New Master Switch Found in the Brain That Regulates Desire for Food and Ability to Reproduce

Body weight and fertility have long known to be related to each other – women who are too thin, for example, can have trouble becoming pregnant. Now, a master switch has been found in the brain of mice that controls both, and researchers at the Salk Institute for Biological Studies say it may work the same way in humans.

Newswise — Body weight and fertility have long known to be related to each other – women who are too thin, for example, can have trouble becoming pregnant. Now, a master switch has been found in the brain of mice that controls both, and researchers at the Salk Institute for Biological Studies say it may work the same way in humans.

Findings from the study, published ahead of print in the Aug. 31 online edition of Nature Medicine, suggest that variations in the gene that produces this master switch, known as TORC1, could contribute a genetic component to obesity and infertility, and might be regulated with a novel drug.

"This gene is crucial to the daisy chain of signals that run between body fat and the brain," says Marc Montminy, Ph.D., a professor in the Clayton Foundation Laboratories for Peptide Biology, who led the study. "It likely plays a pivotal role in how much we, as humans, eat and whether we have offspring."

It is just as important as leptin, the well-known star regulator of appetite, Montminy says, because leptin turns on TORC1, which in turn activates a number of genes known to help control feeding and fertility.

Judith Altarejos Ph.D., first author on this study, had been trying to understand human energy balance, and what can go awry to promote obesity, diabetes and other metabolic syndromes. In this study, she looked at the signals that travel from body fat to the brain, informing the brain of how well fed the body is. The primary hormone that performs that function is leptin, which travels through the bloodstream to the hypothalamus in the brain (the appetite center), keeping the brain aware of the body's nutritional status.

"Leptin tells the brain that times are good, your body is full, and that it is not necessary to eat more at the moment," Montminy says. The hormone also is known to play a role in reproduction - although, until this study, no one understood what is was. (Very thin women often do not have periods.)

"Controlling appetite and reproduction together provides a big evolutionary advantage," Montminy says. "If there is no food, the brain believes the body should not reproduce because without body fat, a baby's growth in the womb could be stunted, and without food to replenish the body's energy reserves, there will be nothing to feed the offspring."

"Leptin works remarkably well to give the brain a good indication of how much food has been eaten; 99.9 percent of the time it balances food intake with energy use," he says. "The problem is that no machine works 100 percent of the time, and that slight bit of inefficiency can lead to extra body weight."

Obesity results when the brain becomes "deaf" to the leptin signal, so one goal of Montminy's research is to "try to make a way to make sure the brain signals are being heard." But to do that, he and his research team first have to understand all of the signals involved in the satiety pathway.

Through years of research, they have uncovered a family of genes that act as energy switches, turning other genes on or off. One gene, TORC2, acts like a fasting switch that flips on the production of glucose in the liver when blood glucose levels run low, usually during sleep. During the day, the hormone insulin normally shuts down TORC2, ensuring that blood sugar levels don't rise too high. Problems along the pathway, however, can help lead to diabetes.

In this study, Altarejos looked at the function of TORC1, which she knew was produced in the brain – unlike TORC2 and TORC3 – but didn't know what its function was. To do this, she created mice that lacked one or both copies of the TORC1 gene – the first such "knock-out" mice to be developed.

Mice born without TORC1 looked fine at birth, but at about eight weeks, they began to gain weight and became persistently obese in adulthood, with two to three times as much adipose fat as normal mice, and they also became insulin resistant. "Their hormones and blood sugar resembled that seen in humans with these disorders," Montminy says.

They also discovered, to their surprise, that mice of both sexes were infertile; the uteri and ovaries in female mice were anatomically dysfunctional, for example. "We don't study infertility, but we put two and two together," he says. "We knew leptin is the critical hormone for regulating body weight, and that it is also very important for regulating reproduction."

Altarejos discovered that TORC1, which is found within nerve cells, responds to signals from leptin, which binds to receptors on the outside of the same cells. TORC1 then turns on a spate of genes, two of which are well known. One is the CART (Cocaine and Amphetamine Regulated Transcript) gene that is known to stifle

appetite. The other, KISS1 (named by its discoverers at the Penn State Hershey Medical Center) is required for reproduction; mutations in the gene produce human infertility.

So when leptin binds with its receptor on brain cells, it turns on TORC1, which, in turns activates CART to suppress appetite, because more food is not needed, and KISS1, signaling reproduction can now commence in this well-fed body. Conversely, when leptin is not activating brain receptors, TORC1 is turned off, as are CART and KISS1.

They also discovered that when mice inherit only one TORC1 gene (instead of the normal two, one from each parent), fertility is restored but the mice gain more weight than normal mice. “This suggests that half of the dose of TORC switch is enough to cause problems in leptin signaling in the brain, and it may be that subtle mutations in TORC1 in humans could be responsible for an inheritable risk factor for gaining weight,” Montminy says.

Tweaking mutated and inefficient TORC genes may be possible through drug therapy, he adds. “TORC1 is regulated by phosphate handling enzymes called kinases, and kinases often make for very good drug targets,” Montminy says.

Authors who contributed to the work include postdoctoral researchers Judith Y. Altarejos, Ph.D., Naomi Goebel, Ph.D., and Hiroshi Inoue, Ph.D., all in the Montminy lab, Michael Conkright, Ph.D., at the Scripps Research Institute in Jupiter, Florida, postdoctoral researcher Xianjin Xie, Ph.D., at Cell Signaling Technology, in Danvers, Massachusetts, postdoctoral researchers Carlos M. Arias, Ph.D., and professor Paul E. Sawchenko, Ph.D., both in the Laboratory of Neuronal Structure and Function at the Salk Institute.

The Salk Institute for Biological Studies in La Jolla, California, is an independent nonprofit organization dedicated to fundamental discoveries in the life sciences, the improvement of human health and the training of future generations of researchers. Jonas Salk, M.D., whose polio vaccine all but eradicated the crippling disease poliomyelitis in 1955, opened the Institute in 1965 with a gift of land from the City of San Diego and the financial support of the March of Dimes.

Children of older fathers more likely to have bipolar disorder

Older age among fathers may be associated with an increased risk for bipolar disorder in their offspring, according to a report in the September issue of Archives of General Psychiatry, one of the JAMA/Archives journals.

Bipolar disorder is a common, severe mood disorder involving episodes of mania and depression, according to background information in the article. Other than a family history of psychotic disorders, few risk factors for the condition have been identified. Older paternal age has previously been associated with a higher risk of complex neurodevelopmental disorders, including schizophrenia and autism.

Emma M. Frans, M.Med.Sc., of the Karolinska Institutet, Stockholm, Sweden, and colleagues identified 13,428 patients in Swedish registers with a diagnosis of bipolar disorder. For each one, they randomly selected from the registers five controls who were the same sex and born the same year but did not have bipolar disorder.

When comparing the two groups, the older an individual's father, the more likely he or she was to have bipolar disorder. After adjusting for the age of the mother, participants with fathers older than 29 years had an increased risk. "After controlling for parity [number of children], maternal age, socioeconomic status and family history of psychotic disorders, the offspring of men 55 years and older were 1.37 times more likely to be diagnosed as having bipolar disorder than the offspring of men aged 20 to 24 years," the authors write.

The offspring of older mothers also had an increased risk, but it was less pronounced than the paternal effect, the authors note. For early-onset bipolar disorder (diagnosed before age 20), the effect of the father's age was much stronger and there was no association with the mother's age.

"Personality of older fathers has been suggested to explain the association between mental disorders and advancing paternal age," the authors write. "However, the mental disorders associated with increasing paternal age are under considerable genetic influence." Therefore, there may be a genetic link between advancing age of the father and bipolar and other disorders in offspring.

"As men age, successive germ cell replications occur, and de novo [new, not passed from parent to offspring] mutations accumulate monotonously as a result of DNA copy errors," the authors continue. "Women are born with their full supply of eggs that have gone through only 23 replications, a number that does not change as they age. Therefore, DNA copy errors should not increase in number with maternal age. Consistent with this notion, we found smaller effects of increased maternal age on the risk of bipolar disorder in the offspring." *(Arch Gen Psychiatry. 2008;65[9]:1034-1040. Available pre-embargo to the media at www.jamamedia.org.)*

Scientists develop new method to investigate origin of life

Scientists at Penn State have developed a new computational method that they say will help them to understand how life began on Earth. The team's method has the potential to trace the evolutionary histories of proteins all the way back to either cells or viruses, thus settling the debate once and for all over which of these life forms came first. "We have just begun to tap the potential power of this method," said Randen Patterson, a

Penn State assistant professor of biology and one of the project's leaders. "We believe, if it is possible at all, that it is within our grasp to determine whether viruses evolved from cells or vice-versa."

The new computational method will be described in a paper to be published in a future issue of the journal Proceedings of the National Academy of Sciences. The journal also will post the paper on the early on-line section of its Web site sometime during the week ending 6 September 2008.

The team is focusing on an ancient group of proteins, called retroelements, which comprise approximately 50 percent of the human genome by weight and are a crucial component in a number of diseases, including AIDS. "Retroelements are an ancient and highly diverse class of proteins; therefore, they provide a rigorous benchmark for us to test our approach. We are happy with the results we derived, even though our method is in an early stage," said Patterson. The team plans to make the algorithms that they used in their method available to others as open-source software that is freely available on the Web.

Scientists map out the evolutionary histories of organisms by comparing their genetic and/or protein sequences. Those organisms that are closely related and share a recent common ancestor have greater degrees of similarity among their sequences. In their paper, the researchers describe how they used 11 groups of the retroelement proteins -- ranging from bacteria to human HIV -- to trace the evolutionary histories of retroelements. Their method uses a computer algorithm to generate evolutionary profiles -- also called phylogenetic profiles -- that are compared all-against-all. For example, given four sequences, the new method compares profile A to profiles B, C, and D; it compares profile B to profiles C and D; and so on, for a total of six comparisons. The method then selects the regions of the profiles that match and creates a tree-like diagram, called a phylogenetic tree, based on the retroelements' similarities to one another. The tree provides evolutionary distance estimates and, hence, phylogenetic relationships among retroelements. Patterson said that the results from this study help to clarify many existing theories on retroelement evolution.

The conventional method for estimating evolutionary relationships, called multiple sequence alignment, also produces evolutionary trees, but can be insensitive to relationships among the most distantly related proteins, in large part because it makes only one simultaneous comparison across all of the genetic/protein sequences. To obtain more detailed information about possible relationships among the sequences, a human expert who can manually search for such relationships is needed. But Patterson said that relying on humans to do the work is not ideal.

"Although the human mind is the most powerful tool for pattern recognition, human-based measurements often are hard to reproduce," he said. "For example, if you do something and I do something, we're going to do it differently. It's better to have a standardized method for gauging relationships among ancient proteins, and that's exactly what we've created." According to Damian van Rossum, Penn State research associate/assistant professor of biology and another leader on the project, the new method can be used in conjunction with the conventional method to get a clearer picture of the evolutionary histories of proteins. "The more independent measures you have, the better view of the world you can get," he said.

"The baobab tree represents one of the most ancient species of life on the planet. In our paper, we investigate ancient and highly divergent proteins, called retroelements, whose evolutionary histories hold keys to uncovering the origins of life. Our research demonstrates that phylogenetic profiles generated using the Gestalt Domain Detection Algorithm-Basic Local Alignment Tool (GDDA-BLAST) provide an independent method for estimating the evolutionary histories of retroelements." **Randen Patterson and Damian van Rossum, Penn State**

In addition to searching for the origins of life, the team also is using its method to simultaneously gather data on the shapes of proteins, their functions in the body, and their evolutionary histories. In another paper, which

was published in 2008 in the online journal Physics Archives, members of the team previously had demonstrated that their new method can simultaneously measure all three of these characteristics. "Previously, people have shown that profiling methods can resolve functional and structural differences and similarities between proteins, but to date no one has shown that you can measure evolutionary distances," said van Rossum. "Not only can our method measure evolutionary distances, but it also can measure functional and structural characteristics at the same time."

Patterson said that there are about 30,000 profiles in an online scientific repository that they can use to generate their phylogenetic profiles. He expects that the team's method will become even more powerful as additional sequences are added to this protein bank. In fact, the method already has become more refined in the short time since the team submitted its manuscript to the journal. "We already are producing evolutionary trees with much more detail than what we show in the paper," he said. "In fact, we are surprised at our progress so far in our goal of tracing these histories all the way back to the beginning of life."

This research was supported by the Commonwealth Universal Research Enhancement (CURE) Program, the Penn State Eberly College of Science, the Penn State Huck Institutes of the Life Sciences, and the Searle Scholars Program.

'Gender bending' chemicals found in beer and wine

* 09:00 01 September 2008

* NewScientist.com news service

*** Ewen Callaway**

Worried about eating too much "gender-bending" soya? It turns out a host of other foods also contain high levels of oestrogen-like chemicals, including beer wine and roasted peanuts.

Gunter Kuhnle of the MRC Dunn Human Nutrition Unit in Cambridge, UK, and colleagues surveyed dozens of foods and beverages using mass spectrometry, an extremely sensitive chemical technique. Most previous surveys of foods and drinks focused on one kind of phytoestrogen that is found in high levels in nuts and seeds called lignans, but ignored another kind called isoflavones.

By searching for isoflavones, Kuhnle found that phytoestrogens are present in far more foods and drinks than had previously been realised.

Studies on the health effects of phytoestrogens have painted a mixed and muddled picture. Some have hinted that the compounds protect against cancer, heart disease and the side-effects of the menopause, while others have linked high levels to an increased risk of breast cancer and male infertility. Still others have documented no link between phytoestrogens and those same ailments. So snack at your own risk – or reward.

Journal reference: Journal of Agricultural and Food Chemistry (DOI: 10.1021/jf801534g)

Phytoestrogen content of common foodstuffs (micrograms of phytoestrogen per 100 grams)

Monogamy gene found in people

* 22:00 01 September 2008

* NewScientist.com news service

*** Priya Shetty**

What if you could tell whether a man is husband material just by peering at his genes?

There has been speculation about the role of the hormone vasopressin in humans ever since we discovered that variations in where receptors for the hormone are expressed makes prairie voles strictly monogamous but meadow voles promiscuous; vasopressin is related to the "cuddle chemical" oxytocin. Now it seems variations in a section of the gene coding for a vasopressin receptor in people help to determine whether men are serial commitment-phobes or devoted husbands.

Hasse Walum at the Karolinska Institute in Stockholm, Sweden, and colleagues looked at the various forms of the gene coding for a vasopressin receptor in 552 Swedish people, who were all in heterosexual partnerships. The researchers also investigated the quality of their relationships.

They found that variation in a section of the gene called RS3 334 was linked to how men bond with their partners. Men can have none, one or two copies of the RS3 334 section, and the higher the number of copies, the worse men scored on a measure of pair bonding.

