http://www.eurekalert.org/pub_releases/2011-02/bmj-oih021111.php

Obesity is heart disease killer in its own right, irrespective of other risk factors

Obesity is associated with fatal coronary heart disease independently of traditional risk factors and deprivation

Obesity is a killer in its own right, irrespective of other biological or social risk factors traditionally associated with coronary heart disease, suggests research published online in Heart.

Increasing weight is associated with a higher prevalence of known risk factors for coronary artery disease, such as diabetes, high blood pressure and cholesterol. And it has been assumed that these have been responsible for the increased risk of heart disease seen in obesity, say the authors.

The research team tracked the health of more than 6,000 middle aged men with high cholesterol, but no history of diabetes or cardiovascular disease, for around 15 years.

After excluding men who had cardiovascular problems or died within two years of the start of monitoring, to correct for any bias, 214 deaths and 1,027 non-fatal heart attacks/strokes occurred during the whole period.

The risk of a heart attack was compared across categories of increasing body mass index (BMI), using two different approaches. One simply corrected for any differences in the age or smoking status of the men, while the second corrected for cardiovascular risk factors such as high cholesterol and blood pressure, deprivation and any medications the men were taking.

Not unexpectedly, the results showed that the higher a man's weight, the higher was his likelihood of having other risk factors for cardiovascular disease. And there was no increased risk of a non-fatal heart attack with increasing BMI, (when using either approach)

But the risk of death was significantly higher in men who were obese - a BMI of 30 to 39.9 kg/m2. In the model simply correcting for age and smoking, this risk was 75% higher. And despite correcting for known cardiovascular risk factors, medication, and deprivation in the second model, the risk was still 60% higher.

Inflammation is a strong factor in fatal cardiovascular disease, and obesity is increasingly being recognised as an inflammatory state, which may partly explain how obesity is linked to heart disease, say the authors. This has implications for treatment and prevention, they add.

In an accompanying podcast, which expands on the findings, lead author Dr Jennifer Logue, of the British Heart Foundation Cardiovascular Research Centre, at the University of Glasgow, cautions that the number of obese men in the sample was small, so the results need to be replicated elsewhere.

But she says, this is mainly because when the study started 20 years ago, the prevalence of obesity was low. But all that has now changed. "The obesity generation is coming of age. We are going to see more and more complications from obesity, and coming at an earlier age," she warns.

http://www.eurekalert.org/pub_releases/2011-02/nioe-nsf021411.php

NIH study finds 2 pesticides associated with Parkinson's disease

New research shows a link between use of two pesticides, rotenone and paraquat, and Parkinson's disease. People who used either pesticide developed Parkinson's disease approximately 2.5 times more often than non-users.

The study was a collaborative effort conducted by researchers at the National Institute of Environmental Health Sciences (NIEHS), which is part of the National Institutes of Health, and the Parkinson's Institute and Clinical Center in Sunnyvale, Calif.

"Rotenone directly inhibits the function of the mitochondria, the structure responsible for making energy in the cell," said Freya Kamel, Ph.D., a researcher in the intramural program at NIEHS and co-author of the paper appearing online in the journal Environmental Health Perspectives. "Paraquat increases production of certain oxygen derivatives that may harm cellular structures. People who used these pesticides or others with a similar mechanism of action were more likely to develop Parkinson's disease.

The authors studied 110 people with Parkinson's disease and 358 matched controls from the Farming and Movement Evaluation (FAME) Study ***(http://www.niehs.nih.gov/research/atniehs/labs/epi/studies/fame/index.cfm)*** to investigate the relationship between Parkinson's disease and exposure to pesticides or other agents that are toxic to nervous tissue. FAME is a case-control study that is part of the larger Agricultural Health Study ***(http://www.niehs.nih.gov/research/atniehs/labs/epi/studies/ahs/index.cfm)***, a study of farming and health in approximately 90,000 licensed pesticide applicators and their spouses. The investigators diagnosed Parkinson's disease by agreement of movement disorder specialists and assessed the lifelong use of pesticides using detailed interviews.

There are no home garden or residential uses for either paraquat or rotenone currently registered. Paraquat use has long been restricted to certified applicators, largely due to concerns based on studies of animal models

of Parkinson's disease. Use of rotenone as a pesticide to kill invasive fish species is currently the only allowable use of this pesticide.

"These findings help us to understand the biologic changes underlying Parkinson's disease. This may have important implications for the treatment and ultimately the prevention of Parkinson's disease," said Caroline Tanner, M.D., Ph.D., clinical research director of the Parkinson's Institute and Clinical Center, and lead author of the article.

Reference: *Tanner CM, Kamel F, Ross GW, Hoppin JA, Goldman SM, Korell M, Marras C, Bhudhikanok GS, Kasten M, Chade AR, Comyns K, Richards MB, Meng C, Priestly B, Fernandez HH, Cambi F, Umbach DM, Blair A, Sandler DP, Langston JW. 2011. Rotenone, paraquat and Parkinson's disease. Environ Health Perspect; doi:10.1289/ehp.1002839 [Online 26 January 2011].* ロテノン、パラコート

http://www.scientificamerican.com/article.cfm?id=your-brain-in-love-graphsci

http://www.scientificamerican.com/article.cfm?id=graphic-science-passionate-love-in-the-brain

Passionate Love in the Brain, as Revealed by MRI Scans [Web Exclusive Graphic]

By Mark Fischetti | February 14, 2011 | 0

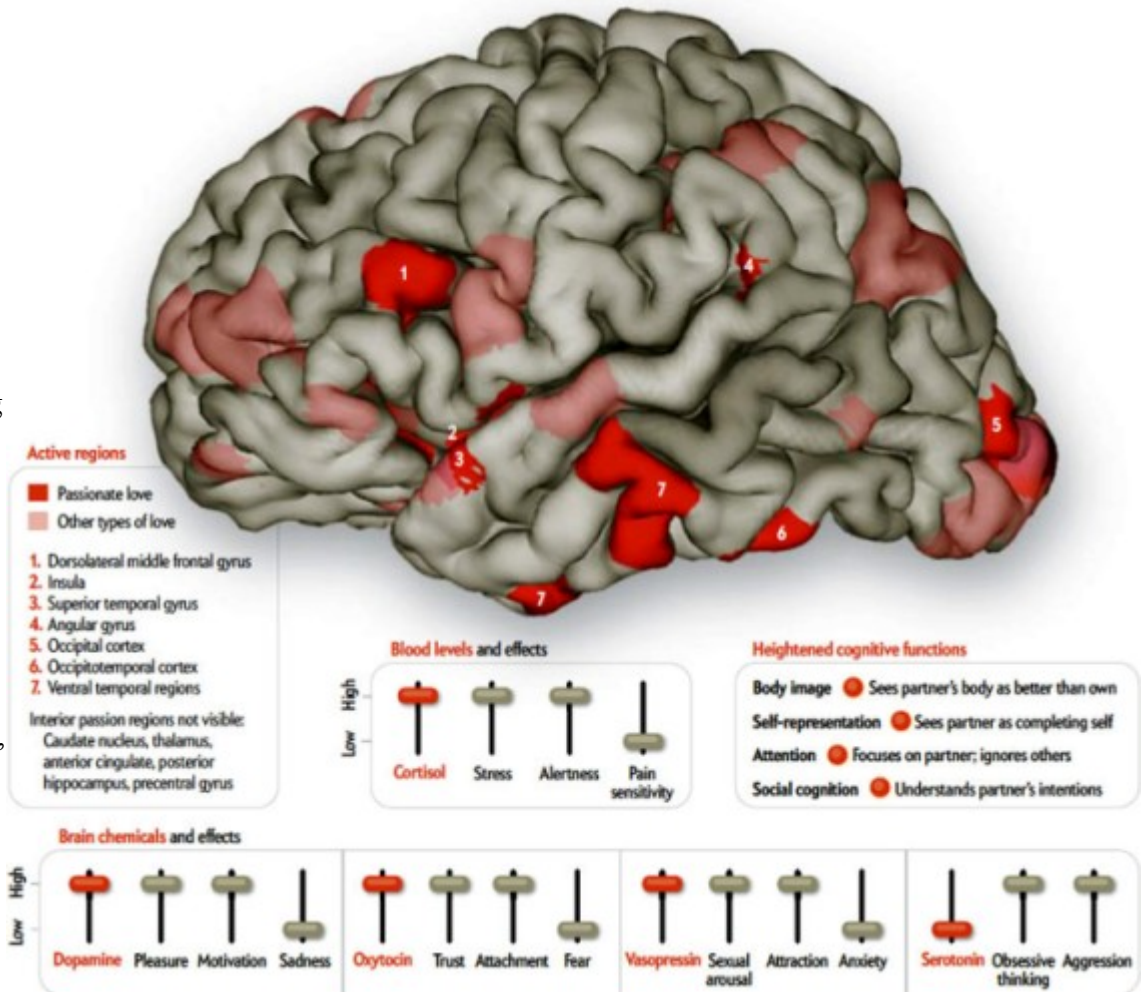
A dozen brain regions, working together, create feelings of passionate love.

Stephanie Ortigue of Syracuse University and her colleagues worldwide compared MRI studies of people who indicated they were either in love or were experiencing maternal or unconditional love. The comparison revealed a "passion network" - the red regions shown here at various angles. The network releases neurotransmitters and other chemicals in the brain and blood that create the sensations of attraction, arousal, pleasure…and obsession. For more details on how the network affects cognitive functions, see "Graphic Science: Your Brain in Love" in the February 2011 issue of Scientific American.

Your Brain in Love

Cupid's arrows, laced with neurotransmitters, find their marks

Men and women can now thank a dozen brain regions for their romantic fervor. Researchers have revealed the fonts of desire by comparing functional MRI studies of people who indicated they were experiencing passionate love, maternal love or unconditional love. Together, the regions release neurotransmitters and other chemicals in the brain and blood that prompt greater euphoric sensations such as attraction and pleasure. Conversely, psychiatrists might someday help individuals who become dangerously depressed after a heartbreak by adjusting those chemicals.



Passion also heightens several cognitive functions, as the brain regions and chemicals surge. “It’s all about how that network interacts,” says Stephanie Ortigue, an assistant professor of psychology at Syracuse University, who led the study. The cognitive functions, in turn, “are triggers that fully activate the love network.” Tell that to your sweetheart on Valentine’s Day.

Graphics by James W. Lewis, West Virginia University (brain), and Jen Christiansen.

http://news.discovery.com/space/keplers-exoplanets-visualized.html

Kepler's Exoplanets Visualized

By Ian O'Neill | Mon Feb 14, 2011 07:20 PM ET

Sure, we all have a grasp as to what it would mean if astronomers found an exoplanet roughly the same size as the Earth, orbiting within the "Goldilocks Zone" of its parent star -- i.e., it's not too hot or too cold for liquid water to exist on the surface.

When one of those bad boys are discovered, the next question would be: "Where's the life?"

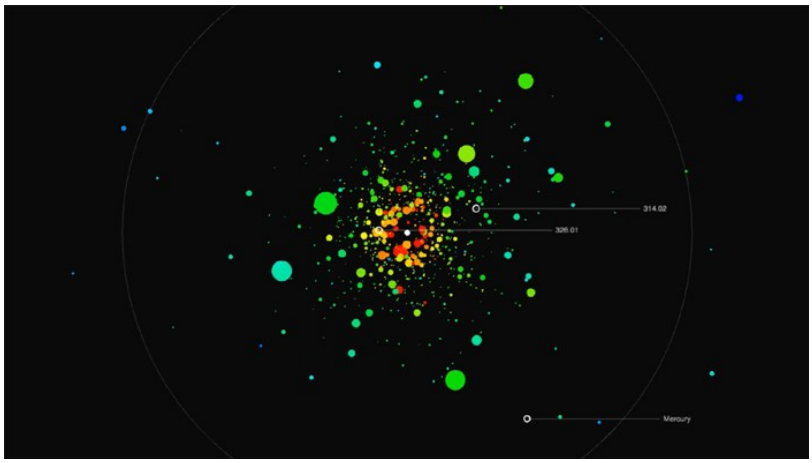
But how close are we getting to that fabled Earth-like exoplanet ("exoEarth"? Or ExoEarth™? You heard it here first)? Well, this outstanding animation might be able to help out, courtesy of Jer Thorp, Data Artist in Residence at the New York Times:

What are we seeing here? Well, as per *Jer's Vimeo description*:

This is a visualization of the 1236 exoplanet candidates observed by Kepler.

As you can see, the vast majority of these planets orbit their stars at a distance less than Earth. This is likely due to the relatively short observation period - it is highly probable that many more planets will be found as the duration of study increases.

Two candidates are highlighted: KOI 326.01 and KOI 314.02. Out of all the candidates, those two may have the best chances of satisfying some of the "habitability" criteria astronomers tend to use.



Kepler Exoplanet Candidates from blprnt on Vimeo.

By throwing all of the 1236 exoplanets recently announced by the Kepler science team into one "solar system," one can get a very real sense about how far the planetary candidates are from their parent star, their temperatures and relative sizes.

Jer has also singled out KOI 326.01 and KOI 314.02, because they are Kepler candidates (or "Kepler Objects of Interest," hence the "KOI" designation) that are considered to be most "Earth-like." When the characteristics of our very own Mercury, Earth, Mars and Jupiter are thrown in, you can easily see how alien many of these newly discovered worlds really are.

To be honest, I think the animation speaks for itself; a wonderful melding of space and art.

Source: Physics World

http://www.eurekalert.org/pub_releases/2011-02/esfm-lha021411.php

Losing hair at 20 is linked to increased risk of prostate cancer in later life

Men who start to lose hair at the age of 20 are more likely to develop prostate cancer in later life and might benefit from screening for the disease, according to a new study published online in the cancer journal, Annals of Oncology [1] today.

The French study compared 388 men being treated for prostate cancer with a control group of 281 healthy men and found that those with the disease were twice as likely as the healthy men to have started going bald when they were 20. However, if the men only started to lose their hair when they were 30 or 40, there was no difference in their risk of developing prostate cancer compared to the control group. The study found no association between early hair loss and an earlier diagnosis of prostate cancer, and nor was there any link between the pattern of hair loss and the development of cancer.

Until now there has been conflicting evidence about the link between balding and prostate cancer; this is the first study to suggest a link between going bald at the young age of 20 and the development of prostate cancer in later life.

Professor Philippe Giraud (M.D., PhD), Professor of Radiation Oncology at the Paris Descartes University (Paris, France) and at the European Georges Pompidou Hospital (Paris, France), who led the research, said: "At present there is no hard evidence to show any benefit from screening the general population for prostate cancer. We need a way of identifying those men who are at high risk of developing the disease and who could be targeted for screening and also considered for chemo-prevention using anti-androgenic drugs such as finasteride. Balding at the age of 20 may be one of these easily identifiable risk factors and more work needs to be done now to confirm this."

Androgenic alopecia, sometimes known as male pattern baldness, is common in men, affecting 50% throughout their lifetime. A link has been established between baldness and androgenic hormones, and androgens also play a role in the development and growth of prostate cancer. Finasteride blocks the conversion of testosterone to an androgen called dihydrotestosterone, which is thought to cause hair loss, and the drug is used to treat the condition. It has also been shown to decrease the incidence of prostate cancer.

From September 2004 Prof Giraud and his colleagues asked the men in their study to answer a questionnaire about their personal history of prostate cancer (if any) and to indicate on four pictures any balding patterns that they had at ages 20, 30 and 40. The pictures showed four stages of hair loss: no balding (stage I), frontal hair loss (receding hairline around the temples), vertex hair loss (a round bald patch at the top of the head), or a combination of both types of hair loss (stage IV). The men's doctors were also asked to provide a medical history of their patients, including any diagnosis of prostate cancer, age at diagnosis, stage of the disease and treatment. The study ran for 28 months. The men with prostate cancer were diagnosed with the disease between the ages of 46 and 84.

Dr Michael Yassa (M.D.), currently Assistant Professor at the University of Montreal (Montreal, Canada) and a radiation oncologist at the Maisonneuve-Rosemont Hospital in Montreal, but who previously worked as a radiation oncology Fellow at the European Georges Pompidou Hospital, said: "There were only three men with stage III and none with stage IV hair loss at the age of 20, but the data revealed that any balding at stages II-IV (37 cases and 14 controls) was associated with double the risk of prostate cancer later in life. This trend was lost at ages 30 and 40.

"We were unable to find an association between the type or pattern of hair loss and the development of cancer. This might be due to the very low prevalence of stage III and IV hair loss at the ages of 20 and 30 in our study."

The researchers say the link between baldness and the development of prostate cancer is still unclear. "Further work should be done, both at the molecular level and with larger groups of men, to find the missing link between androgens, early balding and prostate cancer," said Dr Yassa.

Notes:

[1] "Male pattern baldness and the risk of prostate cancer". Annals of Oncology. doi:10.1093/annonc/mdq695

[2] The authors declared no conflict of interest.

http://www.eurekalert.org/pub_releases/2011-02/w-zrt021111.php

Zinc reduces the burden of the common cold

Zinc supplements reduce the severity and duration of illness caused by the common cold, according to a systematic review published in The Cochrane Library.

The findings could help reduce the amount of time lost from work and school due to colds.

The common cold places a heavy burden on society, accounting for approximately 40% of time taken off work and millions of days of school missed by children each year. The idea that zinc might be effective against the common cold came from a study carried out in 1984, which showed that zinc lozenges could reduce how long symptoms lasted. Since then, trials have produced conflicting results and although several biological explanations for the effect have been proposed, none have been confirmed.

The review updates a previous Cochrane Systematic Review, carried out in 1999, with data from several new trials. In total, data from 15 trials, involving 1,360 people, were included. According to the results, zinc syrup, lozenges or tablets taken within a day of the onset of cold symptoms reduce the severity and length of illness. At seven days, more of the patients who took zinc had cleared their symptoms compared to those who took placebos. Children who took zinc syrup or lozenges for five months or longer caught fewer colds and took less time off school. Zinc also reduced antibiotic use in children, which is important because overuse has implications for antibiotic resistance.

"This review strengthens the evidence for zinc as a treatment for the common cold," said lead researcher Meenu Singh of the Post Graduate Institute of Medical Education and Research in Chandigarh, India. "However, at the moment, it is still difficult to make a general recommendation, because we do not know very much about the optimum dose, formulation or length of treatment."

Further research should focus on the benefits of zinc in defined populations, the review suggests. "Our review only looked at zinc supplementation in healthy people," said Singh. "But it would be interesting to find out whether zinc supplementation could help asthmatics, whose asthma symptoms tend to get worse when they catch a cold." The researchers also say that more work needs to be carried out in low-income countries, where zinc deficiency may be prevalent.

http://www.eurekalert.org/pub_releases/2011-02/bawh-oak021511.php

Obesity and knee osteoarthritis shorten healthy years of life

Researchers estimate healthy years of life losses due to obesity and knee osteoarthritis in Americans 50-84 years of age

Boston, MA – An estimated 10 million Americans suffer from knee osteoarthritis (OA), making it one of the most common causes of disability in the US. Due to obesity and symptomatic knee OA, Americans over the age of 50 will together lose the equivalent of 86 million healthy years of life, concluded researchers at Brigham and Women's Hospital (BWH), who investigated the potential gains in quality and quantity of life that could be achieved averting losses due to obesity and knee OA. These findings are published in the February 15 issue of Annals of Internal Medicine.

