution, this ushering in of a new era, this spawning of off-the-shelf, DIY, poor man's satellite exploration.

And I wanted a replica.

All kidding aside, the Sprites could be the spark for a paradigm shift in the way we explore space. There's strength in numbers. The major advantage of a Sprite approach to space exploration is the added certainty that a mission will be completed. If a few hundred fail out of 10,000 or tens of thousands you probably wouldn't even know the difference. I asked the senior scientist on the Sprite team, Mason Peck, what excited him most about his chip-sized spacecraft. He responded in an email:

"The most powerful idea here is that a cloud of Sprites offers statistical certainty in the completion of a mission. In contrast, a large traditional satellite (say…Cassini or Voyager) has to work with similar reliability, but it has a sample size of one or two. The statistics of a cloud of thousands or millions of Sprites offers so-called statistical confidence that is much higher. and if you want even higher probability of mission success, just add more Sprites; there is no need to rebuild or rearchitect an exquisite single spacecraft to extract higher performance."

Their incredible light weight also means they can go where no other satellites have gone before. "I want to see these things shot out of the solar system as high-energy projectiles," says Peck. "The smaller they get, the worse their performance, but he easier they are to accelerate to very high speeds." Consistent with the group's mantra of Sprite personalization, Peck is asking how our tech-savvy Singularity Hub might make that happen. "Invite your readers to come up with a way to treat these things as particles in a particle weapon, using a technology that lets them approach maybe 10% of the speed of light. [At those speeds] they'll reach the nearest star in our lifetimes, and our kids will hear back from them."

So readers, would you like to be part of the Sprite team? For as little as a buck you can help Zachary get the Sprites to orbit. And for a deep understanding of particle physics and interstellar space travel you can help Peck get the Sprites to Alpha Centauri.

Now didn't space exploration just get that much more fun?

http://www.sciencedaily.com/releases/2011/10/111014095629.htm

How to Punish Corporate Wrongdoers to Deter Bad Behavior

If courts were to award appropriate punitive damages that punish wrongdoers at a level tied to a company's financial worth, then businesses would be deterred from bad behavior

ScienceDaily - If courts were able to award appropriate punitive damages that punish wrongdoers at a level tied to a company's financial worth, then businesses big and small would be at risk of being put out of business by punitive damages unconscionable offenses and would be deterred from bad behavior in the first place, according to Judy Feuer Zimet of the Phoenix School of Law in Phoenix, Arizona.

Writing in the International Journal of Private Law, Zimet points out that in many legal cases over the last two decades, companies have repeatedly been fined for breaking environmental and other laws, but have not suffered losses to their profit line that were adequate to deter them from repeating offences. She cites the case of Wright County Farm Eggs and owner Jack Decoster's long list of repeated violations that culminated in 2010 with a national salmonella outbreak. She also cites the oil company BP, which since 2005 has been held to account for a staggering 760 safety violations that resulted in a mere $373 million in fines.

Meanwhile, BP's annual profits are in the double figure billions of dollars. The serious oil spill in the Gulf of Mexico in 2010 forced the company to create a $20 billion victims' compensation fund. Zimet suggests that had fines for the 759 prior violations been sufficiently punishing, BP might have been more effective in addressing the problems that led to the 2010 spill.

"A punishment that successfully deters future wrongdoing requires an amount sufficient to impact a defendant's financial condition," says Zimet, Current factors used to assess the amount of punitive damages should be reassessed. Courts can better punish and deter wrongdoing by calculating punitive damages based upon a defendant's wealth rather than the relationship between compensatory and punitive damages."

Zimet discusses two cases in which appropriate punitive damages had the desired effect on changing corporate behavior. Two successive cases against motor vehicle manufacturer BMW of North America saw the company accused of fraud after a customer discovered that it had repainted a car yet withheld that information when the car was sold. In this first case, the trial court awarded a mere $4600 in compensatory damages and BMW made no changes to its behavior. A second case saw BMW North America forced to pay $4 million in punitive damages. The company immediately thereafter changed its policy and began reporting refinishing work to new car purchasers. This shows that when the risk of liability is substantial, companies will reform bad behavior.