Not only that, men with two copies of RS3 334 were more likely to be unmarried than men with one or none, and if they were married, they were twice as likely to have a marital crisis.

Commitment phobia

Given that everyone surveyed had been in their relationship for at least five years, the team suggests that having multiple copies somehow contributes to commitment problems in men. Because the results were collected for a different study the team couldn't quiz the men on whether they were faithful, says Wallum.

It is not clear exactly how multiple copies of RS3 334 affect expression of the vasopressin receptor, and our most intimate relationships. And yet that's the most interesting question, says Thomas Insel, director of the National Institute of Mental Health in Bethesda, Maryland.

In some animals, the theory is that the brain has two "motivational" systems: one for reward, the other for social perception. In prairie voles and marmosets, receptors for the two systems sit on adjacent cells, so social activity is highly rewarding, leading to monogamy. To see if the same mechanism is at work in people will mean using tissue from post-mortems to map where vasopressin receptors lie, to see if variations are linked to the number of copies of RS3 334.

RS3 334's social effects extend beyond bonding in couples. Earlier this year, the same gene section was shown to affect signalling in people's amygdalas, linked to trust. Another study found that people with autism, which is characterised by unusual social behaviour, often have multiple copies of RS3 334.

Walum's colleague Paul Lichtenstein says the team's next task is to test how a nasal vasopressin spray affects altruism and jealousy. *Journal reference: Proceedings of the National Academy of Sciences, DOI: 10.1073pnas.0803081105*

Virus weaves itself into the DNA transferred from parents to babies

Effects of unique form of congenital infection unknown

Parents expect to pass on their eye or hair color, their knobby knees or their big feet to their children through their genes. But they don't expect to pass on viruses through those same genes.

New research from the University of Rochester Medical Center shows that some parents pass on the human herpes virus 6 (HHV-6) to their children because it is integrated into their chromosomes. This is the first time a virus has been shown to become part of the human DNA and then get passed to subsequent generations. This unique mode of congenital infection may be occurring in as many as 1 of every 116 newborns, and the long-term consequences for a child's development and immune system are unknown.

"At this point, we know very little about the implications of this type of infection, but the section of the chromosome into which the virus appears to integrate is important to the maintenance of normal immune function," said Caroline Breese Hall, M.D., professor of Pediatrics and Medicine at the University of Rochester Medical Center, and author of the study which publishes in Pediatrics this month. "With further study, we hope to discern whether this type of infection affects children differently than children infected after birth."

HHV-6 causes roseola, an infection that is nearly universal by 3 years of age. The typical roseola syndrome produces several days and up to a week of a high fever and may have variable other symptoms including mild respiratory and gastrointestinal symptoms. With roseola, just as the fever breaks, the child may briefly develop a rash. A congenital infection of HHV-6 – or one that is present at birth – produces high levels of virus in the body but scientists (doctors) do not know whether it produces any developmental or immune system problems.

Some congenital infections can cause serious problems in fetuses. If a mother contracts cytomegalovirus (CMV) while pregnant, her fetus is at risk of hearing or vision loss, developmental disabilities and problems with the lungs, liver and spleen. Some of those health problems don't show up until months or years after birth. HHV-6 virus is a closely related virus to CMV, and the congenital infection rate of CMV is similar to that of congenital HHV-6 – about 1 percent. However, this research shows that a congenital HHV-6 infection differs greatly from a congenital CMV infection in that it is often integrated into the chromosomes of the baby rather than passed through the placenta.

"This is the first time a herpes virus has been recognized to integrate into the human genome. To think that it's actually a part of us – that's really fascinating," said Mary Caserta, M.D., associate professor of Pediatrics at the University of Rochester Medical Center and one of the paper's authors. "This opens up a whole new realm of exploration."

Of 254 children enrolled in this study between July 2003 and April 2007, 43 had congenital HHV-6 infections based on cord blood samples. Of 211 children without congenital infection, 42 were children who acquired an HHV-6 infection during the study. Of the infants who had congenital infections, 86 percent of them (37) had the virus integrated into their chromosomes. Only six of the congenitally infected babies were infected by the mother through the placenta .

Children who had integrated HHV-6 had higher levels of virus in the body than those who were infected through the placenta. HHV-6 DNA was found in the hair of one parent of all children with integrated virus with available parental samples (18 mothers and 11 fathers), which means the children acquired the integrated infections through their mother's egg or father's sperm at conception. The virus's DNA was not found in hair samples of parents of children who were infected after birth.

This study is part of a series of ongoing studies on children with HHV-6 infections at the University's Golisano Children's Hospital at Strong. This study was funded by grants from the National Institute of Child Health and Development and, in part, by grants from the General Clinical Research Center, the National Center for Research Resources, the National Institutes of Health and the HHV-6 Foundation.

Battling Diabetes with Beta Cells

TAU replicates insulin-producing cells, providing new hope for diabetics

Affecting eight percent of America's population, diabetes can lead to blindness, kidney failure, strokes and heart disease. Thanks to Tel Aviv University researchers, a new cure -- based on advances in cell therapy -- may be within reach.

Prof. Shimon Efrat from TAU's Sackler Faculty of Medicine, whose research group is among world leaders in beta cell expansion, has developed a way to cultivate cells derived from insulin-producing beta cells from human tissue in the laboratory. It may be possible to implant these new healthy cells into patients with type 1 diabetes.

If successful, this method, which artificially replicates the insulin cells people need, could ensure that fewer people will die while waiting for a life-saving pancreas and kidney. Prof. Efrat's research paves the way for new and alternative forms of treatment in cases in which organ transplantation is not an option. And one day, the procedure may be as simple as a blood transfusion.

The Multiplication Effect

Type 1 diabetes, the most severe form of the condition, emerges as a chronic condition in childhood or early adulthood, when the body's immune system stops working properly and destroys the beta cells in the pancreas. Beta cells are needed to produce insulin, and a shortage of insulin inhibits the breakdown of food into energy. By the time a diagnosis is made, most beta cells are destroyed beyond repair. Injections of insulin can ease the symptoms, but some sufferers from the disease eventually require extreme measures, such as organ transplants, to stay alive.

"The shortage of organ donors makes the development of new cell sources for cell therapy critical," says Prof. Efrat. "Using beta cell expansion, we are able to grow a massive reserve of healthy cells that may be made to produce enough insulin to restore the function of the destroyed cells."

In contrast to previous research, which failed to multiply mouse beta cells in culture, Prof. Efrat's work has increased the number of human beta cells successfully. "In theory, cells from one donor can be multiplied thousands of times," says Prof. Efrat, explaining that the next hurdle will be to "convince" these beta cells to produce insulin in the human body. Another major hurdle he faces is to get a body's immune system to accept these new cells when transplanted. Human clinical trials, Prof. Efrat cautions, may not begin for another five years or more.

The research, published in the acclaimed journal Diabetes and featured in a report by the Juvenile Diabetes Research Foundation, was performed in collaboration with the graduate students Holger Russ and Yael Bar.

Stanford's 'autonomous' helicopters teach themselves to fly

BY Dan Stober Video

Stanford computer scientists have developed an artificial intelligence system that enables robotic helicopters to teach themselves to fly difficult stunts by watching other helicopters perform the same maneuvers.

The result is an autonomous helicopter than can perform a complete airshow of complex tricks on its own.

The stunts are "by far the most difficult aerobatic maneuvers flown by any computer controlled helicopter," said Andrew Ng, the professor directing the research of graduate students Pieter Abbeel, Adam Coates, Timothy Hunter and Morgan Quigley.

The dazzling airshow is an important demonstration of "apprenticeship learning," in which robots learn by observing an expert, rather than by having software engineers peck away at their keyboards in an attempt to write instructions from scratch.

Stanford's artificial intelligence system learned how to fly by "watching" the four-foot-long helicopters flown by expert radio control pilot Garett Oku. "Garett can pick up any helicopter, even ones he's never seen, and go fly amazing aerobatics. So the question for us is always, why can't computers do things like this?" Coates said.

Computers can, it turns out. On a recent morning in an empty field at the edge of campus, Abbeel and Coates sent up one of their helicopters to demonstrate autonomous flight. The aircraft, brightly painted Stanford red, is an off-the-shelf radio control helicopter, with instrumentation added by the researchers.

For five minutes, the chopper, on its own, ran through a dizzying series of stunts beyond the capabilities of a full-scale piloted helicopter and other autonomous remote control helicopters. The artificial-intelligence helicopter performed a smorgasbord of difficult maneuvers: traveling flips, rolls, loops with pirouettes, stall-turns with pirouettes, a knife-edge, an Immelmann, a slapper, an inverted tail slide and a hurricane, described as a "fast backward funnel."

The pièce de résistance may have been the "tic toc," in which the helicopter, while pointed straight up, hovers with a side-to-side motion as if it were the pendulum of an upside down clock.

"I think the range of maneuvers they can do is by far the largest" in the autonomous helicopter field, said Eric Feron, a Georgia Tech aeronautics and astronautics professor who worked on autonomous helicopters while at MIT. "But what's more impressive is the technology that underlies this work. In a way, the machine teaches itself how to do this by watching an expert pilot fly. This is amazing."

Writing software for robotic helicopters is a daunting task, in part because the craft itself, unlike an airplane, is inherently unstable. "The helicopter doesn't want to fly. It always wants to just tip over and crash," said Oku, the pilot.

To scientists, a helicopter in flight is an "unstable system" that comes unglued without constant input. Abbeel compares flying a helicopter to balancing a long pole in the palm of your hand: "If you don't provide feedback, it will crash."

Early on in their research, Abbeel and Coates attempted to write computer code that would specify the commands for the desired trajectory of a helicopter flying a specific maneuver. While this hand-coded approach succeeded with novice-level flips and rolls, it flopped with the complex tic-toc."

It might seem that an autonomous helicopter could fly stunts by simply replaying the exact finger movements of an expert pilot using the joy sticks on the helicopter's remote controller. That approach, however, is doomed to failure because of uncontrollable variables such as gusting winds.

When the Stanford researchers decided their autonomous helicopter should be capable of flying airshow stunts, they realized that even defining their goal was difficult. What's the formal specification for "flying well?" The answer, it turned out, was that "flying well" is whatever an expert radio control pilot does at an airshow.

So the researchers had Oku and other pilots fly entire airshow routines while every movement of the helicopter was recorded. As Oku repeated a maneuver several times, the trajectory of the helicopter inevitably varied slightly with each flight. But the learning algorithms created by Ng's team were able to discern the ideal trajectory the pilot was seeking. Thus the autonomous helicopter learned to fly the routine better—and more consistently—than Oku himself.

During a flight, some of the necessary instrumentation is mounted on the helicopter, some on the ground. Together, they continuously monitor the position, direction, orientation, velocity, acceleration and spin of the helicopter in several dimensions. A ground-based computer crunches the data, makes quick calculations and beams new flight directions to the helicopter via radio 20 times per second.

The helicopter carries accelerometers, gyroscopes and magnetometers, the latter of which use the Earth's magnetic field to figure out which way the helicopter is pointed. The exact location of the craft is tracked either by a GPS receiver on the helicopter or by cameras on the ground. (With a larger helicopter, the entire navigation package could be airborne.)

There is interest in using autonomous helicopters to search for land mines in war-torn areas or to map out the hot spots of California wildfires in real time, allowing firefighters to quickly move toward or away from them. Firefighters now must often act on information that is several hours old, Abbeel said.

"In order for us to trust helicopters in these sort of mission-critical applications, it's important that we have very robust, very reliable helicopter controllers that can fly maybe as well as the best human pilots in the world can," Ng said. Stanford's autonomous helicopters have taken a large step in that direction, he said.

Women pick men who look like dad

Zoe Ball

Zoe Ball's choice appears to support the theory

Women tend to choose husbands who look like their fathers, a study shows.

And it works both ways - the women in the Proceedings B study also resembled their partner's mother.

The latest work from the University of Pécs in Hungary provides yet more evidence for the phenomenon, known as sexual imprinting.

Others have shown women use dads as a template for picking a mate even if they are adopted, suggesting imprinting is led by experience not simply genes.

This notion is backed by other work showing the imprinting link is lost on women who did not have good relationships with their fathers.

The Hungarian team measured the facial proportions of the members of 52 families.

They found significant correlations between the young men and their fathers-in-law, especially on facial proportions belonging to the central area of face - nose and eyes.

Women also showed resemblance to their mothers-in-law in the facial characteristics of their lower face - lips and jaw.

Lead researcher Tamas Bereczkei said: "Our results support the sexual imprinting hypothesis which states that children shape a mental template of their opposite-sex parents and search for a partner who resembles that perceptual schema."

Familiarity alone does not appear to account for choosing a partner because the participants did not adopt templates for their same-sex parents, they said. They say males and females choose different facial areas of parents to be models in accordance with their general sexual preferences for facial traits.

Experts say there may be an advantage to selecting a mate somewhat similar to themselves genetically. Dr Lynda Boothroyd from the University of Durham, a psychologist who has carried out similar research, said: "There is an argument that a certain degree of similarity makes people more fertile and genetically compatible." But there is a balance between the benefits of marrying someone genetically close and the risks of inbreeding.

"We have a lot of mechanisms - such as pheromones and smell - to stop us choosing someone too similar to us, like an immediate family member," said Dr Boothroyd.

US army has laser guns in its sights

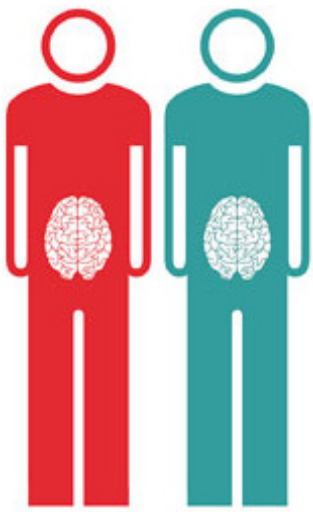
LASER weapons mounted on trucks could be ready to roll into battle within five years. This week Boeing won a $36 million contract from the US Army Space and Missile Defense Command to build the optics needed to track and focus lethal laser energy onto rockets, artillery shells and mortar rounds. The High Energy Laser Technology Demonstrator will use a new solid-state laser powered by electricity from a truck-mounted diesel generator, rather than bulky and dangerous chemicals.

Later this year, military engineers will stage a shoot-out between two rival designs for the 100-kilowatt solid-state laser. The winning laser will have to be ruggedised to survive field conditions and made small enough to fit inside the truck. The laser is scheduled to start shooting at real targets in 2013.

Personal Health

Let the Mind Help Tame an Irritable Bowel

By JANE E. BRODY



Jez Burrows

If you've ever had butterflies in your stomach or an attack of nerves that sent you racing for the bathroom, you already know that the intestinal tract has a mind of its own. The millions who suffer from irritable bowel syndrome, or I.B.S., perhaps know it best.