"Reducing obesity to levels observed in 2000 would prevent 172,792 cases of coronary heart disease, 710,942 cases of diabetes, and 269,934 total knee replacements," said Elena Losina, PhD lead author of the study and co-director of Orthopedics and Arthritis Center for Outcomes Research in the Dept of Orthopedic Surgery at BWH. "All told, it would save roughly 19.5 million years of life among US adults aged 50-84."

Experts have long known that knee osteoarthritis is on the rise among Americans, due in part to the growing obesity epidemic and longer life expectancy. Obesity and knee OA are among the most frequent chronic conditions in older Americans. However, how that translates into years of healthy life lost has not been accurately estimated. Dr. Losina and colleagues used a mathematical simulation model to assemble national data on the occurrence of knee OA, obesity and other important conditions such as coronary heart disease, diabetes, cancer and chronic lung disease. Their analysis examines the contribution of both obesity and knee OA to losses in quantity and quality of life. It also evaluates how those losses are distributed among racial and ethnic subpopulations in the United States.

"There are 86 million healthy years of life at stake, a disproportionate number of them being lost by Black and Hispanic women," said Jeffrey N. Katz, MD, Director of the Orthopedics and Arthritis Center for Outcomes Research at the BWH and a senior author of the study. "These staggering numbers may help patients and physicians to better grasp the scale of the problem and the potential benefits of behavior change."

This study was funded by grants from National Institute of Arthritis, Musculoskeletal and Skin Disease and the Arthritis Foundation. Contributing authors include Rochelle P. Walensky, MD, MPH, Massachusetts General Hospital, William M. Reichmann, MA, Holly L. Holt, Hanna Gerlovin, Daniel H. Solomon, MD, MPH and Jeffrey N. Katz, from Brigham and Women's Hospital, David Hunter MD from University of Sydney, Australia, Joanne M. Jordan, MD from University of North Carolina, Chapel Hill, Drs. Lisa Suter and A. David Paltiel, from Yale University School of Medicine.

http://www.scientificamerican.com/article.cfm?id=mutant-stem-cells-can-cause-sk

Mutant Stem Cells Can Cause Skin Cancer at Cuts

Cells meant to fix injuries can trigger tumours in cancer-prone mice.

By Erika Check Hayden

Wounds could allow certain types of mutated cell to migrate to the surface of the skin, triggering tumours in people predisposed to cancer, according to a study.

A variety of cancers have been associated with wounds -- for instance, battlefield injuries can lead to a type of tumour called Marjolin's ulcer, and 'kangri cancer' afflicts some people from Kashmir at the site of burns caused by personal heaters carried under the clothes. But until now, no one has shown how skin tumours could arise when the skin is damaged by a physical injury.

A study published today in Proceedings of the National Academy of Sciences by Sunny Wong and Jeremy Reiter, biochemists at the University of California, San Francisco, suggests that the mechanism could involve the migration of mutated stem cells.

"We know that chronic wounding can contribute to cancer development," said Anthony Oro, a dermatologist at Stanford University School of Medicine in California. "This work says that if you have a predisposition to getting cancer, wounding might enhance the chance it will develop."

Wound worries

Wong and Reiter looked at a mouse model for basal cell carcinoma -- the most common type of skin cancer. The tumours are thought to be caused by sun damage to the epidermis, the outer layer of skin. But some features of basal cell carcinomas mimic those of the stem cells that mend damage to the skin; for example, the cancers grow slowly and can sometimes differentiate into other types of cells. That has led researchers to speculate that stem cells might contribute to the formation of such cancers.

To test this, the researchers investigated an oncogene -- a gene that, when mutated, can cause cancer -- called Smoothened -- which is sometimes mutated in people with basal cell carcinomas. They activated a mutated version of the gene in the skin stem cells near hair follicles in mice, but this alone did not cause the rate of

cancers to increase. So the team conducted a second experiment, activating the gene and then wounding the mice by punching out a small disc of skin from their backs. This time, the mice developed tumours resembling basal cell carcinomas at the wound sites.

Wong and Reiter found that the stem cells with mutated genes stayed near the follicles, in the lower layers of skin -- until the mice were wounded. Once the animals had been cut, the cells migrated to the upper layers of skin to fix the damage, but while there, they disrupted a biochemical signalling pathway that has been linked to basal cell carcinoma development -- and thus seeded cancer growth.

What's more, the cells were able to seed cancers for up to five weeks after the oncogene was activated, and even when the wounds were no more severe than a paper cut. In fact, Reiter says that when he first found that injuries could trigger cancer, he "started to get worried about shaving".

Dormant danger

The study suggests that, after DNA in the skin's stem cells is damaged to create a mutation in an oncogene, the mutated cells might rest for years without causing cancer, and might cause problems only when a wound prompts them to act.

But other researchers say that most basal cell carcinomas do not develop at the sites of injury, so the finding is of limited significance. "This is certainly not a major mechanism underlying basal cell carcinoma formation in humans," says Sabine Werner, a cell biologist at the Swiss Federal Institute of Technology in Zurich.

But Werner acknowledges that the study does demonstrate a note-worthy principle. "It may well be that mobilization of cells with oncogenic mutations to other sites -- in particular to sites with a pro-tumorigenic micro-environment, such as wounds -- could trigger tumorigenesis. This is the most interesting finding of this manuscript," she says.

Reiter says that his paper holds a hopeful message: that the niches in which stem cells are normally found -- such as the area surrounding hair follicles in mice -- are good at suppressing cancers.

"It's surprising that activating oncogenes in a stem-cell population doesn't cause tumours," he says. "This gives us a glimpse of a way in which our bodies protect us."

http://www.nytimes.com/2011/02/15/health/15polio.html

Can Polio Be Eradicated? A Skeptic Now Thinks So

By DONALD G. McNEIL Jr.

Two weeks ago, at the end of an interview about whether polio really can be eradicated, Bill Gates muttered aloud to an aide escorting the interviewer: "I've got to get my D. A. Henderson response down better."

By that he meant that as long as he was committing his fortune and prestige to the battle against polio - as he did that day in an announcement at the former Manhattan home of Franklin D. Roosevelt - he would need a stronger riposte to journalists quoting Dr. Henderson's powerful arguments that the virus is just too elusive to subdue.

In a world of quotable medical experts, why does it matter what one particular expert thinks? Because, for better or worse, the mantle has been wrapped around the venerable 82-year-old Donald A. Henderson that he is "The Man Who Wiped Out Smallpox."

(In truth, the smallpox fight - the only successful one so far against a human illness - had many generals. One is Dr. William H. Foege, 74, a former director of the Centers for Disease Control who is now a senior adviser to the Bill and Melinda Gates Foundation and who fervently believes that polio can be eradicated. But over the years, Dr. Henderson has patiently explained his doubts, in persuasive detail, to many medical journalists calling him with questions about any disease eradication effort.)

What neither Mr. Gates nor the reporter interviewing him knew was that Dr. Henderson had changed his mind two days before.

"I see as much greatly augmented the probability that we can stop wild polio virus," he said Wednesday in a follow-up interview - the opposite conclusion to the one he had given to the same reporter on Jan. 26, five days before the Gates interview. "I apologize," he added. "It's not my wont to turn on a dime like this. I don't think I've done anything like this before."

What changed his mind, he said, was a conversation with Dr. Ciro de Quadros on Jan. 29.

Dr. de Quadros, a former director of the Pan American Health Organization, has his own mantle: "The Man Who Found the Last Case of Smallpox in Ethiopia and Chased Polio and Measles Out of the Western Hemisphere."

While nothing has changed about the virus or the vaccine, several things Dr. de Quadros told him were persuasive, he said. "I was unaware of how committed Gates is," he said. "He's saying polio is his No. 1 priority."

Also, he said, he was impressed with the new nine-member monitoring board being set up to advise the World Health Organization. Polio has been driven down by 99 percent since 1985, but the last decade has been frustrating, with repeated outbreaks in countries where the virus had been eliminated.

"There's been too little dissent in the last 10 years," he said of the approach used by the W. H. O. and its partners, much of which depended on endless new rounds of fund-raising. "Now the thinking and the muscle have changed," he said.

Also, Gates Foundation money will allow more experimentation with the oral vaccine used in poor countries. In theory, he said, the live virus in it can be weakened enough to prevent the one-in-two-million chance that it will mutate into a form that can paralyze, a problem known as vaccine-derived polio. (While one in two million sounds infinitesimal, it is not when 134 million children are vaccinated in one day, as happened in India in 1998.) And it may be possible to make a vaccine that needs no refrigeration. Vaccine going bad in the tropical sun is a major problem for rural vaccination teams.

Also, he added, Dr. de Quadros himself taking a role will change the field.

"I watched him perform in Ethiopia," said Dr. Henderson, who recruited Dr. de Quadros into the smallpox campaign. "The obstacles were unbelievable - the emperor assassinated, two revolutionary groups fighting, nine of his own teams kidnapped, even a helicopter captured and held for ransom. He kept the teams in the field - and that helicopter pilot went out and vaccinated all the rebels."

Asked about Dr. Henderson's change of mind, Mr. Gates said on Monday, "He's right, and I'm looking forward to sitting down with him in the next month and getting his advice on this thing."

http://www.nytimes.com/2011/02/15/health/15first.html

Pacemaker, 1933

By NICHOLAS BAKALAR

On Sunday, June 11, 1933, The New York Times reported on a meeting of the American Medical Association that would begin the next day.

Along with exhibits on "high-voltage X-ray treatment" of cancer, on instruments used in famous murder cases and on poisons removed from the organs of homicide victims, it said, "Here will be demonstrated the 'artificial pacemaker,' by which hearts that have stopped beating may sometimes be resuscitated."

The device and various successors were clearly not ready for prime time because it was not until April 28, 1955 that The Times was able to report that a professor of medicine at Harvard had kept a patient's heart beating for 109 hours with an "electric pacemaker."

And in January 1958, it described an "artificial electrical pacemaker" used during surgery to restart a stopped heart and keep it beating until normal rhythm returned.

Then, on Nov. 27, 1958, came a report of what was apparently the first successful long-term use of a pacemaker in a human heart.

"Electrode in Heart Saves Man's Life" read the headline above a picture of Pincus Shapiro, a 76-year-old retired clothing salesman who had had been kept alive on the device for more than three months. He was now being released from the hospital, detached from the machine, with his heart beating on its own.

Mr. Shapiro (shown with his wife, Estelle, and his cardiologist, Dr. Seymour Furman at Montefiore Hospital in the Bronx) bears a distinct resemblance to Groucho Marx, an impression heightened by the cigar held between his teeth that Dr. Furman is helpfully lighting for him.

On a table in the foreground sits a large box with a small viewing screen and about two dozen dials and switches. This was the device to which Mr. Shapiro had been attached for the previous 96 days by a 50-foot extension cord "attached to the heart catheter tube so that Mr. Shapiro could take short walks with his electronic safeguard still plugged in."

A portable pacemaker was soon developed. On June 23, 1959, The Times reported that a silverware salesman named Herman Nisonoff had walked out of Montefiore "with his heartbeat in his hand."

A picture shows Mr. Nisonoff with a device the size of a cigar box in his lap and wires running under his checkered sports coat. He was, the article said, "believed to be the first person ever to leave a hospital with his heartbeat permanently under the protection of an electronic device." The batteries would be expected to last 120 days, and Mr. Nisonoff would be seeing his doctors at least once a week.

Pincus Shapiro died in 1962. By the following year more than 3,000 people were living with implanted pacemakers the size of a large wristwatch, and on Oct. 24, 1965, an article on the first page of the Sunday business section noted that more than 10,000 Americans "are probably alive today because of a tiny device that has been implanted in their bodies called the electronic pacemaker."

Today, an estimated one million Americans have pacemakers, and about 200,000 new ones are implanted every year.

http://www.scientificamerican.com/article.cfm?id=handicapped-by-our-genes

Knocking Out a "Dumb" Gene Boosts Memory in Mice

By Ferris Jabr | Tuesday, February 15, 2011 | 7

We like to think of our brain as an incredibly sophisticated thinking machine that has been fine-tuned by evolution.

But recently researchers working with mice found that a tiny genetic manipulation significantly boosted brainpower with seemingly no negative consequences. People have this gene, too, and it is active in the same brain area. In other words, we may have a gene in our heads that is actively making us dumber.

Emory University pharmacologist John Hepler and his team studied a section of the hippocampus called CA2, found in both mice and humans. Although the hippocampus is crucial for memory, the neurons in CA2, oddly, fail to participate in the cellular process on which learning and memory depend: long-term potentiation, which strengthens communication between neurons that fire together.

The researchers noticed that the neurons in CA2 were saturated with RGS14, a signaling protein that mysteriously inhibits long-term potentiation. When the investigators bred mice lacking the gene that codes for RGS14, they found that the neurons in CA2 suddenly demonstrated long-term potentiation.

The genetic tweak affected more than physiology—it changed how the mice performed on memory tests, too. The experimenters presented two identical objects to knockout mice, which lacked the RGS14 gene, and to normal mice. Four hours and again 24 hours later, the researchers switched one of the objects with a new object. The knockout mice spent far more time exploring the new object than the normal mice did, indicating that the altered rodents had a better memory for distinguishing familiar and strange objects. Knockout mice also learned to navigate a water maze and locate a submerged platform faster than normal mice did. The scientists observed no detriments from removing the RGS14 gene.

"Why would we have a gene that makes us dumber?" asks Serena Dudek, a neuroscientist at the National Institute of Environmental Health Sciences and a co-author of the study, which was published in the September issue of the Proceedings of the National Academy of Sciences USA. "We don't know. But if the gene is conserved by natural selection, there must be some reason. Intuitively, it seems there should be a downside to having this gene knocked out, but we haven't found it so far. It may be that these mice are hallucinating, and you just can't tell."

Alcino Silva, a neurobiologist at the University of California, Los Angeles, and an expert on the biology of memory enhancement who was not involved in the new study, agrees. "My suspicion is when you enhance one thing, you cause deficits in others," Silva says.

Despite their suspicions that the consequences of disabling this gene will materialize eventually, both Silva and Dudek see therapeutic potential: the RGS14 gene and protein are now promising future targets of treatments for learning and memory disabilities.

Editor's note: *The original print title was "Handicapped by Our Genes?"*

http://www.eurekalert.org/pub_releases/2011-02/uom-jop021411.php

Jewel-toned organic phosphorescent crystals: A new class of light-emitting material

ANN ARBOR, Mich.---*Pure organic compounds that glow in jewel tones could potentially lead to cheaper, more efficient and flexible display screens, among other applications.*

University of Michigan researcher Jinsang Kim and his colleagues have developed a new class of material that shines with phosphorescence---a property that has previously been seen only in non-organic compounds or organometallics.

Kim and his colleagues made metal-free organic crystals that are white in visible light and radiate blue, green, yellow and orange when triggered by ultraviolet light. By changing the materials' chemical composition, the researchers can make them emit different colors.

The new luminous materials, or phosphors, could improve upon current organic light-emitting diodes (OLEDs) and solid-state lighting. Bright, low-power OLEDs are used in some small screens on cell phones or cameras. At this time, they aren't practical for use in larger displays because of material costs and manufacturing issues.

Organic phosphors developed at the University of Michigan could one day lead to cheaper organic light-emitting diodes. Here, they glow in blue and orange when triggered by ultraviolet light. **Marcin Szczepanski, U-M College of Engineering**

The OLEDs of today aren't 100 percent organic, or made of carbon compounds. The organic materials used in them must be spiked with metal to get them to glow.

"Purely organic materials haven't been able to generate meaningful phosphorescence emissions. We believe this is the first example of an organic that can compete with an organometallic in terms of brightness and color tuning capability," said Kim, an associate professor of materials science and engineering, chemical engineering, macromolecular science and engineering, and biomedical engineering.

This work is newly published online in Nature Chemistry.

The new phosphors exhibit "quantum yields" of 55 percent. Quantum yield, a measure of a material's efficiency and brightness, refers to how much energy an electron dissipates as light instead of heat as it descends from an excited state to a ground state. Current pure organic compounds have a yield of essentially zero.

In Kim's phosphors, the light comes from molecules of oxygen and carbon known as "aromatic carbonyls," compounds that produce phosphorescence, but weakly and under special circumstances such as extremely low temperatures. What's unique about these new materials is that the aromatic carbonyls form strong halogen bonds with halogens in the crystal to pack the molecules tightly. This arrangement suppresses vibration and heat energy losses as the excited electrons fall back to the ground state, leading to strong phosphorescence.

"By combining aromatic carbonyls with tight halogen bonding, we achieve phosphorescence that is much brighter and in practical conditions," said Onas Bolton, a co-author of this paper who recently received his Ph.D. in Materials Science and Engineering.

This new method offers an easier way to make high-energy blue organic phosphors, which are difficult to achieve with organometallics.

Organic light emitting diodes are lighter and cheaper to manufacture than their non-organic counterparts, which are made primarily of ceramics. Today's OLEDs still contain small amounts of precious metals, though. These new compounds can bring the price down even further, because they don't require precious metals. They're made primarily of inexpensive carbon, oxygen, chlorine and bromine.

"This is in the beginning stage, but we expect that it will not be long before our simple materials will be available commercially for device applications," Kim said. "And we expect they will bring a big change in the LED and solid-state lighting industries because our compounds are very cheap and easy to synthesize and tune the chemical structure to achieve different colors and properties."

Former doctoral student Kangwon Lee discovered the unique properties of these materials while developing a biosensor---a compound that detects biological molecules and can be used in medical testing and environmental monitoring. The phosphors have applications in this area as well. After Lee's discovery, Bolton developed the metal-free pure-organic phosphors.

The paper is titled "Activating efficient phosphorescence from purely-organic materials by crystal design." In addition to Kim, Bolton, and Lee, other contributors are: former postdoctoral researcher Hyong-Jun Kim in the Department of Materials Science and Engineering and recent Chemical Engineering graduate Kevin Y. Lin. This work is partly funded by the National Science Foundation and the National Research Foundation of Korea.

The university is pursuing patent protection for the intellectual property, and is seeking commercialization partners to help bring the technology to market.

For more information: Jinsang Kim: http://www.mse.engin.umich.edu/people/faculty/kim

http://www.eurekalert.org/pub_releases/2011-02/uow-wpu021411.php

World phosphorous use crosses critical threshold

MADISON — *Recalculating the global use of phosphorous, a fertilizer linchpin of modern agriculture, a team of researchers warns that the world's stocks may soon be in short supply and that overuse in the industrialized world has become a leading cause of the pollution of lakes, rivers and streams.*

Writing in the Feb. 14 edition of the journal Environmental Research Letters, Stephen Carpenter of the University of Wisconsin-Madison and Elena Bennett of McGill University report that the human use of phosphorous, primarily in the industrialized world, is causing the widespread eutrophication of fresh surface water. What's more, the mineable global stocks of phosphorous are concentrated in just a few countries and are in decline, posing the risk of global shortages within the next 20 years.

"There is a finite amount of phosphorous in the world," says Carpenter, a UW-Madison professor of limnology and one of the world's leading authorities on lakes and streams. "This is a material that's becoming more rare and we need to use it more efficiently."