"No longer should compensatory damages steer punitive damages," asserts Zimet. "The Supreme Court should replace this factor by a formerly existing factor: determine the financial position of the defendant and its ability to pay."

http://www.eurekalert.org/pub_releases/2011-10/nu-cac101311.php

Could a computer one day rewire itself?

Scientists develop new nanomaterial that 'steers' current in multiple dimensions

Scientists at Northwestern University have developed a new nanomaterial that can "steer" electrical currents. The development could lead to a computer that can simply reconfigure its internal wiring and become an entirely different device, based on changing needs.

As electronic devices are built smaller and smaller, the materials from which the circuits are constructed begin to lose their properties and begin to be controlled by quantum mechanical phenomena. Reaching this physical barrier, many scientists have begun building circuits into multiple dimensions, such as stacking components on top of one another. The Northwestern team has taken a fundamentally different approach. They have made reconfigurable electronic materials: materials that can rearrange themselves to meet different computational needs at different times.

"Our new steering technology allows use to direct current flow through a piece of continuous material," said Bartosz A. Grzybowski, who led the research. "Like redirecting a river, streams of electrons can be steered in multiple directions through a block of the material -- even multiple streams flowing in opposing directions at the same time." Grzybowski is professor of chemical and biological engineering in the McCormick School of Engineering and Applied Science and professor of chemistry in the Weinberg College of Arts and Sciences.

The Northwestern material combines different aspects of silicon- and polymer-based electronics to create a new classification of electronic materials: nanoparticle-based electronics. The study, in which the authors report making preliminary electronic components with the hybrid material, will be published online Oct. 16 by the journal Nature Nanotechnology. The research also will be published as the cover story in the November print issue of the journal.

"Besides acting as three-dimensional bridges between existing technologies, the reversible nature of this new material could allow a computer to redirect and adapt its own circuitry to what is required at a specific moment in time," said David A. Walker, an author of the study and a graduate student in Grzybowski's research group.

Imagine a single device that reconfigures itself into a resistor, a rectifier, a diode and a transistor based on signals from a computer. The multi-dimensional circuitry could be reconfigured into new electronic circuits using a varied input sequence of electrical pulses.

The hybrid material is composed of electrically conductive particles, each five nanometers in width, coated with a special positively charged chemical. (A nanometer is a billionth of a meter.) The particles are surrounded by a sea of negatively charged atoms that balance out the positive charges fixed on the particles. By applying an electrical charge across the material, the small negative atoms can be moved and reconfigured, but the relatively larger positive particles are not able to move.

By moving this sea of negative atoms around the material, regions of low and high conductance can be modulated; the result is the creation of a directed path that allows electrons to flow through the material. Old paths can be erased and new paths created by pushing and pulling the sea of negative atoms. More complex electrical components, such as diodes and transistors, can be made when multiple types of nanoparticles are used.

The title of the paper is "Dynamic Internal Gradients Control and Direct Electric Currents Within Nanostructured Materials." In addition to Grzybowski and Walker, other authors are Hideyuki Nakanishi, Paul J. Wesson, Yong Yan, Siowling Soh and Sumanth Swaminathan, from Northwestern, and Kyle J. M. Bishop, a former member of the Grzybowski research group, now with Pennsylvania State University.

http://www.eurekalert.org/pub_releases/2011-10/cc-rdt101311.php

Researchers discover that same gene has opposite effects in prostate, breast cancers

Gene promotes prostate cancer when 'turned on,' breast cancer when "turned off"

Researchers at Cleveland Clinic have discovered that a gene – known as an androgen receptor (AR) – is found in both prostate and breast cancers yet has opposite effects on these diseases.

In prostate cancer, the AR gene promotes cancer growth when the gene is "turned on." In breast cancer, the AR gene promotes cancer growth when the gene is "turned off," as is often the case after menopause, when AR production ceases in women.

What this means is that treating prostate and breast cancers require completely opposite approaches to AR. In treating prostate cancer, the strategy should be to block AR; in breast cancer, the strategy should be to support AR production.