I.B.S., with its symptoms of bloating, abdominal pain, flatulence, diarrhea or constipation or an alternating cycle of the two, can seriously impair the ability to work and enjoy leisure activities. Up to 15 percent of the population is affected, though only half seek medical help.

The gut and brain are intimately connected, with more nerve cells in the intestines than in the central nervous system. The gut has been called the body's second brain, containing 95 percent of the body's neurotransmitter serotonin and direct nerve connections to the brain.

So it is no surprise that this common disorder of intestinal function has a strong mind-body connection. This does not mean I.B.S. is a psychosomatic condition caused by emotions, but rather that emotional upsets can aggravate symptoms in someone with a hyper-reactive bowel.

It also means that learning to minimize stress and emotional disturbances can reduce the symptoms of I.B.S., perhaps more effectively than medications, recent research has indicated. Yet much educational material about this condition underplays the mind-body connection and the vital role that emotional retraining can play in controlling it.

This is perhaps an overreaction to the past when most patients with I.B.S. were told there was nothing physically wrong with them — it was all in their heads. After all, they had no obvious organic cause like a tumor, infection or ulcer.

In the modern era of medicalization, the pendulum swung the other way. Gastroenterologists now recognize that I.B.S. is a real physiological, or "functional," disorder, though no specific cause has been discovered.

Recent studies have implicated serotonin as one factor, since patients with I.B.S. have reduced receptors for this chemical. And studies have shown that low levels of selective serotonin reuptake inhibitors can sometimes relieve its symptoms.

In many patients, symptoms can be set off by large meals or certain foods, among them wheat, rye, barley, chocolate, milk products, alcohol, coffee, tea and colas. By keeping a food diary and recording symptom flare-ups, patients can identify their sensitivities and avoid the culprit foods.

Reuniting Mind and Body

A small but growing number of specialists are seeking to reunite mind and body by treating patients with a combination of medications, dietary precautions and emotional re-education. Their early studies indicate that this mind-body approach is more effective than either alone.

Dr. Charles D. Gerson, a gastroenterologist affiliated with Mount Sinai Medical Center, works with his wife, Mary-Joan Gerson, a psychotherapist, and their daughter, Jessica, a hypnotherapist, at the Mind-Body Digestive Center in New York.

Dr. Gerson said in an interview that for patients who are seriously impaired by I.B.S., medications help but "there is no magic pill that solves the whole problem. Patients need a more holistic approach. Those who accept emotional as well as physical causes of their condition do better."

While it is destructive for patients with I.B.S. to be told it is all in their heads, it is also wrong to ignore the psychosocial factors that play a role, he said.

"I tell patients that if they don't deal with the emotional factors that relate to their problem," Dr. Gerson said, "they are likely to continue to have symptoms."

New Ways of Thinking

Personal relationships can have a major impact. Symptoms are worse if there is conflict in the family, better if relationships are supportive, the Gersons have found. When a person is in a bad marriage, divorce can become a cure.

The brain has the ability to inhibit sensations from the gut. But, as Dr. Gerson put it, "I.B.S. patients tend to be hypervigilant — too aware of what is going on in their gut." Through techniques like hypnotherapy and cognitive-behavioral therapy, it is possible to change how the brain perceives what is happening in the body.

In hypnotherapy, patients learn to visualize their colon as functioning more normally. In cognitive-behavioral therapy or short-term psychotherapy, patients can learn to change symptom-provoking beliefs, like thinking that their colon will always be abnormal or that a given circumstance will provoke symptoms.

In a British study of 204 patients in which more than two-thirds of them were initially helped by hypnotherapy, 81 percent of those maintained the improvement up to six years after the treatment. Learning to practice stress-reduction and relaxation techniques can be as helpful as learning which foods to avoid.

Questions, Not Tests

The medical profession tends to emphasize the physical aspects of the condition rather than patient insight, putting patients through a series of tests that focus on the colon, like colonoscopies.

But an international panel of experts concluded that in the vast majority of cases — the exceptions are patients who warrant a full physical work-up — questioning patients about their condition is enough to arrive at an accurate diagnosis.

The panel's criteria, published in The Journal of Family Practice in February, include recurrent abdominal pain or discomfort for at least six months and symptoms for at least three days a month in the past three months that may improve with defecation or are associated with a change in the frequency of bowel movements or in the form or appearance of stool.

Tests are indicated if a patient's symptoms began after age 50, if there is a family history of inflammatory bowel disease or cancer, or if the patient has blood in the stool, fever, jaundice, a weight loss of more than 10 percent, anemia, symptoms that occur during the night, extreme abdominal tenderness, enlargement of an abdominal organ or profuse diarrhea.

In the journal article, Dr. Neil T. Moynihan and his co-authors emphasized that in the absence of the above "red flags," "extensive testing, including the routine use of blood tests, stool studies, and imaging is not required."

They described the role of various drug options, among them low doses of antidepressants, antibiotics for patients with an overgrowth of intestinal bacteria, the over-the-counter drug Imodium for patients with diarrhea, water-absorbing laxatives for patients with constipation, and probiotics, a nonprescription combination of healthful bacteria.

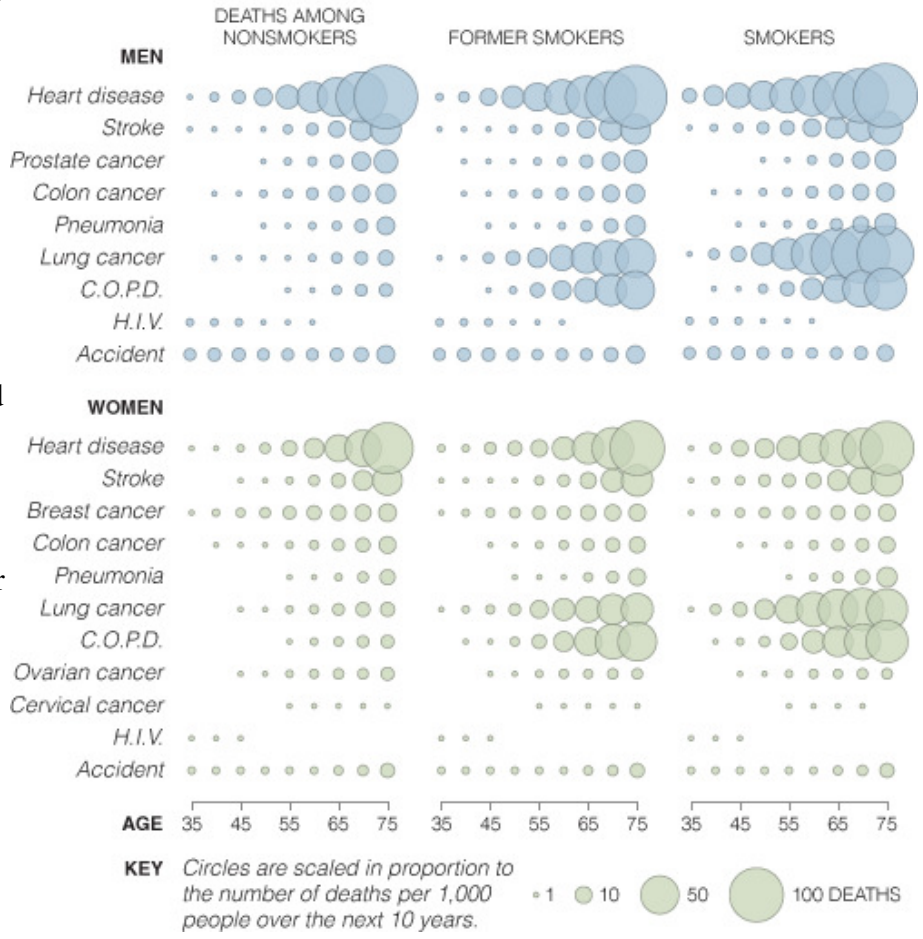
But they also noted that hypnotherapy helped "even those whose conditions were refractory to other forms of therapy." They pointed out that while there may be no cure for I.B.S., symptom relief is possible for most, if not all, patients.

Vital Statistics

The Odds It Will Kill You? See New Charts

By NICHOLAS BAKALAR

A 55-year-old man who smokes is as likely to die in the next 10 years as a 65-year-old who has never smoked. Less than 1 woman in 1,000 younger than 50 will die in the next decade from cervical cancer. A 35-year-old nonsmoking man is five times as likely to die in an accident before 45 as he is to die of heart disease, and a 35-year-old woman is twice as likely to die accidentally by 45 as she is to die from breast cancer.



New risk charts in a paper published in The Journal of the National Cancer Institute provide a broader perspective than most of the risk calculators on the Internet, because they cover the risks for 10 different causes of death, and for all causes combined, while differentiating by age and between smokers, nonsmokers and former smokers.

At first glance, it may appear that smokers and nonsmokers die of heart disease at the same rate, but a 35-year-old male smoker is seven times as likely to die of heart disease as a nonsmoker the same age. The numbers begin to converge as some smokers survive the more common smokers' diseases, and by age 75, their rate of death from heart disease is almost the same as nonsmokers'.

Dr. Lisa M. Schwartz, a co-author of the paper and an associate professor of medicine at Dartmouth, said people were often presented with statistics intended to frighten them about a particular disease. But a disease may present a large risk to some and very little to others. "These charts allow you to get stats that are about people who are more like you," she said.

Another advantage of the new charts, Dr. Schwartz said, is the 10-year time frame. "Often numbers are presented as lifetime statistics, which make the risk look too large, or as one-year statistics, which make the risk look too small. The charts provide the information you need to understand a risk, and whether to consider taking some action to reduce it."

Too much calcium in blood may increase risk of fatal prostate cancer

WINSTON-SALEM, N.C. – Men who have too much calcium in their bloodstreams may have an increased risk of fatal prostate cancer, according to a new analysis from Wake Forest University School of Medicine and the University of Wisconsin.

"We show that men in upper range of the normal distribution of serum calcium subsequently have an almost three-fold increased risk for fatal prostate cancer," said Gary G. Schwartz, Ph.D., associate professor of cancer biology and of epidemiology and prevention at Wake Forest, a part of Wake Forest University Baptist Medical Center. Such excess calcium can be lowered, he said.

The research appears in the September issue of Cancer Epidemiology, Biomarkers & Prevention, a journal of the American Association for Cancer Research.

Co-author Halcyon G. Skinner of the School of Medicine and Public Health at the University of Wisconsin stressed there is "little relationship between calcium in the diet and calcium in serum. So men needn't be concerned about reducing their ordinary dietary intakes of calcium."

Schwartz and Skinner analyzed the results of 2,814 men who participated in the National Health and Nutrition Examination Survey (NHANES-1). Measurement of the amount of calcium in the bloodstreams was determined an average of 9.9 years before prostate cancer was diagnosed.

The researchers focused on the 85 cases of prostate cancer and 25 prostate cancer deaths among the 2,814 men and divided the group into thirds, based on the serum calcium level. "Comparing men in the top third with men in the bottom third, we found a significantly increased hazard for fatal prostate cancer.

"To our knowledge, this is the first study to examine prostate cancer risk in relation to serum calcium," Schwartz and Skinner wrote. "These results support the hypothesis that high serum calcium, or a factor strongly associated with it, such as high serum parathyroid hormone, increases the risk for fatal prostate cancer."

In an interview, Schwartz said that if the relationship between serum calcium and prostate cancer "turns out to be causal, it suggests a means for potentially reducing the risk of fatal disease through medicines that reduce serum levels of calcium and/or parathyroid hormone."

He added, "Both calcium and parathyroid hormone are known to promote the growth of prostate cancer cells in the laboratory."

Skinner said, "The take-home message is that this may offer a simple means to detect men who are at increased risk of fatal prostate cancer."

Schwartz said serum calcium ordinarily is tightly regulated by parathyroid hormone, so there is little variation in an individual's serum calcium over time. "Calcium is basically the current that runs many of the functions of your body. Calcium is important for not only neuromuscular conductions, electrical conductions, but for the conduction of muscles in your heart."

Too little calcium in blood, less than 7 milligrams per deciliter, can cause uncontrolled muscular convulsions or contractions. Too much calcium, above 14 milligrams per deciliter, can cause a coma. "Your body obviously cannot afford to oscillate between convulsions and coma, so the range of serum calcium is tightly controlled."

The upper third of NHANES-1 participants had high normal calcium levels, ranging from 9.9 to 10.5 milligrams per deciliter.

"If confirmed, our study shows that calcium at the high end of normal is associated with a three-fold increased risk of fatal prostate cancer later in life," Schwartz said. But unlike well-known risk factors for prostate cancer such as age, race or family history, which cannot be altered, "a man's serum calcium levels can be."

Several drugs already used in patients with high levels of parathyroid hormone, such as patients with chronic kidney disease, could be used to reduce calcium and/or parathyroid hormone in the blood, he said.

Measurements of serum calcium are routinely collected and are part of most medical visits. Thus, a physician can readily determine whether a man's serum calcium level is at the high end of normal.

"What is particularly exciting – if this study is replicated, and attempts to do so are already in progress – is that it suggests that a man may reduce his risk of fatal prostate cancer by lowering serum levels of calcium and/or parathyroid hormone," he said.

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Substance found in fruits and vegetables reduces likelihood of the flu

Quercetin fights off flu in mouse study

BETHESDA, Md. (Sept. 3, 2008) — Mice given quercetin, a naturally occurring substance found in fruits and vegetables, were less likely to contract the flu, according to a study published by The American Physiological Society. The study also found that stressful exercise increased the susceptibility of mice to the flu, but quercetin canceled out that negative effect.

Quercetin, a close chemical relative of resveratrol, is present in a variety of fruits and vegetables, including red onions, grapes, blueberries, tea, broccoli and red wine. It has been shown to have anti-viral properties in cell culture experiments and some animal studies, but none of these studies has looked specifically at the flu.

The study, "Quercetin reduces susceptibility to influenza infection following stressful exercise," was carried out by J. Mark Davis, E.A. Murphy, J.L. McClellan, and M.D. Carmichael, of the University of South Carolina and J.D. Gangemi of Clemson University. The study appears in the current issue of the American Journal of Physiology-Regulatory, Integrative and Comparative Physiology.

The study was conducted using mice, but if quercetin provides a similar benefit for humans, it could help endurance athletes, soldiers and others undergoing difficult training regimens, as well as people under psychological stress, according to Davis.

Study builds on previous research

"Quercetin was used because of its documented widespread health benefits, which include antiviral activity, abundance in the diet and reported lack of side effects when used as a dietary supplement or food additive," Davis said.

Earlier mouse studies have found that stressful exercise can increase susceptibility to upper respiratory infections, although it is not yet clear if the same is true for humans. There was also preliminary information that mice may be more susceptible to the flu when they exercise to fatigue. The researchers in the current study hypothesized that exercise would increase the chance of the mice getting the flu but that quercetin would counteract the increased risk.

