Self-Cleaning Technology from Mars Can Keep Terrestrial Solar Panels Dust Free

ScienceDaily (Aug. 23, 2010) - Find dusting those tables and dressers a chore or a bore? Dread washing the windows? Imagine keeping dust and grime off objects spread out over an area of 25 to 50 football fields. That's the problem facing companies that deploy large-scale solar power installations, and scientists have now presented the development of one solution - self-dusting solar panels - based on technology developed for space missions to Mars.

In a report at the 240th National Meeting of the American Chemical Society (ACS) on August 22, they described how a self-cleaning coating on the surface of solar cells could increase the efficiency of producing electricity from sunlight and reduce maintenance costs for large-scale solar installations.

"We think our self-cleaning panels used in areas of high dust and particulate pollutant concentrations will highly benefit the systems' solar energy output," study leader Malay K. Mazumder, Ph.D. said. "Our technology can be used in both small- and large-scale photovoltaic systems. To our knowledge, this is the only technology for automatic dust cleaning that doesn't require water or mechanical movement."

Mazumder, who is with Boston University, said the need for that technology is growing with the popularity of solar energy. Use of solar, or photovoltaic, panels increased by 50 percent from 2003 to 2008, and forecasts suggest a growth rate of at least 25 percent annually into the future. Fostering the growth, he said, is emphasis on alternative energy sources and society-wide concerns about sustainability (using resources today in ways that do not jeopardize the ability of future generations to meet their needs).

Large-scale solar installations already exist in the United States, Spain, Germany, the Middle East, Australia, and India. These installations usually are located in sun-drenched desert areas where dry weather and winds sweep dust into the air and deposit it onto the surface of solar panel. Just like grime on a household window, that dust reduces the amount of light that can enter the business part of the solar panel, decreasing the amount of electricity produced. Clean water tends to be scarce in these areas, making it expensive to clean the solar panels.

"A dust layer of one-seventh of an ounce per square yard decreases solar power conversion by 40 percent," Mazumder explains. "In Arizona, dust is deposited each month at about 4 times that amount. Deposition rates are even higher in the Middle East, Australia, and India."

Working with NASA, Mazumder and colleagues initially developed the self-cleaning solar panel technology for use in lunar and Mars missions. "Mars of course is a dusty and dry environment," Mazumder said, "and solar panels powering rovers and future manned and robotic missions must not succumb to dust deposition. But neither should the solar panels here on Earth."

The self-cleaning technology involves deposition of a transparent, electrically sensitive material deposited on glass or a transparent plastic sheet covering the panels. Sensors monitor dust levels on the surface of the panel and energize the material when dust concentration reaches a critical level. The electric charge sends a dust-repelling wave cascading over the surface of the material, lifting away the dust and transporting it off of the screen's edges.

Mazumder said that within two minutes, the process removes about 90 percent of the dust deposited on a solar panel and requires only a small amount of the electricity generated by the panel for cleaning operations.

The current market size for solar panels is about $24 billion, Mazumder said. "Less than 0.04 percent of global energy production is derived from solar panels, but if only four percent of the world's deserts were dedicated to solar power harvesting, our energy needs could be completely met worldwide. This self-cleaning technology can play an important role."

Bottled tea beverages may contain fewer polyphenols than brewed tea

BOSTON, Aug. 22, 2010 - The first measurements of healthful antioxidant levels in commercial bottled tea beverages has concluded that health-conscious consumers may not be getting what they pay for: healthful doses of those antioxidants, or "poylphenols," that may ward off a range of diseases.

Scientists reported here today at the 240th National Meeting of the American Chemical Society (ACS) that many of the increasingly popular beverages included in their study, beverages that account for $1 billion in annual sales in the United States alone, contain fewer polyphenols than a single cup of home-brewed green or black tea. Some contain such small amounts that consumers would have to drink 20 bottles to get the polyphenols present in one cup of tea.

"Consumers understand very well the concept of the health benefits from drinking tea or consuming other tea products," said Shiming Li, Ph.D., who reported on the new study with Professor Chi-Tang Ho and his colleagues. "However, there is a huge gap between the perception that tea consumption is healthy and the actual amount of the healthful nutrients - polyphenols - found in bottled tea beverages. Our analysis of tea beverages found that the polyphenol content is extremely low."

Li pointed out that in addition to the low polyphenol content, bottled commercial tea contains other substances, including large amounts of sugar and the accompanying calories that health-conscious consumers may be trying to avoid. He is an analytical and natural product chemist at WellGen, Inc., a biotechnology company in North Brunswick, N.J., that discovers and develops medical foods for patients with diseases, including a proprietary black tea product that will be marketed for its anti-inflammatory benefits, which are due in part to a high polyphenol content.

Li and colleagues measured the level of polyphenols - a group of natural antioxidants linked to anti-cancer, anti-inflammatory, and anti-diabetic properties - of six brands of tea purchased from supermarkets. Half of them contained what Li characterized as "virtually no" antioxidants. The rest had small amounts of polyphenols that Li said probably would carry little health benefit, especially when considering the high sugar intake from tea beverages.

"Someone would have to drink bottle after bottle of these teas in some cases to receive health benefits," he said. "I was surprised at the low polyphenol content. I didn't expect it to be at such a low level."

The six teas Li analyzed contained 81, 43, 40, 13, 4, and 3 milligrams (mg.) of polyphenols per 16-ounce bottle. One average cup of home-brewed green or black tea, which costs only a few cents, contains 50-150 mg. of polyphenols.

After water, tea is the world's most widely consumed beverage. Tea sales in the United States have quadrupled since 1990 and now total about $7 billion annually. The major reason: Scientific evidence that the polyphenols and other antioxidants in tea may reduce the risk of cancer, heart disease, and other afflictions.

Li said that some manufacturers do list polyphenol content on the bottle label. But the amounts may be incorrect because there are no industry or government standards or guidelines for measuring and listing the polyphenolic compounds in a given product. A regular tea bag, for example, weighs about 2.2 grams and could contain as much as 175 mg. of polyphenols, Li said. But polyphenols degrade and disappear as the tea bag is steeped in hot water. The polyphenol content also may vary as manufacturers change their processes, including the quantity and quality of tea used to prepare a batch and the tea brewing time.

"Polyphenols are bitter and astringent, but to target as many consumers as they can, manufacturers want to keep the bitterness and astringency at a minimum," Li explained. "The simplest way is to add less tea, which makes the tea polyphenol content low but tastes smoother and sweeter."

Li used a standard laboratory technique, termed high-performance liquid chromatography (HPLC), to make what he described as the first measurements of polyphenols in bottled tea beverages. He hopes the research will encourage similar use of HPLC by manufacturers and others to provide consumers with better nutritional information.

Alien hunters 'should look for artificial intelligence'

By Jason Palmer Science and technology reporter, BBC News

Allen telescope array The Allen telescope array will comprise 350 telescopes listening for ET signals

A senior astronomer has said that the hunt for alien life should take into account alien "sentient machines".

Seti, the Search for Extraterrestrial Intelligence, has until now sought radio signals from worlds like Earth.

But Seti astronomer Seth Shostak argues that the time between aliens developing radio technology and artificial intelligence (AI) would be short.

Writing in Acta Astronautica, he says that the odds favour detecting such alien AI rather than "biological" life.

Many involved in Seti have long argued that nature may have solved the problem of life using different designs or chemicals, suggesting extraterrestrials would not only not look like us, but that they would not at a biological level even work like us. However, Seti searchers have mostly still worked under the assumption - as a starting point for a search of the entire cosmos - that ETs would be "alive" in the sense that we know.

That has led to a hunt for life that is bound to follow at least some rules of biochemistry, live for a finite period of time, procreate, and above all be subject to the processes of evolution.

But Dr Shostak makes the point that while evolution can take a large amount of time to develop beings capable of communicating beyond their own planet, technology would already be advancing fast enough to eclipse the species that wrought it. "If you look at the timescales for the development of technology, at some point you invent radio and then you go on the air and then we have a chance of finding you," he told BBC News.

"But within a few hundred years of inventing radio - at least if we're any example - you invent thinking machines; we're probably going to do that in this century.

"So you've invented your successors and only for a few hundred years are you... a 'biological' intelligence."

From a probability point of view, if such thinking machines ever evolved, we would be more likely to spot signals from them than from the "biological" life that invented them.

'Moving target'

John Elliott, a Seti research veteran based at Leeds Metropolitan University, UK, says that Dr Shostak is putting on a firmer footing a feeling that is not uncommon in the Seti community.

"You have to start somewhere, and there's nothing wrong with that," Dr Elliott told BBC News. Milky Way galactic centre Alien AI may choose to linger at galactic centres, where matter and energy are plentiful

"But having now looked for signals for 50 years, Seti is going through a process of realising the way our technology is advancing is probably a good indicator of how other civilisations - if they're out there - would've progressed. "Certainly what we're looking at out there is an evolutionary moving target."

Both Dr Shostak and Dr Elliott concede that finding and decoding any eventual message from such alien thinking machines may prove more difficult than in the "biological" case, but the idea does provide new directions to look.

Dr Shostak says that artificially intelligent alien life would be likely to migrate to places where both matter and energy - the only things he says would be of interest to the machines - would be in plentiful supply. That means the Seti hunt may need to focus its attentions near hot, young stars or even near the centres of galaxies.

"I think we could spend at least a few percent of our time... looking in the directions that are maybe not the most attractive in terms of biological intelligence but maybe where sentient machines are hanging out."

A promising target for developing treatments against Parkinson's disease

Researchers at Johns Hopkins have shown that using specific drugs can protect nerve cells in mice from the lethal effects of Parkinson's disease. The researchers' findings are published in the August 22 issue of Nature Medicine.

The newly discovered drugs block a protein that, when altered in people, leads to Parkinson's disease. Parkinson's disease causes deterioration of the nervous system that leads to tremors and problems with muscle movement and coordination. There is no proven protective treatment yet. Only recently have genetic causes of Parkinson's disease been identified that have the potential to be used for developing targeted therapies for patients with the disease.

The protein LRRK2 (pronounced lark 2) is overactive in some Parkinson's disease patients and causes nerve cells to shrivel up and die. Why exactly overactive LRRK2 is toxic and leads to Parkinson's disease is still unknown. Since overactive LRRK2 is deadly, researchers speculated that blocking LRRK2 from acting might protect nerve cells. The research team tested drugs that were commercially available and known to prevent proteins like LRRK2 from acting and adding chemical phosphates to other proteins. Out of 70 drugs tested, eight were found to block LRRK2 from working.

Two of these eight previously were shown by others to be able to cross the blood-brain barrier. So the researchers injected these two drugs twice daily into mice engineered to carry Parkinson-causing LRRK2 changes in their brain. After three weeks, they examined the mouse brains to see if nerve cells had died. One drug provided almost complete protection against nerve cell death. Another drug had about 80 percent fewer dead cells than in mock treated mice. A third drug, which does not inhibit LRRK2 was not effective.

"This data suggests that if you were to develop a safe drug, then you could potentially have a new treatment for Parkinson's disease patients with LRRK2 mutations," says Ted Dawson, M.D., Ph.D., professor of neurology and physiology and scientific director of the Johns Hopkins Institute for Cell Engineering.

The two drugs that blocked LRRK2 and prevented death of nerve cells in mice with Parkinson's disease both had similar chemical structures. "One could envision generating compounds around that core structure to develop a relatively selective and potent inhibitor of LRRK2," says Dawson.

Dawson is collaborating with researchers at Southern Methodist University to design more specific inhibitors of LRRK2 and the group plans to license this technology. Once they identify promising candidate drugs, those candidates still will have to be tested for toxic side effects. The drugs' approval by the FDA for use in humans may still be many years away.