Researchers from Cleveland Clinic's Lerner Research Institute, including Charis Eng, M.D., Ph.D., Chair, Genomic Medicine Institute; Robert Silverman, Ph.D., and Warren Heston, Ph.D., both of the Department of Cancer Biology; focused on whether the androgen receptor (AR) molecule offers evidence of the tumor suppressor protein PTEN. The research discovered that AR inhibits PTEN expression in prostate cancer cells, but stimulates it in breast cancer cells.

The conclusions, published in the Oct. 21, 2011 issue of Oncogene, explain why prostate cancer progression is associated with increased AR expression (and a common prostate cancer treatment strategy involves blocking AR), while most breast cancers occur post-menopause, after AR production has ceased (making AR supplementation a strategy for treating breast cancer).

Dr. Eng and her colleagues have mapped the interaction between AR and PTEN in both prostate and breast cancer cells, which suggests that this interaction activates or represses subsequent gene expression depending on organ-specific cofactors. Although PTEN is a known tumor suppressor, and loss of PTEN expression has been associated with numerous cancers (including breast and prostate cancers), its regulation has not been well understood. The current data provide new information regarding PTEN regulation, and suggest that identifying regulatory cofactors will be a valuable next step in determining cancer risk, as well as potential new therapies.

"We now see how androgen affects PTEN expression – and ultimately cancer," said Dr. Eng. "Our observations help explain why this prostate cancer risk can be halved by drinking red wine, which increases PTEN expression. Our data also suggest that treatment of the exact same cancer must be personalized for males and for females."

http://www.eurekalert.org/pub_releases/2011-10/uop-lbi101311.php

Low birthweight infants five times more likely to have autism

Autism researchers at the University of Pennsylvania School of Nursing have found a link between low birthweight and children diagnosed with autism

Autism researchers at the University of Pennsylvania School of Nursing have found a link between low birthweight and children diagnosed with autism, reporting premature infants are five times more likely to have autism than children born at normal weight.

The children, some born as small as about a pound, were followed for 21 years making this study, published in the prestigious journal Pediatrics, one of the most remarkable of its kind. The infants were born between September 1984 through July 1987 in Middlesex, Monmouth, and Ocean counties in New Jersey at birthweights from 500 to 2000 grams or a maximum of about 4.4 pounds.

"As survival of the smallest and most immature babies improves, impaired survivors represent an increasing public health challenge," wrote lead author Jennifer Pinto-Martin, MPH, PhD, director of the Center for Autism and Developmental Disabilities Research and Epidemiology (CADDRE) at Penn Nursing. "Emerging studies suggest that low birthweight may be a risk factor for autism spectrum disorders." Links between low birthweight and a range of motor and cognitive problems have been well established for some time, but this is the first study that establishes that these children are also at increased risk for autism spectrum disorders (ASD).

"Cognitive problems in these children may mask underlying autism," said Dr. Pinto-Martin. "If there is suspicion of autism or a positive screening test for ASD, parents should seek an evaluation for an ASD. Early intervention improves long-term outcome and can help these children both at school and at home."

In future studies, Penn researchers will investigate possible links between brain hemorrhage, a complication of premature birth, and autism by examining brain ultrasounds taken of these children as newborns.

The researchers, including a team at The Children's Hospital of Philadelphia, followed 862 children from birth to young adulthood finding that five percent of the children were diagnosed with autism, compared to one percent of the general population in what researchers called "the first study to have estimated the prevalence of ASD . . . using research validated diagnostic instruments."

The $3 million study was funded by the National Institute of Mental Health.

http://www.reuters.com/article/2011/10/14/us-smells-migraines-idUSTRE79D4L120111014

Imagined smells can precede migraines

Hallucinated scents can, rarely, be a part of the "aura" that some people perceive before a migraine attack, a new study finds.

By Amy Norton

NEW YORK (Reuters Health) - About 30 percent of people with recurrent migraines have sensory disturbances shortly before their headache hits. Those disturbances, known as aura, are usually visual -- such as seeing flashes of light or blind spots. They can also include problems like tingling sensations or numbness, or difficulty speaking or understanding language. But disturbances in the sense of smell -- so-called olfactory hallucinations -- have not been generally recognized as a part of migraine aura. They are not, for example, listed as an aura symptom in the international criteria doctors use to diagnose migraine.