Phosphorous is an essential element for life. Living organisms, including humans, have small amounts and the element is crucial for driving the energetic processes of cells. In agriculture, phosphorous mined from ancient marine deposits is widely used to boost crop yields. The element also has other industrial uses.

But excess phosphorous from fertilizer that washes from farm fields and suburban lawns into lakes and streams is the primary cause of the algae blooms that throw freshwater ecosystems out of kilter and degrade water quality. Phosphorous pollution poses a risk to fish and other aquatic life as well as to the animals and humans who depend on clean fresh water. In some instances, excess phosphorous sparks blooms of toxic algae, which pose a direct threat to human and animal life.

"If you have too much phosphorous, you get eutrophication," explains Carpenter of the cycle of excessive plant and algae growth that significantly degrades bodies of fresh water. "Phosphorous stimulates the growth of algae and weeds near shore and some of the algae can contain cyanobacteria, which are toxic. You lose fish. You lose water quality for drinking."

The fertilizer-fueled algae blooms themselves amplify the problem as the algae die and release accumulated phosphorous back into the water.

Carpenter and Bennett write in their Environmental Research Letters report that the "planetary boundary for freshwater eutrophication has been crossed while potential boundaries for ocean anoxic events and depletion of phosphate rock reserves loom in the future."

Complicating the problem, says Carpenter, is the fact that excess phosphorous in the environment is a problem primarily in the industrialized world, mainly Europe, North America and parts of Asia. In other parts of the world, notably Africa and Australia, soils are phosphorous poor, creating a stark imbalance. Ironically, soils in places like North America, where fertilizers with phosphorous are most commonly applied, are already loaded with the element.

"Some soils have plenty of phosphorous, and some soils do not and you need to add phosphorous to grow crops on them," Carpenter notes. "It's this patchiness that makes the problem tricky."

Bennett and Carpenter argue that agricultural practices to better conserve phosphate within agricultural ecosystems are necessary to avert the widespread pollution of surface waters. Phosphorous from parts of the world where the element is abundant, they say, can be moved to phosphorous deficient regions of the world by extracting phosphorous from manure, for example, using manure digesters.

Deposits of phosphate, the form of the element that is mined for agriculture and other purposes, take many millions of years to form. The nations with the largest reserves of the element are the United States, China and Morocco.

The new study was supported by grants from the U.S. National Science Foundation and the Natural Sciences and Engineering Research Council of Canada.

http://www.physorg.com/news/2011-02-genetic-evidence-antioxidants-cancer.html

Researchers provide genetic evidence that antioxidants can help treat cancer

Researchers from Jefferson's Kimmel Cancer Center have genetic evidence suggesting the antioxidant drugs currently used to treat lung disease, malaria and even the common cold can also help prevent and treat cancers because they fight against mitochondrial oxidative stress -- a culprit in driving tumor growth.

For the first time, the researchers show that loss of the tumor suppressor protein Caveolin-1 (Cav-1) induces mitochondrial oxidative stress in the stromal micro-environment, a process that fuels cancer cells in most common types of breast cancer.

"Now we have genetic proof that mitochondrial oxidative stress is important for driving tumor growth," said lead researcher Michael P. Lisanti, M.D., Ph.D., professor of cancer biology at Jefferson Medical College of Thomas Jefferson University and member of the Kimmel Cancer Center at Jefferson. "This means we need to make anti-cancer drugs that specially target this type of oxidative stress. And there are already antioxidant drugs out there on the market as dietary supplements, like N-acetyl cysteine."

These findings were published in the online February 15 issue of Cancer Biology & Therapy.

Lisanti's lab previously discovered Cav-1 as a biomarker that functions as a tumor suppressor and is the single strongest predictor of breast cancer patient outcome. For example, if a woman has triple negative breast cancer and is Cav-1 positive in the stroma, her survival is greater than 75 percent at 12 years, versus less than 10 percent at 5 years if she doesn't have the Cav-1 protein, according to Dr. Lisanti.

The researchers also established Cav-1's role in oxidative stress and tumor growth; however, where that stress originates and its mechanism(s) were unclear.

To determine this, Jefferson researchers applied a genetically tractable model for human cancer associated fibroblasts in this study using a targeted sh-RNA knock-down approach. Without the Cav-1 protein, researchers found that oxidative stress in cancer associated fibroblasts leads to mitochondrial dysfunction in stromal fibroblasts. In this context, oxidative stress and the resulting autophagy (production of recycled nutrients) in the tumor-microenvironment function as metabolic energy or "food" to "fuel" tumor growth.

The researchers report that the loss of Cav-1 increases mitochondrial oxidative stress in the tumor stroma, increasing both tumor mass and tumor volume by four-fold, without any increase in tumor angiogenesis.

"Antioxidants have been associated with cancer reducing effects—beta carotene, for example—but the mechanisms, the genetic evidence, has been lacking," Dr. Lisanti said. "This study provides the necessary genetic evidence that reducing oxidative stress in the body will decrease tumor growth."

Currently, anti-cancer drugs targeting oxidative stress are not used because is it commonly thought they will reduce the effectiveness of certain chemotherapies, which increase oxidative stress.

"We are not taking advantage of the available drugs that reduce oxidative stress and autophagy, including metformin, chloroquine and N-acetyl cysteine," Dr. Lisanti said. "Now that we have genetic proof that oxidative stress and resulting autophagy are important for driving tumor growth, we should reconsider using antioxidants and autophagy inhibitors as anti-cancer agents."

The diabetic drug metformin and chloroquine, which is used for the prevention and treatment of malaria, prevent a loss of Cav-1 in cancer associated fibroblasts (which is due to oxidative stress), functionally cutting off the fuel supply to cancer cells.

This research also has important implications for understanding the pathogenesis of triple negative and tamoxifen-resistance in ER-positive breast caner patients, as well as other epithelial cancers, such as prostate cancers.

"Undoubtedly, this new genetically tractable system for cancer associated fibroblasts will help identify other key genetic 'factors' that can block tumor growth," Dr. Lisanti said. *Provided by Thomas Jefferson University*

http://www.nytimes.com/2011/02/15/health/views/15cases.html

Shedding a Protective Cocoon, Woven by Delusions

By MARC E. AGRONIN, M.D.

The woman described the sensation as a delicate flicker, like a moth trapped in a small gauze bag. She ran her slender fingers repeatedly over the spot in her slightly distended abdomen and said, "Doctor, right here."

Sometimes, she told me, the flicker gave way to a more forceful kick that rippled beneath her hand and then spread like a warm tide over her body. She felt contented and soothed as she imagined the baby growing inside.

I was tempted to smile, but I kept still. An actual pregnancy would have been international news: the woman was 83 years old, recovering from a hip fracture and pneumonia. But her delusion was not unique. Indeed, our nursing home was having something of a baby boom.

Just the day before, another woman who had recently suffered a stroke insisted that she had given birth to twin boys, who were now crying in the adjacent nursery. I reminded her that she was 90, but my words were no match for the force of her belief. She looked at me blankly and called again for her babies.

Her husband, distraught, begged me to consider some pharmacologic remedy. But I was struck not by any mental suffering on the woman's part, but by the opposite.

In the face of terrible losses and confusion, her mind had found refuge in imaginary children. Their coos and cries brought comfort and hope.

Pseudocyesis, as delusional pregnancy is called, is neither common late in life nor a normal response to aging or illness. It is a form of psychosis, and it can lead to severe anxiety or disruptive behavior that must be treated.

But it is too easy to see pathology in what may actually be a protective mechanism in the aging brain. What a psychiatrist might call a symptom held deep meaning for each woman, and prompted them to focus on recovering from severe illness.

In each case, I had to act in the opposite direction of my instinct as a doctor. Medication might have only sedated them and even taken away a protective cocoon. Instead I let time do its work: the delusions faded, and physical and mental recovery took hold.

Such examples are relatively rare and, one might argue, easily romanticized. But they hold a larger lesson about the aging brain.

What we perceive as a brain in flight or decline, disengaging from the world or tumbling into a netherworld of oldness, might actually be a more selective, creative and wiser brain.

The paradox is that even as the normal aging brain loses capacity across numerous discrete skills — memory-processing speed, verbal reasoning and visuospatial ability, to name a few — it is simultaneously growing in knowledge, emotional maturity, adaptability to change and even levels of well-being and happiness.

I witnessed this common phenomenon in a couple I know well. The woman is a sharp and active 82-year-old who only recently retired as a social worker. Her new husband, now 92, was a World War II bomber pilot and retired marketing genius who always prided himself on his mental discipline and physical stamina.

Recently he began to complain bitterly of creeping short-term memory impairment and a general slowing of his motor functions. Both factors can bring him great unhappiness. During a recent meeting, however, I pressed him on his complaints, asking, “Is that all there is to growing old — decline, slowing and loss?”

His bride interrupted and told how their relationship was unique because of old age, in many ways deeper and more intimate than either had experienced as younger people.

Even as his memory declined, she said, his emotional maturity and wisdom had increased, opening perspectives and relationships he had never had before. Here was old age — and an aging brain — acting as a force that added even as it took away.

In telling this tale as a relatively young doctor who works primarily with older individuals, I could easily be accused of painting an overly rosy picture of what I want growing old to be.

If so, I plead guilty. But I do so in the spirit of the gerontologist Thomas Cole, who suggests that the ways in which we look at old age begin to constitute its reality.

We will all grow old, and despite the inevitable changes we do have choices. Indeed, growing evidence suggests that the aging brain retains and even increases the potential for resilience, growth and well-being.

I have seen this lesson lived in my friends, loved ones and older patients, whether free of illness or fettered by it. I saw it in the two older women whose imagined pregnancies brought needed hope at a time of threatened despair. Their fervent wishes, though unattainable, allowed them to achieve something better.

Similarly, we can all hope for a vital and meaningful old age — for our elders, ourselves and our children. In the end, we may actually get what we wish for.

Dr. Marc E. Agronin, a geriatric psychiatrist at the Miami Jewish Health Systems in Florida, is the author of the new book “How We Age.”

http://www.eurekalert.org/pub_releases/2011-02/tmsh-rfb021611.php

Researchers find brain insulin plays critical role in the development of diabetes

Researchers from Mount Sinai School of Medicine have discovered a novel function of brain insulin, indicating that impaired brain insulin action may be the cause of the unrestrained lipolysis that initiates and worsens type 2 diabetes in humans. The research is published this month in the journal Cell Metabolism.

Led by Christoph Buettner, MD, Assistant Professor of Medicine in the Division of Endocrinology, Diabetes and Bone Disease at Mount Sinai School of Medicine, the research team first infused a tiny amount of insulin into the brains of rats and then assessed glucose and lipid metabolism in the whole body. In doing so, they found that brain insulin suppressed lipolysis, a process during which triglycerides in fat are broken down and fatty acids are released.

Furthermore, in mice that lacked the brain insulin receptor, lipolysis was unrestrained. While fatty acids are important energy sources during fasting, they can worsen diabetes, especially when they are released after the person has eaten, as happens in people with diabetes. Researchers previously believed that insulin's ability to suppress lipolysis was entirely mediated through insulin receptors expressed on adipocytes, or fat tissue cells.

"We knew that insulin has this fundamentally important ability of suppressing lipolysis, but the finding that this is mediated in a large part by the brain is surprising," said Dr. Buettner. "The major lipolysis-inducing pathway in our bodies is the sympathetic nervous system and here the studies showed that brain insulin reduces sympathetic nervous system activity in fat tissue. In patients who are obese or have diabetes, insulin fails to inhibit lipolysis and fatty acid levels are increased. The low-grade inflammation throughout the body's tissue that is commonly present in these conditions is believed to be mainly a consequence of these increased fatty acid levels."

Dr. Buettner added, "When brain insulin function is impaired, the release of fatty acids is increased. This induces inflammation, which can further worsen insulin resistance, the core defect in type 2 diabetes. Therefore, impaired brain insulin signaling can start a vicious cycle since inflammation can impair brain insulin signaling." This cycle is perpetuated and can lead to type 2 diabetes. Our research raises the possibility that enhancing brain insulin signaling could have therapeutic benefits with less danger of the major complication of insulin therapy, which is hypoglycemia."

Dr. Buettner's team plans to further study conditions that lead to diabetes such as overfeeding to test if excessive caloric intake impairs brain insulin function. A major second goal will be to find ways of improving brain insulin function that could break the vicious cycle by restraining lipolysis and improving insulin resistance. This study is supported by a grant from the National Institutes of Health and the American Diabetes Association. First author of the study is Thomas Scherer, PhD, postdoctoral fellow in the Department of Medicine in the Division of Endocrinology, Diabetes and Bone Disease.

http://www.eurekalert.org/pub_releases/2011-02/uoc--ggu021611.php

Geologists get unique and unexpected opportunity to study magma

Such molten rock could become sources of high-grade energy, says UC Riverside's Wilfred Elders

RIVERSIDE, Calif. – Geologists drilling an exploratory geothermal well in 2009 in the Krafla volcano in Iceland encountered a problem they were simply unprepared for: magma (molten rock or lava underground) which flowed unexpectedly into the well at 2.1 kilometers (6,900 ft) depth, forcing the researchers to terminate the drilling.

"To the best of our knowledge, only one previous instance of magma flowing into a geothermal well while drilling has been documented," said Wilfred Elders, a professor emeritus of geology in the Department of Earth Sciences at the University of California, Riverside, who led the research team. "We were drilling a well that was designed to search for very deep – 4.5 kilometers (15,000 feet) – geothermal resources in the volcano. While the magma flow interrupted our project, it gave us a unique opportunity to study the magma and test a very hot geothermal system as an energy source."

Currently, a third of the electric power and 95 percent of home heating in Iceland is produced from steam and hot water that occurs naturally in volcanic rocks.

"The economics of generating electric power from such geothermal steam improves the higher its temperature and pressure," Elders explained. "As you drill deeper into a hot zone the temperature and pressure rise, so it should be possible to reach an environment where a denser fluid with very high heat content, but also with unusually low viscosity occurs, so-called 'supercritical water.' Although such supercritical water is used in large coal-fired electric power plants, no one had tried to use supercritical water that should occur naturally in the deeper zones of geothermal areas."

Elders and colleagues report in the March issue of Geology (the research paper was published online on Feb. 3) that although the Krafla volcano, like all other volcanoes in Iceland, is basaltic (a volcanic rock containing 45-50 percent silica), the magma they encountered is a rhyolite (a volcanic rock containing 65-70 percent silica).

"Our analyses show that this magma formed by partial melting of certain basalts within the Krafla volcano," Elders said. "The occurrence of minor amounts of rhyolite in some basalt volcanoes has always been something of a puzzle. It had been inferred that some unknown process in the source area of magmas, in the mantle deep below the crust of the Earth, allows some silica-rich rhyolite melt to form in addition to the dominant silica-poor basalt magma."

Elders explained that in geothermal systems water reacts with and alters the composition of the rocks, a process termed "hydrothermal alteration." "Our research shows that the rhyolite formed when a mantle-derived basaltic magma encountered hydrothermally altered basalt, and partially melted and assimilated that rock," he said.

Elders and his team studied the well within the Krafla caldera as part of the Iceland Deep Drilling Project, an industry-government consortium, to test whether geothermal fluids at supercritical pressures and temperatures could be exploited as sources of power. Elders's research team received support of $3.5 million from the National Science Foundation and $1.5 million from the International Continental Scientific Drilling Program.

In the spring of 2009 Elders and his colleagues progressed normally with drilling the well to 2 kilometers (6,600 feet) depth. In the next 100 meters (330 feet), however, multiple acute drilling problems occurred. In June 2009, the drillers determined that at 2104 meters (6,900 feet) depth, the rate of penetration suddenly increased and the torque on the drilling assembly increased, halting its rotation. When the drill string was pulled up more than 10 meters (33 feet) and lowered again, the drill bit became stuck at 2095 meters (6,875 feet). An intrusion of magma had filled the lowest 9 meters (30 feet) of the open borehole. The team terminated the drilling and completed the hole as a production well.

"When the well was tested, high pressure dry steam flowed to the surface with a temperature of 400 Celsius or 750 Fahrenheit, coming from a depth shallower than the magma," Elders said. "We estimated that this steam could generate 25 megawatts of electricity if passed through a suitable turbine, which is enough electricity to power 25,000 to 30,000 homes. What makes this well an attractive source of energy is that typical high-temperature geothermal wells produce only 5 to 8 megawatts of electricity from 300 Celsius or 570 Fahrenheit wet steam." Elders believes it should be possible to find reasonably shallow bodies of magma, elsewhere in Iceland and the world, wherever young volcanic rocks occur.

"In the future these could become attractive sources of high-grade energy," said Elders, who got involved in the project in 2000 when a group of Icelandic engineers and scientists invited him to join them to explore concepts of developing geothermal energy.

The Iceland Deep Drilling Project has not abandoned the search for supercritical geothermal resources. The project plans to drill a second deep hole in southwest Iceland in 2013.

Elders was joined in the research project by researchers at HS Orka hf (HS Power Co.), Iceland; UC Davis; Stanford University; Iceland GeoSurvey; Landsvirkjun Power, Iceland; the U.S. Geological Survey; New Mexico Institute of Mining and Technology; and the University of Oregon, Eugene.

http://www.eurekalert.org/pub_releases/2011-02/mgh-ehp021611.php

Enzyme helps prepare lung tissue for metastatic development

A Massachusetts General Hospital (MGH) study has identified a new role for an important enzyme in preparing lung tissue for the development of metastases.

Published in the early edition of Proceedings of the National Academy of Sciences, the report describes how focal adhesion kinase (FAK) is involved in producing areas of vascular leakiness in lung tissue – known to be part of the premetastatic process – and increases expression of a molecule that attracts cancer cells to potential metastatic sites.

"Blood from all tissues of the body travels to the lungs for oxygenation, increasing the likelihood that circulating metastatic cells will interact with the lung microvasculature," says Rakesh K. Jain, PhD, director of the Steele Laboratory for Tumor Biology at MGH and senior author of the study. "Identifying factors that prepare this 'hospitable soil' for tumor formation may help us develop strategies to slow or halt that process."

In order to form metastases, cancer cells carried through the bloodstream need to find an environment that allows them to adhere and proliferate. While recent research supports the hypothesis that primary tumors secrete factors that prepare distant sites for potential metastatic development, defining the role of specific factors has been challenging. The current study investigated whether the ability of tumors in other parts of the body to induce formation of distinct areas of abnormal leakiness in lung tissue contributes to the development of metastases.

The researchers first confirmed that either the presence of an implanted tumor or infusions of factors secreted by tumors produced localized areas of leakiness in the lungs of mice. Analysis of the tumor-secreted factors identified specific molecules known to increase vascular permeability, including the angiogenesis-inducing vascular endothelial growth factor (VEGF). Metastatic cells infused into mice treated with either tumor-secreted factors or VEGF preferentially adhered to sites of leaky lung tissue, and both this attraction of tumor cells and the increase in vascular permeability were reduced by blocking VEGF activity.