Says Dawson, treatments developed specifically against LRRK2 may even be able to treat other forms of Parkinson's disease - those not caused by LRRK2 alterations - as there may be several alterations in different proteins that can lead Parkinson's disease.

"We're curing Parkinson's disease in a mouse and now we have to discover drugs that actually work in human neurons. Then we'll hopefully be able to make the leap forward to get a treatment to work in humans," says Dawson.

Other authors on the manuscript included Byoung Lee, Joo-Ho Shin, Andrew West, HanSeok Ko, Yun-Il Lee and co-investigator Valina Dawson of Johns Hopkins Medicine; Jackalina VanKampen and Leonard Petrucelli of the Mayo Clinic College of Medicine; Kathleen Maguire-Zeiss and Howard Federoff of the Georgetown University Medical Center; and William Bowers of the University of Rochester Medical Center.

Funding for this research was provided by grants from the National Institutes of Health, the Army Medical Research and Material Command, the Mayo Foundation and the Michael J. Fox Foundation.

Body clock drugs could ease psychiatric disorders and jet lag

Researchers funded by the Biotechnology and Biological Sciences Research Council (BBSRC) and the Medical Research Council (MRC) have successfully used a drug to reset and restart the natural 24 hour body clock of mice in the lab. The ability to do this in a mammal opens up the possibility of dealing with a range of human difficulties including some psychiatric disorders, jet lag and the health impacts of shift work.

This work is led by Professor Andrew Loudon from the University of Manchester and Dr Mick Hastings of the MRC Laboratory of Molecular Biology in Cambridge, working with a multi-disciplinary team of scientists from Pfizer led by Dr Travis Wager, and is published today (24 August) in PNAS.

Professor Loudon said "It can be really devastating to our brains and bodies when something happens to disrupt the natural rhythm of our body clocks. This can be as a result of disease or as a consequence of jet lag or frequent changing between day and night shifts at work.

"We've discovered that we can control one of the key molecules involved in setting the speed at which the clock ticks and in doing so we can actually kick it into a new rhythm."

Most living creatures and plants have an internal body timing system - called the circadian clock. This is a complex system of molecules in every cell that drives the rhythmicity of everything from sleep in mammals to flowering in plants. Light and the day and night cycle are very important for resetting the clock and the fine adjustments are made through the action of several enzymes, including one called casein kinase 1, which has been the centre of this project.

Professor Loudon continued "The circadian clock is linked to the 24 hour day-night cycle and the major part of the clock mechanism 'ticks' once per day. If you imagine each 'tick' as represented by the rise and fall of a wave over a 24 hour period, as you go up there is an increase in the amount of proteins in the cell that are part of the clock mechanism, and as you go down, these substances are degraded and reduce again. What casein kinase 1 does is to facilitate the degradation part.

"So you can imagine that the faster casein kinase 1 works, the steeper the downward part of the wave and the faster the clock ticks - any change in casein kinase 1 activity, faster or slower, would adjust the 'ticking' from 24 hours to some other time period. Consider that if your body suddenly starts working on a 23 hour or 25 hour clock, many of your natural processes, such as sleeping and waking could soon become out of step with day and night.."

The team found a drug that slows casein kinase 1 down and used it in mice where the circadian rhythm has ceased i.e. the clock has stopped ticking all together. In live mice and also in cells and tissue samples from mice, they were able to re-establish the ticking of the clock by using the drug to inhibit the activity of casein kinase 1.

Professor Loudon concluded "We've shown that it's possible to use drugs to synchronise the body clock of a mouse and so it may also be possible to use similar drugs to treat a whole range of health problems associated with disruptions of circadian rhythms. This might include some psychiatric diseases and certain circadian sleep disorders. It could also help people cope with jet lag and the impact of shift work."

Professor Janet Allen, BBSRC Director of Research said "The most effective way to develop drugs to treat a health problem is to understand the basic biology that underpins what is going on in our bodies. In this case, by understanding the basic biology of the enzyme controlling biological clocks the research team have been able to identify potential drug-based solutions to a range of issues that affect many people's health and quality of life."

Dr Michel Goedert, Head of the Neurobiology Division at Medical Research Council Laboratory of Molecular Biology said "We're all familiar with jet-lag and that sense of being disoriented in time. What is probably less widely understood is how this effect can impact on those with certain mental illnesses. It is crucial to find out what can go wrong at the molecular and cellular level in the brain if we are to determine what treatments will work for patients. If further studies in humans confirm what this study has shown in mice, this could eventually lead to an entirely new approach to treating mental illnesses such as bipolar disorder."

Dr. Wager, Associate Research Fellow, Pfizer said "It is amazing what can be accomplished when first-rate academic groups and pharmaceutical discovery units team up. Leveraging each other's talents we now have a deeper understanding of the role casein kinase plays within biological systems. Having the ability to entrain or re-entrain an arrhythmic system opens the door to new treatment option for circadian rhythm disorders. Targeting the inhibition of casein kinase with small molecules may lead to the discovery of novel drugs for the treatment of bipolar depression and other circadian rhythm disorders. The burden of these disorders is enormous and new treatment options are needed."

Full bibliographic information *Meng et al. 2010, "Entrainment of disrupted circadian behavior through inhibition of casein kinase 1 (CK1) enzymes", PNAS 107(34) p15240*

Faking It: Why Wearing Designer Knockoffs May Have Hidden Psychological Costs

Polishing your self-image with counterfeit goods may lead to lying, cheating and cynicism

By Wray Herbert

Within just a few blocks from my office, street vendors will sell me a Versace T-shirt or a silk tie from Prada, cheap. Or I could get a deal on a Rolex watch or a chic pair of Ray-Ban shades. These are not authentic brand-name products, of course. They are inexpensive replicas. But they make me look and feel good, and I doubt any of my friends can tell the difference.

That's why we buy knockoffs, isn't it? To polish our self-image and broadcast that polished version of our personality to the world - at a fraction of the price. But does it work? After all, we first have to convince ourselves of our idealized image if we are going to sway anyone else. Can we really become Ray-Ban-wearing, Versace-bedecked sophisticates in our own mind, just by dressing up?

New research suggests that knockoffs may not work as magically as we would like. Indeed, they may backfire. Three scientists - Francesca Gino of the University of North Carolina at Chapel Hill, Michael I. Norton of Harvard Business School and Dan Ariely of Duke University - have been exploring in the laboratory the power and pitfalls of fake adornment. They want to find out if counterfeit labels might have hidden psychological costs, warping people's actions and attitudes.

In one study, the scientists recruited a large sample of young women and had them wear pricey Chloé sunglasses. The glasses were the real thing, but half the women thought they were wearing knockoffs. The researchers wanted to see if wearing counterfeit shades - a form of dishonesty - might make the women act dishonestly in other ways.

They asked the women to perform a couple of tasks that presented opportunities for lying and cheating. In one, the women worked on a complicated set of mathematical puzzles - a task they could not possibly complete in the time allowed. When their allotted time was up, the women were told to score themselves on the honor system - and to take money for each correct score. Unbeknownst to them, the scientists were monitoring both their work and their scoring.

And guess what? The women who thought they were wearing the fake Chloé shades cheated more - considerably more. Fully 70 percent inflated their performance when they thought nobody was checking on them - and, in effect, stole cash from the coffer. By comparison, "only" 30 percent of the group who knew they wore authentic Chloés cheated.

The Price of Being Phony

To double-check this distressing result, the scientists put the women through a different drill, asking them to indicate whether there were more dots on the right or left side of their screen. Choosing "left" earned them half a cent, and choosing "right" earned them five cents, regardless of whether the answer was correct. In other words, the task forced a choice between a correct answer and the more profitable answer. And again the women wearing what they believed to be knockoffs pocketed the petty cash much more often than did their peers who knew they wore the authentic shades.

Notably, the women wearing supposedly counterfeit goods cheated even though the "fake" sunglasses were randomly handed out, suggesting that it was not something about their self-image going into the study that led them to cheat. To the contrary, it was the very act of wearing the so-called knockoffs that was triggering the dishonesty.

This is bizarre and disturbing, but it gets worse. The psychologists wondered whether illusory image making might not only corrupt personal ethics but also lead to a cynical attitude toward other people. In other words, if wearing counterfeit stuff makes people feel inauthentic and behave unethically, might they see others as phony and unethical, too? To test this, the scientists again handed out genuine and supposedly counterfeit Chloé shades, but this time they had the volunteers complete a survey about "people they knew." Would these people use an express line with too many groceries? Pad an expense report? Take home office supplies? There were also more elaborate scenarios involving business ethics and a series of statements ("my GPA is 4.0") that the volunteers had to rate as likely to be true or more likely to be a lie. The idea was that all the answers taken together would characterize each volunteer as having a generally positive view of others - or a cynical one.

The result? Cynical, without question. Compared with volunteers who were wearing authentic Chloé glasses, those who had been told that they were wearing knockoffs saw other people as more dishonest, less truthful and more likely to act unethically in business dealings.

So what's going on here? Ironically, as the scientists reported in the May issue of Psychological Science, wearing counterfeit glasses not only fails to bolster our ego and self-image the way we hope, it actually

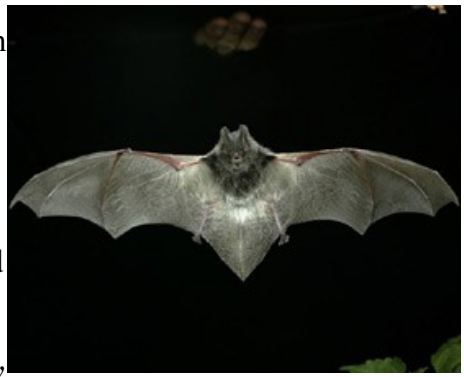
undermines our internal sense of authenticity. “Faking it” makes us feel like phonies and cheaters on the inside, and this alienated, counterfeit “self” leads to cheating and cynicism in the real world.

Counterfeiting is a serious economic and social problem, epidemic in scale. Most people buy these fake brand-name items because they are a lot cheaper than the real deal, but this research suggests that a hidden moral cost has yet to be tallied.

Bat Species Uses Stealth Technique to Capture Prey

A rare British bat has developed remarkable stealth technology to sneak up on moths.

Mon Aug 23, 2010 02:52 PM ET | content provided by Susan Milius, Science News



In a long-running war between bats and moths, at least one bat has gotten the upper wing.

Western barbastelle bats in Europe typically ping out their echolocation calls softly enough to locate a moth for dinner before the moth hears them coming, says Holger Goerlitz of the University of Bristol in England.

It's the first documented case of a bat species outwitting its prey by quiet stealth, he and his colleagues say online in a Current Biology paper released August 19. The battle between bats and moths has become a classic system for studying the evolution of predators and their prey.

A western barbastelle bat gives its echolocation calls more softly than many other aerial hunters, giving it the drop on moths that can hear other bats coming in time to get away. **Dietmar Nill**

In searching for moths, barbastelles echolocate at about the 94 decibel level, roughly the equivalent of a busy highway, Goerlitz reports. This bat version of whispering is 10 to 100 times lower in amplitude than other aerial-hunting bats' echolocation calls. Those rank more in the range of jet engines and the vuvuzelas blaring at the latest World Cup, Goerlitz says.

People can't hear frequencies high enough to detect any of this bat racket -- "quite lucky for us," Goerlitz says.

To measure the loudness of the barbastelle calls, researchers needed to know how far away from a microphone a flying bat was when it pinged. So they set up a microphone array where bats swooped through at night. The slight differences in times that the calls took to reach different microphones let researchers figure out the bat's position for each of more than 100 calls.

This array also let the researchers answer the critical question of whether the barbastelle's softer echolocation was soft enough for stealth attacks on eared moths. Researchers restrained European moths called large underwings along the bat flight alley and monitored the activity of their auditory nerves.