Davis and his colleagues examined four groups of mice. Two groups performed three consecutive days of running to fatigue on a treadmill to mimic a short period of stressful exercise. One group of runners received quercetin, the other did not.

The remaining two groups did not exercise. One non-exercise group received quercetin while the other did not. All four groups were then exposed to a common flu virus, H1N1.

The researchers found that:

* Stressful exercise increased susceptibility to the flu. The mice that exercised to fatigue for three days were more likely to develop the flu than the mice that did not exercise (91% versus 63%).

* The mice that exercised developed the flu much sooner than those that did not (6.9 days versus 12.4 days).

* Mice that exercised and took quercetin had nearly the same rate of illness as those that did not exercise. In other words, quercetin canceled out the negative effect of stressful exercise.

* The severity of the symptoms among those mice that either did not exercise or those that exercised but took the quercetin was about the same.

* Quercetin had protective effects for the mice that did not exercise.

Although this study was done with mice, a recent human study found that people who took quercetin suffered fewer illnesses following three days of exhaustive exercise compared to those who did not. Unlike the mouse study, the humans were not inoculated with a virus.

"This is the first controlled experimental study to show a benefit of short-term quercetin feedings on susceptibility to respiratory infection following exercise stress," said Davis. "Quercetin feeding was an effective preventive strategy to offset the increase in susceptibility to infection that was associated with stressful exercise."

Editor's Note: To arrange an interview with Dr. Davis, please contact Christine Guilfoy at cguilfoy@the-aps.org or (301) 634-7253. Funding: The Defense Advanced Research Projects Agency (DARPA).

New virtual telescope zooms in on Milky Way's super-massive black hole

Radio dishes in 3 states create virtual telescope 2,800 miles across

CAMBRIDGE, Mass. — An international team, led by astronomers at the MIT Haystack Observatory, has obtained the closest views ever of what is believed to be a super-massive black hole at the center of the Milky Way galaxy.

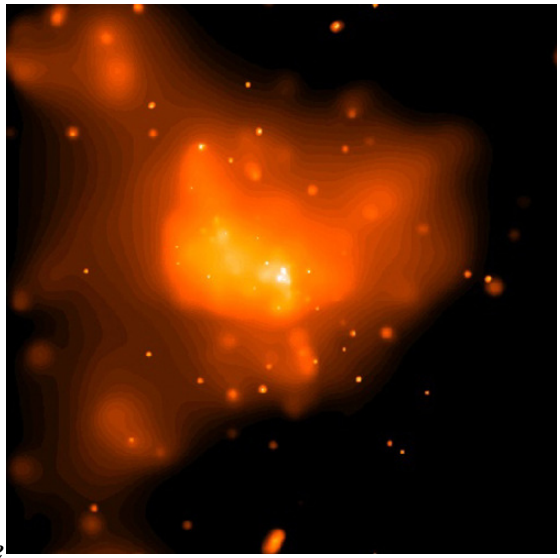
The astronomers linked together radio dishes in Hawaii, Arizona and California to create a virtual telescope more than 2,800 miles across that is capable of seeing details more than 1,000 times finer than the Hubble Space Telescope. The cosmic target of the observations was the source known as Sagittarius A* ("A-star"), long thought to mark the position of a black hole whose mass is 4 million times that of the sun. Though Sagittarius A* was discovered three decades ago, the new observations for the first time have an angular resolution, or ability to observe small details, that is matched to the size of the black hole "event horizon" — the region inside of which nothing, including light, can ever escape.

The concept of black holes, objects so dense that their gravitational pull prevents anything including light itself from ever escaping their grasp, has long been hypothesized, but their existence has not yet been proved

conclusively. Astronomers study black holes by detecting the light emitted by matter that heats up as it is pulled closer to the event horizon. By measuring the size of this glowing region at the Milky Way center, the new observations have revealed the highest density yet for the concentration of matter at the center of our galaxy, which "is important new evidence supporting the existence of black holes," said Sheperd Doeleman of MIT, lead author of the study that will be published in the Sept. 4 issue of the journal Nature.

"This technique gives us an unmatched view of the region near the Milky Way's central black hole," Doeleman said. "The new observations have a resolution equivalent to being able to see, from Earth, a baseball on the surface of the moon."

The key to making these observations is a technique called very long baseline interferometry, or VLBI, which links simultaneous observations from several radio telescopes that can be thousands of miles apart. The signals from these radio dishes are combined to create a "virtual" telescope with the same resolving power as a single telescope as large as the distance between the participating dishes. As a result, VLBI can reveal exquisitely sharp details. To create the continent-sized telescope, the team developed and installed special equipment at four observatories: the Arizona Radio Observatory's Submillimeter Telescope (ARO-SMT) of the University of Arizona, the Combined Array for Research in Millimeter-wave Astronomy (CARMA) in California, and both the James Clerk Maxwell Telescope (JCMT) and the Submillimeter Array (SMA) in Hawaii.



Astronomers have used an array of radio telescopes to zoom in on the centre of the Milky Way, which is thought to harbour a supermassive black hole. The object appears as a bright white spot in the middle of this X-ray image **(Image: NASA/Penn State/G Garmire et al.)**

The new observations were done using very short radio waves of 1.3 millimeters wavelength, which can penetrate the fog of interstellar gas that blurs observations at longer wavelengths. Like a distant light seen through a dense mist, longer-wavelength views of the Galactic Center are dimmed and distorted. "The short wavelength observations combined with the large distances between the radio observatories is what makes this virtual telescope uniquely suited to study the black hole," said Lucy Ziurys, Director of the Arizona Radio Observatory and a co-author of the study.

Though it takes light more than 25,000 years to reach us from the center of the Milky Way, the team measured the size of Sagittarius A* to be only one-third the Earth-sun distance — a trip that light would make in only three minutes. The astronomers concluded that the source of the radiation likely originates in either a disk of matter swirling in toward the black hole, or a high-speed jet of matter being ejected by the black hole. "Future observations that create even larger virtual telescopes will be able to pinpoint exactly what makes Sagittarius A* light up," Doeleman said. "Most galaxies are now thought to have black holes at their centers, but because Sagittarius A* is in our own galaxy, it is our best chance to observe what's happening at an event horizon."

"This pioneering paper demonstrates that such observations are feasible," commented theorist Avi Loeb of Harvard University, who was not a member of the discovery team. "It opens up a new window for probing the structure of space and time near a black hole and testing Einstein's theory of gravity."

This research involved 28 co-authors from several institutions, including the MIT Haystack Observatory, the Harvard-Smithsonian Center for Astrophysics, CARMA, the Arizona Radio Observatory of the University of Arizona, the James Clerk Maxwell Telescope, University of California at Berkeley, the California Institute of Technology, and the Max Planck Institute for Radioastronomy, among others. This work was funded by the National Science Foundation.

Arteries from distinct regions of the body have unique immune functions

Human arteries play distinct roles in the immune system depending on their anatomical location, researchers at Emory University School of Medicine have discovered.

Their findings explain why vascular diseases affect different parts of the arterial network and could help doctors fine-tune the treatment of such diseases as atherosclerosis and vasculitis. Atherosclerosis causes heart attacks and strokes because it occurs preferentially in arteries supplying the heart and the brain.

The results were published online this week by the journal Circulation.

Arteries can play an active role in sensing foreign invasion and bodily injury, because cells embedded in the arterial walls called dendritic cells act like smoke-sensing fire alarms for the immune system, says senior author

Cornelia Weyand, MD. PhD, co-director of the Kathleen B. and Mason I. Lowance Center for Human Immunology at Emory University.

"All of our major arteries have this alarm system," she says. "To our surprise, we found that the arteries of the neck, the arms, the abdomen and the legs are triggered by different infectious organisms. Thus, each artery functions in a specialized way."

Some vascular diseases attack arteries only in the abdomen or in the neck and upper extremities, and this selectivity has puzzled doctors for years, Weyand says.

To probe the differences among arteries, Weyand and her co-workers examined the activity of genes that encode Toll-like receptors in blood vessels from human donors.

Toll-like receptors are a cornerstone of the "innate" immune system, which can be activated by common features of infection-causing invaders. The capture of bacterial or viral fragments through Toll-like receptors alerts the immune system early during an infectious attack. Toll-like receptors can respond to whip-like antennas on bacteria called flagellae, parts of bacterial cell walls, or DNA and RNA that leaks from viruses or bacteria.

Each type of artery had a different set of Toll-like receptor genes turned on, the authors found. In contrast to arteries, veins could not be stimulated through Toll-like receptors.

For example, cells in the iliac arteries, located in the vicinity of the gut, respond avidly to flagellae but cells from the subclavian arteries, which transport blood to the upper body, do not.

A possible explanation is that dendritic cells from iliac arteries are better able to sense flagellae because of the abundant bacterial flora that inhabits the gut, Weyand says.

Weyand hypothesizes that the dendritic cells in arteries are mainly performing a protective, calming function. Arteries are in constant contact with blood borne infectious agents, with potentially dangerous consequences of damaging the vessel wall.

"It's when that protective function breaks down that we see inflammation and various vascular diseases," she says. She says her team is now investigating how the dendritic cells in arteries move and change as they receive various signals.

The first author of the paper is research specialist Olga Pryshchep, with contributions from postdoctoral fellow Wei Ma-Krupa, PhD, Joerg Goronzy, MD, PhD, co-director of the Lowance Center, and Brian Younge, MD, of the Mayo Clinic.
The research team used samples from 37 deceased donors with an average age of 64. Only arterial samples without atherosclerotic lesions were used.
The research was funded by the National Institutes of Health, the Dana Foundation and the McIntyre Family Discovery Fund.
Reference: Vessel-specific Toll-like receptor profiles in human medium and large arteries Circulation, Sep 2008; doi:10.1161/CIRCULATIONAHA.108.789172

New research challenges long-held assumptions of flightless bird evolution

GAINESVILLE, Fla. --- Large flightless birds of the southern continents – African ostriches, Australian emus and cassowaries, South American rheas and the New Zealand kiwi – do not share a common flightless ancestor as once believed.

Greater Tinamou

Instead, each species individually lost its flight after diverging from ancestors that did have the ability to fly, according to new research conducted in part by University of Florida zoology professor Edward Braun.

The new research, which appears this week in the online edition of the Proceedings of the National Academy of Sciences, has several important implications.

First, it means some ratites, like the emus, are much more closely related to their airborne cousins, the tinamous, than they are to other ratites, Braun said.

Second, it means the ratites are products of parallel evolution – different species in significantly different environments following the exact same evolutionary course.

Braun and his fellow researchers began closely studying this group of flightless birds, known collectively as ratites, after a discovery made while working on a larger-scale effort to better understand the evolution of birds and their genomes by analyzing corresponding genetic material sampled from the tissue of many different bird species and determining how they relate to one another.

As they analyzed the genetic material, they noticed that the ratites did not form a natural group based on their genetic makeup. Rather, they belonged to multiple related but distinct groups that contained another group of birds, the tinamous, with the ability to fly.

Previously, the ratites were used as a textbook example of vicariance, a term that describes the geographical division of a single species, resulting in two or more very similar sub-groups that can then undergo further evolutionary change and eventually become very distinct from one another.

Scientists assumed that a single flightless common ancestor of the ratites lived on the supercontinent of Gondwana, which slowly broke up into Africa, South America, Australia and New Zealand; once divided, the ancestor species evolved slightly in each new location to produce the differences among the present-day ratites, Braun said.

But in light of this new information, he said it's more likely that the ratites' ancestors distributed themselves among the southern continents after the breakup of Gondwana, which began about 167 million years ago, in a much more obvious way.

They flew.

Although these new revelations teach evolutionary scientists a great deal, they also pose a great many new questions. For example, why did these birds evolve into such similar organisms in such different environments?

"To know for sure, we'll have to go into the lab and really study the genetics underlying the ratites' developmental pathway," Braun said. "But nobody would have asked that question without the type of data we've collected, which raises the question in the first place."

The scientists' effort to analyze such a tremendous amount of genetic material collected from birds across the globe is in turn just a single part of a program called Assembling the Tree of Life, funded and organized by the National Science Foundation, which aims to assemble a body of similar research for every group of organisms on the planet, including animals, plants, fungi, algae and bacteria.

The conclusions about ratite origin are just a small part of a massive research project aimed to better understand the evolutionary relationships among bird species, which involved five institutions, 18 researchers, $2 million of funding and four years of work. In addition to the University of Florida, researchers came from the Smithsonian Institution, the Field Museum of Natural History, Wayne State University and Louisiana State University.

Acupuncture clinical trial a boon for local participants experiencing fertility challenges

Charlottesville, Va., Sept. 3, 2008 -- Getting pregnant with her first child was difficult, but when Rebecca Killmeyer of Charlottesville, Va. experienced a miscarriage during her second pregnancy, she wasn't sure if she would ever have another baby. When she decided to enter a study testing the impact of acupuncture on women with polycystic ovary syndrome (PCOS) at the University of Virginia Health System, she came out with a miracle.

"To our great surprise we were blessed with a third pregnancy during the PCOS study," said Killmeyer. "I'm absolutely certain the acupuncture treatments helped me ovulate regularly, which allowed me to become pregnant."

Lisa Pastore, assistant professor of obstetrics and gynecology at UVA Health System and principle researcher of the study, was hoping for results like this. Her goal has been to help women with PCOS have regular menstrual cycles. PCOS causes a hormonal imbalance, interfering with ovulation and ultimately, fertility. With several women in the study reporting pregnancies, Pastore believes that acupuncture could be an important alternative, non-drug therapy for women with this disorder.

"Over the last year we have seen women who never had a regular menstrual cycle start having regular periods. We can also boast several pregnancies since the study began," said Pastore. "Now we would like to recruit more people to the study in order to complete the study. It is important for research to have enough participants to ensure that the results are scientifically credible and not due to chance."

Scared and skeptical was how Killmeyer described her initial feelings towards the experimental treatment, but soon her worries gave way to relaxation.

"When I saw those tiny little needles coming at me I thought to myself, 'I didn't sign up for this!' but I tried it and after a few minutes I was asleep on the table," Killmeyer said. "The sessions were completely refreshing after awhile."

Killmeyer learned of her PCOS in 2005. Over the past five years she did not have regular, monthly periods. One month after she started acupuncture treatments she got a period and for the next three months, they continued.

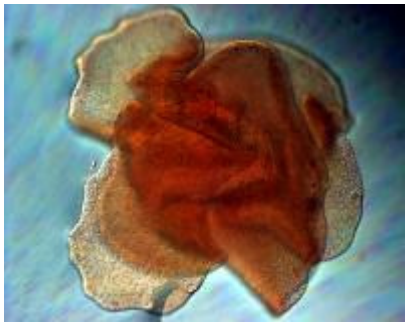
"I had finished all my acupuncture treatments and was in the end stages of the study when I became pregnant," Killmeyer said. "We had already scheduled our follow-up appt with our fertility doctors when we found out we were pregnant."