Since VEGF is known to activate FAK – which plays a role in cellular signaling – in the endothelial cells that line pulmonary blood vessels, the researchers analyzed levels of the enzyme at the sites of induced vascular leakiness and found them to be elevated. "Blocking the activity of FAK in lung endothelial cells reduced both vascular permeability and the adhesion of metastatic cells to those tissues. Additional genetic experiments revealed that FAK produces these effects through increased local expression of the cellular adhesion molecule E-selectin," says Dai Fukumura, MD, PhD, of the Steele Lab, a co-senior author of the report.

Co-senior author Dan G. Duda, DMD, PhD, also of the Steele Lab, adds, "Anti-metastatic therapy is the ultimate frontier for cancer therapy, but existing treatments – both traditional chemotherapy and newer antiangiogenesis agents – have limited effectiveness in preventing the development of metastases. Our findings provide proof of principle that FAK inhibition is a valid antimetastatic strategy that should be investigated in future translational studies."

Jain is the Cook Professor of Radiation Oncology (Tumor Biology), Duda an assistant professor of Radiation Oncology, and Fukumura an associate professor of Radiation Oncology at Harvard Medical School. The lead author of the PNAS paper is Sachie Hiratsuka, MD, PhD, of the Steele Laboratory at MGH. Additional co-authors are Shom Goel, MD, and Walid Kamoun, PhD, Steele Lab; and Yoshiro Maru, MD, PhD, Tokyo Women's Medical University. The study was supported by grants from the National Institutes of Health and other funders.

http://www.eurekalert.org/pub_releases/2011-02/vt-ofo021411.php

Oldest fossils of large seaweeds, possible animals tell story about oxygen in an ancient ocean

Almost 600 million years ago, before the rampant evolution of diverse life forms known as the Cambrian explosion, a community of seaweeds and worm-like animals lived in a quiet deep-water niche under the sea near what is now Lantian, a small village in Anhui Province of South China.

Then they simply died, leaving some 3,000 nearly pristine fossils preserved between beds of black shale deposited in oxygen-free waters. Scientists from the Chinese Academy of Sciences, Virginia Tech in the U.S., and Northwest University in Xi'an, China report the discovery of the fossils and the mystery in the Feb. 17 issue of Nature. *

In addition to perhaps ancient versions of algae and worms, the Lantian biota – named for its location - included macrofossils with complex and puzzling structures. In all, scientists identified about 15 different species at the site.

The fossils suggest that morphological diversification of macroscopic eukaryotes – the earliest versions of organisms with complex cell structures -- may have occurred only tens of millions of years after the snowball earth event that ended 635 million years ago, just before the Ediacaran Period. And their presence in the highly organic-rich black shale suggests that, despite the overall oxygen-free conditions, brief oxygenation of the oceans did come and go.

"So there are two questions," said Shuhai Xiao, professor of geobiology in the College of Science at Virginia Tech. "Why did this community evolve when and where it did? It is clearly different in terms of the number of species compared to biotas preserved in older rocks. There are more species here and they are more complex and larger than what evolved before. These rocks were formed shortly after the largest ice age ever, when much of the global ocean was frozen. By 635 million years ago, the snowball earth event ended and oceans were clear of ice. Perhaps that prepared the ground for the evolution of complex eukaryotes."

The team was examining the black shale rocks because, although they were laid down in waters that were not good for oxygen-dependent organisms, "they are known to be able to preserve fossils very well," said Shuhai. "In most cases, dead organisms were washed in and preserved in black shales. In this case, we discovered fossils that were preserved in pristine condition where they had lived – some seaweeds still rooted."

The conclusion that the environment would have been poisonous is derived from geochemical data, "but the bedding surfaces where these fossils were found represent moments of geological time during which free oxygen was available and conditions were favorable. They are very brief moments to a geologist," said Xiao. "but long enough for the oxygen-demanding organisms to colonize the Lantian basin and capture the rare opportunities."

These images are part and counterpart of a macroscopic Lantian fossil, probably a seaweed, with differentiated morphologies including a distinct root-like holdfast to secure the organism on sea bottom, a conical stem, and a crown of ribbon-like structures. Scale bar is 1 centimeter. **Photo by Zhe Chen**

The research team suggests in the article in Nature that the Lantian basin was largely without oxygen but was punctuated by brief oxic episodes that were opportunistically populated by complex new life forms, which were subsequently killed and preserved when the oxygen disappeared. "Such brief oxic intervals demand high-resolution sampling for geochemical analysis to capture the dynamic and complex nature of oxygen history in the Ediacaran Period," said lead author Xunlai Yuan, professor of palaeontology with the Chinese Academy of Sciences.

Proving that hypothesis awaits further study. The rocks in the study region are deposited in layered beds. The nature of the rock changes subtly and there are finer and finer layers that can be recognized within each bed. "We will need to sample each layer to see whether there is any difference in oxygen contents between layers with fossils and those without" said co-author Chuanming Zhou, professor of palaeontology with the Chinese Academy of Sciences.

**The paper, "An Early Ediacaran Assemblage of Macroscopic and Morphologically Differentiated Eukaryotes," by Xunlai Yuan and Zhe Chen of the Chinese Academy of Sciences; Shuhai Xiao of Virginia Tech; Chuanming Zhou, also of the Chinese Academy of Sciences; and Hong Hua of Northwest University in Xi'an, appears in the Feb. 17 issue of Nature.*

The research was supported by Chinese Academy of Sciences, National Natural Science Foundation of China, Chinese Ministry of Science and Technology, National Science Foundation, NASA Exobiology and Evolutionary Biology Program, and a Guggenheim fellowship to Xiao.

http://www.eurekalert.org/pub_releases/2011-02/gwum-grr021411.php

GW researchers reveal first autism candidate gene that demonstrates sensitivity to sex hormones

WASHINGTON— ***George Washington University researcher, Dr. Valerie Hu, Professor of Biochemistry and Molecular Biology, and her team at the School of Medicine and Health Sciences, have found that male and female sex hormones regulate expression of an important gene in neuronal cell culture through a mechanism that could explain not only higher levels of testosterone observed in some individuals with autism, but also why males have a higher incidence of autism than females.***

The gene, RORA, encodes a protein that works as a "master switch" for gene expression, and is critical in the development of the cerebellum as well as in many other processes that are impaired in autism. Dr. Hu's earlier research found that RORA was decreased in the autistic brain. In this study, the research group

demonstrates that aromatase, a protein which is regulated by RORA, is also reduced in autistic brains. This is significant because aromatase converts testosterone to estrogen. Thus, a decrease in aromatase is expected to lead in part to build up of male hormones which, in turn, further decrease RORA expression, as demonstrated in this study using a neuronal cell model. On the other hand, female hormones were found to increase RORA in the neuronal cells. The researchers believe that females may be more protected against RORA deficiency not only because of the positive effect of estrogen on RORA expression, but also because estrogen receptors, which regulate some of the same genes as RORA, can help make up for the deficiency in RORA.

"It is well known that males have a higher tendency for autism than females; however, this new research may, for the first time, provide a molecular explanation for why and how this happens. This is just the tip of the iceberg in terms of understanding some of the biology underlying autism, and we will continue our work to discover new ways to understand and, hopefully, to someday combat this neurodevelopmental disorder," said Dr. Hu.

In her research published in 2009, Dr. Hu and colleagues found that RORA deficiencies were only apparent in the most severe cases of autism and were observed in the brain tissues of both male and female subjects. They further found that the deficiency in RORA was linked to a chemical modification of the gene (called methylation) which effectively reduces the level of RORA.

http://www.eurekalert.org/pub_releases/2011-02/uoc--rhu021411.php

Regrowing hair: UCLA-VA researchers may have accidentally discovered a solution

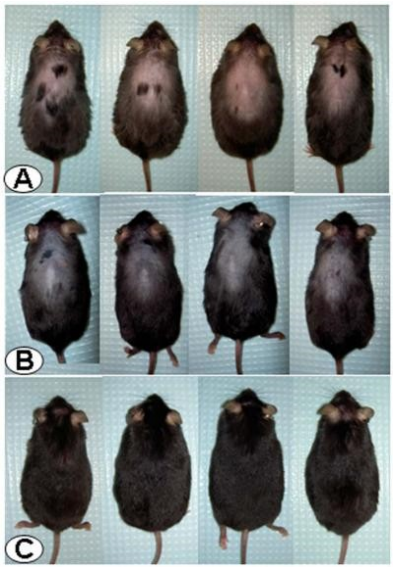
It has been long known that stress plays a part not just in the graying of hair but in hair loss as well.

Over the years, numerous hair-restoration remedies have emerged, ranging from hucksters' "miracle solvents" to legitimate medications such as minoxidil. But even the best of these have shown limited effectiveness.

Now, a team led by researchers from UCLA and the Veterans Administration that was investigating how stress affects gastrointestinal function may have found a chemical compound that induces hair growth by blocking a stress-related hormone associated with hair loss — entirely by accident.

The serendipitous discovery is described in an article published in the online journal PLoS One.

"Our findings show that a short-duration treatment with this compound causes an astounding long-term hair regrowth in chronically stressed mutant mice," said Million Mulugeta, an adjunct professor of medicine in the division of digestive diseases at the David Geffen School of Medicine at UCLA and a corresponding author of the research. "This could open new venues to treat hair loss in humans through the modulation of the stress hormone receptors, particularly hair loss related to chronic stress and aging."



The CRF1/CRF2 receptor antagonist, astressin-B, injected intraperitoneally (ip) in CRF-OE mice with fully developed alopecia induces hair growth and pigmentation. Photographs: Row A: Male CRF-OE mice (4 months old) injected ip once daily for 5 consecutive days with saline at 3 days after the last injection and Row B: astressin-B (5 mg/mouse) at 3 days after the last ip injection, and Row C: the same mice as in the middle panel Row B at 4 weeks after the last ip injection. **UCLA/VA**

The research team, which was originally studying brain–gut interactions, included Mulugeta, Lixin Wang, Noah Craft and Yvette Taché from UCLA; Jean Rivier and Catherine Rivier from the Salk Institute for Biological Studies in La Jolla, Calif.; and Mary Stenzel-Poore from the Oregon Health and Sciences University.

For their experiments, the researchers had been using mice that were genetically altered to overproduce a stress hormone called corticotrophin-releasing factor, or CRF. As these mice age, they lose hair and eventually become bald on their backs, making them visually distinct from their unaltered counterparts. The Salk Institute researchers had developed the chemical compound, a peptide called astressin-B, and described its ability to block the action of CRF. Stenzel-Poore had created an animal model of chronic stress by altering the mice to overproduce CRF.

UCLA and VA researchers injected the astressin-B into the bald mice to observe how its CRF-blocking ability affected gastrointestinal tract function. The initial single injection had no effect, so the investigators continued the injections over five days to give the peptide a better chance of blocking the CRF receptors. They measured the inhibitory effects of this regimen on the stress-induced response in the colons of the mice and placed the animals back in their cages with their hairy counterparts.

About three months later, the investigators returned to these mice to conduct further gastrointestinal studies and found they couldn't distinguish them from their unaltered brethren. They had regrown hair on their previously bald backs.

"When we analyzed the identification number of the mice that had grown hair we found that, indeed, the astressin-B peptide was responsible for the remarkable hair growth in the bald mice," Mulugeta said. "Subsequent studies confirmed this unequivocally."

Of particular interest was the short duration of the treatments: Just one shot per day for five consecutive days maintained the effects for up to four months.

"This is a comparatively long time, considering that mice's life span is less than two years," Mulugeta said.

So far, this effect has been seen only in mice. Whether it also happens in humans remains to be seen, said the researchers, who also treated the bald mice with minoxidil alone, which resulted in mild hair growth, as it does in humans. This suggests that astressin-B could also translate for use in human hair growth. In fact, it is known that the stress-hormone CRF, its receptors and other peptides that modulate these receptors are found in human skin.

The finding is an offshoot of a study funded by the National Institutes of Health.

UCLA and the Salk Institute have applied for a patent on the use of the astressin-B peptide for hair growth.

http://www.eurekalert.org/pub_releases/2011-02/uosc-dgl021011.php

Dwarfism gene linked to protection from cancer and diabetes

Long-term study of remote community finds almost no cancer or diabetes in individuals with genetically low growth hormone activity

A 22-year study of abnormally short individuals suggests that growth-stunting mutations also may stunt two of humanity's worst diseases. Published in Science Translational Medicine, part of the Science family of journals, the study raises the prospect of achieving similar protection in full-grown adults by other means, such as pharmaceuticals or controlled diets.

The international study team, led by cell biologist Valter Longo of the University of Southern California and Ecuadorian endocrinologist Jaime Guevara-Aguirre, followed a remote community on the slopes of the Andes mountains. The community includes many members with Laron syndrome, a deficiency in a gene that prevents the body from using growth hormone. The study team followed about 100 such individuals and 1,600 relatives of normal stature. Over 22 years, the team documented no cases of diabetes and one non-lethal case of cancer in Laron's subjects. Among relatives living in the same towns during the same time period, 5 percent were diagnosed with diabetes and 17 percent with cancer.

Because other environmental and genetic risk factors are assumed to be the same for both groups, Longo and his team concluded that -- at least for adults past their growing years -- growth hormone activity has many downsides. "The growth hormone receptor-deficient people don't get two of the major diseases of aging. They also have a very low incidence of stroke, but the number of deaths from stroke is too small to determine whether it's significant," Longo said.

Overall lifespan for both groups was about the same, with the abnormally short subjects dying more often from substance abuse and accidents. The study did not include psychological assessments that could have helped explain the difference. "Although all the growth hormone deficient subjects we met appear to be relatively happy and normal and are known to have normal cognitive function, there are a lot of strange causes of death, including many that are alcohol-related," Longo said.

Longo noted that any treatment for preventive reduction of growth hormone would have to show fewer and milder side effects than drugs used against a confirmed disease. But he added that any preventive treatment would target adults with high growth hormone activity in order to bring it down to average, and not to the extremely low and potentially riskier state observed in Laron's subjects.

If high growth factor levels "become a risk factor for cancer as cholesterol is a risk factor for cardiovascular diseases," drugs that reduce the growth factor could become the new statins, Longo said.

Such drugs would be used at first only for families with a very high incidence of cancer or diabetes.

And because growth hormone activity decreases naturally with age, any preventive treatment would be appropriate only until the effects of advanced age took over, Longo explained.

Animal studies provide evidence for the health benefits of blocking growth hormone. Groups led by John Kopchick of Ohio University and Andrzej Bartke of Southern Illinois University achieved a record 40 percent lifespan extension with growth factor deficient mice in studies published in 2000 and 1996, respectively.

Later, the researchers linked growth factor deficiency to reduced tumor risk.

The Food and Drug Administration has already approved drugs that block growth hormone activity in humans. These are used to treat acromegaly, a condition related to gigantism.

Because studies have shown that growth hormone deficiency protects mouse and human cells against some chemical damage, Longo said his team would initially seek approval for a clinical trial to test such drugs for the protection of patients undergoing chemotherapy.

Growth hormone-blocking drugs such as pegvisomant appear to be well tolerated, Longo said. But even if chronic growth hormone blocking should come with a minor side effect, Longo predicted that societies and governments would make the trade in exchange for less chronic disease. He called it the "square survival curve," where most of one's life is lived without major illness. "It's the dream of every administration, anywhere in the world. You live a long healthy life, and then you drop dead," Longo said.

Exactly how growth hormone deficiency might protect a person is not fully understood. In test tube studies, Longo's team found that serum from Laron's subjects had a double protective effect: it protected DNA against oxidative damage and mutations but it promoted the suicide of cells that became highly damaged. Laron's subjects tend to have very low insulin levels and low insulin resistance, which may explain the absence of diabetes.

In joint experiments with a group led by Rafael de Cabo at the National Institute on Aging, human cells exposed to the Laron's serum also showed surprising changes in the activity of genes linked to life extension in yeast and other model organisms. Although Longo and colleagues had identified such genes 15 years ago, they had not been shown to be important for disease prevention in humans.

Artificial hormone blocking is not the only way to reduce these hormones in humans. A natural method appears to achieve the same effect: restriction of calories or of specific components of the diet such as proteins.

Several studies are underway to assess the effect of dietary restriction in humans and other primates. The results are not yet known, but a recent study by Longo's group showed that fasting induces rapid changes in growth factors similar to those caused by the Laron mutation.

However, because fasting or restriction in particular nutrients for long periods can lead to dangerous conditions including anorexia, reduced blood pressure and immunosuppression -- and because individuals with rare genetic mutations can suffer life-threatening effects from even short periods of fasting -- Longo emphasized that additional studies are needed and that any changes in diet must be approved and monitored by a physician.

The study in Science Translational Medicine began as an attempt by Longo to test evidence from animal studies that longevity mutations prevent progressive DNA damage and/or cancer.

Co-author Guevara-Aguirre wanted to understand the reasons for the stunted growth of children in the remote community, centered in the Loja province of southern Ecuador.

Initially, Longo said, the children "were more looked at in search of problems than solutions." But as the study wore on, Guevara-Aguirre began to notice that the adults in the community were not dying of the usual chronic diseases. That was the clue Longo had been seeking. After hearing of the Ecuador study, he invited Guevara-Aguirre to present at a symposium on aging and cancer in 2006 at USC's Leonard Davis School of Gerontology, where Longo is associate professor.

Together, they obtained funding from the Center of Excellence in Genomic Science in the USC College of Letters, Arts and Sciences, which sponsored part of the initial field research in Ecuador, and from the National Institute on Aging, which sponsored the cellular studies.

Longo and Guevara-Aguirre's collaborators were co-lead author Priya Balasubramaniam, postdoctoral researcher in Longo's laboratory in the USC Leonard Davis School of Gerontology; Sue Ingles, associate professor in the Keck School of Medicine of USC; Min Wei, research assistant professor, Federica Madia, research associate, and Chia-Wei Cheng, graduate student, all in Longo's lab; Marco Guevara-Aguirre and Jannette Saavedra of the Institute of Endocrinology, Metabolism and Reproduction, in Quito, Ecuador; David Hwang and Pinchas Cohen of the David Geffen School of Medicine at UCLA; Rafael de Cabo of the National Institute on Aging; and Alejandro Martin-Montalvo of the National Institute on Aging and the Centre for Biomedical Research on Rare Diseases in Sevilla, Spain.

Balasubramaniam and Marco Guevara-Aguirre were responsible for major parts of the study in the laboratory and in the field, respectively.

http://www.physorg.com/news/2011-02-therapy-depression-effectively-non-specialists.html

Therapy for depression can be delivered effectively by non-specialists

Depression can be treated effectively with psychotherapy by mental health nurses with minimal training, according to new preliminary research findings.

The study, led by Durham University's Mental Health Research Centre, shows that patients with severe depression can be treated successfully with behavioural activation – a psychotherapy for depression – by non-specialist mental health staff which could potentially lead to considerable cost-savings for the NHS.

Currently, psychotherapies, such as behavioural activation, are delivered by specialist clinicians and therapists. In the study, the mental health nurses received five days training in behavioural activation and one hour of clinical supervision every fortnight.

Although the findings are preliminary, the researchers say they could pave the way for increasing access to psychological therapies for people with depression and could help to alleviate the shortage of specialist therapists. Estimates suggest that less than 10 per cent of people with depression, who need some form of psychological therapy, get access to it. The research, conducted by Durham University, University of Exeter, and the University of York, is published in the British Journal of Psychiatry.