A European bat with louder echolocation, at 127 decibels sound pressure level, triggered the moth's auditory nerves from about 30 meters away. Yet the barbastelle's pings didn't register until the bat had closed in to 3.5 meters. That's close enough for the barbastelle to have already detected the moth from calls echoing off the insect.

"The use of low-intensity echolocation calls when foraging for airborne prey is to my mind the clearest example of an adaptation that can best, and perhaps only, be explained as a means of eluding detection by eared insects," says behavioral ecologist John Ratcliffe of the University of Southern Denmark in Odense, who has also studied bat hunting.

To see if barbastelles' muted echolocation actually allows them to feast on more sharp-eared moths, Goerlitz's colleagues developed genetic markers to identify prey species in bat droppings. The analysis found that 89 percent of what barbastelles catch are moths, and 85 percent of those moths have ears. In contrast, the Leisler's bat, which pings at a similar frequency to the barbastelles' but much more loudly, has been recorded catching at most 56 percent moths. "Moths are nice food," Goerlitz says. "They are big and fat and have a lot of energy."

Gorelitz notes that there doesn't seem to be any other evolutionary advantage to keeping the noise down besides stealth in hunting. And there is a tradeoff: more sneak power but less ability to detect potential food from a longer distance.

Many moths can hear the echolocation calls of Leisler's bat some 30 meters away. This recording slows the calls down from a frequency of 28,000 Hz to about 2,800 Hz so people can hear it. Barbastelle calls, however, don't give away the bat until it's 3.5 meters away. (Recording slowed from about 33,000 Hz to about 3,300 Hz to make it audible.)

Drinking water before meals helps dieting, says study

Woman drinking water Water contains no calories and drinking it makes us feel full

Drinking water before meals can help people to lose weight, says a US study. Scientists from Virginia found that slimmers can lose an average of 5lb extra if they drink two glasses of water three times a day before meals. They tested the theory on 48 older adults, split into two groups, over 12 weeks.

While drinking water can make you feel full on zero calories, say researchers, too much water can also lead to serious health problems. The researchers presented their findings at the National Meeting of the American Chemical Society in Boston.

All adults who took part in the study were aged 55 to 75.

The first group followed a low-calorie diet but did not drink any extra water before meals.

The second group followed the low-calorie diet but also drank two glasses of water before each meal.

'No calories'

Over the course of 12 weeks, those drinking water lost about 15.5lbs while the others lost about 11lbs.

A previous study found that middle-aged and older people who drank two glasses of water before eating a meal ate between 75 and 90 fewer calories during that meal.

Professor Brenda Davy, senior author of the study, from Virginia Tech, said it was the first randomised controlled trial looking at water consumption and dieting.

She said the reason water may be so effective is because it fills up the stomach with a liquid that has no calories. "People should drink more water and less sugary, high-calorie drinks. It's a simple way to facilitate weight management," Professor Davy said.

Diet drinks and other drinks with artificial sweeteners may also help people reduce their calorie intake and lose weight, researchers said.

However, Professor Davy advised against drinks sweetened with sugar, because they are high in calories.

A regular can of fizzy drink contains about 10 teaspoons of sugar, she explained.

The study was funded by the charity, The Institute for Public Health and Water Research.

Researchers zero in on protein that destroys HIV

Using a $225,000 microscope, researchers have identified the key components of a protein called TRIM5α that destroys HIV in rhesus monkeys.

The finding could lead to new TRIM5α-based treatments that would knock out HIV in humans, said senior researcher Edward M. Campbell, PhD, of Loyola University Health System.

Campbell and colleagues report their findings in an article featured on the cover of the Sept. 15, 2010 issue of the journal Virology, now available online.

In 2004, other researchers reported that TRIM5α protects rhesus monkeys from HIV. The TRIM5α protein first latches on to a HIV virus, then other TRIM5α proteins gang up and destroy the virus.

Humans also have TRIM5α, but while the human version of TRIM5α protects against some viruses, it does not protect against HIV.

Researchers hope to turn TRIM5α into an effective therapeutic agent. But first they need to identify the components in TRIM5α that enable the protein to destroy viruses. "Scientists have been trying to develop antiviral therapies for only about 75 years," Campbell said. "Evolution has been playing this game for millions of years, and it has identified a point of intervention that we still know very little about."

TRIM5α consists of nearly 500 amino acid subunits. Loyola researchers have identified six 6 individual amino acids, located in a previously little-studied region of the TRIM5α protein, that are critical in the ability of the protein to inhibit viral infection. When these amino acids were altered in human cells, TRIM5α lost its ability to block HIV-1 infection. (The research was done on cell cultures; no rhesus monkeys were used in the study.)

By continuing to narrow their search, researchers hope to identify an amino acid, or combination of amino acids, that enable TRIM5α to destroy HIV. Once these critical amino acids are identified, it might be possible to genetically engineer TRIM5α to make it more effective in humans. Moreover, a better understanding of the underlying mechanism of action might enable the development of drugs that mimic TRIM5α action, Campbell said.

In their research, scientists used Loyola's wide-field "deconvolution" microscope to observe how the amino acids they identified altered the behavior of TRIM5α. They attached fluorescent proteins to TRIM5α to, in effect, make it glow. In current studies, researchers are fluorescently labeling individual HIV viruses and measuring the microscopic interactions between HIV and TRIM5α.

"The motto of our lab is one of Yogi Berra's sayings - 'You can see a lot just by looking,'" Campbell said.

Campbell is an assistant professor in the Department of Microbiology and Immunology at Loyola University Chicago Stritch School of Medicine. His co-authors are Jaya Sastri, a Stritch graduate student and first author; Christopher O'Connor, a former post-doctorate researcher at Stritch; Cindy Danielson and Michael McRaven of Northwestrn University Feinberg School of Medicine and Patricio Perez and Felipe Diaz-Griffero of Albert Einstein College of Medicine.

The study was supported by a grant from the National Institutes of Health.

Richest planetary system discovered

Up to 7 planets orbiting a sun-like star

"We have found what is most likely the system with the most planets yet discovered," says Christophe Lovis, lead author of the paper reporting the result. "This remarkable discovery also highlights the fact that we are now entering a new era in exoplanet research: the study of complex planetary systems and not just of individual planets. Studies of planetary motions in the new system reveal complex gravitational interactions between the planets and give us insights into the long-term evolution of the system."

The team of astronomers used the HARPS spectrograph, attached to ESO's 3.6-metre telescope at La Silla, Chile, for a six-year-long study of the Sun-like star HD 10180, located 127 light-years away in the southern constellation of Hydrus (the Male Water Snake). HARPS is an instrument with unrivalled measurement stability and great precision and is the world's most successful exoplanet hunter.

Thanks to the 190 individual HARPS measurements, the astronomers detected the tiny back and forth motions of the star caused by the complex gravitational attractions from five or more planets. The five strongest signals correspond to planets with Neptune-like masses — between 13 and 25 Earth masses [1] — which orbit the star with periods ranging from about 6 to 600 days. These planets are located between 0.06 and 1.4 times the Earth–Sun distance from their central star.

"We also have good reasons to believe that two other planets are present," says Lovis. One would be a Saturn-like planet (with a minimum mass of 65 Earth masses) orbiting in 2200 days. The other would be the least massive exoplanet ever discovered, with a mass of about 1.4 times that of the Earth. It is very close to its host star, at just 2 percent of the Earth–Sun distance. One "year" on this planet would last only 1.18 Earth-days.

"This object causes a wobble of its star of only about 3 km/hour— slower than walking speed — and this motion is very hard to measure," says team member Damien Ségransan. If confirmed, this object would be another example of a hot rocky planet, similar to Corot-7b (eso0933).

The newly discovered system of planets around HD 10180 is unique in several respects. First of all, with at least five Neptune-like planets lying within a distance equivalent to the orbit of Mars, this system is more populated than our Solar System in its inner region, and has many more massive planets there [2]. Furthermore, the system probably has no Jupiter-like gas giant. In addition, all the planets seem to have almost circular orbits.

So far, astronomers know of fifteen systems with at least three planets. The last record-holder was 55 Cancri, which contains five planets, two of them being giant planets. "Systems of low-mass planets like the one around HD 10180 appear to be quite common, but their formation history remains a puzzle," says Lovis.

Using the new discovery as well as data for other planetary systems, the astronomers found an equivalent of the Titius–Bode law that exists in our Solar System: the distances of the planets from their star seem to follow a regular pattern [3]. "This could be a signature of the formation process of these planetary systems," says team member Michel Mayor.

Another important result found by the astronomers while studying these systems is that there is a relationship between the mass of a planetary system and the mass and chemical content of its host star. All very massive planetary systems are found around massive and metal-rich stars, while the four lowest-mass systems are found around lower-mass and metal-poor stars [4]. Such properties confirm current theoretical models.

The discovery is announced today at the international colloquium "Detection and dynamics of transiting exoplanets", at the Observatoire de Haute-Provence, France.

Notes

[1] Using the radial velocity method, astronomers can only estimate a minimum mass for a planet as the mass estimate also depends on the tilt of the orbital plane relative to the line of sight, which is unknown. From a statistical point of view, this minimum mass is however often close to the real mass of the planet.

[2] On average the planets in the inner region of the HD 10180 system have 20 times the mass of the Earth, whereas the inner planets in our own Solar System (Mercury, Venus, Earth and Mars) have an average mass of half that of the Earth.

[3] The Titius–Bode law states that the distances of the planets from the Sun follow a simple pattern. For the outer planets, each planet is predicted to be roughly twice as far away from the Sun as the previous object. The hypothesis correctly predicted the orbits of Ceres and Uranus, but failed as a predictor of Neptune's orbit.

[4] According to the definition used in astronomy, "metals" are all the elements other than hydrogen and helium. Such metals, except for a very few minor light chemical elements, have all been created by the various generations of stars. Rocky planets are made of "metals".

More information *This research was presented in a paper submitted to Astronomy and Astrophysics ("The HARPS search for southern extra-solar planets. XXV. Up to seven planets orbiting HD 10180: probing the architecture of low-mass planetary systems" by C. Lovis et al.).*

The team is composed of C. Lovis, D. Ségransan, M. Mayor, S. Udry, F. Pepe, and D. Queloz (Observatoire de Genève, Université de Genève, Switzerland), W. Benz (Universität Bern, Switzerland), F. Bouchy (Institut d'Astrophysique de Paris,

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ESO, the European Southern Observatory, is the foremost intergovernmental astronomy organisation in Europe and the world's most productive astronomical observatory. It is supported by 14 countries: Austria, Belgium, the Czech Republic, Denmark, France, Finland, Germany, Italy, the Netherlands, Portugal, Spain, Sweden, Switzerland and the United Kingdom. ESO carries out an ambitious programme focused on the design, construction and operation of powerful ground-based observing facilities enabling astronomers to make important scientific discoveries. ESO also plays a leading role in promoting and organising cooperation in astronomical research. ESO operates three unique world-class observing sites in Chile: La Silla, Paranal and Chajnantor. At Paranal, ESO operates the Very Large Telescope, the world's most advanced visible-light astronomical observatory and VISTA, the world's largest survey telescope. ESO is the European partner of a revolutionary astronomical telescope ALMA, the largest astronomical project in existence. ESO is currently planning a 42-metre European Extremely Large optical/near-infrared Telescope, the E-ELT, which will become "the world's biggest eye on the sky".