Five percent of reproductive age women are affected by PCOS. Symptoms of PCOS can include small cysts on their ovaries, infrequent or irregular vaginal bleeding, male-pattern hair growth, and acne. Insulin resistance and pre-diabetes also can develop.

While there are many traditional drugs and therapies that manage this syndrome, this research is assessing whether acupuncture can be successful in regulating hormones and curing the symptoms of PCOS.

For more information or to conduct interviews, please call the UVa Health System Public Relations Office at (434) 243-2734.

Trichoplax genome sequenced -- 'Rosetta stone' for understanding evolution



New Haven, Conn. —Yale molecular and evolutionary biologists in collaboration with Department of Energy scientists produced the full genome sequence of Trichoplax, one of nature's most primitive multicellular organisms, providing a new insight into the evolution of all higher animals.

The findings reported in the online edition of the journal Nature show that while Trichoplax has one of the smallest nuclear genomes found in a multi-cellular creature, it contains signature sequences for gene regulation found in more complex animals and humans. Further, it defines Trichoplax as a branching point of animal evolution.

"Trichoplax placozoans are animals that have only four body cell types and no structured organs. They represent descendents of the oldest multi-celled animal, perhaps older even than sponges," said author Stephen Dellaporta, professor of molecular, cellular and developmental biology at Yale.

This study shows that compared with the nuclear genome of humans that contains 3 billion base pairs, Trichoplax has only 98 million. Earlier sequencing work showed that the mitochondrial genome of Trichoplax is over twice the size of those found in most animals with genes, introns and spacer sequences like the most primitive organisms.

However, size is not all that matters. DNA sequences that organisms share in common represents what was in their genomes at the time of their divergence. Unlike other model systems for studying evolution, including fruit flies and worms, even the arrangement of genes is conserved between the Trichoplax and human genomes.

"Trichoplax shares over 80 percent of its genes with humans," said Dellaporta. "We are exited to find that Trichoplax contains shared pathways and defined regulatory sequences that link these most primitive ancestors to higher animal species. The Trichoplax genome will serve as a type of "Rosetta Stone" for understanding the origins of animal-specific pathways."

Trichoplax is from an ancient lineage and brings significant insights to understanding how animal life evolved from the common ancestor 600 million years ago. The consortium believes that the Trichoplax genome establishes a new standard basal group for the comparative analysis of animal genomes, genes, and biological processes.

***Trichoplax adhaerens Grell-BS-1999 v1.*0Photo: light microscopy by Ana Signorovitch**

The sole representative species of the phylum Placozoa, Trichoplax adhaerens represents the simplest known animal, with the smallest known animal genome. The DNA sequence of the 50-Mbp Trichoplax genome will have far-reaching scientific importance, providing significant genomic insights into our understanding of how animal life evolved. This genome will have enormous utility to the scientific community, becoming the standard basal group for the comparative analysis of animal genomes, genes, and biological processes. Researchers who study the lower metazoans will clearly benefit, as will the bioinformatics and comparative genomics community. Prospects for future funding of functional annotation, microarrays, and evolutionary genomic studies are excellent, and available biological resources include established laboratory cultures, high-quality genomic DNA, arrayed fosmid and full-length cDNA libraries. A Trichoplax genome will make it possible to determine the gene and proteome content of the simplest known animals and provide the first genomics platform in a simple multicellular system.

The genome portal for Trichoplax is http://genome.jgi-psf.org/Triad1/Triad1.home.html and further information about the Trichoplax project at Yale can be found at http://www.peabody.yale.edu/collections/iz/iz_genome.html

Study co-authors include Mansi Srivastava, Emina Begovic, Jarrod Chapman, Uffe Hellsten, Takeshi Kawashima, Alan Kuo, Therese Mitros, Asaf Salamov, Meredith Carpenter, Ana Signorovitch, Maria Moreno, Kai Kamm, Jane Grimwood, Jeremy Schmutz, Harris Shapiro, Igor Grigoriev, Leo Buss, Bernd Schierwater, Stephen Dellaporta and Daniel Rokhsar. Funding for this work was from the Gordon and Betty Moore Foundation, the National Science Foundation, the German Science Foundation and the Human Frontiers Science Program.

Citation: Nature (early online August 21, 2008)

New clues found to history of ancient tomb

The Yomiuri Shimbun

NARA--Archaeologists have discovered new evidence regarding the physical layout of a late 3rd century tomb mound in Sakurai, Nara Prefecture, that may cast new light on its long history, which includes possible connections to a mysterious ancient kingdom.

Recent excavation work indicates that the moat of the Hashihaka tomb mound, which some archaeologists believe is associated with the legendary Yamataikoku kingdom, was more than twice as far from the mound than previously thought, according to the local municipal board of education.

The new finding about the site's original topography is expected to greatly benefit understanding of its overall history, and possibly that of similar sites.

The 280-meter-long, keyhole-shaped mound is the oldest of its kind in Japan, and is believed by some to be the burial site of Himiko, queen of Yamataikoku.

The ancient Yamataikoku kingdom is described in Chinese manuscripts, but its location remains unknown.

A ditch discovered in the excavation work is believed to be part of the mound's outer moat.

According to the board, the ditch is located about 60 meters from the mound and runs parallel to its western side. The ditch is reportedly eight meters long and up to 1.3 meters deep.

If the researchers' theory that the ditch is part of the outer moat is correct, it would mean the moat surrounded the mound at distances of 60 to 70 meters, more than twice as far as previously thought.

Archaeologists previously believed the moat came only as close as 30 meters to the western side of the keyhole-shaped mound. The new finding does not change the belief that the mound had two moats, or on the assumed location of the inner moat. Fragments of earthenware dating back to the late 3rd century were also unearthed in the recent excavation work.

Kaoru Terasawa, manager of the general affairs and planning department at the Archaeological Institute of Kashihara, Nara Prefecture, said: "The Hashihaka tomb mound is the oldest large keyhole-shaped tomb mound in Japan. Understanding the entire picture of its history will help us examine its relationships with other ancient tomb mounds across the nation."

The tomb mound is located in the remains of Makimuku, a city thought to have existed early in the Yamato dynasty. It is said the dynasty built the Hashihaka tomb mound after solidifying its power base in the region, using as a model a similar but smaller tomb mound built in the early- to mid-3rd century.

Earth's windiest region confirmed by crewed flight

* 11:21 04 September 2008

* NewScientist.com news service

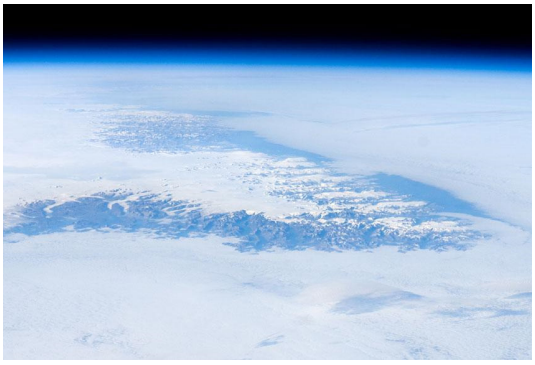
*** Catherine Brahic**

For the first time, research planes have flown in the windiest region on Earth. The location – the appropriately named Cape Farewell in Greenland – generated the winds likely to have carried Viking explorers from Iceland and Greenland to North America, making them the first Europeans to discover the continent.

Ian Renfrew of the University of East Anglia in the UK, led an expedition to Cape Farewell, at the southernmost tip of Greenland, in February and March 2007. "Strong winds were ripping the tops of the waves off and hurling them downwind," he says. Flying in such conditions was "stomach-churning," he adds.

According to satellite data, winds speeds off Cape Farewell reach at least 20 metres per second (44.7 miles per hour or gale force) 16% of the year and 29% of the winter, making it the windiest spot on the planet (Bulletin of the American Meteorological Society DOI: 10.1175/BAMS-88-12-1965, pdf format).

Renfrew's exhibition aimed to check computer simulations of the wind, and its possible role in world climate systems.



Cape Farewell, seen here from the International Space Station, is the southernmost tip of Greenland **(Image: NASA)**

Global importance

Climatologists have suggested that the winds, known as the Greenland tip jet, could be a key force in driving the world's climate and the global ocean circulation by pushing cold, dense water to the ocean floor and triggering the thermohaline circulation.

This massive "conveyor belt" carries seawater around the world's oceans. The North Atlantic is a critical point, where warm surface water coming from the tropics on the Gulf Stream is cooled and becomes denser. In doing so, it sinks to the ocean bed and pushes the deep segment of the conveyor belt forward.

Robert Pickart of the Woods Hole Oceanographic Institute in Massachusetts, US, and colleagues have suggested that the exceptional winds at Cape Farewell trigger this overturning (Nature vol 424, p 152).

"They cool and evaporate the surface water making it more salty, and therefore more dense, just south of Greenland," explains Renfrew.

If this is true, then the Cape Farewell winds help drive the Gulf Stream, which keeps Europe warm, despite their high latitude.

Viking sagas

Data from the 2007 expedition should help researchers learn more about this process. Planes were flown directly into the Greenland jet, collecting real-time information on its structure, the wind speeds at different altitudes, and the interactions between the jet and sea surface.

"We found quite extraordinary wind speeds of about 50 metres per second – which are hurricane strength winds – blowing close to the surface, just 600 metres above the waves," he told New Scientist. The observation confirmed computer model predictions.

Early Icelandic sagas describe the accidental discovery of what is now Newfoundland by two Vikings, Leif Erikson, son of Erik the Red, and Bjarni Herjólfsson. In all of these accounts, violent winds blew the discoverers off course, whilst they were trying to reach Greenland.

As a result, they overshot and, according to the Vinland Sagas, "after being tossed about at sea for a long time [Erikson] chanced upon land where he had not expected any to be found. Fields of self-sown wheat and vines were growing there; also, there were trees known as maple."

In another account, Herjólfsson is "beset by winds from the north and fog" and ends up finding land covered with forests to the west of Greenland.

Journal reference: Bulletin of the American Meteorological Society (DOI: 10.1175/2008BAMS2508.1)

Infectious, test tube-produced prions can jump the 'species barrier'

Researchers have shown that they can create entirely new strains of infectious proteins known as prions in the laboratory by simply mixing infectious prions from one species with the normal prion proteins of another species. The findings are reported in the September 5th issue of the journal Cell, a Cell Press publication.

Prion diseases, also known as transmissible spongiform encephalopathies (TSEs), are infectious neurodegenerative diseases affecting the brain of several species of mammals including humans. Creutzfeldt-Jakob disease (CJD) is the most common prion disease in humans, along with scrapie in sheep, bovine spongiform encephalopathy (BSE, aka mad cow) in cattle, and chronic wasting disease (CWD) in deer and other cervids.

Unlike conventional infectious microorganisms, the infectious agent in the case of prion diseases consists exclusively of a misfolded form of the prion protein, earlier studies showed.

The researchers now find that prion strains produced by combining normal hamster proteins with infectious mouse proteins can infect hamsters and vice versa. Although they are both rodents, prions from one of the two species normally don't readily infect the other, a common phenomenon amongst prions known as a species barrier, the researchers explained.

The novel prions they produced not only look different, but they also produce symptoms in the animals that differ from any known strain found in nature, they report.

"We are forcing the system by putting everything together, but this suggests that the variety of possible prions is really very large," said Claudio Soto of the University of Texas Medical Branch. "We shouldn't be surprised if new barriers are crossed and new prions arise. There is the potential for a large variety of new infectious prions—some of which may have dramatic effects."

"The infectious agent is nothing like what we're used to," Soto said. "It's just a protein with a different shape from the normal protein we all have." Those misfolded and misshapen proteins can spread by causing normal protein to change their shape. Those aberrant forms band together, forming fibrils.

Soto's team recently reported the generation of infectious prions by amplification of prion misfolding in the test tube. In those experiments, they used a technology called protein misfolding cyclic amplification (PMCA) that mimics some of the fundamental steps involved in the replication of infectious prions in living animals, but at an accelerated rate. The method involves placing small quantities of infectious prions with large quantities of the normal protein from the same species together, allowing the infectious form to imprint on the normal form and thereby replicate itself.

Now, they show that the same method can generate new strains when infectious prions from one species are mixed with normal prion proteins from another species. The finding provides conclusive evidence that the imprinting of disease-causing prions on normal forms can overcome species barriers, and doesn't require any other infectious agent.

This new insight has profound implications for public health, according to the researchers.

"One of the scariest medical problems of the last decades has been the emergence of a new and fatal human prion disease--variant CJD--originated by cross-species transmission of BSE from cattle," the researchers said. BSE has also spread to other animals, including exotic cats, other primates and domestic cats, after they ate feed derived from diseased cows.

The new method might provide insight into the risk that other prion diseases could spread from one species to another, Soto said. For instance, scientists don't know whether chronic wasting disease, a condition now on the rise amongst deer in some parts of the U.S., can be transmitted to humans or not.

Test tube studies like this one might help answer that question, and-- in the case that the deer prions can make the leap—such studies may inform scientists about what those prions might look like, he said. By studying any new prion strains created in mice with the human prion protein, scientists might also gain insight into the potential symptoms associated with those diseases.

" The data demonstrate that PMCA is a valuable tool for the investigation of the strength of the barrier between diverse species, its molecular determinants, and the expected features of the new infectious material produced," the researchers concluded. "Finally, our findings suggest that the universe of possible prions is not restricted to those currently known but that likely many unique infectious foldings of the prion protein may be produced and that one of the sources for this is cross-species transmission."

The researchers include Joaquin Castilla, University of Texas Medical Branch, Galveston, TX; Dennisse Gonzalez-Romero, University of Texas Medical Branch, Galveston, TX; Paula Saa, University of Texas Medical Branch, Galveston, TX ,Universidad Autonoma de Madrid, Madrid, Spain; Rodrigo Morales, University of Texas Medical Branch, Galveston, TX , University of Chile, Santiago, Chile; Jorge De Castro, University of Texas Medical Branch, Galveston, TX; and Claudio Soto, University of Texas Medical Branch, Galveston, TX .

Gladstone scientists identify genetic link that may neutralize HIV

Apobec3 Gene controls antibody response to retrovirus

Scientists from the Gladstone Institute of Virology and Immunology (GIVI) and the National Institutes of Allergy and Infectious Diseases (NIAID) have identified a gene that may influence the production of antibodies that neutralize HIV. This new information will likely spur a new approach for making an HIV vaccine that elicits neutralizing antibodies. Neutralizing antibodies, once produced in the host, can attack and checkmate an infecting virus. The research was reported in the September 5 issue of Science.