In the study, researchers compared behavioural activation treatment delivered by mental health nurses with usual care delivered by GPs. Forty seven patients participated in the trial. They found that the patients treated with behavioural activation by the nurses showed significantly more signs of recovery, were functioning better and were more satisfied with the treatment compared to the group who received what is classed as 'usual care' by their GP.

Behavioural activation is a practical treatment where the focus is on pinpointing which elements in someone's life influence their moods. Changes over time in these person-environment relationships are explored and worked on to help the person engage in a more rewarding daily structure. This is done through self monitoring, scheduling and exploring difficult situations and the person's responses to these.

Lead author of the study, David Ekers, is an Honorary Clinical Lecturer at Durham University and Nurse Consultant at Tees, Esk and Wear Valleys NHS Foundation Trust.

He said: "This is a small-scale study and certainly more research with bigger trials is needed but it shows some very promising early findings. The results indicate that with limited training, generic mental health workers can be trained to deliver clinically effective behavioural activation to people with long-standing depression.

"Behavioural activation therapy has already been shown to be equally effective as cognitive behavioural therapy but previous studies have always tested it with experienced psychotherapists. This is the first time it has been shown that behavioural activation can be an effective treatment when delivered by 'inexperienced' therapists.

"All of this is particularly relevant in the current economic climate whereby there may be increased risk of depression, and demands on the NHS in that area could become heavier."

Depression is the third most common reason for people visiting their GP, according to the Office of National Statistics. Depression occurs in one in 10 adults in Britain at any one time, with one in 20 people at any one time suffering from major or 'clinical' depression.*

Colin Walker, Policy and Campaigns Manager for mental health charity Mind, commented: "Mind has found evidence that one in five people with mental health problems are waiting over a year between asking for help and receiving access to talking therapies. Expanding the types of therapies on offer and how they are delivered might be an effective way of reducing the time that people wait to receive support but much more research is necessary to ensure that this approach is truly effective.

"It's vital that mental health workers inexperienced in providing talking therapies are adequately trained to deliver such services and that this is not just adopted as a cost saving exercise to replace other types of treatments." *Provided by Durham University*

http://www.newscientist.com/article/dn20138-sacred-rules-of-engagement-defeat-rationality-in-war.html

'Sacred' rules of engagement defeat rationality in war

*** 13:15 16 February 2011 by Michael Marshall**

Do you believe that some principles are sacred? If you do, it could make you a hawk rather than a dove in time of war.

A new study suggests that most societies have "sacred rules" for which their people would die rather than compromise. If people perceive one such rule to have been violated, they may feel morally obliged to retaliate against the wrongdoers – even if the retaliation does more harm than good.

Psychologist Jeremy Ginges of the New School for Social Research in New York City and anthropologist Scott Atran of the National Centre for Scientific Research in Paris, France, presented 50 US students with a hypothetical crisis in which a foreign country captured 100 US citizens and was expected to kill them. Half the volunteers were asked to consider a military response to the kidnapping, and half a diplomatic response.

When told that their action would result in all hostages being saved, both groups endorsed the plan presented to them. Told that one hostage would die, however, most "diplomats" became reluctant to endorse the proposed response. "Militarists" had no such qualms. In fact, the most common response suggested that they would support military action even if 99 hostages died as a consequence. Similar results were found in studies of Nigerian and Palestinian volunteers.

"People are much more willing to accept grievous losses during violence than in diplomacy," Atran says. "It doesn't make any sense."

Forceful logic

Atran has a theory to explain the unusual results. The diplomats considered the costs and benefits of their decision but the military-thinkers apparently ignored such considerations, he thinks. He concludes that their decision must have been governed by their society's sacred rules instead.

In the hostage situation, the abductors were threatening to violate the sacred rule against killing innocent people. That rule was so strong for the participants that they felt morally obliged to meet violence with violence, regardless of the outcome.

Would you really?

"Their ideas are immensely plausible," says David Livingstone Smith, a philosopher at the University of New England in Biddeford, Maine – although he points out that the experiments only reveal what people say they would do, not what they actually would do.

A reliance on sacred rules may have been beneficial in humans' distant past, which might explain how the rules emerged, says Dominic Johnson, who studies global conflict and cooperation at the University of Edinburgh, UK. Early groups of humans who cemented themselves together with a shared set of such sacred rules would have had an advantage over less cooperative groups, he thinks.

How relevant these results are to the behaviour of political or military leaders is still up for debate – and is a subject that Atran and Ginges intend to explore in follow-up studies.

Journal reference: Proceedings of the Royal Society B, DOI: 10.1098/rspb.2010.2384

http://www.bbc.co.uk/news/science-environment-12484314

Climate change raises flood risk, researchers say

Richard Black By Richard Black Environment correspondent, BBC News

Greenhouse gas emissions are making extreme rainfall events more common, scientists say - and in the UK, have increased the risk of flooding.

Two research groups present their findings in the journal Nature.

Using real-world data and computer models, one team says it has proven the link between greenhouse emissions and the observed increase in extreme rains in the Northern Hemisphere. The other says greenhouse warming made the UK floods of 2000 more likely.

That autumn saw the highest rains in England and Wales since records began in 1766. The Hampshire village of Hambledon was underwater for six weeks, and insurers put the final cost to the country at more than £1bn.

A research team led from Oxford University ran computer models of the atmosphere as it actually was, and parallel models of the atmosphere as it would have been without the carbon dioxide and other greenhouse gases that had accumulated from humanity's emissions. This produced projections of rainfall patterns, which were then fed into a further model that translated rainfall into the impact on river basins across England and Wales.

The 2000 floods occurred when river basins filled up rapidly.

"We looked at how greenhouse gas emissions affected the odds of a flood," related Pardeep Pall, the Oxford researcher who led the study. "We found that the emissions substantially increased the odds of a flood occurring in 2000, with about a doubling of the likelihood."

Global influence

In the second study, researchers from Canada and the UK looked at the increase in the frequency of extreme rainfall events documented across much of the Northern Hemisphere between 1950 and 2000.

There are variations from year to year and from place to place; but across the piece, intense downpours have become more common over the period.

The researchers suggest there is nothing that can explain this trend except the slow steady increase in temperatures caused by greenhouse gas emissions.

"In North America, precipitation extremes correspond to the El Nino effect in pretty characteristic ways, where some regions get heavy rainfall while others receive less extreme precipitation," said Francis Zwiers from the University of Victoria in Canada. "But we don't see these spatial variations in our study, and our models don't generate that kind of spatial structure either. "The evidence is leading us in another direction, to a phenomena that influences precipitations in a global scale - and the only thing we can think of is the changing composition of the atmosphere."

For decades scientists have believed that on a global scale, a warmer world should be a wetter one, as warm air holds more moisture than cold air. But the researchers say this is the first "formal identification" of the link between emissions and intense rains.

They also found that a number of the computer models commonly used in research currently underestimate the extent to which heavy rains have increased.

Model concerns

Both research groups were at pains to emphasise that these two papers are not the end of the road. More research needs to be done, they say, with better records needed from regions of the world where data is scarce, improvements in models, and an extension to other types of weather event.

"There will be for some time to come extreme weather events happening that have been made less likely by human influence on climate," said Myles Allen, one of the Oxford group behind the year 2000 analysis.

"Disentangling these things and deciding which events have been made more likely and which less likely is a difficult but a very interesting scientific endeavour."

This was a point taken up by Sir Brian Hoskins from the Grantham Institute for Climate Change Research, who was not involved with either of these studies.

"Both studies depend heavily on the accuracy of their computer models," he told reporters.

"We need to understand better the actual physics of different flooding events and make sure that the models are able to capture this. Studies like these should be repeated as models continue to improve."

Researchers said they also needed to include other changes to the atmosphere in future analyses, such as the tiny aerosol particles of dust that reflect sunlight back into space.

'Alarming' picture

If the risk of floods is increasing, policymakers will have to ask themselves how to respond; and in the UK, the government has come under fire in recent weeks having cut the flood defence budget by 8% earlier this month.

But a spokesman for the Department for Environment, Food and Rural Affairs (Defra) said the implications of the research - which Defra partially funded - were being taken on board.

"This work reinforces the scientific evidence that the UK needs to tackle climate change and become more resilient to the likelihood of extreme weather events caused by climate change," he said.

"Defra will spend more than £2.1billion over the next four years to provide greater protection to at least 145,000 homes. Defra is also exploring innovative new ways of managing flood risk, such as supporting three land management demonstration projects to see if the rate at which rainfall enters watercourses can be slowed."

Bjorn Lomborg, the Danish "sceptical environmentalist" who was in London for a seminar, told BBC News that society had to look at where and how people lived.

"Some people criticise computer models and of course they are only computer models, but it's the only way we can talk about the future, through models - so I don't disagree with using models," he said.

"But is the right way to handle future flooding by focusing on climate change? The answer is no - that's an incredibly expensive way of making extreme flooding very slightly less likely in 100 years.

"We should focus on the simple ways - making better protection, making sure people don't settle on flood plains, and that we have some places where rivers can naturally flood as they did in the past."

As Professor Lomborg was speaking to the BBC in London, Christiana Figueres, executive secretary of the UN climate convention (UNFCCC), was telling the Spanish parliament that tackling emissions was becoming ever more of a priority.

"It is alarming to admit that if the community of nations is unable to fully stabilise climate change, it will threaten where we can live, where and how we grow food and where we can find water - the very stability on which humanity has built its existence. "On a global level, increasingly unpredictable weather patterns will lead to falling agricultural production and higher food prices, leading to food insecurity.

"Recent experiences around the world clearly show how such situations can cause political instability and undermine the performance of already fragile states."

http://www.bbc.co.uk/news/health-12480310

Negative experiences can stop painkillers working

By James Gallagher Health reporter, BBC News

A patient's belief that a drug will not work can become a self fulfilling prophecy, according to researchers.

They showed the benefits of painkillers could be boosted or completely wiped out by manipulating expectations. The study, published in Science Translational Medicine, also identifies the regions of the brain which are affected. Experts said this could have important consequences for patient care and for testing new drugs.

Heat was applied to the legs of 22 patients, who were asked to report the level of pain on a scale of one to 100. They were also attached to an intravenous drip so drugs could be administered secretly.

The initial average pain rating was 66. Patients were then given a potent painkiller, remifentanil, without their knowledge and the pain score went down to 55.

They were then told they were being given a painkiller and the score went down to 39.

Then, without changing the dose, the patients were then told the painkiller had been withdrawn and to expect pain, and the score went up to 64. So even though the patients were being given remifentanil, they were reporting the same level of pain as when they were getting no drugs at all.

Professor Irene Tracey, from Oxford University, told the BBC: "It's phenomenal, it's really cool. It's one of the best analgesics we have and the brain's influence can either vastly increase its effect, or completely remove it."

The study was conducted on healthy people who were subjected to pain for a short period of time. She said people with chronic conditions who had unsuccessfully tried many drugs for many years would have built up a much greater negative experience, which could impact on their future healthcare.

Professor Tracey said: "Doctors need more time for consultation and to investigate the cognitive side of illness, the focus is on physiology not the mind, which can be a real roadblock to treatment."

Brain scans during the experiment also showed which regions of the brain were affected. The expectation of positive treatment was associated with activity in the cingulo-frontal and subcortical brain areas while the negative expectation led to increased activity in the hippocampus and the medial frontal cortex. Researchers also say the study raises concerns about clinical trials used to determine the effectiveness of drugs.

George Lewith, professor of health research at the University of Southampton, said: "It's another piece of evidence that we get what we expect in life.

"It completely blows cold randomised clinical trials, which don't take into account expectation."

http://www.scientificamerican.com/article.cfm?id=dumped-drugs-lead-to-resistant

Dumped drugs lead to resistant microbes

A continual discharge of antibiotic-contaminated water has created a hotspot of bacterial antibiotic resistance in an Indian river.

By Naomi Lubick

High levels of antibiotic resistance have been found in bacteria that live downstream from a waste-water treatment plant in Patancheru, near Hyderabad in India.

Two years ago, Joakim Larsson of the University of Gothenburg, Sweden, and his colleagues reported that the treatment plant released drugs in its effluent water at levels sometimes equivalent to the high doses that are given therapeutically. The antibiotic-containing water reaching the plant came from 90 bulk pharmaceutical manufacturers in the region, near Hyderabad, they determined. The researchers wondered what might be happening to bacteria in the environment exposed to these drugs.

Serendipitous resistance

Bacteria can trade bundles of drug-resistance genes in mobile "cassettes" carried, for example, on small circles of DNA called plasmids, which can replicate themselves independently of the bacterium's chromosome. To find these DNA snippets, Larsson and his colleagues used a DNA sequencing approach called "shotgun metagenomics," to analyze all the DNA present in the effluent, the river water and the river sediments they had gathered in the earlier study. Postdoctoral researcher Erik Kristiansson developed a bioinformatics method to parse the information and search for evidence of known antibiotic-resistance genes.

In three sites downstream of the plant, the resistance genes made up almost 2 percent of the DNA samples taken there, the researchers report in PLoS ONE. Because only one or two genes out of the typical genome of around 5,000 genes are necessary to protect the bacterium, that's a lot of genetic resistance, says Dave Ussery, a microbiologist at the Technical University of Denmark, who was not involved in the work.

The researchers found resistance genes for a wide range of antibiotics but the relationship to the antibiotics present was not straightforward. For example, the most frequent resistance genes found were for a class of antibiotics called sulfonamides, but the researchers found no evidence of the drugs themselves. They hypothesize that this may be an instance where resistance to one group of drugs could provide resistance to others.

And despite detecting high concentrations of fluoroquinolones, a chemical class that includes the heavy-hitting antibiotic ciprofloxacin, the team found less evidence of resistance to these drugs downstream than upstream from the plant. The researchers suggest that the levels of fluoroquinolones in the downstream effluent were so high that they overpowered even the resistant bugs.

Finding resistance amid so much exposure to active drug ingredients "is not surprising," comments David Graham at Newcastle University, UK, who has studied sites in Cuba, for example, exposed to lower levels of medical waste. "But in a way, it's sort of like a beaker experiment," he says, that tests the worst-case scenario, only this is "in a natural system. That's what makes it useful."

Round the world ticket?

The spread of antibiotic-resistance genes is complicated, says Björn Olsen, an infectious-disease specialist at Uppsala University in Sweden. Olsen says resistance hotspots like the one at Patancheru could end up behaving like a volcanic eruption: "the cloud is going to drop down somewhere else, not just around the sewage plant". His team recently documented multidrug-resistant Escherichia coli in the feces of birds that migrate to the Arctic.

The presence of high levels of antibiotics in the river and its sediments might not actually be the factor driving the genetic resistance, warns Sheridan Haack, a microbiologist at the U.S. Geological Survey (USGS) in Lansing, Mich. Resistance genes already present in bacteria from human waste, or developed by the bacteria used in the plant's treatment stages to break down the sludge, could be swept along with the effluent into the river.

Whatever the reason, the high rates of resistance found by Larsson and his team are interesting, says Haack, and the team seems to be the first to combine this metagenomic approach to environmental samples with bioinformatics. She says that Larsson's team should now use more traditional, specific searches for resistance genes and for the surviving bacterial species that are carrying those genes.

Ussery cautions that even if the bacteria found are not dangerous to humans or other animals in the area, they may transfer their resistance genes to bacteria that are. "They need to know who's there," says Ussery, to identify which species are surviving and which are the sources of genetic resistance.

http://www.eurekalert.org/pub_releases/2011-02/uoc--att021711.php

Asthma tied to bacterial communities in the airway

Asthma may have a surprising relationship with the composition of the species of bacteria that inhabit bronchial airways, a finding that could suggest new treatment or even potential cures for the common inflammatory disease, according to a new UCSF-led study.

Using new detection methods, researchers learned that the diversity of microbes inside the respiratory tract is far vaster than previously suspected – creating a complex and inter-connected microbial neighborhood that appears to be associated with asthma, and akin to what has also been found in inflammatory bowel disease, vaginitis, periodontitis, and possibly even obesity.

Contrary to popular belief, the scientists also learned that the airways are not necessarily entirely sterile environments, even in healthy people, while the airways of asthmatics are infected by a richer, more complex collection of bacteria. These findings could improve understanding of the biology of asthma, and potentially lead to new and much-needed therapies. The study is published online in the Journal of Allergy and Clinical Immunology. http://www.jacionline.org/issues?issue_key=S0091-6749(10)X0018-5

"People thought that asthma was caused by inhalation of allergens but this study shows that it may be more complicated than that – asthma may involve colonization of the airways by multiple bacteria," said study co-author Homer Boushey, MD, a UCSF professor of medicine in the division of Pulmonary and Critical Care Medicine.

Asthma is one of the most common diseases in the world, with approximately 300 million asthmatics globally, including 24 million in the United States, according to the Centers for Disease Control. The disease has been on the rise for the last 60 years.

"It has gone from 3 percent of the population to slightly more than 8 percent of the population in the U.S.," said Boushey. "It is most prevalent in western, developed nations – and we don't know why."

In recent years, scientists began studying communities of mixed-species microorganisms (microbiome) found in both diseased and healthy people to better understand their role in a variety of diseases. But research on the microbiome in respiratory disease is relatively uncharted terrain.

"We know fairly little about the diversity, complexity and collective function of bacteria living in the respiratory tract, and how they might contribute to diseases like asthma," said Yvonne J. Huang, MD, the paper's first author. She is a research fellow and clinical instructor in the UCSF Pulmonary Division.

"Traditionally, the airways have been thought to be sterile. However, this study suggests this is not the case. Certain asthma patients who require inhaled corticosteroid therapy possess a great abundance of bacteria compared to healthy individuals, and have an increased relative abundance of specific organisms that is correlated with greater sensitivity of their airways."

In their three-year pilot project, the scientists collected samples from the airway linings of 65 adults with mild to moderate asthma and 10 healthy subjects. Then, using a tool that can identify approximately 8,500 distinct groups of bacteria in a single assay, the scientists profiled the organisms present in each sample to look for relationships between bacterial community composition and clinical characteristics of the patients' asthma.

The researchers found that bronchial airway samples from asthmatic patients contained far more bacteria than samples from healthy patients. The scientists also found greater bacterial diversity in the asthmatic patients who had the most hyper-responsive or sensitive airways (a feature of asthma).

"People have viewed asthma as a misdirected immune reaction to environmental exposures, but few have thought of it in the context of airway microbiota composition," said senior author Susan Lynch, PhD, an assistant professor of medicine and director of the UCSF Colitis and Crohn's Disease Microbiome Research Core in the division of gastroenterology.

"We took an ecological approach, considering the bacteria in the context of their microbial neighborhoods to identify relationships between characteristics of these communities and features of the disease…This new approach will help us to better understand the microbiota-host relationships that define human health."

The authors say that further studies are needed to determine how these specific bacteria identified in the study may influence the cause and development of asthma.