***Links** - Research paper: http://www.eso.org/public/archives/releases/sciencepapers/eso1035/eso1035.pdf*

- More info: Exoplanet Press Kit: http://www.eso.org/public/outreach/products/press-kits/pdf/exoplanet_highres.pdf

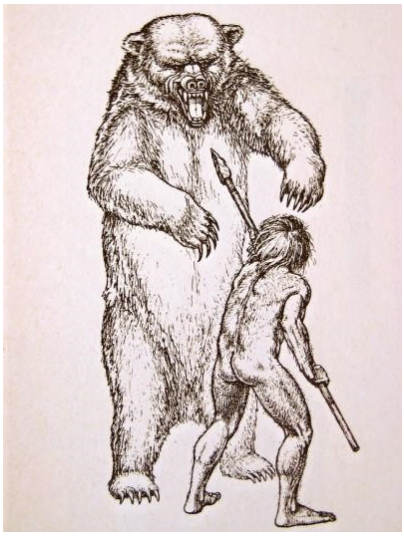
The PRISCUS List

In the current issue of Deutsches Ärzteblatt International (Dtsch Arztebl Int 2010; 107[31-32]: 543-51), Stephanie Holt, a clinical pharmacologist, and coauthors present the PRISCUS List: a list of medications that carry an increased risk of side effects when given to elderly patients.

The authors present the new list, which was developed specifically for Germany in the setting of a joint project entitled PRISCUS (Latin for "old and venerable"), and discuss its potential applications. Most patients take more medications as they grow older and thus run a greater risk of drug interactions and side effects. Medications that might cause side effects more frequently in elderly patients than they do in the overall population are called potentially inappropriate medications (PIM). A number of PIM lists already exist for countries other than Germany; these cannot be applied directly to the German situation because of differences between countries with respect to drug approval, prescribing practices, and treatment guidelines. The experts who created the PRISCUS list for Germany, proceeding on the basis of a literature search and a qualitative analysis of existing PIM lists from other countries, judged 83 medications to be potentially inappropriate for elderly patients. The authors of the article call the PRISCUS list an important aid in medical decision-making.

The full list can be seen at www.priscus.net (in German). http://www.aerzteblatt.de/v4/archiv/pdf.asp?id=77857

True causes for extinction of cave bear revealed



The decline of the cave bear began 50,000 years ago due to human expansion. **RockCreek**

The cave bear started to become extinct in Europe 24,000 years ago, but until now the cause was unknown. An international team of scientists has analysed mitochondrial DNA sequences from 17 new fossil samples, and compared these with the modern brown bear. The results show that the decline of the cave bear started 50,000 years ago, and was caused more by human expansion than by climate change.

"The decline in the genetic diversity of the cave bear (Ursus spelaeus) began around 50,000 years ago, much earlier than previously suggested, at a time when no major climate change was taking place, but which does coincide with the start of human expansion", Aurora Grandal-D'Anglade, co-author of the study and a researcher at the University Institute of Geology of the University of Coruña, tells SINC.

According to the research study, published in the journal Molecular Biology and Evolution, radiocarbon dating of the fossil remains shows that the cave bear ceased to be abundant in Central Europe around 35,000 years ago.

"This can be attributed to increasing human expansion and the resulting competition between humans and bears for land and shelter", explains the scientist, who links this with the scarce fossil representation of the bear's prey in the abundant fossil record of this species.

In order to reach their conclusions, the team of scientists, led by the Max Planck Institute for Evolutionary Anthropology (Germany) studied mitochondrial DNA sequences from bear fossils in European deposits (Siberia, Ukraine, Central Europe and the Iberian Peninsula, specifically Galicia), and carried out a Bayesian analysis (of statistical probability).

The scientists also made comparisons with the modern brown bear (Ursus arctos) and with fossil samples of this species of bear, and managed to show why one became extinct and the other did not. In order to

demonstrate this, the study analysed 59 cave bear DNA sequences and 40 from the brown bear, from between 60,000 and 24,000 years ago for the cave bear and from 80,000 years ago up to the present day for the brown bear.

Decline of the caves, extinction of the bears

The impoverishment of ecosystems during the last glacial maximum was "the 'coup de grace' for this species, which was already in rapid decline", the author explains.

The present day brown bear did not suffer the same fate and has survived until today for one simple reason – brown bears did not depend so heavily on the cave habitat, which was becoming degraded, and this is why they did not follow the same pattern as the cave bears.

"Brown bears rely on less specific shelters for hibernation. In fact, their fossil remains are not very numerous in cave deposits", the Galician researcher says.

The definitive extinction of the cave bear "broadly" coincides with the last cooling of the climate during the Pleistocene (between 25,000 and 18,000 years ago), which may have led to a reduction in shelter and the vegetation that the animals fed on.

The cave bear inhabited Europe during the Late Pleistocene and became definitively extinct around 24,000 years ago, although it held out for a few thousand years longer in some areas, such as the north west of the Iberian Peninsula, than in other places. This ursid was a large animal, weighing 500 kg on average, and was largely a herbivore. The bear hibernated in the depths of limestone caves, where the remains of individuals that died during hibernation slowly accumulated over time.

References: *Stiller, Mathias; Baryshnikov, Gennady; Bocherens, Herve; Grandal D'Anglade, Aurora; Hilpert, Brigitte; Muenzel, Susanne C.; Pinhasi, Ron; Rabeder, Gernot; Rosendahl, Wilfried; Trinkaus, Erik; Hofreiter, Michael; Knapp, Michael. "Withering Away-25,000 Years of Genetic Decline Preceded Cave Bear Extinction" Molecular Biology and Evolution 27(5): 975-978, mayo de 2010. doi:10.1093/molbev/msq083*

First Mention

Parkinson's Disease, 1858

By NICHOLAS BAKALAR

Parkinson's disease is second only to Alzheimer's as the most common neurological illness in the United States, and its symptoms — rigidity, imbalance and uncontrollable shaking — are all too familiar. By the time James Parkinson formally described it in 1817, the illness had been known for centuries.

When The New York Times first mentioned the ailment, on April 5, 1858, it followed Dr. Parkinson's example, calling it "chronic shaking palsy" in a roundup of news from Long Island. A man suffering from the disease, the report said, was baptized at a church in Brooklyn and the presiding minister "observed to him on his immersion: 'In the highest and best of senses the Lord Jesus, my brother, healeth thee of all thy diseases.' "

Sometimes, presumably when the context required more formality, The Times used the medical term for the illness, "paralysis agitans" — for example, in a report about Civil War pensions published April 2, 1894.

The newspaper used "Parkinson's disease" for the first time on Sept. 25, 1918, when it published a vivid account of the divorce proceedings of Charles S. Mellen, a former president of the New York, New Haven & Hartford Railroad Company. Mr. Mellen's lawyer asked for a delay because his client was "suffering from Parkinson's disease, for which he was taking electrical treatments." It is safe to say that those treatments were no more or less effective than the Brooklyn baptism.

The disease was mentioned again on Jan. 2, 1928, this time with some poignancy. "Sir Henry Head, the neurologist," the special cable began, "has fallen victim to the mysterious, incurable disease on which he possibly is the greatest living authority — the form of creeping paralysis known as Parkinson's disease." Sir Henry died of the illness in 1940.

In the mid-1930s, the name Parkinson's disease was still not common, and almost always required explanation. In an obituary on Feb. 22, 1935, for example, The Times wrote that a man "had suffered from the chronic progressive nerve ailment known as Parkinson's disease."

But if the name was still obscure to the general public, it was no mystery to people engaged in insurance fraud. On Oct. 14, 1936, The Times reported that a man had been arrested for falsely collecting $60,000 in disability insurance payments by pretending that "he had been stricken with a form of paralysis known as Parkinson's disease."

On Aug. 16, 1942, The Times printed a report about students at Western Reserve University who, as part of the war effort, were growing plants from which scopolamine could be derived. The drug, previously imported but unobtainable since the start of the war, was used "in the treatment of Parkinson's disease" — a reference that by then could be made without explanation. The article was published with a photograph of six young

women in short skirts lined up facing the camera, each brandishing a hoe and performing what appears to be an act of synchronized gardening.

Yet the term “shaking palsy” persisted until its last appearance in The Times as a synonym for Parkinson’s disease in an Associated Press dispatch on Nov. 3, 1983. Jane E. Brody mentioned the term in an article in 1985, but then only to mark its historical importance.

After that, a search for “Parkinson’s disease” in The Times database yields more than 2,400 entries, and “shaking palsy” yields but one. On Jan. 2, 2005, an article about the rare-book collection of the New York Academy of Medicine mentioned one of its prize possessions: an original 1817 copy of “An Essay on the Shaking Palsy,” by James Parkinson.

Risks: Full-Calorie Beer Has a Link to Psoriasis

By RONI CARYN RABIN

A new study has found a surprising link between beer drinking in women and psoriasis, the autoimmune disease characterized by itchy, scaly skin.

The researchers reported that women who had five or more full-calorie beers a week (but not those who drank light beer or other liquor) were at almost twice the risk for psoriasis.

Beer is usually made from barley, and the starch used to ferment it contains glutens, which have been linked to psoriasis, said the study’s lead author, Dr. Abrar A. Qureshi, an assistant professor of dermatology at Brigham and Women’s Hospital in Boston.

The scientists tracked 82,869 psoriasis-free participants in the Nurses’ Health Study from 1991 until 2005. The women, who were 27 to 44 at the beginning of the study, provided information about their alcohol consumption every few years. By the end of the study, 1,150 of the nurses had developed psoriasis. The regular beer drinkers were 1.76 times as likely to have it as the others, independent of other risk factors like smoking, physical activity and weight, according to the study, published Aug. 16 in Archives of Dermatology.

Though the study does not definitively prove that beer drinking leads to psoriasis, Dr. Qureshi said, the researchers did set it up to look for possible causes. “In terms of temporal sequence,” he continued, “the beer intake preceded the onset of psoriasis.”

No Laughing Matter: Laughter Can Play Key Role in Group Dynamics

ScienceDaily (Aug. 24, 2010) — Laughter can play key roles in group communication and group dynamics -- even when there's nothing funny going on. That's according to new research from North Carolina State University that examined the role of laughter in jury deliberations during a capital murder case.

The researchers were given access to the full transcript of jury deliberations in the 2004 Ohio trial of Mark Ducic, a white male charged with two murders and 30 additional counts, largely related to drug violations. "This was a rare opportunity to gain insight into the jury's deliberative process," says Dr. Joann Keyton, a professor of communication at NC State and co-author of the study. "As far as we know, this is the only jury transcript available for study from a death penalty case."

Looking at the transcript, Keyton and her co-author -- Dr. Stephenson Beck of North Dakota State University -- were struck by the amount of laughter. "This was intriguing," Keyton says. "We're interested in how people communicate within a group in order to accomplish a task, and we saw this as an opportunity to explore the role of laughter in how people signal support -- or lack of support -- for other people's positions within a group." Keyton notes that there is very little research on the role of laughter in communication, particularly when divorced from humor.

The researchers learned that laughter could be used as a tool, intentionally and strategically, to control communication and affect group dynamics. For example, one juror was very vocal and made it clear early in the case that she was opposed to the death penalty. In one instance, when that juror agreed with other jury members, one of the other members said "She's so smart," resulting in laughter from other members of the group. "That had the effect of further distancing her from the rest of the jury," Keyton says.

"When juries form, they don't know each other," Keyton says. "So part of the jury process is to create relationships within the group -- for example, figuring out who thinks like me, who will have the same position I have. There are power dynamics at play."

The researchers also found that "laughter matters, even when it is a serious group task," Keyton says. "Laughter is natural, but we try to suppress it in formal settings. So, when it happens, it's worth closer examination."

For example, at one point the jury was unclear on whether a sentence related to one of the charges was for 30 days or 30 years. This confusion led to widespread laughter. "The laughter allowed the jurors to release some tension, while also allowing them to acknowledge they had made an error -- so they could move forward with that error corrected," Keyton says.