Scientists have been striving in vain to stimulate strong protective antibodies with an HIV vaccine for years because these antibodies hold great promise for controlling HIV infection in humans. HIV is a type of virus called a "retrovirus," which copies its RNA genetic material into DNA and incorporates it into the DNA of its host.

In 1978, researchers at the National Institutes of Health (NIH) studying a similar retrovirus in mice discovered a gene called Rfv3 that influenced the production of neutralizing antibodies that allowed the animals to recover. By 1999, they had narrowed the location of Rfv3 to a relatively small region on mouse chromosome 15, but that region contained more than 60 genes. The laboratory of GIVI Director Warner C. Greene and a team of scientists from NIAID now demonstrate that Rfv3 is Apobec3, an innate immunity gene with antiretroviral activity.

"This newfound link between Apobec3 and the production of neutralizing antibodies came as a complete surprise," said Dr. Greene, senior author on the paper.

While the studies involved a different retrovirus infecting mice, the findings may extend to HIV. HIV uses one of its genes, Vif, to specifically disable human Apobec3 proteins and HIV-infected patients rarely make broadly neutralizing antibodies against this virus. This new study raises the possibility that drugs or vaccines that interfere with Vif might allow humans to naturally make better neutralizing antibody responses against HIV.

"We now have a host factor needed for the production of neutralizing antibodies that HIV targets and destroys," said Gladstone scientist Mario Santiago, PhD. "This offers a fresh perspective on how to strengthen this arm of the immune response against HIV, with direct implications for immunotherapy and vaccine development."

The scientists conducted a series of genetic experiments by mating mice with different Rfv3 and Apobec3 profiles. The researchers demonstrated that Apobec3, like Rfv3, contributes to the early control of retroviral infection in mice, and also influences specific retroviral antibody responses. In addition, they discovered that Rfv3 susceptible mouse strains that fail to make antibody responses have a natural defect in Apobec3. These results provide convincing evidence that Rfv3 and Apobec3 are the same gene.

"We set out to solve a 30-year old mystery in retrovirus biology and in the process made a discovery that might impact future development of HIV vaccines. Science really is full of unexpected twists and turns," said Dr. Greene.

The link between Apobec3 and neutralizing antibody responses becomes even more tantalizing in view of other recent studies of people who somehow resist HIV infection despite years of frequent exposure to the virus. These individuals produce a particular type of antibody recognizing the virus and genetic mapping studies of their resistance points to a chromosomal region where the human Apobec3 genes are clustered.

The research group is now poised to investigate Apobec3 differences in these individuals and is currently screening for compounds that would rescue Apobec3 function during HIV infection.

Reference

Santiago M.L, Montano, M., Benitez,R., Messer, R.J., Yonemoto, W., Chesebro, B., Hasenkrug, K.J., and Greene, WC. Apobec3 encodes Rfv3, a gene influencing neutralizing antibody control of retrovirus infection. Science: 1161121.

Yale Researchers Find "Junk DNA" May Have Triggered Key Evolutionary Changes in Human Thumb and Foot

Out of the 3 billion genetic letters that spell out the human genome, Yale scientists have found a handful that may have contributed to the evolutionary changes in human limbs that enabled us to manipulate tools and walk upright.

Results from a comparative analysis of the human, chimpanzee, rhesus macaque and other genomes reported in the journal Science suggest our evolution may have been driven not only by sequence changes in genes, but by changes in areas of the genome once thought of as "junk DNA."

Those changes activated genes in primordial thumb and big toe in a developing mouse embryo, the researchers found.

"Our study identifies a potential genetic contributor to fundamental morphological differences between humans and apes," said James Noonan, Assistant Professor of Genetics in the Yale University School of Medicine and the senior author of the study.

Researchers have long suspected changes in gene expression contributed to human evolution, but this had been difficult to study until recently because most of the sequences that control genes had not been identified. In the last several years, scientists have discovered that non-coding regions of the genome, far from being junk, contain thousands of regulatory elements that act as genetic "switches" to turn genes on or off.

An indication of their biological importance, many of these non-coding sequences have remained similar, or "conserved," even across distantly related vertebrate species such as chickens and humans. Recent functional studies suggest some of these "conserved non-coding sequences" control the genes that direct human development.

In collaboration with scientists at Lawrence Berkeley National Laboratory in California, the Genome Institute of Singapore, and the Medical Research Council in the United Kingdom, Noonan searched the vast non-coding regions of the human genome to identify gene regulatory sequences whose function may have changed during the evolution of humans from our ape-like ancestors.

Noonan and his colleagues looked for sequences with more base pairs in humans than in other primates. The most rapidly evolving sequence they identified, termed HACNS1, is highly conserved among vertebrate species but has accumulated variations in 16 base pairs since the divergence of humans and chimpanzees some 6 million years ago. This was especially surprising, as the human and chimpanzee genomes are extremely similar overall, Noonan said.

Using mouse embryos, Noonan and his collaborators examined how HACNS1 and its related sequences in chimpanzee and rhesus monkey regulated gene expression during development. The human sequence activated genes in the developing mouse limbs, in contrast to the chimpanzee and rhesus sequences. Most intriguing for human evolution, the human sequence drove expression at the base of the primordial thumb in the forelimb and the great toe in the hind limb. The results provided tantalizing, but researchers say preliminary, evidence that the functional changes in HACNS1 may have contributed to adaptations in the human ankle, foot, thumb and wrist-- critical advantages that underlie the evolutionary success of our species.

However, Noonan stressed that it is still unknown whether HACNS1 causes changes in gene expression in human limb development or whether HACNS1 would create human-like limb development if introduced directly into the genome of a mouse.

"The long-term goal is to find many sequences like this and use the mouse to model their effects on the evolution of human development," Noonan said.

National Institutes of Health and the U.S. Department of Energy funded the work.

American Woolly Mammoths Pushed Out Siberian Kin

Jennifer Viegas, Discovery News

DNA shows the world's last surviving woolly mammoths were born in the United States and the Arctic. Woolly mammoths from those regions displaced Siberian mammoths, causing the latter group to mysteriously disappear off the face of the Earth.

The findings, published in the latest Current Biology, are based on the largest study ever conducted on DNA extracted from woolly mammoths, which grew tusks up to 16 feet long and had enormous, elephantine bodies.

The paper, which focused on mitochondrial DNA (mtDNA) -- genetic material inherited from mothers -- is also the second largest study to date for any ancient DNA.

Although North American and Siberian woolly mammoths shared a common ancestor around 900,000 years ago, the two groups went their separate ways for thousands of years, until the first group started to move back into Siberia between 100,000 to 50,000 years ago.

"Whether the (North American) mammoths were better suited to the environment or the (local) population simply dwindled due to other reasons is unknown, but I would not be surprised if the North American mammoth immigrants were partly to blame," coauthor Hendrik Poinar told Discovery News.

Poinar, a McMaster University anthropologist, and his international team analyzed mtDNA from 160 mammoth samples from Holarctica, the term for the region that now includes Asia, Europe and North America. The scientists made three other key discoveries about mammoths.

The first is that two different species of mammoths might have both lived in Siberia at one point. The second species could have been a more primitive form, such as Trongotherii or Meriodonalis.

The scientists also determined that the Bering Land Bridge, which joined Alaska to eastern Siberia, was more of a barrier than a gateway.

"I think it is increasingly clear that the bridge was indeed a filter more than a bridge," Poinar said. "It certainly was not a freeway, and it makes us think about what ecological function it clearly played over the last several millennia."

He explained that only four or five mammoth migration events took place over the bridge during a period of tens of thousands of years.

The scientists also ruled out the popular theory that climate change played a direct role in the mammoth's extinction, since the mammoths "sailed through The Last Glacial Maximum (the time of maximum extent of the ice sheets) with little effect on their overall diversity."

The woolly mammoth populations on mainland North America and Siberia did not die out until 9,800 to 11,000 years ago. Much smaller populations, on Wrangel Island off the coast of Siberia and the Pribilof Islands off Alaska lived on until 3,500 to 5,000 years ago.

Poinar admits that climate probably played some role in the mammoth's demise but, he adds, "I cannot buy that humans did not have a hand in (the extinction) as well."

Jim Mead, professor and chair of East Tennessee State University's Department of Geosciences, told Discovery News that the new study "is very interesting."

"It certainly indicates that we all must look to other models about the various megafaunal populations in the Holarctice," Mead said, adding that, "it is intriguing that the mammoth mirrors that of bison and other megamammals."

Bison, mammoths, early relatives of bears, horses and other large mammals all experienced population expansions and reductions at similar times. This suggests that climate change was affecting these groups, humans were hunting them more, or perhaps both climate and a human fondness for meat together affected these ancient animals.

Should nurses replace GPs as frontline providers of primary care?

Head to head: Should primary care be nurse led?

Should nurses be the frontline providers of primary care, taking the place of general practitioners as the first point of patient contact? Two experts debate the issue on bmj.com today.

Nurses can deliver as high quality care as general practitioners in most areas of general practice including preventive health care, the management of long term conditions, and first contact care for people with minor illness, writes Bonnie Sibbald, Professor of health services research at the University of Manchester.

She argues that substituting nurses for doctors has the potential to improve the efficiency of primary health care. Too often GPs provide the same services as nurses and this leads to duplication rather than substitution of care.

In fact, she says, GPs skills would be better used to tackle more complex health problems which have a higher degree of uncertainty about their diagnosis and treatment.

According to Sibbald, general practices in the UK are already aware of the value of nurses to improve the scope and quality of primary care. Over the last twenty years, there has been a rapid expansion in the numbers of practice nurses recruited to meet new service contracts. For instance, nurses now provide immunisations, vaccinations, and cervical screening services and will be a key part of meeting the quality of care targets for people with long term conditions set out in the General Medical Services contract of 2004.

She believes that recent changes to legislation, such as the right for qualified nurses to prescribe licensed medicines, have begun to allow nurses to realise their full potential.

This trend, she concludes, must be followed "to its logical conclusion, acknowledging nurses to be the true frontline providers of primary care"… [while the] "general practitioners' role should evolve to become that of a consultant in primary care receiving referrals from nurses."

But Dr Rhona Knight, a GP from Leicester who has first hand experience in a nurse led practice, argues that nurse led primary care would restrict patient choice and undermine the importance of nurses' unique contribution to primary health care.

She acknowledges that patients report a high level of satisfaction with nurse consultations, but points to evidence that patients prefer to consult with a GP if they think their symptoms are serious.

She points out that GPs' training takes 10 years and that they are hugely experienced in dealing with undifferentiated illness which enables them to be key deliverers and leaders of generalist healthcare. In contrast, she says, advanced nurse training is less developed and recommends a minimum of only 500 indirect or direct supervised hours and the competencies cover "just nine pages".

Currently, she says, a lack of nationally agreed standards means that nurses have varied roles with inconsistent training, knowledge, experience and titles.

Nurses would need increased training and a similar curriculum to GPs to be able to take the lead in dealing with all illnesses, she argues. One solution could be for nurses to take a graduate health science medical course and train to be a GP and be appropriately rewarded for this role, she concludes.

In an accompanying feature, Rebecca Coombes outlines some of the major impediments to senior nurses taking on some medical roles including a lack of professional regulation, low pay, and cultural objections from doctors.

Ancient Musical Instruments Play Again Through Astra Project

Ancient musical instruments can now be heard for the first time in hundreds of years, due to a new computer modelling project. ASTRA (Ancient instruments Sound/Timbre Reconstruction Application) has recreated the sounds of the harp-like Epigonion musical instrument from Ancient Greece and has performed one of the oldest known musical scores dating back to the Middle Ages. To achieve this it used the advanced GÉANT2 and EUMEDCONNECT research networks to link high capacity computers together, sharing information to enable the computer-intensive modelling of musical sounds.

Knowledge of the Epigonion musical instrument, dating back from the Ancient Greek era, is based on archaeological findings, historical pictures and literature. Using this archaeological data as an input, it was then transformed by a complex digital audio rendering technique to model the actual sound of the instrument. This advanced physical modelling synthesis creates a virtual model of the instrument and reproduces the sound that the instrument might have made by simulating its behaviour as a mechanical system. The Epigonion is a wooden string instrument that musicians have likened the sound to something similar to a modern harp or a harpsichord. The ASTRA team have compiled the sounds of four Epigonion instruments to recreate a medieval musical piece, making this the first time that these instruments have been heard performing together. Samples of the Epigonion and the musical piece can be accessed at http://www.astraproject.org/examples/dufay.mp3

“This is an exciting project for us and for musicians and historians around the world. For the first time we can actually hear the musical sounds of the past, using modelling techniques rather than guesswork,” says Professor De Mattia, Director of the Conservatory of Music of Salerno and Coordinator of the ASTRA project. Recreating the sound of the Epigonion instrument and the compilation of this musical piece is a great achievement and is the first step towards our goal of constructing a full orchestra in the future.”

“The combination of the high speed GÉANT2 and EUMEDCONNECT networks and grid computing infrastructures provide the immense computing power vital for this exciting project,” commented Dr La Rocca, Coordinator of ASTRA gridification. “Previously the amount of computing power needed to recreate ancient

music was unobtainable, but the use of high capacity research networks provides us with the ability to turn our research into reality."

The physical modelling process needs extreme amounts of computing power – taking about four hours for a high powered computer to correctly reproduce a sound lasting only 30 seconds. To bring together sufficient power and to share information the ASTRA project is using the GILDA and EUMEDGRID grid computing infrastructures, which link computing resources across the Mediterranean at high speed (up to 2.5 Gbps) through the GÉANT2 and EUMEDCONNECT research networks.

"The success of the ASTRA project demonstrates how high speed networking technology can underpin research collaboration across a wide range of subjects and allow the academic world to work together across multiple locations," said Dai Davies, General Manager, DANTE. "This unique project is delivering a fascinating glimpse into the music of the past for the benefit of the students and researchers of today – we look forward to hearing more music as ASTRA develops."

The benefits of the collaborative approach used in this project are far reaching. ASTRA not only makes it possible to recreate instruments that previously would have been either too expensive or too difficult to manufacture by hand, it also allows any model and its associated data to be accessed by our collaborators. Research data can therefore be shared around the world, making it a truly international project of immense value to working archaeologists and historians.

Intellectual work induces excessive calorie intake

Quebec City, September 4, 2008—A Université Laval research team has demonstrated that intellectual work induces a substantial increase in calorie intake. The details of this discovery, which could go some way to explaining the current obesity epidemic, are published in the most recent issue of Psychosomatic Medicine.

The research team, supervised by Dr. Angelo Tremblay, measured the spontaneous food intake of 14 students after each of three tasks: relaxing in a sitting position, reading and summarizing a text, and completing a series of memory, attention, and vigilance tests on the computer. After 45 minutes at each activity, participants were invited to eat as much as they wanted from a buffet.