The study was supported by the National Heart, Lung and Blood Institute and by the Strategic Asthma Basic Research Center at UCSF, supported by the Sandler Family Foundation. Huang was funded by a National Institutes of Health grant and by a UC Tobacco-related Disease Research Program award; Lynch receives research support from the NIH; Boushey is an ad-hoc consultant for KaloBios Pharmaceuticals, Inc., is on the advisory committee for Pharmaxis, is on ad-hoc advisory committees for GlaxoSmithKline and Merck, and receives research support from GlaxoSmithKline.

http://www.eurekalert.org/pub_releases/2011-02/tri-fss021711.php

First-of-its-kind study shows benefits of electrical stimulation therapy for people paralyzed by spinal cord injury

Findings have implications for quality of life and independence

A new treatment approach which uses tiny bursts of electricity to reawaken paralyzed muscles "significantly" reduced disability and improved grasping in people with incomplete spinal cord injuries, beyond the effects of standard therapy, newly published research shows.

In a study published online in the journal Neurorehabilitation and Neural Repair, Toronto researchers report that functional electrical stimulation (FES) therapy worked better than conventional occupational therapy alone to increase patients' ability to pick up and hold objects.

FES therapy uses low-intensity electrical pulses generated by a pocket-sized electric stimulator.

"This study proves that by stimulating peripheral nerves and muscles, you can actually 'retrain' the brain," says the study's lead author, Dr. Milos R. Popovic, a Senior Scientist at Toronto Rehab and head of the hospital's Neural Engineering and Therapeutics Team. "A few years ago, we did not believe this was possible."

Study participants who received the stimulation therapy also saw big improvements in their independence and ability to perform everyday activities such as dressing and eating, says Dr. Popovic. "This has real implications for people's quality of life and independence, and for their caregivers."

Unlike permanent FES systems, the one designed by Dr. Popovic and colleagues is for short-term treatment. The therapist uses the stimulator to make muscles move in a patient's limb. The idea is that after many repetitions, the nervous system can 'relearn' the motion and eventually activate the muscles on its own, without the device.

The randomized trial, the first of its kind, involved 24 rehabilitation inpatients who could not grasp objects or perform many activities of daily living. All received conventional occupational therapy five days per week for eight weeks. However, one group (9 people) also received an hour of FES therapy daily, while another group (12 people) had an additional hour of conventional occupational therapy only. (Three patients did not complete the trial.)

Comparisons between the functional abilities of the two groups showed that stimulation therapy "significantly reduced disability and improved voluntary grasping beyond the effects of considerable conventional upper extremity therapy in individuals with tetraplegia," the authors write.

Dr. Popovic notes that patients who received only occupational therapy saw a "gentle improvement" in their grasping ability, but the level of improvement achieved with FES therapy was at least three times greater using the Spinal Cord Independence Measure, which evaluates degree of disability in patients with spinal cord injury.

A biomedical engineer, Dr. Popovic holds the Toronto Rehabilitation Institute Chair in Spinal Cord Injury Research. He is also a professor in the Institute of Biomaterials and Biomedical Engineering at the University of Toronto.

Based on their findings, the study's authors recommend that stimulation therapy should be part of the therapeutic process for people with incomplete spinal cord injuries whose hand function is impaired. Dr. Popovic's team is working to make this a reality. They have almost completed a prototype of their stimulator,

but need financial support to take it forward. Dr. Popovic thinks the device could be available to hospitals within a year of being funded.

"FES (stimulation therapy) has the potential to have a significant and positive impact on the lives of individuals living with the devastating results of spinal cord injury," says Dr. Anthony Burns, Medical Director of Toronto Rehab's spinal cord rehabilitation program. Calling the trial "groundbreaking," Dr. Burns says he will work with Dr. Popovic "to make this intervention available to our patients, and to answer important questions such as the duration of the effect."

One limitation of the study is that the research team could not get all participants to take part in a six-month follow-up assessment. However, six individuals who received FES therapy were assessed six months after the study. All had better hand function after six months than on the day they were discharged from the study.

Another study, now underway, will determine whether stimulation therapy can improve grasping ability in people with chronic (long-term) incomplete spinal cord injuries.

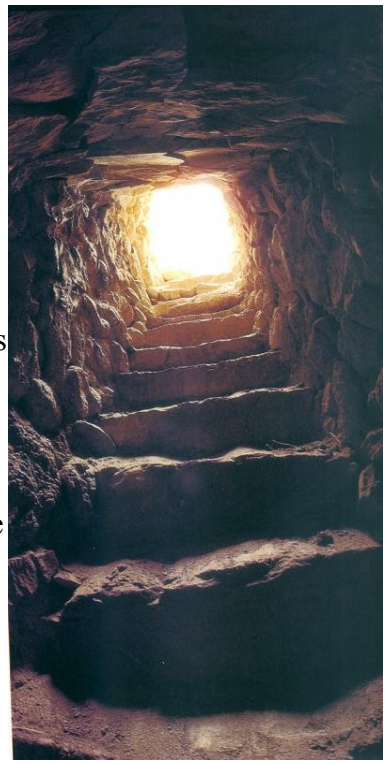
Administering stimulation therapy is easy and cost-effective, says Dr. Popovic, who stresses that it should augment, and not replace, existing occupational therapy.

Other authors of the newly published study are Naaz Kapadia, and Drs. Vera Zivanovic and Julio Furlan of Toronto Rehab, and Drs. Cathy Craven and Colleen McGillivray of Toronto Rehab and the University of Toronto. The research was supported by The Physicians' Services Incorporated Foundation and the Christopher and Dana Reeve Foundation. Additional financial support was provided by Toronto Rehab and the Ontario Ministry of Health and Long-Term Care.

http://www.eurekalert.org/pub_releases/2011-02/afot-wfs021711.php

World's first skyscraper was a monument to intimidation

Tel Aviv University describes how Jericho's 11,000-year-old 'cosmic' tower came into being



Tel Aviv — Discovered by archaeologists in 1952, a 28-foot-high stone tower discovered on the edge of the town of Jericho has puzzled scientists ever since. Now, eleven centuries after it was built, Tel Aviv University archaeologists at the ancient site Tel Jericho are revealing new facts about the world's first "skyscraper."

Recent computer-based research by doctoral student Roy Liran and Dr. Ran Barkai of Tel Aviv University's Jacob M. Alkow Department of Archaeology and Ancient Near Eastern Cultures at the Lester and Sally Entin Faculty of Humanities sheds light on who built the 28-foot-high tower — and why.

The researchers note that this is the first instance of human beings erecting such a tall structure, even before the transition to agriculture and food production in the region. Liran and Dr. Barkai now believe that the tower, which required about ten years to build, is an indication of power struggles at the beginning of the Neolithic period, and that a particular person or people exploited the primeval fears of Jericho's residents in persuading them to build it. The new revelations about the ancient tower were recently published in the journal Antiquity.

"In the newly published article, we present a new and exciting discovery," Liran and Dr. Barkai said in a joint statement, "which is connected to the exact position of the tower on the edges of the village of Jericho, and the shadow that covers the site when the sun sets on the longest day of the year."

This is a view of the interior of the tower at Tel Jericho. **American Friends of Tel Aviv University**

A stairway (and tower) to Heaven

"Reconstruction of the sunset revealed to us that the shadow of the hill as the sun sets on the longest day of the year falls exactly on the Jericho tower, envelops the tower and then covers the entire village," the researchers explained. "For this reason, we suggest that the tower served as an earthly element connecting the residents of the site with the hills around them and with the heavenly element of the setting sun." Its construction may be related to the primeval fears and cosmological beliefs of the villagers, they note.

Tel Jericho, located in modern day Jericho in the West Bank, is one of the most ancient sites in the world. The eight and half meter tower, which was built with a steep flight of stairs approximately one meter wide, rises above a four-meter wall that probably encompassed the city. The existence of the tower led to Jericho's identification as the first city in the world, even though it was in fact a settlement of pre-agricultural hunter gatherers.

"This was a time when hierarchy began and leadership was established," Dr. Barkai told the Jerusalem Post. "We believe this tower was one of the mechanisms to motivate people to take part in a communal lifestyle."

Debunking old theories

Some researchers have proposed that the tower and wall together comprised a system of fortification and a defense against flooding. Others have suggested the tower and wall as a geographical marker, defining the territory of the early residents of Jericho, and a symbol of the wealth and power of the ancient village.

In a 2008 article, the Tel Aviv University researchers proposed that the tower and wall of Jericho should be seen as cosmological markers, connecting the ancient village of Jericho with the nearby Mount Qarantal and sunset on the longest day of the year. The new paper fortifies their hypothesis.

This idea is based on the fact that the axis of the flight of stairs in the tower was built at a precise angle to the setting of the sun on the longest day of the year behind the highest peak overlooking Jericho, Mount Qarantal. They believe that it is humanity's first skyscraper, however small, and also the world's first public building.

http://www.eurekalert.org/pub_releases/2011-02/aaoo-tkr020811.php

Total knee replacement patients functioning well after 20 years

Research shows high functionality even after two decades

Most patients who undergo total knee replacement (TKR) are age 60 to 80. More than 90 percent of these individuals experience a dramatic reduction in knee pain and a significant improvement in the ability to perform common activities. However questions have been raised about the decline in physical function over the long term despite the absence of implant-related problems. New research revealed today at the 2011 Annual Meeting of the American Academy of Orthopaedic Surgeons (AAOS) evaluates patient functionality 20 years after knee replacement.

"It is a common concern for older adults to wonder how they will function several years after the knee replacement and if revision will be necessary," explained John B. Meding MD, study author and Attending Orthopaedic Surgeon, The Center for Hip and Knee Surgery, Mooresville, IN.

Although aging may cause a gradual decline in physical activity, a remarkable functional capacity and activity level continues 20 years of more after TKR.

Between 1975 and 1989, 1,757 primary cruciate (ligament behind the knee)-retaining TKRs were preformed at the Center for Hip and Knee Surgery in Mooresville, IN. The study examined 128 patients who were living at the 20 year follow-up. The average age at operation in the group of 171 TKRs was 63.8 years. Eighty-two percent of these patients had osteoarthritis and 73 percent were female. The average follow-up was 21.1 years and the average age at follow-up was 82.3 years.

The study found:

* Ninety-five patients could walk at least five blocks.
* Nearly half, 48 percent, of patients reported unlimited walking.
* All but two patients could negotiate up and down stairs without a banister.
* Only three patients were considered housebound.
* There were no implant failures after 20 years.

"These findings definitely add to the conversation with patients considering surgery. If a patient actually lives that long, a well-functioning TKR may help allow them to maintain a remarkable functional capacity and activity level not just for five or 10 years but for 20 years and beyond," continued Dr. Meding. "This research refutes any perception that the importance of a well-functioning TKR diminishes over time because of an overall declining functional status. Elderly people are using their surgically replaced knees for fairly active lifestyles many years after surgery."

Patients considering knee replacement should talk to their orthopaedic surgeons about the implant's life expectancy. Other questions to consider before surgery can be found at http://orthoinfo.org/.

Disclosure: *Dr. Meding and his co-authors received no compensation for their study*

http://www.physorg.com/news/2011-02-machines-game.html

Machines beat us at our own game: What can we do?

(AP) -- ***Machines first out-calculated us in simple math. Then they replaced us on the assembly lines, explored places we couldn't get to, even beat our champions at chess. Now a computer called Watson has bested our best at "Jeopardy!"***

A gigantic computer created by IBM specifically to excel at answers-and-questions left two champs of the TV game show in its silicon dust after a three-day tournament, a feat that experts call a technological breakthrough.

Watson earned $77,147, versus $24,000 for Ken Jennings and $21,600 for Brad Rutter. Jennings took it in stride writing "I for one welcome our new computer overlords" alongside his correct Final Jeopardy answer.

The next step for the IBM machine and its programmers: taking its mastery of the arcane and applying it to help doctors plow through blizzards of medical information. Watson could also help make Internet searches far more like a conversation than the hit-or-miss things they are now.

Watson's victory leads to the question: What can we measly humans do that amazing machines cannot do or will never do?

The answer, like all of "Jeopardy!," comes in the form of a question: Who - not what - dreamed up Watson? While computers can calculate and construct, they cannot decide to create. So far, only humans can.

"The way to think about this is: Can Watson decide to create Watson?" said Pradeep Khosla, dean of engineering at Carnegie Mellon University in Pittsburgh. "We are far from there. Our ability to create is what allows us to discover and create new knowledge and technology."

Experts in the field say it is more than the spark of creation that separates man from his mechanical spawn. It is the pride creators can take, the empathy we can all have with the winners and losers, and that magical mix of adrenaline, fear and ability that kicks in when our backs are against the wall and we are in survival mode.

What humans have that Watson, IBM's earlier chess champion Deep Blue, and all their electronic predecessors and software successors do not have and will not get is the sort of thing that makes song, romance, smiles, sadness and all that jazz. It's something the experts in computers, robotics and artificial intelligence know very well because they can't figure out how it works in people, much less duplicate it. It's that indescribable essence of humanity. Nevertheless, Watson, which took 25 IBM scientists four years to create, is more than just a trivia whiz, some experts say.

Richard Doherty, a computer industry expert and research director at the Envisioneering Group in Seaford, N.Y., said he has been studying artificial intelligence for decades. He thinks IBM's advances with Watson are changing the way people think about artificial intelligence and how a computer can be programmed to give conversational answers - not merely lists of sometimes not-germane entries.

"This is the most significant breakthrough of this century," he said. "I know the phones are ringing off the hook with interest in Watson systems. The Internet may trump Watson, but for this century, it's the most significant advance in computing." And yet Watson's creators say this breakthrough gives them an extra appreciation for the magnificent machines we call people.

"I see human intelligence consuming machine intelligence, not the other way around," David Ferrucci, IBM's lead researcher on Watson, said in an interview Wednesday. "Humans are a different sort of intelligence. Our intelligence is so interconnected. The brain is so incredibly interconnected with itself, so interconnected with all the cells in our body, and has co-evolved with language and society and everything around it."

"Humans are learning machines that live and experience the world and take in an enormous amount of information - what they see, what they taste, what they feel, and they're taking that in from the day they're born until the day they die," he said. "And they're learning from all the input all the time. We've never even created something that attempts to do that."

The ability of a machine to learn is the essence of the field of artificial intelligence. And there have been great advances in the field, but nothing near human thinking. "I've been in this field for 25 years and no matter what advances we make, it's not like we feel we're getting to the finish line," said Carnegie Mellon University professor Eric Nyberg, who has worked on Watson with its IBM creators since 2007. "There's always more you can do to bring computers to human intelligence. I'm not sure we'll ever really get there."

Bart Massey, a professor of computer science at Portland State University, quipped: "If you want to build something that thinks like a human, we have a great way to do that. It only takes like nine months and it's really fun." Working on computer evolution "really makes you appreciate the fact that humans are such unique things and they think such unique ways," Massey said.

Nyberg said it is silly to think that Watson will lead to an end or a lessening of humanity. "Watson does just one task: answer questions," he said. And it gets things wrong, such as saying grasshoppers eat kosher, which Nyberg said is why humans won't turn over launch codes to it or its computer cousins.

Take Tuesday's Final Jeopardy, which Watson flubbed and its human competitors handled with ease. The category was U.S. cities, and the clue was: "Its largest airport is named for a World War II hero; its second largest, for a World War II battle."

The correct response was Chicago, but Watson weirdly wrote, "What is Toronto?????"

A human would have considered Toronto and discarded it because it is a Canadian city, not a U.S. one, but that's not the type of comparative knowledge Watson has, Nyberg said.

"A human working with Watson can get a better answer," said James Hendler, a professor of computer and cognitive science at Rensselaer Polytechnic Institute. "Using what humans are good at and what Watson is good at, together we can build systems that solve problems that neither of us can solve alone."

That's why Paul Saffo, a longtime Silicon Valley forecaster, and others, see better search engines as the ultimate benefit from the "Jeopardy!"-playing machine. "We are headed toward a world where you are going to

have a conversation with a machine," Saffo said. "Within five to10 years, we'll look back and roll our eyes at the idea that search queries were a string of answers and not conversations."

The beneficiaries, IBM's Ferrucci said, could include technical support centers, hospitals, hedge funds or other businesses that need to make lots of decisions that rely on lots of data.

For example, a medical center might use the software to better diagnose disease. Since a patient's symptoms can generate many possibilities, the advantage of a Watson-type program would be its ability to scan the medical literature faster than a human could and suggest the most likely result. A human, of course, would then have to investigate the computer's finding and make the final diagnosis.

IBM isn't saying how much money it spent building Watson. But Doherty said the company told analysts at a recent meeting that the figure was around $30 million. Doherty believes the number is probably higher, in the "high dozens of millions."

In a few years, Carnegie Mellon University robotic whiz Red Whittaker will be launching a robot to the moon as part of Google challenge. When it lands, the robot will make all sorts of key and crucial real-time decisions - like Neil Armstrong and Buzz Aldrin did 42 years ago - but what humans can do that machines can't will already have been done: Create the whole darn thing.

More information: IBM's Watson: http://tinyurl.com/4r8w6gr Jeopardy: http://jeopardy.com

http://www.newscientist.com/article/dn20148-foreshocks-may-warn-that-a-big-quake-is-coming.html

Foreshocks may warn that a big quake is coming

Advance warning is the ultimate prize for earthquake studies. Now, for the first time, one study offers tantalising evidence that it may be possible to build such a system to warn of some impending large quakes about an hour before they strike.

The finding comes from an analysis of the seismic record from the lead-up to a devastating earthquake that hit Turkey in 1999. This revealed that foreshocks rippled away from the source of the rupture in the 45 minutes before the quake – the first time that foreshocks have been conclusively linked to a major earthquake.

Theoretical models predict that the crust is unstable in the hours leading up to a major earthquake, but detecting that instability in the real world has proven a challenge.

Five foreshocks

Michel Bouchon at the University of Grenoble, France, and a team of French and Turkish geologists studied seismograms recorded before the Izmit earthquake, which killed some 17,000 people. In one recording, the team saw five small shocks in the final 20 minutes before the event, each characterised by a signature sequence of two types of waves, called P-waves and S-waves. In each of the five small shocks, a P-wave was followed 2.4 seconds later by a higher-amplitude S-wave. P-waves are sometimes known as primary waves, because they travel faster through the Earth and so are the first to arrive at monitoring stations.

"The difference in time between these two arrivals was always the same, implying that they came from the same spot on the fault," says Bouchon. The strongest of the shocks was also recorded at other nearby stations. By performing the same calculations on those records, the researchers could work out exactly where the shocks originated. This turned out to be within a few hundred metres of the focus of the Izmit quake itself, suggesting that the quake and the shocks were linked.

Warning, not prediction

Although the five foreshocks differed from each other in total magnitude, their waveforms were remarkably similar. Bouchon and colleagues hunted through the rest of the seismograms to see if they had missed other occurrences of that waveform. They found about 40 in total.

The team saw a pattern in the foreshocks: they became progressively stronger and more closely spaced leading up to the quake itself. The researchers say this is "encouraging" for the development of early warning systems, and plan to examine the records of other well-recorded earthquakes for similar signals.

Even if these findings lead to the development of an earthquake warning system, Ian Main, a seismologist at the University of Edinburgh, UK, warns that its usefulness will be limited. "Earthquake early warning is not the same as earthquake prediction," he says. An early warning system could only give hours notice, not the days that would be needed to prepare an evacuation.

Main also says that the system is likely to be applicable only to some quake zones. The San Andreas fault zone that runs through California is the best-monitored in the world, yet analysis of the seismograms recorded in the build-up to the 2004 Parkfield earthquake there revealed no evidence of any foreshocks (Nature, DOI: 10.1038/nature04067).