"Laughter is one way of dealing with ambiguity and tension in situations where a group is attempting to make consequential decisions and informal power dynamics are in play," Keyton says. "There are very few opportunities to see group decision making, with major consequences, in a public setting," Keyton explains. "It is usually done in private, such as in corporate board meetings or judicial proceedings. But laughter is something that occurs frequently, and not only because something is funny. Nobody in the jury was laughing at jokes."

The article, "Examining Laughter Functionality in Jury Deliberations," is published in a special issue of Small Group Dynamics, in which every paper focuses on a different aspect of the Ducic jury deliberations.

The strange case of solar flares and radioactive elements

Intrigue at the speed of light (almost)

It's a mystery that presented itself unexpectedly: The radioactive decay of some elements sitting quietly in laboratories on Earth seemed to be influenced by activities inside the sun, 93 million miles away.

Is this possible?

Researchers from Stanford and Purdue University believe it is. But their explanation of how it happens opens the door to yet another mystery.

There is even an outside chance that this unexpected effect is brought about by a previously unknown particle emitted by the sun. "That would be truly remarkable," said Peter Sturrock, Stanford professor emeritus of applied physics and an expert on the inner workings of the sun.

The story begins, in a sense, in classrooms around the world, where students are taught that the rate of decay of a specific radioactive material is a constant. This concept is relied upon, for example, when anthropologists use carbon-14 to date ancient artifacts and when doctors determine the proper dose of radioactivity to treat a cancer patient.

Random numbers

But that assumption was challenged in an unexpected way by a group of researchers from Purdue University who at the time were more interested in random numbers than nuclear decay. (Scientists use long strings of random numbers for a variety of calculations, but they are difficult to produce, since the process used to produce the numbers has an influence on the outcome.)

Ephraim Fischbach, a physics professor at Purdue, was looking into the rate of radioactive decay of several isotopes as a possible source of random numbers generated without any human input. (A lump of radioactive cesium-137, for example, may decay at a steady rate overall, but individual atoms within the lump will decay in an unpredictable, random pattern. Thus the timing of the random ticks of a Geiger counter placed near the cesium might be used to generate random numbers.)

As the researchers pored through published data on specific isotopes, they found disagreement in the measured decay rates – odd for supposed physical constants.

Checking data collected at Brookhaven National Laboratory on Long Island and the Federal Physical and Technical Institute in Germany, they came across something even more surprising: long-term observation of the decay rate of silicon-32 and radium-226 seemed to show a small seasonal variation. The decay rate was ever so slightly faster in winter than in summer.

Was this fluctuation real, or was it merely a glitch in the equipment used to measure the decay, induced by the change of seasons, with the accompanying changes in temperature and humidity?

"Everyone thought it must be due to experimental mistakes, because we're all brought up to believe that decay rates are constant," Sturrock said.

The sun speaks

On Dec 13, 2006, the sun itself provided a crucial clue, when a solar flare sent a stream of particles and radiation toward Earth. Purdue nuclear engineer Jere Jenkins, while measuring the decay rate of manganese-54, a short-lived isotope used in medical diagnostics, noticed that the rate dropped slightly during the flare, a decrease that started about a day and a half before the flare.

If this apparent relationship between flares and decay rates proves true, it could lead to a method of predicting solar flares prior to their occurrence, which could help prevent damage to satellites and electric grids, as well as save the lives of astronauts in space.

The decay-rate aberrations that Jenkins noticed occurred during the middle of the night in Indiana – meaning that something produced by the sun had traveled all the way through the Earth to reach Jenkins' detectors. What could the flare send forth that could have such an effect?

Jenkins and Fischbach guessed that the culprits in this bit of decay-rate mischief were probably solar neutrinos, the almost weightless particles famous for flying at almost the speed of light through the physical world – humans, rocks, oceans or planets – with virtually no interaction with anything.

Then, in a series of papers published in Astroparticle Physics, Nuclear Instruments and Methods in Physics Research and Space Science Reviews, Jenkins, Fischbach and their colleagues showed that the observed variations in decay rates were highly unlikely to have come from environmental influences on the detection systems.

Reason for suspicion

Their findings strengthened the argument that the strange swings in decay rates were caused by neutrinos from the sun. The swings seemed to be in synch with the Earth's elliptical orbit, with the decay rates oscillating as the Earth came closer to the sun (where it would be exposed to more neutrinos) and then moving away.

So there was good reason to suspect the sun, but could it be proved?

Enter Peter Sturrock, Stanford professor emeritus of applied physics and an expert on the inner workings of the sun. While on a visit to the National Solar Observatory in Arizona, Sturrock was handed copies of the scientific journal articles written by the Purdue researchers.

Sturrock knew from long experience that the intensity of the barrage of neutrinos the sun continuously sends racing toward Earth varies on a regular basis as the sun itself revolves and shows a different face, like a slower version of the revolving light on a police car. His advice to Purdue: Look for evidence that the changes in radioactive decay on Earth vary with the rotation of the sun. "That's what I suggested. And that's what we have done."

A surprise

Going back to take another look at the decay data from the Brookhaven lab, the researchers found a recurring pattern of 33 days. It was a bit of a surprise, given that most solar observations show a pattern of about 28 days – the rotation rate of the surface of the sun.

The explanation? The core of the sun – where nuclear reactions produce neutrinos – apparently spins more slowly than the surface we see. "It may seem counter-intuitive, but it looks as if the core rotates more slowly than the rest of the sun," Sturrock said.

All of the evidence points toward a conclusion that the sun is "communicating" with radioactive isotopes on Earth, said Fischbach. But there's one rather large question left unanswered. No one knows how neutrinos could interact with radioactive materials to change their rate of decay.

"It doesn't make sense according to conventional ideas," Fischbach said. Jenkins whimsically added, "What we're suggesting is that something that doesn't really interact with anything is changing something that can't be changed."

"It's an effect that no one yet understands," agreed Sturrock. "Theorists are starting to say, 'What's going on?' But that's what the evidence points to. It's a challenge for the physicists and a challenge for the solar people too." If the mystery particle is not a neutrino, "It would have to be something we don't know about, an unknown particle that is also emitted by the sun and has this effect, and that would be even more remarkable," Sturrock said.

Tofu ingredient yields formaldehyde-free glue for plywood and other wood products

Wood composites used to make flooring, furniture, and other products could become more eco-friendly thanks to new adhesives made soy flour and a chemical used to make paper towels more water-resistant. Credit: Christian J. Stewart

In a real-life "back to the future" story, scientists today reported that the sustainable, environmentally-friendly process that gave birth to plywood a century ago is re-emerging as a "green" alternative to wood adhesives made from petroleum. Speaking at the 240th National Meeting of the American Chemical Society, they described development of new soy-based glues that use a substance in soy milk and tofu and could mean a new generation of more eco-friendly furniture, cabinets, flooring, and other wood products.

The new adhesive contains soy flour and an additive used to make paper towels resist water. It performs as well as conventional wood adhesives for interior products, the scientists said, and does not produce the harmful formaldehyde vapors released from traditional plywood, particleboard, and other composite products.

"Protein adhesives allowed the development of composite wood products such as plywood in the early 20th century," said Charles Frihart, Ph.D., who participated in the research project. "Petrochemical-based adhesives replaced proteins in most applications based upon cost, production efficiencies, and better durability. However, several technologies and environmental factors have led to a resurgence of protein, especially soy flour, as an important adhesive for interior plywood and wood flooring."

Frihart, a research chemist with the U.S. Department of Agriculture (USDA) Forest Products Laboratory in Madison, Wisc., explained that many wood products today look as if made from solid pieces of wood. However, they actually are composites, consisting of wood pieces bonded together with petroleum-based adhesives.

Certain petroleum-based adhesives can release formaldehyde, a potential human carcinogen, or substance capable of causing cancer. Formaldehyde fumes from these materials also can cause short-term symptoms, especially in sensitive people. These include watery eyes; burning sensations in the eyes, nose, and throat; and skin irritation. Such problems, combined with high petroleum prices and concerns about sustainability, are spurring wood manufacturers to take another look at soy, Frihart said.

Academic, industrial, and government researchers have developed a wide variety of new soy adhesives in an effort to improve upon old formulas. In lab studies, they tested the glues on wood samples under harsh conditions, including water exposure and high temperatures.

The scientists identified a highly promising soy-based glue composed of soy flour, a special water-resistant additive, and other modifiers. Together these ingredients form a polymer glue for interior wood products that performs as well as the existing petroleum adhesives but does not contain formaldehyde, they said.

In the future, Frihart and his colleagues plan to develop soy adhesives that are even stronger than existing ones. Soy-based adhesives currently make up less than five percent of the wood adhesive market, but Frihart expects their use to increase. The Forest Service is developing the adhesives in partnership with Ashland Hercules and Heartland Resource Technologies.

Scientists say natural selection alone can explain eusociality

Work addresses limitations of kin selection, a dominant theory since the 1960s

CAMBRIDGE, Mass. -- Scientists at Harvard University have sketched a new map of the "evolutionary labyrinth" species must traverse to reach eusociality, the rare but spectacularly successful social structure where individuals cooperate to raise offspring.

Mathematical biologists Martin A. Nowak and Corina E. Tarnita and evolutionary biologist Edward O. Wilson present their work this week in the journal Nature. Their modeling shows that the straightforward natural selection theory alone can explain the evolution of eusocial behavior, without the need for kin selection theory.

"The empirical evidence gathered in our paper demonstrates that eusociality is exceedingly rare because species must navigate a lengthy evolutionary labyrinth to reach this state," says Wilson, the Pellegrino University Professor, Emeritus, at Harvard. "We hope our new theory for the evolution of eusociality will open up sociobiology to new avenues of research by liberating the study of social evolution from mandatory adherence to kin selection theory. After four decades ruling the roost, it is time to recognize this theory's very limited prowess."

Eusocial organisms, such as ants, wasps, and bees, form hierarchical social systems with reproductive queens and sterile workers -- meaning many individuals take the evolutionarily counterintuitive step of sacrificing their own reproduction to care for the offspring of others. For four decades kin selection theory, based on the concept of inclusive fitness, has been the major theoretical attempt to explain the evolution of such behavior.

"In some situations, inclusive fitness theory, which tries to calculate fitness effects conferred on relatives, is a suitable alternative to standard population genetics," says Nowak, professor of mathematics and of biology at Harvard and director of the university's Program for Evolutionary Dynamics. "But it is not applicable in general. Our analysis shows that inclusive fitness theory rests on fragile assumptions, which rarely hold in nature. Contrary to many previous claims, we prove that inclusive fitness theory is not an extended theory of evolution and is not needed to explain eusociality. Standard natural selection theory represents a simpler and superior approach, and provides an exact framework for interpreting empirical observations."

Eusociality is rare, but important in evolutionary biology because the few species that adhere to it -- including social insects and, to an extent, humans -- rank among the planet's most dominant. The biomass of ants alone composes more than half that of all insects, exceeding that of all terrestrial nonhuman vertebrates combined. Humans, who are more loosely eusocial, dominate land vertebrates.

"Eusociality has arisen independently some 10 to 20 times in the course of evolution," says Tarnita, a junior fellow in Harvard's Society of Fellows. "Our model shows that it is difficult to get eusociality in the first place, but that it is very stable once it is established. A colony behaves like a 'superorganism,' reproducing the genome of the queen and the sperm she has stored."

Nowak, Tarnita, and Wilson's proposal on eusocial evolution sketches out three distinct steps species can take to sidestep eusociality's evolutionary cost:

* First, species must form groups within a population, such as when nests or food attract individuals to discrete locations some distance apart, when parents and offspring remain together, or when migrating flocks follow leaders.