The researchers had already shown that each session of intellectual work requires only three calories more than the rest period. However, despite the low energy cost of mental work, the students spontaneously consumed 203 more calories after summarizing a text and 253 more calories after the computer tests. This represents a 23.6% and 29.4 % increase, respectively, compared with the rest period.

Blood samples taken before, during, and after each session revealed that intellectual work causes much bigger fluctuations in glucose and insulin levels than rest periods. "These fluctuations may be caused by the stress of intellectual work, or also reflect a biological adaptation during glucose combustion," hypothesized Jean-Philippe Chaput, the study's main author. The body could be reacting to these fluctuations by spurring food intake in order to restore its glucose balance, the only fuel used by the brain.

"Caloric overcompensation following intellectual work, combined with the fact that we are less physically active when doing intellectual tasks, could contribute to the obesity epidemic currently observed in industrialized countries," said Mr. Chaput. "This is a factor that should not be ignored, considering that more and more people hold jobs of an intellectual nature," the researcher concluded.

In addition to Jean-Philippe Chaput and Angelo Tremblay, the study's authors include Vicky Drapeau, Paul Poirier, and Normand Teasdale.

Study: Delaying evolution of drug resistance in malaria parasite possible

GAINESVILLE, Fla. --- There's no magic bullet for wiping out malaria, but a new study offers strong support for a method that effectively delays the evolution of drug resistance in malaria parasites, a University of Florida researcher says.

David Smith, associate director of disease ecology at UF's Emerging Pathogens Institute, said the study will guide scientists and policy makers in extending the longevity of current artemisinin-based malaria drugs combined with partner drugs. Smith is a co-author of a report on the study, scheduled to publish online this week in the Proceedings of the National Academy of Sciences and in print on Sept. 16.

Smith collaborated with lead author Maciej Boni of Resources for the Future and Princeton University, and Ramanan Laxminarayan, also with RFF, to create mathematical models assessing the strategic effectiveness and clinical outcomes of using one, two and three first-line drug therapies to treat malaria within a population over a 20-year period. Their results show that using two or three drugs simultaneously reduced the total clinical

cases and number of failed treatments , and slowed the rate at which drug-resistant genes spread within the parasites that cause malaria: Plasmodium falciparum, P. vivax, P. malariae and P. ovale.

"The models indicate that we can slow the evolution of resistance to current artemisinin-based therapies if nations use them in combination with two or more partner drugs," Smith said. "Currently, most nations don't do this. They use one therapy at a time, wait for it to fail, and then switch to a different therapy."

Artemisinin-combined therapies, or ACTs, are currently not widely implemented due to operational challenges and expense, Smith said. But he said the study offers compelling evidence for global leaders to collaborate and overcome these issues.

"This is not to say that implementing multiple first-line therapies solves all of our malaria problems," Boni said. "Anti-malarial drug development needs to continue so that we have novel and highly effective anti-malarials that can be plugged into the recommended strategy of deploying multiple therapies."

In the past century, chloroquine and sulfadoxine-pyrimethamine were widely used to combat malaria, but the parasites eventually evolved resistance leading to the drugs' failure. Artemesinin drugs, derived from the herb Artemisia annua, are relatively new and the malaria parasite does not yet appear to have a resistance to it. They work by triggering chemical reactions which damage the Plasmodium parasite.

"We don't have anything in the pipeline after ACTs, and it's basically just a matter of time until drug resistance evolves and artemisinin also fails," Smith said. "So the question becomes how do we keep ACTs in our arsenal for as long as effectively possible?"

The researchers' models also show that cycling through single drugs accelerated the rate at which malaria parasites evolved drug resistance. Smith said this occurred because cycling a single drug degraded the parasite's average fitness, which made it easier for drug-resistant genes to spread throughout the parasite population.

The cycling models predicted a declining therapeutic value of a single drug within 3.54 years, versus a longer effective therapeutic value of 9.95 years when three drugs were used in equal proportions within a population. The research was funded in part by grants from the Bill and Melinda Gates Foundation, and the National Institutes of Health.

"Using multiple first-line drugs reduces the selection pressure for resistance to a single drug," Smith said. "This is one way to make the ACTs last longer and benefit more people."

Co-author Laxminarayan, a senior research fellow at RFF, said ACTs are the best treatment option for malaria, now as well as in the foreseeable future.

"Novel treatment strategies improve our ability to delay the emergence of drug resistance without the need to deny treatment," Laxminarayan said.

Wil Milhous, associate dean for research at the University of South Florida's College of Public Health, said the research is "clearly a superb breakthrough in mathematical modeling applied to malaria drug deployment." Milhous has worked to develop new drugs for malaria for more than 25 years and is unaffiliated with the study.

"We have done the math in drug development, but only in terms of the cost of goods for drug combinations to include advanced preclinical and clinical testing. These are extremely time-consuming and costly but critical to regulatory approval," Milhous said. "Now we have a highly quantitative reality check that poor implementation strategies doom drugs to failure."

Bisphenol A linked to metabolic syndrome in human tissue

Cincinnati—New research from the University of Cincinnati (UC) implicates the primary chemical used to produce hard plastics—bisphenol A (BPA)—as a risk factor for metabolic syndrome and its consequences.

In a laboratory study, using fresh human fat tissues, the UC team found that BPA suppresses a key hormone, adiponectin, which is responsible for regulating insulin sensitivity in the body and puts people at a substantially higher risk for metabolic syndrome.

Metabolic syndrome is a combination of risk factors that include lower responsiveness to insulin and higher blood levels of sugar and lipids. According to the American Heart Association, about 25 percent of Americans have metabolic syndrome. Left untreated, the disorder can lead to life-threatening health problems such as coronary artery disease, stroke and type 2 diabetes.

Nira Ben-Jonathan, PhD, and her team are the first to report scientific evidence on the health effects of BPA at environmentally relevant doses equal to "average" human exposure. Previous studies have primarily focused on animal studies and high doses of BPA.

They report their findings in the Aug. 14, 2008, online edition of the journal Environmental Health Perspectives. This scientific data comes just before a key Federal Drug Administration meeting about the safety of the chemical in consumer products scheduled for Sept. 16, 2008.

"People have serious concerns about the potential health effects of BPA. As the scientific evidence continues to mount against the chemical, it should be given serious attention to minimize future harm," says Ben-Jonathan, a professor of cancer and cell biology at UC who has studied BPA for more than 10 years.

"Experimenting with human tissue is the closest we can come to testing the effects of BPA in humans. It's a very exciting breakthrough because epidemiological studies looking at BPA effects on humans are difficult since most people have already been exposed to it," she adds.

Scientists estimate that over 80 percent of people tested have measurable BPA in their bloodstream. The UC study was designed to mimic a realistic human exposure (between 0.1 and 10 nanomolar) so that a more direct correlation between human exposure and health effects could be drawn.

To conduct this study, the UC team collected fresh fat tissue from Cincinnati patients undergoing several types of breast or abdominal surgery. These samples included three types of fat tissue: breast, subcutaneous and visceral (around the organs).

Tissue was immediately taken to the laboratory and incubated with different concentrations of BPA or estrogen for six hours to observe how the varied amounts of BPA affected adiponectin levels. The effects of BPA were then compared to those of estradiol, a natural form of human estrogen.

They found that exposing human tissues to BPA levels within the range of common human exposure resulted in suppression of a hormone that protects people from metabolic syndrome.

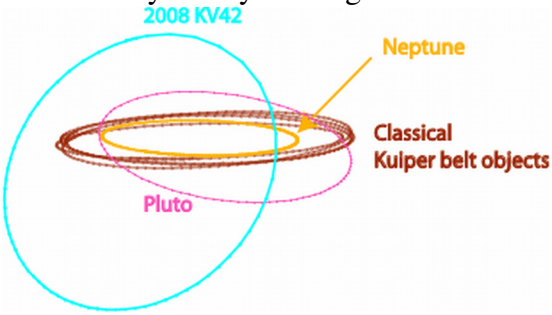
"These results are especially powerful because we didn't use a single patient, a single tissue source or a single occurrence," she adds. "We used different fat tissues from multiple patients and got the same negative response to BPA."

UC's Eric Hugo, PhD, Terry Brandebourg, PhD, Jessica Woo, PhD, J. Wesley Alexander, MD, and Christ Hospital surgeon Jean Loftus, MD, participated in this study. The study was funded by grants from the National Institute of Environmental Health Sciences.

Astronomers discover missing link for origin of comets

An international team of scientists that includes University of British Columbia astronomer Brett Gladman has found an unusual object whose backward and tilted orbit around the Sun may clarify the origins of certain comets.

In the first discovery of its kind, researchers from Canada, France and the United States have discovered an object that orbits around the Sun backwards, and tilted at an angle of 104 degrees – almost perpendicular to the orbits of the planets.



Orbit paths (looking along the plane of the solar system) of the retrograding 2008 KV42 and some other outer solar system objects

"Certain types of comets are not naturally produced after planet formation, especially those with highly tilted orbits," says Prof. Gladman. "This discovery may finally show how they transition from the Oort Cloud to become objects like Halley's Comet."

Composed of icy rock, 2008 KV42 is called a "trans-Neptunian" object since its orbital path is larger than that of Neptune. The object is roughly 50 kilometres across and at present 35 times further from than the Sun than Earth.

The orbits of such objects in the region beyond Neptune's orbit provide fresh insights into the early history of our solar system, says Gladman, who teaches in the Dept. of Physics and Astronomy and holds the Canada Research Chair in Planetary Astronomy.

The international team has been carrying out a targeted search for objects with highly tilted orbits. Their discovery was made using the Canada-France-Hawaii Telescope in Hawaii, with follow-up observations provided by the MMT telescope in Arizona, the Cerro Tololo Inter-American Observatory (CTIO) four-metre telescope in Chile, and the Gemini South telescope, also in Chile, in which Canada is a partner.

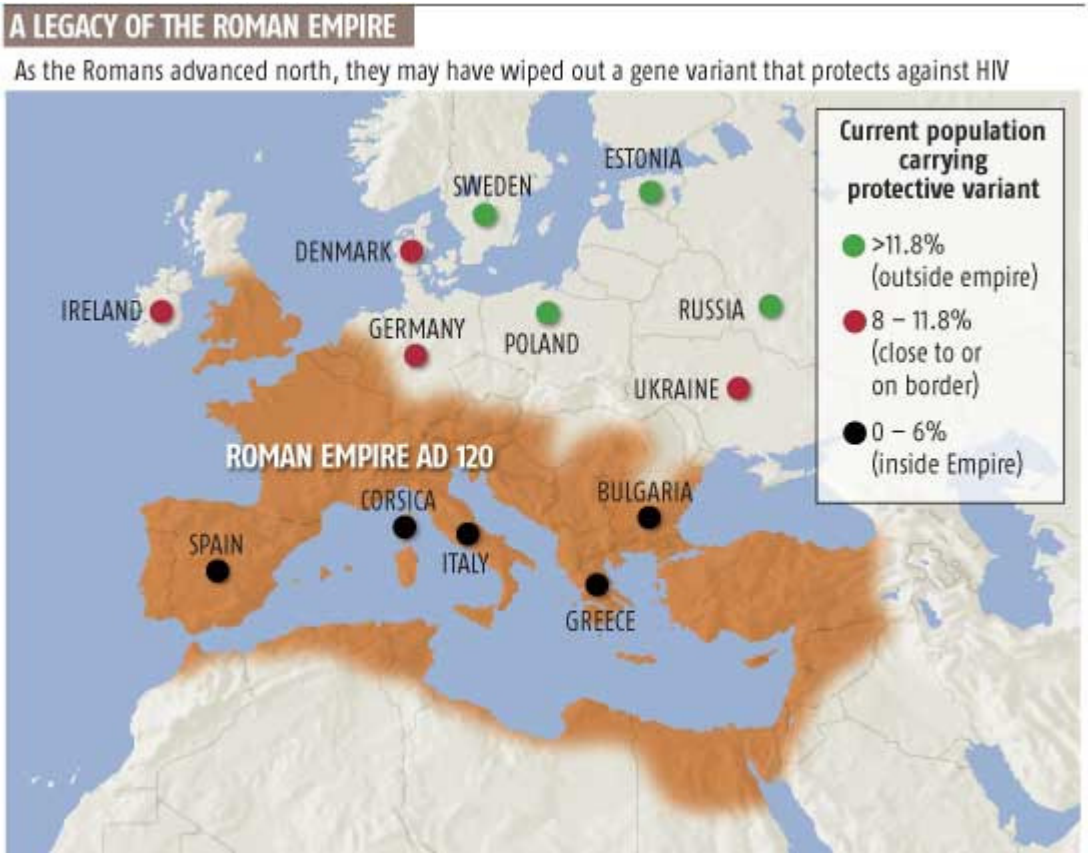
"Having quick access to the MMT and Gemini South telescopes, via the generous support of the observers and directors, was critical here. Given the highly unusual orbit, the object would have been lost without the rapid tracking from these large telescopes," says Gladman.

The discovery team is currently performing follow-up observations of 2008 KV42 to pin down its orbit with greater precision. They will then begin unravelling the archaeological information trapped in the orbit of this highly exceptional member of the trans-Neptunian population.

Did the Romans destroy Europe's HIV resistance?

* 03 September 2008

*** Matt Walker**



THE hand of history has a very long reach. It appears that the Roman Empire left a legacy that may still affect modern Europe - those living within its conquered lands are more susceptible to HIV. It could explain why a gene that confers resistance to HIV varies in frequency across the continent.

The gene in question codes for a protein receptor called CCR5. The HIV virus binds to this receptor before entering cells. One gene variant, called CCR5-Delta32, has 32 DNA base pairs missing and produces a receptor that HIV cannot bind to, which prevents the virus from entering the cells. People with this variant have some resistance to HIV infection and also take longer to develop AIDS.

Generally, only people in Europe and western Asia carry the variant, and it becomes less and less frequent as you move south. For example, more than 15 per cent of people in some areas of northern Europe carry CCR5-Delta32, compared with fewer than 4 per cent of Greeks (see map). It is not clear why this is so, since the HIV pandemic - which began in the early 1980s - is too recent to have influenced the distribution of the variant.

However, the changing frequency of the variant reflects the changing boundary of the Roman Empire from 500 BC to AD 500, says Eric Faure at the University of Provence in Marseille, France. When Faure and colleague Manuela Royer-Carenzi investigated possible links between Roman colonisation and the frequency of the CCR5-Delta32 variant in nearly 19,000 DNA samples from across Europe, they found that the gene variant seemed to dwindle in regions conquered by the Romans (Infection, Genetics and Evolution, DOI: 10.1016/j.meegid.2008.08.007).

Alternative theories include the idea that the protective variant originated in Scandinavia, and was spread north and east by the Vikings. But the pattern of Viking migration does not match the current distribution of the variant. Another theory is that a major disease, such as plague or smallpox, created a selection pressure on the gene variant which increased its frequency. But its distribution does not match that of disease outbreaks, either.