The Parkfield quake was magnitude 6.0, compared to Izmit's 7.6 and Bouchon thinks foreshocks may only occur in very large quakes. If that turns out to be true, his early warning system will only apply to the most severe events. *Journal reference: Science, DOI: 10.1126/science.1197341*

http://www.physorg.com/news/2011-02-innocent-crime.html

Study examines why innocent suspects confess to a crime

Why would anyone falsely confess to a crime they didn't commit? It seems illogical, but according to The Innocence Project, there have been 266 post-conviction DNA exonerations since 1989 -- 25 percent of which involved a false confession.

A new Iowa State University study may shed light on one reason for those false confessions. In two experiments simulating choices suspects face in police interrogations, undergraduate subjects altered their behavior to confess to illegal activities in order to relieve short-term distress (the proximal consequence) while discounting potential long-term (distal) consequences.

"The thing about these exoneration cases is that they all pertained to heinous crimes; that's why there was DNA evidence available. And so we wanted to determine why someone may be willing to falsely confess to one of those crimes," said Stephanie Madon, an ISU associate professor of psychology and the study's lead author. "We thought it might have to do with the pay-off structure of police interrogations. Some interrogation methods -- like physical isolation and the presentation of false evidence -- have immediate consequences for suspects that encourage them to confess. Though they also face consequences that encourage them to deny guilt -- such as the possibility of conviction and incarceration -- these consequences are more distal.

"So the suspect is weighing these two consequences at once and that's going to shape their behavior," she continued. "That's what we were interested in understanding. Which of these consequences is going to influence confession decisions -- those that are happening right now, or the ones that may happen in the future?"

ISU study published in Law and Human Behavior

Iowa State researchers Max Guyll, an assistant professor of psychology; Kyle Scherr, a psychology graduate student; Sarah Greathouse, a former assistant professor of psychology; and Gary Wells, Distinguished Professor of psychology; collaborated with Madon on the study. It will be posted online this week by the journal Law and Human Behavior.

In the first experiment, 81 (38 women, 43 men) ISU psychology undergraduates were interviewed about their prior criminal and unethical behaviors, with their admissions and denials each paired with proximal or distal consequences. The proximal consequence was having to answer a long set of repetitive questions. The distal consequence was having to meet with a police officer in several weeks to discuss their answers in detail.

Researchers found that participants shifted their admissions to avoid the short-term consequence of repetitive questions.

"What we found is that our participants clearly made admission decisions on the basis of the proximal consequence," Madon said. "They would admit to having done some criminal or unethical behavior in order to avoid answering repetitive questions. And they did that even though they knew that it increased the likelihood that they would have to meet with the police officer in several weeks to discuss their answers in more detail."

In the second experiment, 143 (93 women, 50 men) ISU psychology undergraduates were again interviewed about their prior criminal and unethical behaviors. This time, the proximal and distal consequences were reversed from the first experiment. So the proximal consequence was meeting with the police officer immediately after the interview, while the distal consequence was to return to the lab in several weeks to answer the repetitive questions.

"Once again, the participants' admissions were shaped by the proximal consequences. They did not want to meet with the police officer," Madon said. "And so, they responded in a way that got them out of doing that -- even though it increased their likelihood of coming back in several weeks to answer repetitive questions."

Suspects confess to avoid a police interrogation

The researchers say these results may help explain why some suspects confess to crimes in order to avoid a police interrogation -- even though they increase their risk of conviction and severe penalties by doing so. The study's authors theorize that innocent suspects so strongly believe that the truth will eventually be borne out, they may perceive the distal consequences facing them -- conviction, prison, or even a death sentence -- to be remote and unlikely.

"One of the things we wanted to do in this research was to identify an underlying process at play during interrogations, so it can apply to a variety of police interrogation methods," Madon said. "Our findings have implications for any [police interrogation] method that causes suspects to focus on immediate consequences over future consequences."

Madon sees the results underscoring the need to limit the use of police interrogation methods that may exploit suspects' vulnerabilities and encourage them into making confession decisions on the basis of short-term gains. *Provided by Iowa State University*

http://news.nationalgeographic.com/news/2011/02/110217-hudson-river-pcb-fish-evolution-water/

Hudson River Fish Evolve Toxic PCB Immunity

Anne Minard for National Geographic News

This story is part of a special National Geographic News series on global water issues.

Bottom-feeding fish in the Hudson River have developed a gene that renders them immune to the toxic effects of PCBs, researchers say.

A genetic variant allows the fish to live in waters notoriously polluted by the now-banned industrial chemicals, and distinguishes the fish—Atlantic tomcod (Microgadus tomcod)—as one of the world's fastest evolving populations.

"This is very, very rapid evolutionary change," said Isaac Wirgin, an environmental toxicologist at New York University's School of Medicine, and the study's lead investigator. "Normally you think of evolution occurring in thousands to millions of years. You're talking about all this occurring in 20 to 50 generations maybe." The study appears in the Feb. 18 online issue of Science.

A mature Atlantic tomcod collected from the Hudson River. **Photograph courtesy Mark Mattson, Normandeau Associates via Science/AAAS**

Toxic River, Oblivious Fish

PCBs, or polychlorinated biphenyls, were first introduced in 1929 and were used in hundreds of industrial and commercial applications, mostly as electrical insulators. They were banned 50 years later, but they don't simply degrade. Partly because of PCB contamination, a 200-mile stretch of the Hudson River is the nation's largest Superfund site.

The 10-inch Atlantic tomcod has thrived despite the exposure to PCBs, and levels of the chemical in the livers of these fish are among the highest reported in nature. But until now, scientists have never understood how they survived PCB exposures that kill most other fish.

"Exposure of fish embryos to PCBs in the lab causes the heart to be smaller, to not beat properly," Wirgin said. He and his colleagues suspected the fish harbored some sort of protection. They spent four years capturing tomcod from contaminated and relatively clean areas of the Hudson River during the winter spawning season.

Lightning-Fast Evolution

It turns out the fish sport a handy modification to a gene encoding a protein known to regulate the toxic effects of PCBs and related chemicals, called the aryl hydrocarbon receptor2, or AHR2.

The fish are missing six base pairs of DNA of the AHR2 gene, and the two amino acids each triplet would code for. PCBs bind poorly to the mutated receptors, apparently blunting the chemicals' effects.

The adaptation occurs almost universally in Hudson River tomcod, but crops up only infrequently in two other tomcod populations—in Connecticut's Niantic River and the Shinnecock Bay at Long Island's south shore. The fact that it exists at all in those nearby populations leads the researchers to believe the Hudson Bay tomcod had the mutation at least to a low degree before the PCB onslaught. In a classic case of natural selection, the fish with the mutated genes survived.

"They were getting blasted with chemicals all of a sudden," Wirgin said, "and the early life stages are so sensitive. If they didn't have a mechanism to deal with this, it's likely the population would have been extirpated."

Achilles' Heel?

General Electric released about 1.3 million pounds of PCBs into the Hudson River from 1947 to 1976, and bears most of the responsibility for the cleanup.

Following highly controversial wrangling throughout the past decade, GE conducted a year's worth of experimental dredging in 2009. The EPA studied the risks from resuspended contaminants and decided cleanup is the best option. Dredging will resume this spring and will last for at least six years.

Cleanup might not be best for tomcod, Wirgin said. That's because evolutionary theory predicts a genetic mutation like theirs could render them compromised in some other area of their biology, and perhaps not well adapted to life without PCBs.

But it's likely to be a boon for the Hudson's predatory fish that are less likely to have an adaptation to PCBs—and are therefore gravely at risk from a diet of tomcod.

http://www.eurekalert.org/pub_releases/2011-02/uops-opo021811.php

1 person of 1,900 met AHA's definition of ideal heart health, says University of Pittsburgh study

PITTSBURGH, Feb. 18 – *Only one out of more than 1,900 people evaluated met the American Heart Association (AHA) definition of ideal cardiovascular health, according to a new study led by researchers at the University of Pittsburgh School of Medicine. Their findings were recently published online in Circulation.*

Ideal cardiovascular health is the combination of these seven factors: nonsmoking, a body mass index less than 25, goal-level physical activity and healthy diet, untreated cholesterol below 200, blood pressure below 120/80 and fasting blood sugar below 100, explained senior investigator and cardiologist Steven Reis, M.D., associate vice chancellor for clinical research at Pitt.

"Of all the people we assessed, only one out of 1,900 could claim ideal heart health," said Dr. Reis. "This tells us that the current prevalence of heart health is extremely low, and that we have a great challenge ahead of us to attain the AHA's aim of a 20 percent improvement in cardiovascular health rates by 2020."

As part of the Heart Strategies Concentrating on Risk Evaluation (Heart SCORE) study, the researchers evaluated 1,933 people ages 45 to 75 in Allegheny County with surveys, physical exams and blood tests. Less than 10 percent met five or more criteria; 2 percent met the four heart-healthy behaviors; and 1.4 percent met all three heart-healthy factors. After adjustment for age, sex and income level, blacks had 82 percent lower odds than whites of meeting five or more criteria.

A multipronged approach, including change at the individual level, the social and physical environment, policy and access to care, will be needed to help people not only avoid heart disease, but also attain heart health, Dr. Reis said. "Many of our study participants were overweight or obese, and that likely had a powerful influence on the other behaviors and factors," he noted. "Our next step is to analyze additional data to confirm this and, based on the results, try to develop a multifaceted approach to improve health. That could include identifying predictors of success or failure at adhering to the guidelines."

The team includes Claudia Bambs, M.D., M.Sc., Pontificia Universidad Cato´lica de Chile, Santiago, Chile; Kevin E. Kip, Ph.D., University of South Florida, Tampa; Andrea Dinga, M.Ed., R.D., L.D.N., Suresh R. Mulukutla, M.D., and Aryan N. Aiyer, M.D., University of Pittsburgh School of Medicine.

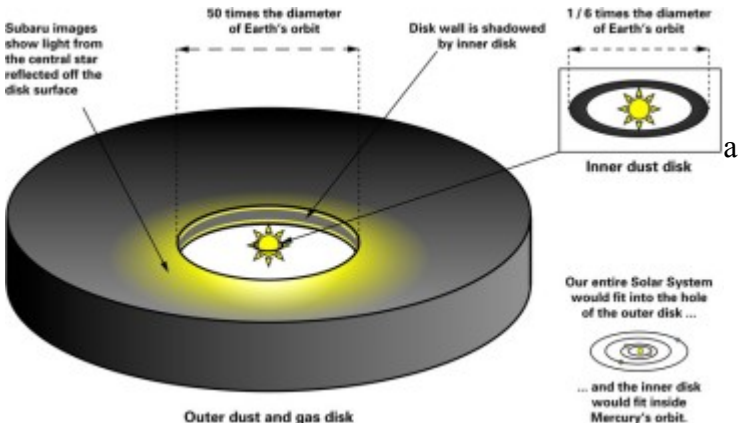
The study was funded by the National Institutes of Health and the Pennsylvania Department of Health.

http://www.eurekalert.org/pub_releases/2011-02/m-btt021811.php

Back to the roots of the solar system

Planets form in disks of dust and gas that surround young stars. A look at the birth places means a journey into the past of the earth and its siblings.

Now, astronomers have been able to obtain detailed images of the protoplanetary disks of two stars using the Subaru telescope in Hawaii. This is the first time that disk structures comparable in size to our own solar system have been resolved this clearly, revealing features such as rings and gaps that are associated with the formation of giant planets. The observations are part of a systematic survey to search for planets and disks around young stars using a state-of-the-art high-contrast camera designed specifically for this purpose.



Planetary systems like our own share a humble origin as mere by-products of star formation. A newborn star's gravity gathers leftover gas and dust in dense, flattened disk of matter orbiting the star. Clumps in the disk sweep up more and more material, until their own gravity becomes sufficiently strong to compress them into the dense bodies we know as planets. Recent years have seen substantial advances both in observations (mostly indirect) and in theoretical modelling of such "protoplanetary" disks. The two new observations have added intriguing new details, revealing some structures that had never before been seen directly.

This is a sketch of the three-dimensional shape of the protoplanetary disk around the star LkCa 15. Only the light reflected from the outer disk (shown in yellow) is seen on the HiCIAO images. The other structural features have been inferred from previous indirect observations of the system. The large gap between the inner and the outer disk has most likely been carved out by one or more newborn planets that orbit the star. The planets themselves have not been detected -- yet. **MPIA / Christian Thalmann**

One of the two studies targeted the star LkCa 15, which is located around 450 light-years from Earth in the constellation Taurus. At an age of a few million years, LkCa 15 is a young star – the Sun is a thousand times older. From previous observations of its infrared spectrum and its millimetre emissions, scientists had deduced the presence of a large gap in the centre of its protoplanetary disk. The new images show starlight gleaming off the disk surface, clearly outlining the sharp edge of the gap for the first time. Most interestingly, the elliptical shape of the gap is not centred on the star, but appears lopsided.

"The most likely explanation for LkCa 15's disk gap, and in particular its asymmetry, is that one or more planets, freshly born from the disk material, have swept up the gas and dust along their orbits," says Christian Thalmann, who led the study while on staff at the Max Planck Institute for Astronomy (MPIA). Intriguingly, the disk gap is sufficiently large to accommodate the orbits of all the planets in our own Solar System. It is therefore tempting to speculate that LkCa 15 might be in the process of forming an entire planetary system much like our own. "We haven't detected the planets themselves yet, adds Thalmann. But that may change soon."

The second observation, led by Jun Hashimoto (National Observatory of Japan), targeted the star AB Aur in the constellation Auriga, at a distance of 470 light-years from Earth. This star is even younger, with an age of a mere one million years. The observations were the first to show details down to length scales comparable to the size of our own solar system – for comparison: At a distance of 470 light-years, the solar system has the same apparent size as a 1 Euro coin viewed at a distance of more than 10 km. They show nested rings of material that are tilted with respect to the disk's equatorial plane, and whose material, intriguingly, is not distributed symmetrically around the star – irregular features that indicate the presence of at least one very massive planet.

Both observations where made with the HiCIAO instrument at the 8.2 metre Subaru Telescope. Imaging a disk or planet close to a star is an enormous challenge, as it is very difficult to discern the light emitted by those objects in the star's intense glare. HiCIAO meets this challenge by correcting for the distorting influence of the Earth's atmosphere and by physically blocking out most of the star's light.

The observations are part of the SEEDS project, short for Strategic Explorations of Exoplanets and Disks with Subaru. MPIA's managing director, Thomas Henning, one of the project's co-investigators, explains: "SEEDS is a five-year systematic search for exoplanets and protoplanetary disks. We are thrilled about the images the Subaru telescope has produced as part of this project. Detailed observations like these are the key to understanding how planetary systems, including our own solar system, came into being." SEEDS involves more than 100 researchers from 25 astronomical institutions in Asia (NAOJ and others), Europe (MPIA and others), and the US (Princeton University and others).

Original Publication *Thalmann, C. et al. Imaging of a Transitional Disk Gap in Reflected Light: Indications of Planet Formation Around the Young Solar Analog LkCa 15 Astrophysical Journal Letters 718, p. L87-L91*

http://www.eurekalert.org/pub_releases/2011-02/ps-jlc020711.php

Juggling languages can build better brains

Once likened to a confusing tower of Babel, speaking more than one language can actually bolster brain function by serving as a mental gymnasium, according to researchers.

Recent research indicates that bilingual speakers can outperform monolinguals--people who speak only one language--in certain mental abilities, such as editing out irrelevant information and focusing on important information, said Judith Kroll, Distinguished Professor of Psychology, Penn State. These skills make bilinguals better at prioritizing tasks and working on multiple projects at one time.

"We would probably refer to most of these cognitive advantages as multi-tasking," said Kroll, director of the Center for Language Science. "Bilinguals seem to be better at this type of perspective taking."

Kroll said that these findings counter previous conclusions that bilingualism hindered cognitive development.

"The received wisdom was that bilingualism created confusion, especially in children," said Kroll told attendees today (Feb. 18) at the annual meeting of the American Association for the Advancement of Science in Washington D.C. "The belief was that people who could speak two or more languages had difficulty using either. The bottom line is that bilingualism is good for you."

Researchers trace the source of these enhanced multi-tasking skills to the way bilinguals mentally negotiate between the languages, a skill that Kroll refers to as mental juggling. When bilinguals speak with each other, they can easily slip in and out of both languages, often selecting the word or phrase from the language that most clearly expresses their thoughts. However, fluent bilinguals rarely make the mistake of slipping into another language when they speak with someone who understands only one language.

"The important thing that we have found is that both languages are open for bilinguals; in other words, there are alternatives available in both languages," Kroll said. "Even though language choices may be on the tip of

their tongue, bilinguals rarely make a wrong choice." This language selection, or code switching, is a form of mental exercise, according to Kroll. "The bilingual is somehow able to negotiate between the competition of the languages," Kroll said. "The speculation is that these cognitive skills come from this juggling of languages."

Kroll's symposium at the meeting included distinguished language scientists who have investigated the consequences of bilingualism across the lifespan. Ellen Bialystok, Distinguished Research Professor of Psychology at York University, Toronto, was instrumental in demonstrating that bilingualism improves certain mental skills.

According to Bialystok, the benefits of bilingualism appear across age groups. Studies of children who grow up as bilingual speakers indicate they are often better at perspective-taking tasks, such as prioritizing, than monolingual children. Experiments with older bilingual speakers indicate that the enhanced mental skills may protect them from problems associated with aging, such as Alzheimer's disease and dementia.

Researchers use MRIs and electroencephalographs to track how the brain operates when it engages in language juggling. They also use eye-movement devices to watch how bilinguals read sentences. When a person reads, the eyes jump through the sentence, stopping to comprehend certain words or phrases. These distinctive eye movements can offer researchers clues on the subtle ways bilinguals comprehend language compared to monolinguals.

Kroll noted that the enhanced brain functions of bilinguals do not necessarily make them more intelligent or better learners. "Bilinguals simply acquire specific types of expertise that help them attend to critical tasks and ignore irrelevant information," Kroll said.

http://www.bbc.co.uk/news/health-12503798

Key breast cancer 'driver' gene found

Cancer experts have identified a gene which can cause a particularly aggressive form of breast cancer to develop.

ZNF703 is the first "oncogene" to be discovered in five years. It is overactive in around one in 12 breast cancers, and could account for up to 4,000 UK cases a year. Cancer Research UK, whose scientists carried out the work, said the gene was a "prime candidate" for the development of new breast cancer drugs.

An oncogene is one which would normally help instruct healthy cells to divide but if it becomes overactive, it upsets the normal checks and balances that control that process. That damage is described as being "like a car's accelerator becoming stuck down", and the cell and all its daughter cells are permanently instructed to divide. Her2 - another oncogene - is already tested for.

The drug Herceptin was developed to treat Her2 positive breast cancers.

Elimination

Scientists at Cancer Research UK's Cambridge Research Institute and the British Columbia Cancer Agency in Vancouver, Canada carried out the study, which is published in EMBO Molecular Medicine, They looked at gene activity in 1,172 breast tumour samples, as well as looking at breast cancer cells grown in the lab.