"I think that's just because (olfactory hallucinations) have not been commonly reported," said Dr. Matthew S. Robbins, senior researcher on the new study. But no one had done a systematic review of the medical literature on the subject until now, he told Reuters Health,

Robbins and his colleagues at the Montefiore Headache Center in New York reviewed 25 reported cases of patients with headaches (migraine in most cases) and olfactory hallucinations. They also examined records from more than 2,100 patients seen at their center over 30 months. They found that 14 -- or just under 0.7 percent -- had described smelling scents in conjunction with their headaches.

"It's uncommon," Robbins said, "but it is distinctive."

Usually, the pre-migraine scents are not sweet. "The most common was of the burning or smoke variety," Robbins said. Some headache sufferers described a general burning smell, while others said they smelled cigar smoke, wood smoke or burned popcorn.

After those burning scents, "decomposition" odors -- like garbage or sewage -- were the next most common. A few people did describe pleasant odors, including the scent of oranges, coffee or, in one case, foie gras. It's not clear why the hallucinated odors are most often unpleasant -- or why they are only rarely part of migraine aura.

But Robbins noted that, in general, aura symptoms are thought to involve a phenomenon called "cortical spreading depression" -- where a wave of increased electrical activity in nerve cells of the brain is followed by a wave of depressed activity.

That same phenomenon might underlie olfactory hallucinations, Robbins said. Since the brain's smell centers occupy much less real estate than its vision centers, that could, in theory, explain why phantom scents are so much less common than visual disturbances.

It's also possible that some people with migraines and olfactory hallucinations simply don't recognize the phenomenon, according to Robbins. You know something is wrong when you are seeing zigzag lines, for instance, whereas it's easy to assume that an odor is actually coming from somewhere.

A number of disorders, including Parkinson's disease, some epileptic seizures and brain tumors, can cause a person to smell scents that aren't there.

Knowing that migraines can be preceded by olfactory hallucinations might allow some headache sufferers to forgo "exhaustive medical workups" for other conditions, Robbins noted. He stressed, however, that when those hallucinations arise without an accompanying headache, they should be thoroughly checked out.

It's estimated that about 11 percent of the world's population suffers from migraines. So even though olfactory hallucinations are an uncommon part of aura, there could still be a fairly large number of people who experience them, according to Robbins.

SOURCE: *bit.ly/psoVEy Cephalalgia, online September 23, 2011.*

http://www.sciencedaily.com/releases/2011/10/111016212019.htm

Musical Aptitude Relates to Reading Ability

Auditory working memory and attention, for example the ability to hear and then remember instructions while completing a task, are a necessary part of musical ability.

ScienceDaily - Auditory working memory and attention, for example the ability to hear and then remember instructions while completing a task, are a necessary part of musical ability. But musical ability is also related to verbal memory and literacy in childhood.

New research published in BioMed Central's open access journal Behavioral and Brain Functions shows how auditory working memory and musical aptitude are intrinsically related to reading ability, and provides a biological basis for this link.

Researchers from the Auditory Neuroscience Laboratory at Northwestern University tested children on their ability to read and to recognize words. This was compared to the extent of their auditory working memory (remembering a sequence of numbers and then being able to quote them in reverse), and musical aptitude (both melody and rhythm). The electrical activity within the children's brains was also measured as auditory brainstem responses to rhythmic, or random, sounds based on speech.

The team lead by Dr Nina Kraus found that poor readers had reduced neural response (auditory brainstem activity) to rhythmic rather than random sounds compared to good readers. In fact the level of neural enhancement to acoustic regularities correlated with reading ability as well as musical aptitude. The musical ability test, specifically the rhythm aspect, was also related to reading ability. Similarly a good score on the auditory working memory related to better reading and to the rhythm aspect of musical ability.

Dr Kraus explained, "Both musical ability and literacy correlated with enhanced electrical signals within the auditory brainstem. Structural equation modeling of the data revealed that music skill, together with how the nervous system responds to regularities in auditory input and auditory memory/attention accounts for about 40% of the difference in reading ability between children. These results add weight to the argument that music and reading are related via common neural and cognitive mechanisms and suggests a mechanism for the improvements in literacy seen with musical training."