* Second, species must accumulate traits, arising through ordinary natural selection, that favor the switch to eusociality. For instance, Ceratina and Lasioglossum bees, which appear perched on the cusp of eusociality, cooperate in foraging, tunneling, and guarding resources. Another such pre-adaptation is progressive

provisioning, in which a female builds a nest, lays an egg in it, and then feeds or guards larvae until they mature. Most importantly, the candidate species must build a defensible nest.

* Finally, individuals must develop genes supporting eusociality, whether by mutation or recombination. Crossing the threshold to eusociality essentially requires that a female and her offspring not disperse to start new, individual nests, but rather remain at the old nest. While eusocial genes have yet to be identified, at least two eusocial ant species are known to have genes that quell the urge to roam from the nest.

If these steps are followed and a species becomes eusocial, the evolutionary costs of individuals foregoing reproduction are compensated by the greatly reduced mortality of the queen and her larvae, which are protected by the colony. In some ant species, a queen that might live for only a few months if alone can live for 25 years or more as part of a colony, producing millions of offspring in the process.

Nowak, Tarnita, and Wilson's work was funded by the John Templeton Foundation, the National Science Foundation, the National Institutes of Health, the Bill and Melinda Gates Foundation, and J. Epstein.

Scripps Research scientists uncover new mechanism of memory formation

New findings could lead to better treatments for memory disorders

JUPITER, FL, August 24, 2010 –- Scientists from the Florida campus of The Scripps Research Institute have discovered a mechanism that plays a critical role in the formation of long-term memory. The findings shed substantial new light on aspects of how memory is formed, and could lead to novel treatments for memory disorders.

The study was published as the cover story of the journal Neuron on August 26, 2010.

In the study, the scientists found that a main driver of memory formation is myosin II, a motor protein critical to cell movement and growth.

"By showing for the first time that myosin II acts as the principal organizer of memory formation, we are that much closer to identifying the signaling pathways that activate this motor protein in the brain," said Gavin Rumbaugh, an assistant professor in the Department of Neuroscience at Scripps Florida who led the study. "Once we're able to do that, we can begin to develop potential treatments that could restore memory in people who suffer from cognitive disorders like Alzheimer's disease."

In the study, Rumbaugh and his colleagues showed that myosin II mediates a mechanical process that is part of the complex process of memory formation.

Specifically, myosin II links together the initiation of long-term potentiation, a process that enhances signal transmission between two neurons in the creation of memory; the stabilization of synaptic plasticity (the ability of synapses to maintain this enhanced transmission); and the reorganization of neurons' F-actin, a cellular polymer that enables growth of synapses.

"Stimulation in the brain turns on these myosin motors and this triggers the growth of F-actin that ultimately solidifies the enhancement of neuronal communication," Rumbaugh said. "Growth and strengthening of synapses is a process that the brain uses to record our experiences." We are just now beginning to understand the physical substrates within synapses that enable the storage of our life experiences."

He added that the role of F-actin described in the study is consistent with the long-standing idea that long-term potentiation is dependent on changes to the synaptic architecture, suggesting the dynamic reorganization triggered by myosin II represents an early step in information encoding.

"Many parallel brain processes have to be activated to store information," he said. "If any one of them is disrupted, the information doesn't get stabilized and the memory is lost. Myosin II is a central regulator of this process and if you could pharmacologically control myosin II, you could potentially regulate memories at will."

The first author of the study, "Myosin IIB Regulates Actin Dynamics during Synaptic Plasticity and Memory Formation," is Christopher Rex of The University of California, Irvine. Other authors include Cristin F. Gavin and Courtney A. Miller of Scripps Research; Maria Rubio of the University of Alabama, Birmingham; Eniko Kramar, Lulu Y. Chen, Yousheng Jia, Christine Gall and Gary Lynch of University of California, Irvine; Richard Huganir of Johns Hopkins University School of Medicine; and Nicholas Muzyczka of the University of Florida, Gainesville.

The work was supported by the University of Alabama, Birmingham; the McKnight Brain Institute; Alabama Health Sciences Foundation; the National Institutes of Health; and the Kauffman Foundation.

Plant scientists move closer to making any crop drought-tolerant

New research builds on breakthrough discovery at UC Riverside of synthetic chemical pyrabactin

RIVERSIDE, Calif. – Drought-tolerant crops have moved closer to becoming reality.

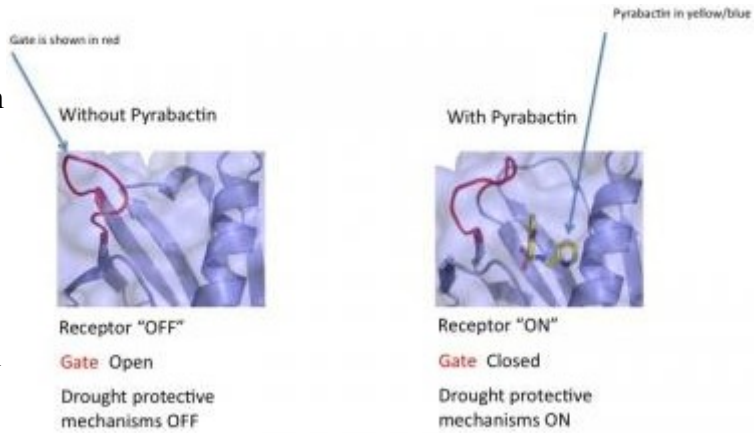
A collaborative team of scientists has made a significant advance on the discovery last year by the University of California, Riverside's Sean Cutler of pyrabactin, a synthetic chemical that mimics a naturally produced stress hormone in plants to help them cope with drought conditions.

Led by researchers at The Medical College of Wisconsin, the scientists report in Nature Structural & Molecular Biology (online) on Aug. 22 that by understanding how pyrabactin works, other more effective chemicals for bringing drought-resistance to plants can be developed more readily.

Abscisic acid versus pyrabactin

Plants naturally produced a stress hormone, abscisic acid (ABA), in modest amounts to help them survive drought by inhibiting growth. ABA has already been commercialized for agricultural use. But it has at least two disadvantages: it is light-sensitive and costly to make.

Pyrabactin, on the other hand, is relatively inexpensive, easy to make, and not sensitive to light. But its drawback is that, unlike ABA, it does not turn on all the "receptors" in the plant that need to be activated for drought-tolerance to fully take hold.



Each plant receptor is equipped with a pocket, akin to a padlock, in which a chemical, like pyrabactin (a synthetic chemical that helps plants cope with drought conditions), can dock into, operating like a key. Each receptor is equipped also with a lid that operates like a gate. For the receptor to be activated, the lid must remain closed. In a receptor where the gate closes, pyrabactin fits in snugly to allow the gate to close. In a receptor not activated by pyrabactin, the chemical binds in a way that prevents the gate from closing and activating the receptor. **Cutler lab, UC Riverside.**

Lock and key

A receptor is a protein molecule in a cell to which mobile signaling molecules – such as ABA or pyrabactin, each of which turns on stress-signaling pathways in plants – may attach. Usually at the top of a signaling pathway, the receptor functions like a boss relaying orders to the team below that then proceeds to execute particular decisions in the cell.

Each receptor is equipped with a pocket, akin to a padlock, in which a chemical, like pyrabactin, can dock into, operating like a key. Even though the receptor pockets appear to be fairly similar in structure, subtle differences distinguish a pocket from its peers. The result is that while ABA, a product of evolution, can fit neatly in any of these pockets, pyrabactin is less successful. Still, pyrabactin, by being partially effective (it works better on seeds than on plant parts), serves as a leading molecule for devising new chemicals for controlling stress tolerance in plants.

Cutler explained that each receptor is equipped with a lid that operates like a gate. For the receptor to be activated, the lid must remain closed. Pyrabactin is effective at closing the gate on some receptors, turning them on, but cannot close the gate on others. The researchers have now cracked the molecular basis of this behavior.

"A key insight from the current work is that this difference is controlled by subtle differences between the receptors in their binding pockets," said Cutler, an associate professor of plant cell biology in the Department of Botany and Plant Sciences and one of the members of the research team.

He explained that in a receptor where the gate closes, pyrabactin fits in snugly to allow the gate to close. In a receptor not activated by pyrabactin, the chemical binds in a way that prevents the gate from closing and activating the receptor. "These insights suggest new strategies for modifying pyrabactin and related compounds so that they fit properly into the pockets of other receptors," Cutler said.

Impact of pyrabactin

According to Cutler, pyrabactin has paved the way for manufacturing new molecules that activate or turn on receptors.

"For it to be a good agriculture chemical, however, it needs to turn on more receptors by fitting into their pockets," he said. "If a derivative of pyrabactin could be found that is capable of turning on all the receptors for drought tolerance, the implications for agriculture are enormous. The current research is an important step on the way to what is likely to be the next big result: an ABA-mimicking chemical that can be sprayed on corn, soy bean and other crops."

The discovery of pyrabactin by the Cutler lab was heralded as a breakthrough research of 2009 by Science magazine. In the current research, Cutler collaborated with Brian Volkman and his research group at the Medical College of Wisconsin, and helped guide critical questions.

"Specifically, we performed genetic experiments that helped us pinpoint which amino acids in the receptors are critical for pyrabactin to either work or not work," Cutler said. "We also identified reasons for why one receptor is sensitive to pyrabactin while a neighboring receptor is not."

A grant from the National Science Foundation supported Cutler's contribution to the study.

Cutler and Volkman were joined in the study by Francis C. Peterson (first author of the research paper), Davin R. Jensen and Joshua J. Weiner of the Medical College of Wisconsin; Sethe Burgie, Craig A. Bingman and George N. Phillips, Jr. of the University of Wisconsin-Madison; and Sang-Youl Park and Chia-An Chang of UCR.

Companion paper

Cutler is a coauthor also on a companion paper, titled "Identification and Mechanism of ABA Receptor Antagonism," that appears online Aug. 22 in Nature Structural & Molecular Biology.

He joins the following researchers in that study: Karsten Melcher (first author), Yong Xu, Ley-Moy Ng, X. Edward Zhou, Fen-Fen Soon, Kelly M. Suino-Powell, Amanda Kovach, Jun Li and H. Eric Xu of the Van Andel Research Institute, Grand Rapids, Mich.; Eu-Leong Yong of the National University of Singapore; and Viswanathan Chinnusamy, Fook S. Tham, and Jian-Kang Zhu of UCR.

University of Nevada professor studies structural basis for autism disorders

6-year study provides documentation of theorized differences in brain's cortex

RENO, Nev. – There is still much that is unknown about autism spectrum disorders, but a University of Nevada, Reno psychologist has added to the body of knowledge that researchers around the world are compiling to try to demystify, prevent and treat the mysterious condition.

"Autism is a unique developmental disability," states Jeffrey Hutsler, assistant professor of psychology at the University of Nevada, Reno, who recently completed a six-year study of brain tissue that, for the first time, provided physical evidence of short-range over-connectivity in the outer layer of the brain's cortex in those with autism disorders. "It creates a lot of noise in the brain, so to speak," he explained. "There was a higher density of synaptic connections, about 20 percent."

Although this short-range over-connectivity had been hypothesized, Hutsler is the first to examine postmortem tissue samples and provide physical evidence of the condition. His research was published recently in the journal, Brain Research. He says his study supports the types of treatments the University is providing at its Early Childhood Autism Program, with early intervention behavioral therapies.

"This is in the layer of the cortex that is one of the last to develop, and a lot of these connections are refined after birth up to about age 4," Hutsler explained. "As you interact with the environment, you sculpt them out."

Those with autism are typically detached from their environment. Hutsler said that their interaction with the environment, or lack thereof, may interfere with that sculpting process. Early intervention with behavioral therapy during the preschool years may be able to aid that sculpting or weeding-out process.