They were able to eliminate genes until there was only the ZNF703 gene left within a region on chromosome 8 that was overactive in all the samples tested. And in two patients studied, ZNF703 was the only gene shown to be overactive, showing it was driving the development of the cancer.

Professor Carlos Caldas, of the Cambridge Research Institute, who led the research, said: "Scientists first discovered this region of DNA may be harbouring genes linked to the development of breast cancer 20 years ago. "But it's only with the technology we have today that we've been able to narrow down the search sufficiently to pinpoint the gene responsible."

He added: "Crucially, testing whether this gene is overactive in a patient's tumour could help highlight those more likely to be resistant to standard hormone therapies, helping to make sure the right drugs are matched to the right patient."

Dr Lesley Walker, director of cancer information at Cancer Research UK, said: "This is the first gene of its kind to be discovered in breast cancer for five years. "This is exciting because it's a prime candidate for the development of new breast cancer drugs designed specifically to target tumours in which this gene is overactive.

"Hopefully this will lead to more effective cancer treatments in the future."

Dr Rachel Greig, of Breakthrough Breast Cancer said the research was "a vital step in understanding the genes that drive the growth of some types of breast cancer".

http://www.newscientist.com/article/mg20928004.500-protein-dose-reverses-learning-problems-in-downs-mice.html

Protein dose reverses learning problems in Down's mice

*** 18 February 2011 by Aria Pearson**

LEARNING and memory problems have been reversed in mice with a syndrome that mimics Down's.

Catherine Spong and colleagues at the National Institutes of Health in Bethesda, Maryland, found they could prevent developmental problems in mice engineered to have Down's syndrome by injecting their mothers with two proteins, called NAP and SAL, while they were still in the womb. This treatment would carry many risks for humans, so the team wondered whether the proteins might also help adult mice.

Spong's team engineered mice to have an extra chromosome 16, which causes similar problems to those caused by an extra chromosome 21 in humans, the trigger for Down's (see picture). The mice then had to find a submerged platform in a water maze using visual cues. Down's mice usually take twice as long to find the platform as healthy mice. However, after four days of oral treatment with NAP and SAL, the Down's mice learned to navigate the maze just as easily as normal mice.

NAP and SAL are fragments of proteins normally produced by glial cells - brain cells that provide nourishment to neurons. We know that glial cells malfunction in people with Down's. Mice treated with the proteins had markers of healthy glial function that were missing in the untreated Down's mice.

In a second experiment, the team investigated whether the treatment caused changes in chemicals known to be involved in "long-term potentiation" (LTP) - a type of brain activity key to memory formation. People and mice with Down's have decreased levels of many chemicals involved in this process. However, treated mice appeared to have increased levels of a receptor called NR2B that is responsible for initiating LTP (Obstetrics & Gynecology, DOI: 10.1097/AOG.0b013e3182051ca5). Craig Heller, co-director of Stanford University's Down Syndrome Research Center in California, says this study makes one thing clear: "Learning disabilities and mental retardations that were considered permanent are treatable."

http://news.discovery.com/animals/dogs-probably-feel-sorry-for-us.html

Dogs Probably Feel Sorry For Us

By Jennifer Viegas | Fri Feb 18, 2011 07:01 PM ET

Dogs appear to empathize with us, to the point that some therapy dogs even seem to take on the emotions of their sick or distressed human charges, according to a new paper in the latest issue of Biology Letters.

The matter is more complicated than you might think, because researchers need to tease apart true empathy from a phenomenon known as "emotional contagion."

Emotional contagion is more of a knee-jerk reaction to various behaviors and other cues. For example, if you yawn, others near you, including dogs, might start to yawn too. They're not necessarily empathizing with you, although areas of the brain tied to empathy are involved. In fact, the mimicry is primarily triggered at a subconscious level. No one is certain why this happens. Some scientists suspect it has to do with communicating levels of alertness and coordinating sleep schedules.

But dogs do more than just copy us, according to the study's authors Karine Silva and Liliana Sousa of the Abel Salazar Biomedical Sciences Institute.

"Indeed, a study showing that pets, namely dogs, behave as 'upset' as children when exposed to familiar people faking distress, strongly suggests 'sympathetic concern,'" Silva and Sousa write. "Also it has been reported that untrained dogs may be sensitive to human emergencies and may act appropriately to summon help, which, if true, suggests empathic perspective taking."

In experiments, dog owners feigned a heart attack or pretended to experience an accident in which a bookcase fell on them and pinned them to the floor. The dogs in these studies just looked confused and didn't do much, but the scientists think canines need to also smell and hear signals tied to actual stress in order to respond. In other words, you probably can't easily fool a dog when it comes to emergencies.

Another study found that therapy dogs are both emotionally and physically affected by their work, "needing massages and calming measures after the sessions," according to the authors.

Silva and Sousa argue that dogs have the capacity to empathize with humans for three main reasons:

1. Dogs originated from wolves, which are highly social animals that engage in cooperative activities and are believed to have some ability to empathize with their fellow wolves.

2. Biological changes produced during the domestication of dogs may have allowed them to synchronize their wolf-inherited empathic capacities with those of humans.

3. Breed diversification and selection for canine intelligence may have increased the dog ability to empathize.

The scientists say further research is needed, with many questions remaining. If dogs do empathize with us, are some better able to do this than others? If so, is that ability at times tied to certain breeds more than others? If the ability is connected to genetics, are some dogs and people just born more empathetic than others? Can you train a dog or a person to be more understanding?

As the researchers point out, all of these related issues "should have considerable implications for education and society as a whole."

http://www.physorg.com/news/2011-02-cosmic-census-crowd-planets-galaxy.html

Cosmic census finds crowd of planets in our galaxy

(AP) -- *Scientists have estimated the first cosmic census of planets in our galaxy and the numbers are astronomical: at least 50 billion planets in the Milky Way.*

At least 500 million of those planets are in the not-too-hot, not-too-cold zone where life could exist. The numbers were extrapolated from the early results of NASA's planet-hunting Kepler telescope.

Kepler science chief William Borucki says scientists took the number of planets they found in the first year of searching a small part of the night sky and then made an estimate on how likely stars are to have planets. Kepler spots planets as they pass between Earth and the star it orbits.

So far Kepler has found 1,235 candidate planets, with 54 in the Goldilocks zone, where life could possibly exist. Kepler's main mission is not to examine individual worlds, but give astronomers a sense of how many planets, especially potentially habitable ones, there are likely to be in our galaxy. They would use the one-four-hundredth of the night sky that Kepler is looking at and extrapolate from there.

Borucki and colleagues figured one of two stars has planets and one of 200 stars has planets in the habitable zone, announcing these ratios Saturday at the American Association for the Advancement of Science annual conference in Washington. And that's a minimum because these stars can have more than one planet and Kepler has yet to get a long enough glimpse to see planets that are further out from the star, like Earth, Borucki said.

For example, if Kepler were 1,000 light years from Earth and looking at our sun and noticed Venus passing by, there's only a one-in-eight chance that Earth would also be seen, astronomers said.

To get the estimate for the total number of planets, scientists then took the frequency observed already and applied it to the number of stars in the Milky Way.

For many years scientists figured there were 100 billion stars in the Milky Way, but last year a Yale scientist figured the number was closer to 300 billion stars. Either way it shows that Carl Sagan was right when he talked of billions and billions of worlds, said retired NASA astronomer Steve Maran, who praised the research but wasn't part of it. And that's just our galaxy. Scientists figure there are 100 billion galaxies.

Borucki said the new calculations lead to worlds of questions about life elsewhere in the cosmos. "The next question is why haven't they visited us?" And the answer? "I don't know," Borucki said.

More information: Kepler site: http://kepler.nasa.gov/

http://www.eurekalert.org/pub_releases/2011-02/uol-gtw021811.php

Groundbreaking technology will revolutionize blood pressure measurement

Pioneering new technology will lead to better treatment decisions and better outcomes for patients

In a major scientific breakthrough, a new blood pressure measurement device is set to revolutionise the way patients' blood pressure is measured. The new approach, invented by scientists at the University of Leicester and in Singapore, has the potential to enable doctors to treat their patients more effectively because it gives a more accurate reading than the current method used. It does this by measuring the pressure close to the heart – the central aortic systolic pressure or CASP.

Blood pressure is currently measured in the arm because it is convenient however this may not always accurately reflect what the pressure is in the larger arteries close to the heart.

The new technology uses a sensor on the wrist to record the pulse wave and then, using computerised mathematical modelling of the pulse wave, scientists are able to accurately read the pressure close to the heart. Patients who have tested the new device found it easier and more comfortable, as it can be worn like a watch.

Being able to measure blood pressure in the aorta which is closer to the heart and brain is important because this is where high blood pressure can cause damage. In addition, the pressure in the aorta can be quite different from that traditionally measured in the arm. The new technology will hopefully lead to better identification of those who will most likely benefit from treatment by identifying those who have a high central aortic systolic pressure value. This will be especially important for younger people in whom the pressure measured in the arm can sometimes be quite exaggerated compared to the pressure in the aorta.

A key question is whether measurement of central aortic pressure will become routine in clinical practice. Professor Williams said: "it is not going to replace what we do overnight but it is a big advance. Further work will define whether such measurements are preferred for everybody or whether there is a more defined role in selective cases to better decide who needs treatment and who doesn't and whether the treatment is working optimally"

The University's close collaboration with the Singapore-based medical device company HealthSTATS International ("HealthSTATS") has led to the development of this world-first technique for more accurate blood pressure measurement.

The research work carried out by the University of Leicester was funded by the Department of Health's National Institute for Health Research (NIHR). The NIHR has invested £3.4million with a further £2.2million Capital funding from the Department of Health to establish a Biomedical Research Unit at Glenfield Hospital, Leicester, dedicated to translational research in cardiovascular research. The work, led by Professor Bryan Williams, Professor of Medicine at the University of Leicester and consultant physician at University Hospitals of Leicester NHS Trust, has the promise to change the way we measure blood pressure.

Professor Williams, who is based in the University of Leicester's Department of Cardiovascular Sciences at Glenfield Hospital, said: "I am under no illusion about the magnitude of the change this technique will bring about. It has been a fabulous scientific adventure to get to this point and it will change the way blood pressure has been monitored for more than a century. The beauty of all of this, is that it is difficult to argue against the proposition that the pressure near to your heart and brain is likely to be more relevant to your risk of stroke and heart disease than the pressure in your arm.

"Leicester is one of the UK's leading centres for cardiovascular research and is founded on the close working relationship between the University and the Hospitals which allows us to translate scientific research into patient care more efficiently. Key to our contribution to this work has been the support from the NIHR without which we would not have been able to contribute to this tremendous advance. The support of the NIHR has been invaluable in backing us to take this project from an idea to the bedside. Critical to the success of this project has been the synergies of combining clinical academic work here with HealthSTATS and their outstanding medical technology platform in Singapore. This has been the game-changer and I really do think this is going to change clinical practice."

Dr. Choon Meng Ting the Chairman and CEO of HealthSTATS said: "This study has resulted in a very significant translational impact worldwide as it will empower doctors and their patients to monitor their central aortic systolic pressure easily, even in their homes and modify the course of treatment for BP-related ailments. Pharmaceutical companies can also use CASP devices for clinical trials and drug therapy. All these will ultimately bring about more cost savings for patients, reduce the incidences of stroke and heart attacks, and save more lives."

Health Secretary Andrew Lansley said: "I saw this new technique in action in Leicester when I visited a few months ago. This is a great example of how research breakthroughs and innovation can make a real difference to patients' lives. We want the NHS to become one of the leading healthcare systems in the world and our financial commitment to the National Institute for Health Research reflects this. "I believe patients deserve the best treatments available and science research like this helps us move closer to making that happen."

Professor Dame Sally Davies, Director General of Research and Development and Interim Chief Medical Officer at the Department of Health, said: "This is fantastic work by Professor Williams and his team and I am delighted to welcome these findings. I am particularly pleased that the clinical research took place at the NIHR Biomedical Research Unit in Leicester. NIHR funding for Biomedical Research Centres and Units across England supports precisely this type of translational research, aimed at pulling-through exciting scientific discoveries into benefits for patients and the NHS by contributing to improved diagnostics and treatments."

For more information contact: *UNIVERSITY OF LEICESTER PRESS OFFICE: (contact details not for publication on any website) Ather Mirza, 0116 252 3335; pressoffice@le.ac.uk*

Film and photo opportunities at the Glenfield Hospital, Leicester – please inform pressoffice@le.ac.uk of any media attending

Notes to editors:

1. Results from the research have been published in the Journal of the American College of Cardiology. The research publication describes a novel method to measure aortic pressure non-invasively. The study reports that using this approach, central aortic systolic pressure can be measured non-invasively with an accuracy of 99% when compared to the pressure measured by inserting a catheter directly into the aorta close to the heart during a cardiac catheter procedure. The Singapore based medical devices company HealthSTATS has embedded this new and validated method into a range of blood pressure measurement devices that are enabled to measure central aortic systolic pressure (CASP), namely A-PULSE CASP®, CASPro® and CASPal®, which are designed for hospital, clinical and home use respectively. All three medical devices have attained the FDA 510(k) listing and CE (MDD) Mark. For the purpose of this research, the A-PULSE CASP® was used.

2. Professor Williams, is an NIHR Senior Investigator led the work in close collaboration with Dr. Ting and team from HealthSTATS in Singapore. Dr Ting, and his team have worked with Professor Williams and Dr. Peter Lacy in Leicester for over 4 years on this project. In that time, the idea has gone from concept into production of new clinical devices.
3. About the Research team in Leicester: Professor Bryan Williams is Professor of Medicine at the University of Leicester and Consultant Physician at the University Hospitals of Leicester NHS Trust. Professor Williams is also an NIHR Senior Investigator and conducts his research at the NIHR-funded Biomedical Research Unit in Cardiovascular Diseases in Leicester. Professor Williams has led research into central aortic pressure and with Dr Ting, the development of the novel method for its measurement.

http://news.bbc.co.uk/earth/hi/earth_news/newsid_9401000/9401945.stm

Monkeys 'show self-doubt' like us

By Victoria Gill Science and nature reporter, BBC News

Monkeys trained to play computer games have helped to show that it is not just humans that feel self-doubt and uncertainty, a study says.

US-based scientists found that macaques will "pass" rather than risk choosing the wrong answer in a brainteaser task. Awareness of our own thinking was believed to be a uniquely human trait. But the study, presented at the AAAS meeting in Washington DC, suggests that our more primitive primate relatives are capable of such self-awareness. Professor John David Smith, from State University of New York at Buffalo and Michael Beran, from Georgia State University, carried out the study.

They trained the macaques, which are to use a joystick-based computer game. The animals were trained to judge the density of a pixel box that appeared at the top of the screen as either sparse or dense. To give their answer, the monkeys simply moved a cursor towards a letter S or a letter D. When the animals chose the correct letter, they were rewarded with an edible treat. There was no punishment for choosing the wrong answer, but the game briefly paused, taking away - for a few seconds - the opportunity for the animals to win another treat.

But the monkeys had a third option - choosing a question mark - which skipped the trial and moved on to the next one. This meant no treat, but it also meant no pause in the game. The scientists saw that the macaques used this option in exactly the same way as human participants who reported that they found a trial too tricky to answer; they chose to "pass" and move on.

Dr Smith presented footage of the animals playing the game at a session that was organised by the European Science Foundation. "Monkeys apparently appreciate when they are likely to make an error," he told BBC News. "They seem to know when they don't know."

In the same trial, capuchins, which belong to the group known as New World monkeys, failed to take this third option.

Dr Smith explained: "There is a big theoretical question at stake here: Did [this type of cognition] develop only once in one line of the primates - emerging only in the line of Old World primates leading to apes and humans?"

He said that the capacity think in this way was "one of the most important facets of humans' reflective mind, central to every aspect of our comprehension and learning". "These results... could help explain why self-awareness is such an important part of our cognitive makeup and from whence it came," he added.

http://www.physorg.com/news/2011-02-china-mars-probe-november.html

China Mars probe set for November launch

China's first Mars probe will be launched from a Russian rocket in November, two years later than originally planned, state media reported Monday.

China's Mars explorer, Yinghuo-1, marks the country's first attempt at deep space exploration after sending a probe to the moon, the state-run China Daily reported, citing comments from a China Academy of Space Technology official.

The 110-kilogram (240-pound) micro-satellite was originally due to blast off in October 2009 with Russia's "Phobos Explorer" from the Baikonur Cosmodrome in Kazakhstan but the launch was postponed, according to previous reports.

The orbiter is due to probe the Martian space environment with a special focus on what happened to the water that appears to have once been abundant on the planet's surface, previous reports said.

China is aiming to build a space exploration programme on par with those of the United States and Russia.

It currently has a probe -- the Chang'e 2 -- orbiting the moon and carrying out various tests in preparation for the expected 2013 launch of the Chang'e-3, which it hopes will be its first unmanned lunar landing.

It became the world's third nation to put a man in space independently -- after the Soviet Union and the United States -- when Yang Liwei piloted the one-man Shenzhou-5 space mission in 2003.

China's Wang Yue is currently participating in a simulation of a mission to Mars in Russia, where astronauts have spent eight months in a space capsule cut off from the world.

http://www.physorg.com/news/2011-02-fabricate-large-area-full-color-quantum-dot.html

Researchers fabricate first large-area, full-color quantum dot display

(PhysOrg.com) -- ***For more than a decade, researchers have been trying to make TV displays out of quantum dots.***

Theoretically, quantum dot displays could provide extremely high-resolution images and higher energy efficiencies than current TVs. Now in a new study, researchers have presented the first large-area, full-color quantum dot display that could lead to the development of displays for the next-generation TVs, mobile phones, digital cameras, and portable game systems.

The researchers, Tae-Ho Kim and coauthors from various institutes in South Korea, have published their study on the first four-inch, full-color quantum dot display in a recent issue of Nature Photonics. The display consists of a film printed with trillions of the tiny quantum dots (an average of 3 trillion per cm2). The quantum dots emit light at a specific wavelength (color) that can be tuned by changing the size of the quantum dots.

Electroluminescence image of a four-inch full-color quantum dot display with a resolution of 320 x 240 pixels. **Image credit: Tae-Ho Kim, et al. ©2011 Macmillan Publishers Limited.**

Previous attempts to make full-color quantum dot displays have faced challenges in that image quality tended to decrease with the size of the display. To overcome this challenge, the researchers in the current study used a different method for applying the quantum dots to the film's surface. Instead of spraying the quantum dots onto the film, the researchers created an "ink stamp" out of a patterned silicon wafer. They used the stamp to pick up strips of size-selected quantum dots, and then stamp them onto the substrate. Unlike the spraying methods, this method does not require the use of a solvent, which previously reduced color brightness.

As the results showed, the new quantum dot display has a greater density and uniformity of quantum dots, as well as a brighter picture and higher energy efficiency than previous quantum dot displays. The new display is also flexible, so applications could include roll-up portable displays or flexible lighting applications. The technology could also be used in photovoltaic devices, which would especially benefit from quantum dots' high energy efficiency.

More information: Tae-Ho Kim, et al. "Full-colour quantum dot displays fabricated by transfer printing." Nature Photonics. DOI: 10.1038/nphoton.2011.12. via: Nature News