Working mostly with 2- to 5-year-olds, tutors at the University's Early Childhood Autism Program spend a minimum of 30 hours per week, one-on-one with each child for at least two years. The tutors, graduate and undergraduate students who are under faculty supervision, use applied behavior analysis, employing positive reinforcement techniques that strengthen appropriate interaction and behavior, as well as decrease inappropriate behavior.

The program is very effective, with virtually all participants showing improvement and about 50 percent showing total recovery from the disorder, meaning they are indistinguishable from their peers when they enter elementary school, according to the program's director, Patrick Ghezzi.

In fact, Ghezzi has been asked to speak about the methods and the UNR Early Childhood Autism Program throughout the world, and has helped to start other programs modeled after Nevada's in countries such as Jordan, Saudi Arabia, German and Portugal. The University's doctoral program in behavior analysis is one of a handful of such accredited programs in the country. Victoria Follette, chair of the University's psychology department, says that research such as Hutsler's is part of her department's increased emphasis in neuroscience research.

"Research in these areas is key to providing the scientific foundation for our understanding of this disorder and has both local and international implications in the treatment of autism," she states.

Ghezzi is glad to have Hutsler, who joined the University in 2006, as part of the University's psychology and autism research team, stating, "He's at the frontier of research in the biomedical field."

Hong Zhang, now a faculty member at Wuhan University in China, co-authored the study with Hutsler when he was a post-doctoral student of Hutsler's. Hutsler and Zhang credit the National Alliance for Autism Research for providing funding for the study, and also are grateful to the Autism Tissue Program, the Harvard Brain Tissue Resource Center and the Tissue Bank for Developmental Disorders at the University of Miami for their assistance with the study. To access the complete journal article, go to www.sciencedirect.com, and enter Hutsler in the author search slot.

Oetzi the Iceman may have been buried, says team

By Howard Falcon-Lang Science reporter, BBC News

Iceman Oetzi was killed by an arrow wound to the shoulder an autopsy suggests

Oetzi, the 5,000 year old "Iceman" found in the Italian Alps, may have been ceremonially buried, archaeologists claim.

An autopsy showed that Oetzi had been murdered, dying of an arrow wound. While this is not disputed, a new study suggests that months after his death, Oetzi's corpse was carried to the high mountain pass where it was found. The discovery site therefore may not be a murder scene after all, but a burial ground.

The new study, led by Professor Luca Bondioli of the National Museum of Prehistory and Ethnology in Rome and his US-Italian team, is published in the journal Antiquity.

Oetzi was discovered on the alpine border between Italy and Austria in 1991. Although thought at first to be the corpse of a modern climber, scientists later proved that the mummified body was more than 5,000 years old.

An autopsy in 2001 further showed that he had been killed by an arrow wound to the shoulder.

Dead and buried

In the new study, researchers produced a detailed map of where the corpse and artefacts were found.

Based on guesses about how the artefacts had dispersed down slope over time, they inferred that the body had originated on a rock platform nearby. They argued that this was a later burial site, and not the original scene of his murder.

This "burial theory" may explain some perplexing facts about Oetzi.

For example, analysis suggests he died in the spring because the pollen of plants that bloom at that time of year is found in his gut. However, pollen within the ice suggests that the corpse was deposited in the late summer.

Professor Bondioli and his team say that these facts makes most sense if the body was deliberately carried to its site of discovery many months after death. This suggests a burial.

Professor Bondioli elaborated: "Oetzi must have been a very important person to be taken to this high mountain pass for burial. Perhaps he was some sort of a chieftan."

Not bullet proof

However, Professor Frank Ruehli of the University of Zurich, the medical doctor who performed the original autopsy, is not totally convinced by the burial theory.

He remarked: "The left arm of the corpse is in a weird position. This must have happened at the time of death."

"If Oetzi was a chieftan, why did his people not move the twisted arm into a more natural position?" he told BBC News. "This would be expected in the burial of an important person".

Also somewhat sceptical is Dr Wolfgang Muller of Royal Holloway University of London. He studied the chemistry of Oetzi's teeth and bones to track his migration route through the Alps.

"It's an interesting new interpretation but it's not bullet proof," he said. "However, if Oetzi was buried they must have carried the body a long way because the nearby villages would have been at a low altitude."

While much remains to be learned about the enigmatic Iceman - as the mummified corpse has been dubbed - one thing is certain: This famous mummy will remain the subject of intense speculation and new research for decades to come.

Cold Salt Water Reduces Damage in Heart Attack Patients

ScienceDaily (Aug. 25, 2010) — Treating heart attack patients with hypothermia reduces the amount of heart damage by more than one third after balloon angioplasty.

Researchers in Lund, Sweden have released the results of a study showing that the amount of heart damage in heart attack patients whose body temperature was lower than 35˚C (95˚F) was reduced by more than one third after they were treated with balloon angioplasty to open their clogged heart vessel. The results are published in the scientific journal Circulation-Cardiovascular Intervention.

In order to reduce patient body temperature, cold salt water was infused through a vein in the arm into the body. At the same time, a cooling catheter was inserted through a vein in the groin.

"We are impressed by the powerful effect and believe that this treatment has the potential to be of great benefit to patients in the future," said David Erlinge, Professor of Cardiology at Lund University, Sweden.

Every year more than three million people around the world suffer the type of heart attack known in the scientific community as an acute myocardial infarction. These patients are at immediate risk in that a major part of the heart muscle may die, which could lead to the development of heart failure and early death.

After several years of studies, the researchers have developed a method for rapidly and safely cooling the patient to below 35˚C before opening the occluded vessel with balloon angioplasty.

The patient remains awake during the procedure and is cooled from the inside, which means that the heart is cooled much quicker than if attempted from the outside with cooling pads or blankets. The patient experiences very little discomfort and if the patient feels cold, he or she is warmed from the outside with a warmblanket.

"We as cardiologists have been very good at opening the occluded blood vessel but not at protecting the heart muscle itself. This new treatment gives hope of great benefit for patients with acute myocardial infarction," said Professor Erlinge.

The discovery has been made by Professor Erlinge's research group at the Department of Cardiology, Lund University, Skåne University Hospital along with his colleagues Dr Göran Olivecrona and Dr Matthias Götberg.

Besides the positive effect in reducing the amount of heart damage, a marked reduction in biomarkers for cardiac injury was also found in blood samples, which helps support the findings. There was also no increase in side effects in the patients who were cooled. The researchers are now planning a larger study called CHILL-MI.

Black rice rivals pricey blueberries as source of healthful antioxidants

BOSTON, Aug. 26, 2010 — Health conscious consumers who hesitate at the price of fresh blueberries and blackberries, fruits renowned for high levels of healthful antioxidants, now have an economical alternative, scientists reported here today at the 240th National Meeting of the American Chemical Society (ACS). It is black rice, one variety of which got the moniker "Forbidden Rice" in ancient China because nobles commandeered every grain for themselves and forbade the common people from eating it.

"Just a spoonful of black rice bran contains more health promoting anthocyanin antioxidants than are found in a spoonful of blueberries, but with less sugar and more fiber and vitamin E antioxidants," said Zhimin Xu, Associate Professor at the Department of Food Science at Louisiana State University Agricultural Center in Baton Rouge, La., who reported on the research. "If berries are used to boost health, why not black rice and black rice bran? Especially, black rice bran would be a unique and economical material to increase consumption of health promoting antioxidants."

Like fruits, "black rice" is rich in anthocyanin antioxidants, substances that show promise for fighting heart disease, cancer, and other diseases. Food manufacturers could potentially use black rice bran or the bran extracts to boost the health value of breakfast cereals, beverages, cakes, cookies, and other foods, Xu and colleagues suggested.

Brown rice is the most widely produced rice variety worldwide. Rice millers remove only the outer husks, or "chaff," from each rice grain to produce brown rice. If they process the rice further, removing the underlying nutrient rich "bran," it becomes white rice. Xu noted that many consumers have heard that brown rice is more nutritious than white rice. The reason is that the bran of brown rice contains higher levels of gamma-tocotrienol, one of the vitamin E compounds, and gamma-oryzanol antioxidants, which are lipid-soluble antioxidants. Numerous studies showed that these antioxidants can reduce blood levels of low-density lipoprotein cholesterol (LDL) — so called "bad" cholesterol — and may help fight heart disease. Xu and colleagues analyzed samples of black rice bran from rice grown in the southern United States. In addition, the lipid soluble antioxidants they found in black rice bran possess higher level of anthocyanins antioxidants, which are water-soluble antioxidants. Thus, black rice bran may be even healthier than brown rice bran, suggested Dr. Xu.

The scientists also showed that pigments in black rice bran extracts can produce a variety of different colors, ranging from pink to black, and may provide a healthier alternative to artificial food colorants that manufacturers now add to some foods and beverages. Several studies have linked some artificial colorants to cancer, behavioral problems in children, and other health problems.

Black rice is used mainly in Asia for food decoration, noodles, sushi, and pudding. Dr. Xu said that farmers are interested in growing black rice in Louisiana and that he would like to see people in the country embrace its use.

Oldest evidence of arrows found

By Victoria Gill Science reporter, BBC News

Researchers in South Africa have revealed the earliest direct evidence of human-made arrows.

The scientists unearthed 64,000 year-old "stone points", which they say were probably arrow heads.

Closer inspection of the ancient weapons revealed remnants of blood and bone that provided clues about how they were used. The team reports its findings in the journal Antiquity.

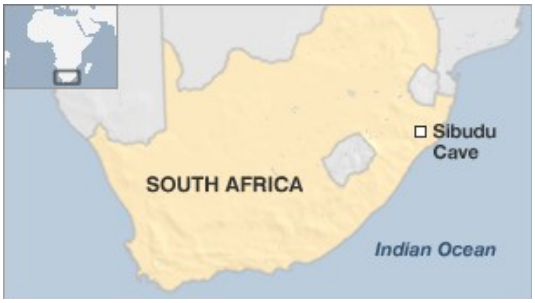
The arrow heads were excavated from layers of ancient sediment in Sibudu Cave in South Africa. During the excavation, led by Professor Lyn Wadley from the University of the Witwatersrand, the team dug through layers deposited up to 100,000 years ago.

Marlize Lombard from the University of Johannesburg, who led the examination of the findings. She described her study as "stone age forensics". "We took the [points] directly from the site, in little [plastic] baggies, to the lab," she told BBC News. "Then I started the tedious work of analysing them [under the microscope], looking at the distribution patterns of blood and bone residues."

Arrow heads (Image: M Lombard/Antiquity) The stone points are approximately 64,000 years old

Because of the shape of these "little geometric pieces", Dr Lombard was able to see exactly where they had been impacted and damaged. This showed that they were very likely to have been the tips of projectiles - rather than sharp points on the end of hand-held spears.

The arrow heads also contained traces of glue - plant-based resin that the scientists think was used to fasten them on to a wooden shaft.



"The presence of glue implies that people were able to produce composite tools - tools where different elements produced from different materials are glued together to make a single artefact," said Dr Lombard.

"This is an indicator of a cognitively demanding behaviour."

The discovery pushes back the development of "bow and arrow technology" by at least 20,000 years.

Ancient engineering

Researchers are interested in early evidence of bows and arrows, as this type of weapons engineering shows the cognitive abilities of humans living at that time.

The researchers wrote in their paper: "Hunting with a bow and arrow requires intricate multi-staged planning, material collection and tool preparation and implies a range of innovative social and communication skills."

Dr Lombard explained that her ultimate aim was to answer the "big question": When did we start to think in the same way that we do now?

"We can now start being more and more confident that 60-70,000 years ago, in Southern Africa, people were behaving, on a cognitive level, very similarly to us," she told BBC News.

Professor Chris Stringer from the Natural History Museum in London said the work added to the view that modern humans in Africa 60,000 years ago had begun to hunt in a "new way".

Neanderthals and other early humans, he explained, were likely to have been "ambush predators", who needed to get close to their prey in order to dispatch them.

Professor Stringer said: "This work further extends the advanced behaviours inferred for early modern people in Africa." "But the long gaps in the subsequent record of bows and arrows may mean that regular use of these weapons did not come until much later.

"Indeed, the concept of bows and arrows may even have had to be reinvented many millennia [later]."

Synthetic Corneas Lend Sight to the Blind

The new corneas eliminate the need for donor corneas and could restore sight to millions of people worldwide.

By Eric Bland | Thu Aug 26, 2010 06:15 AM ET

A new artificial cornea could save the sight of millions of people around the world.

Developed by scientists in Sweden, Canada and California, the new cornea is made from artificial collagen in the lab and, when transplanted into a patient's eye, encourages damaged cells to regenerate and colonize the new tissue. After two years a majority of patients with the artificial corneas had significantly improved vision.

"An artificially fabricated cornea can integrate with the human eye and stimulate regeneration," said May Griffith, a doctor at the Ottawa Hospital Research Institute, the University of Ottawa and Linköping University.

The results were published this week in the journal Science Translational Medicine.

"This approach could help restore sight to millions of people," said Griffith.

The human cornea is a thin, layered and clear tissue that covers parts of the eye such as the colored iris and the pupil. When damaged, the cornea can lead to blurry vision or even complete blindness.

Contact lenses can correct minor problems, but more serious problems can require a full cornea transplant. Clouding of the cornea leads to most cases of blindness worldwide.

The scientists made their artificial cornea from collagen, a common connective tissue found in tendons, ligaments, the cornea itself and other places around the human body. Instead of using natural collagen from humans, however, the scientists created synthetic collagen shaped like a human cornea. By using synthetic collagen, the researchers eliminated the need for donor corneas, which are often in short supply.

After removing single diseased corneas from 10 patients, the scientists inserted the synthetic corneas in their place. After two years with a biosynthetic cornea the patients' own healthy cells had completely covered the synthetic cornea in nine of the 10 patients.

The new synthetic corneas produced tears and responded to touch. Overall vision improved in six of the 10 patients to a level about the same as a human cornea transplant.

All 10 patients had advanced keratoconus, or central corneal scarring, a disease that thins the cornea while giving the eye a more pointed, conical shape. A person suffering from advanced keratoconus sees multiple images and streaking, and is sensitive to light.

Most of the time a contact lens allows patients with keratoconus to function normally, but severe cases require a full transplant. The exact cause of keratoconus is unknown, but studies have associated the condition with various environmental and genetic factors.

The new results are "very impressive," said Shukti Chakravarti, a professor at Johns Hopkins Medical Institute who was not involved in the study. "There is always a dearth of donor tissue, and this would help bypass that."

Even better, by integrating the cornea recipients' own cells into the synthetic cornea, the patients should fight off infections more easily, and be more comfortable.

"Once those cells grow back they can help contribute to better protection of the cornea," said Chakravarti.

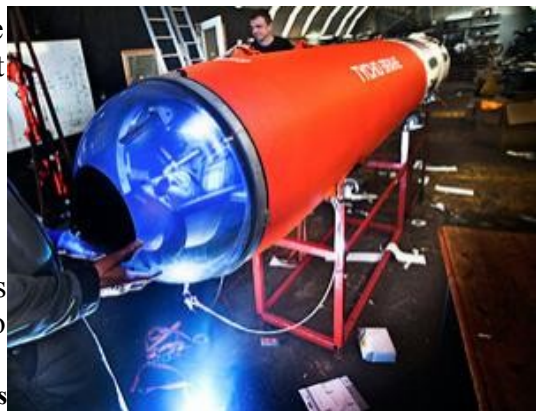
For now the synthetic corneas only work in people with advanced keratoconus, but the doctors and scientists are working to expand the use of synthetic corneas to other eye-related diseases.

"New studies are being planned that will extend the use of the biosynthetic cornea to a wider range of sight-threatening conditions requiring transplantation," said Per Fagerholm, a doctor in Sweden and another co-author of the new study.

Human cannonball astronaut: My rocket is my clothes

*** 14:52 26 August 2010 by Kate McAlpine**

In the next few weeks, Peter Madsen and Kristian von Bengtson plan to launch the first ever standing-room-only spacecraft. Their Tycho Brahe 1 rocket is a cylindrical capsule that snugly fits around a standing person, with a clear plexiglass dome so that the astronaut can see out.



Room for one **Image: Polfoto/Press Association Images**

For this first test flight, Madsen and von Bengtson – founders of the non-profit organisation Copenhagen Suborbitals in Denmark – will put a dummy in the crew compartment and hope to send it 20 kilometres above Earth's surface. Their aim, however, is to use the craft to lift people to heights of 120 kilometres, making it the first Danish rocket to get to space – and the smallest crewed spacecraft ever launched.

Rocket hobbyists have raised doubts about whether the minimalist rocket will remain upright on its way up, but by anyone's standards, it's a daring mission. New Scientist asked Madsen, who has volunteered to be the first passenger, why he wants to embark on such a journey.

Why build a human cannonball instead of a more conventional rocket?

Traditionally, astronauts are launched into space lying on their backs. This means that you have high g-tolerance [can withstand large accelerations], but it's very expensive because it needs a relatively large rocket booster. What we've done, which is very controversial, is to say, "Let's put this man standing."

This gives us a lot of benefits. The rocket becomes a lot smaller – it's only 65 centimetres in diameter – and therefore lighter. Second, it gives the astronaut the visual experience of leaving Earth and travelling up through the atmosphere. This has never happened in the history of space flight.

But how does the standing astronaut survive?

We can choose to design our rocket engines to expose the standing astronaut only to limited g-loads, on the order of 3 to 4 g [three to four times the effect of Earth's gravity] – and only during the first 20 seconds of the flight. That's less than you expose yourself to in a rollercoaster.

We have already used a "human centrifuge" here in Copenhagen to expose people to 5.5 to 6.5 gs. It was crystal clear that this type of g load, at this level and for this period of time, is relatively uncritical to our astronaut.

Will this be the smallest spacecraft ever to carry an astronaut?

You should consider our spacecraft as something totally different. The vessel should be considered like clothes, and the nose-cone a helmet that protects you from the vacuum of space. It's a very different kind of space flight; the person is submerged in the cosmos.

How are you reducing the risk of riding in such a minimal spacecraft?

This is actually a very cautious strategy in developing spacecraft. If you look back to the 1980s, the very first NASA shuttle flight was manned. We do not put people's lives at stake in test flight; we have an unmanned vehicle that flies over and over again until we are certain that it's reasonably safe. You fix those weak spots and fly again until you reach the point that it can take the entire flight without damage. Doing it any other way would be trying to learn to drink from a fire hose.

Could such a human cannonball replace conventional rockets?

It is potentially safer. Personally I believe that wings belong, along with landing gear and flight instrumentation, inside the Earth's atmosphere. When you're outside the Earth's atmosphere, you should build vehicles that are designed for that environment. Wings don't belong in space. And pilots don't belong in space. That's why we built a spacecraft that could – forgive the expression – be flown by a monkey.

So the astronaut has very little control?

Humans can only feel so much and see so much and understand it. You have 10 minutes or 5 minutes in weightlessness, and so we have made our craft completely independent of the astronaut's activity. He's not doing anything with the spacecraft; he's not flying it in any way. He's there as an observer. We have a joystick to control the attitude of the capsule, so the astronaut could turn it around and look in a different direction when he is in space.

Your collaborator called Tycho Brahe 1 an "elaborate art project". Art usually has a message – what is yours?

I suppose it depends on your interpretation of what art is, but one of the things that art can do is that it can open your eyes. Hopefully this mission will give everybody watching an experience of joy, through realising that such things are possible. You can go home and build your own personal spacecraft – that's a good message.

Also, if you look at all the hardware we use, a lot of attention has been paid to making it feel right and look right. I call it a "functional sculpture". It is our vision of what a rocket should look like.

Insulin Resistance, Type 2 Diabetes Linked to Plaques Associated With Alzheimer's Disease

ScienceDaily (Aug. 26, 2010) — People with insulin resistance and type 2 diabetes appear to be at an increased risk of developing plaques in the brain that are associated with Alzheimer's disease, according to new research published in the August 25, 2010, issue of Neurology®, the medical journal of the American Academy of Neurology.

Insulin resistance, or the stage before diabetes, happens when insulin, a hormone in the body, becomes less effective in lowering blood sugar.

"Type 2 diabetes and Alzheimer's disease are two epidemics growing at alarming levels around the world," said study author Kensuke Sasaki, MD, PhD, with Kyushu University in Fukuoka, Japan. "With the rising obesity rates and the fact that obesity is related to the rise in type 2 diabetes, these results are very concerning." The study involved 135 people with an average age of 67 from Hisayama, Japan. The participants had several diabetes glucose tests to measure blood sugar levels. They were also monitored for symptoms of Alzheimer's disease over the next 10 to 15 years. During that time, about 16 percent developed Alzheimer's disease.

After the participants died, researchers examined their autopsied brains for the physical signs of Alzheimer's disease, called plaques and tangles. While 16 percent had symptoms of Alzheimer's disease while alive, a total of 65 percent had plaques.

The study found that people who had abnormal results on three tests of blood sugar control had an increased risk of developing plaques. Plaques were found in 72 percent of people with insulin resistance and 62 percent of people with no indication of insulin resistance. However, the study did not find a link between diabetes factors and tangles in the brain.

"Further studies are needed to determine if insulin resistance is a cause of the development of these plaques," said Sasaki. "It's possible that by controlling or preventing diabetes, we might also be helping to prevent Alzheimer's disease."

Not breast-feeding increases mothers' risk for type 2 diabetes

By Katherine Harmon

The benefits of breast-feeding for babies have proved to be myriad, and an increasing number of studies are finding long-term health benefits for mothers, too, including reduced risk of cardiovascular disease and lower odds of some cancers.

A new analysis confirms earlier observations that breast-feeding helps to decrease a mother's risk of developing type 2 diabetes, and suggests that even a single month of lactation can serve a protective effect. Many major U.S. medical organizations currently recommend breast-feeding infants for at least six months.

Researchers behind the new work found that mothers who did not breast-feed at all had about twice the chance of developing type 2 diabetes than mothers who did, even after controlling for other factors, such as age, race and health history. Twenty-seven percent of the mothers who reported not having breast-fed for at least a month had developed type 2 diabetes.

The protective effect against diabetes may surprise many people. "Diet and exercise are widely known to impact the risk of type 2 diabetes, but few people know that breast-feeding also reduces mothers' risk of

developing the disease later in life," Eleanor Schwarz of the University of Pittsburgh's Department of Medicine and lead author of the study, said in a prepared statement.

The population-based study asked 2,233 women ages 40 to 78 about their breast-feeding and health history and calculated their body mass index. About two thirds (62 percent) of the women said they had breast-fed a baby for at least a month. And those who reported either having breast-fed exclusively for at least one month or at least in part for six months or more all had lower rates of diabetes than mothers who never breast-fed—but about the same rates as women who had never given birth.

Whereas much previous research has suggested at least six months of lactation was needed for substantial protective effects, the new data "showed significant benefits with only one month of lactation," reported the researchers.

Scientists are still working to understand the mechanisms behind this pattern. Schwarz and her colleagues noted that women who breast-feed tend to be faster to shed the additional visceral fat gained during pregnancy, and animal studies have shown that breast-feeding might increase a woman's insulin sensitivity. Women with a higher risk for diabetes might also be less inclined to breast-feed, the authors noted. "Studies have linked obesity and insulin resistance to difficulties with breast-feeding," and in the study, women who were obese were less likely to have breast-fed.

The findings were published online August 27 in The American Journal of Medicine.