So how did the Romans lower resistance across Europe? Some studies suggest that they and other southern Europeans had lower levels of CCR5-Delta32. But Faure does not think that the Romans spread the regular version of the gene into their colonies by breeding with indigenous people. "Gene flow between the two was extremely low," he says.

Instead, he reckons the Romans introduced a disease to which people carrying the CCR5-Delta32 variant were particularly susceptible. As the Romans moved north, this disease killed off people with the variant.

Faure notes that the Romans introduced cats and donkeys into Europe which may have carried pathogens that spread to humans.

What's more, the Romans inadvertently brought with them disease-carrying mosquitoes. Intriguingly, modern people with the CCR5-Delta32 variant are more susceptible to the mosquito-borne West Nile virus.

Dolphin serial killers?

Rowan Hooper, online news editor

Scientists who autopsy cetaceans that wash up dead on British beaches have come to a grim conclusion: some species are being killed by bottlenose dolphins.

Dead porpoises (and other cetaceans) turn up regularly on beaches around Britain. According to a Defra report last year (pdf), the cause of death of 15 out of 56 porpoise bodies found - the majority - was "physical trauma (bottlenose dolphin attack)". The photo above shows the rake marks on a harbour porpoise caused by a bottlenose dolphin.

The killings were first reported from the north-east coast of Scotland, then off the coast of Wales, and this week the body of a Risso's dolphin was found further south still, in Cornwall. The Risso's dolphin (see photo below) was said to have been killed over food shortages and dolphins were described as being so hungry they are turning on each other.

Autopsies show some of the dead animals (13 out of 56) have died of starvation. But not all, and the bottlenose killers are not eating the porpoises they kill. In the case of the Risso's dolphin, it is not even a competitor for the same prey (Risso's feed on squid). So why are they killing other cetaceans?
"We can't state confidently that the killings are tied to declining fish stocks," says dolphin expert Nick Tregenza, who advises the Marine Strandings Network in Cornwall. His guess? "They could be doing it for fun."

Bottlenose dolphins are known to spread behaviour culturally and there are extensive records of violence between and within dolphin pods. "Killing for fun" could be another culturally transmitted behaviour.

Tregenza likens it to the spread of milk-bottle opening by blue tits. "It could be a form of play rather than food competition," he suggests.

Alternatively, he says, a bottlenose dolphin might have tried to help the weak Risso's dolphin and become angry when the Risso's failed to respond.

In a sick way, I kind of like the "killing for fun" explanation. Tregenza says the Cornwall Wildlife Trust has reported that dolphins have been seen picking up stones from the sea bed and throwing them on the surface. "They were thought to be throwing stones at seals on rocks not far away," Tregenza says.

Stone-throwing and killing for fun. Dolphins are even more like us than we thought.

The dead Risso's dolphin, killed by a bottlenose **(photo: Mike Hicks)**

A light bulb and a few chemicals: Scientists find a way to help make new reactions

by Kitta MacPherson · Posted September 4, 2008; 02:00 p.m.

Princeton scientists have discovered a way of stimulating organic molecules that they expect will prompt researchers to create materials from new kinds of chemical reactions.

The method of catalysis, when used, could lead to groundbreaking kinds of drugs and agricultural chemicals and will provide a shortcut to standard multi-step methods of chemical production.
The work, conducted by David MacMillan, the A. Barton Hepburn Professor of Organic Chemistry at Princeton, and David Nicewicz, a postdoctoral fellow, will appear in a special online edition of Science on Sept. 4.

The method is disarmingly easy to perform but deeply complex in terms of the science behind it. At its simplest, the process involves using a weak source of light - like a household light bulb -- to catalyze or propel a reaction in a flask of fluid containing two different classes of chemicals.

Like magic or even a child's tabletop science experiment, the chemicals in the container start to selectively react with each other when exposed to the light.

"This is the first time that chemists have realized the potential to use simple light bulbs - or weak light - to catalytically propel organic chemical reactions … as extremely simple as it sounds," MacMillan said.

The method brings together two different fields of chemistry -- organic catalysis and inorganic photoredox catalysis and involves combining two different compounds and two different catalysts. "There are two interwoven catalytic cycles where everything is happening at just the right time," MacMillan said. "It's like an orchestra with the perfect conductor." Experts agreed that the discovery points to exciting possibilities.

"It will provide access to a variety of interesting compounds currently unavailable due to the new bond connections that it enables," said Stephen Buchwald, the Camille Dreyfus Professor of Chemistry at the Massachusetts Institute of Technology. "This method as well as the basic concepts enunciated in the paper are sure to be of great importance, both in academia and in pharmaceutical and other industries."

"What MacMillan has succeeded in doing is to effect a challenging transformation with an efficient, versatile, mild and environmentally benign process," said John Schwab, who oversees organic synthesis grants at the National Institute of General Medical Sciences of the National Institutes of Health. "It's also a beautiful example of taking lessons from nature and applying them to great practical advantage in a non-natural setting."

The reaction involves the chemicals alpha-bromoketone and aldehyde and two catalysts.

Once the chemicals are placed in a flask, the bulb starts the reaction by emitting a light particle or photon that escapes and is absorbed by the inorganic catalyst in the solution.

Once that catalyst becomes excited, it passes off an electron to an alpha-bromoketone molecule. The alpha fragments and produces a highly active, unstable organic molecule. At exactly the same moment, the organic catalyst interacts with the aldehyde, forming an enamine, also an activated unstable molecule. The two unstable molecules are mutually attracted, race toward each other and then combine.

The resulting chemical bond is significant, MacMillan said, because it represents a new chemical reaction that the field of asymmetric catalysis has been trying to make for many years. Moreover, this light bulb strategy, invented in the University's Merck Center for Catalysis, opens the door to many other chemical reactions that have previously been impossible yet now should be easy to make.

Catalysis, the speeding up or sometimes the slowing down of the rate of a chemical reaction, is caused by the addition of some substance that does not undergo a permanent chemical change. Ten years ago, MacMillan led a team that created a new way of instigating chemical reactions - a new form of catalysis called organocatalysis.

Instead of using metals to propel a chemical reaction (a standard method called organometallic catalysis widely used in the creation of pharmaceuticals), the team developed a way to use organic chemicals such as carbon in the reaction, an environmentally safer, easier and cheaper way to produce drugs. In most cases, the chemical process that creates drugs produces two forms of it, the desired one and a "mirror" image compound.

Because this chemical cousin can often cause untoward side effects, drug industry chemists must find a way to eliminate it. By inventing a method that replaces the expensive and often toxic metallic catalysts with simpler, more readily available organic ones, MacMillan gave them a cheaper shortcut that is now becoming widely adopted on a global scale. *The work appearing in Science was funded by Merck and the National Institutes of Health.*

Gait may be associated with orgasmic ability

Paisley, Scotland - A new study found that trained sexologists could infer a woman's history of vaginal orgasm by observing the way she walks. The study is published in the September 2008 issue of The Journal of Sexual Medicine, the official journal of the International Society for Sexual Medicine and the International Society for the Study of Women's Sexual Health.

Led by Stuart Brody of the University of the West of Scotland in collaboration with colleagues in Belgium, the study involved 16 female Belgian university students. Subjects completed a questionnaire on their sexual behavior and were then videotaped from a distance while walking in a public place. The videotapes were rated by two professors of sexology and two research assistants trained in the functional-sexological approach to sexology, who were not aware of the women's orgasmic history.

The results showed that the appropriately trained sexologists were able to correctly infer vaginal orgasm through watching the way the women walked over 80 percent of the time. Further analysis revealed that the sum of stride length and vertebral rotation was greater for the vaginally orgasmic women. "This could reflect the free, unblocked energetic flow from the legs through the pelvis to the spine," the authors note.

There are several plausible explanations for the results shown by this study. One possibility is that a woman's anatomical features may predispose her to greater or lesser tendency to experience vaginal orgasm. According to Brody, "Blocked pelvic muscles, which might be associated with psychosexual impairments, could both impair vaginal orgasmic response and gait." In addition, vaginally orgasmic women may feel more confident about their sexuality, which might be reflected in their gait. "Such confidence might also be related to the relationship(s) that a woman has had, given the finding that specifically penile-vaginal orgasm is associated with indices of better relationship quality," the authors state. Research has linked vaginal orgasm to better mental health.

The study provides some support for assumptions of a link between muscle blocks and sexual function, according to the authors. They conclude that it may lend credibility to the idea of incorporating training in movement, breathing and muscle patterns into the treatment of sexual dysfunction.

"Women with orgasmic dysfunction should be treated in a multi-disciplinary manner" says Irwin Goldstein, Editor-in-Chief of The Journal of Sexual Medicine." Although small, this study highlights the potential for multiple therapies such as expressive arts therapy incorporating movement and physical therapy focusing on the pelvic floor." *This study is published in the September 2008 issue of The Journal of Sexual Medicine. Media wishing to receive a PDF copy may contact medicalnews@bos.blackwellpublishing.net.*

Researcher says: No-till practices show extended benefits on wheat and forage

VERNON – With more than 3 million acres of wheat in north Texas, 50 percent or more of which is grazed by 1 to 2 million head of cattle, it is important to look at tillage practices and their effect on forage production, said a Texas AgriLife Research expert.

Dr. John Sij, AgriLife Research agronomist at Vernon, has been studying nitrogen response and forage production in relation to tillage practices at the nearby Smith-Walker research farm, where grazing research is conducted under commercial conditions. "When talking about tillage, we have to look at environmental conditions," Sij said, "including frequent droughts, high winds and temperatures, highly erodible soils, low yields, low production inputs, low returns and intense rainfalls."

Conventional tillage can sometimes be excessive and cause moisture loss as well as lower organic matter, he said. Severe wind and water erosion can also occur under conventional tillage, resulting in dust storms and low visibility.

"It is also expensive and time consuming," Sij said. "What you end up with is top soil filling the drainage ditches and the taxpayer has to pay for that to be cleaned out."

The alternative is no-till or reduced tillage, both of which are still being questioned about how well they work, he said. "There's concern about soil compaction from equipment and grazing, but the soil seems to 'relax' as the year goes on," Sij said.

No-till farming has been termed as more expensive because of less-effective chemical weed-control measures, but that is not true, he said. "The problem is there is a lack of proper equipment and research to show whether it works," Sij said.

Some other concerns Sij said he has been questioned about are: the need for tillage to kill bugs and reduce disease, compaction and the probability that the roots cannot penetrate the untilled soil, and possible yield decreases.

Producers can actually get earlier grazing under no-till conditions in some years, he said. "Some of the best stands I saw this year were in no-till because of dry conditions. No-till conserved soil moisture," Sij said.

Overall, he said the benefits of conservation tillage include reduced fuel and labor costs, improved rainfall capture and improved infiltration.

And when figuring the economic difference between conventional tillage and no-till farming in grain-only production systems, the bottom line in the planned returns for 2007-2008 was $63.22 per acre under conventional tillage compared with $79.38 per acre under no-till, Sij said. This represents a $16 advantage for no-till. "2008-2009 could be different," he said. "It might only be about a $4 advantage to no-till because glyphosate prices went up."

Sij studied no-till and conventional tillage under a free-range stocker-cattle situation.

"We didn't have good forage every year," Sij said. "This past year we had little or no forage."

In the study, data were collected on forage production, nitrogen fertilizer effects, grain yield, grain quality and compaction, he said. In dual-use wheat, the plants are clipped monthly to determine yields.

Pre-plant nitrogen rates show almost a linear increase to forage and wheat grain yields, he said. "But you have to be careful – does it pay for itself?" Sij said. "You need some for forage, but there is a fine line. It looks like we need some pre-plant nitrogen for forage production and then apply top-dress fertilizer later to enhance grain yield."

He said producers first need to test for soil nitrate levels within the upper two feet, because it doesn't always get used, especially in a poor crop year. "Don't assume it is all gone," Sij said. "Take a soil sample and see what is left so you don't have to put on as much expensive nitrogen."

Free drug samples may end up costing uninsured more

WINSTON-SALEM, N.C. – Free drug samples provided to physicians by pharmaceutical companies could actually be costing uninsured patients more in the long run, according to a study done by researchers at Wake Forest University Baptist Medical Center and colleagues.

The retrospective study looked at the prescribing habits of more than 70 physicians in a university-affiliated internal medicine practice in the months immediately before and after the closing of their drug sample closet. The results indicate that the availability of free samples from pharmaceutical companies greatly impacts whether an uninsured patient is given a prescription for a generic or a brand-name drug. The complete findings can be found in the September issue of Southern Medical Journal.

"It's true that samples can save patients money in the short-run," said David P. Miller, M.D., lead researcher and internal medicine physician at Wake Forest Baptist. "But our study shows that they may end up paying more in the long run when they are given prescriptions for brand-name only drugs."

For the study, researchers used a pharmacy database to track all of the prescriptions in four classes of chronic medications given to uninsured and Medicaid patients. Nearly 2,000 prescriptions categorized as antihypertensives (blood pressure medications), oral diabetic agents, peptic ulcer and gastroesophageal reflux medications, and non-narcotic pain medications, were tracked for the nine months leading up to and following the relocation of the practice, at which time the drug sample closet was permanently closed due to a lack of suitable storage space in the new building.

Researchers found that, for uninsured patients, the percentage of medications prescribed as generics rose from 12 percent to 30 percent after the clinic closed its drug sample closet. For Medicaid patients, however, there was no significant change in generic prescribing.

Drug samples are available only for brand name drugs, which are often newer, more heavily advertised and almost always much more expensive than generic drugs in the same class.

"The theory is that drug companies hand out samples because it gets physicians in the habit of using a drug and physicians, therefore, are more likely to prescribe that drug later," Miller said.

Many times, initially, a patient will be given a sample of a drug to test tolerability and effectiveness. Often times, when a physician gives a patient a sample, it is accompanied with a prescription to fill after the sample is gone. Sometimes free samples are used by physicians to help patients who cannot afford medications. But the availability of drug samples is not always predictable and, when patients return for refills and the samples they need are missing from a practice, either because the drug representative didn't leave enough or stopped distributing them altogether, patients who were started on brand name drugs in sample form are left paying the price when they have to fill a prescription.

Researchers were surprised to find that, throughout the study, Medicaid patients were generally prescribed generic drugs, even with the availability of branded samples. Surprising, Miller said, because at the time of the study, Medicaid didn't have a formulary, so all drugs for Medicaid patients, branded or generic, were only $1.

One possible explanation, Miller said, is that because Medicaid patients rarely receive samples, doctors' prescribing decisions for these patients were based purely on what drug they thought was best and not on what samples happened to be available in the closet.

"In terms of safety and effectiveness, doctors have the most information about older drugs because they have been used for years and are often more studied," Miller said. "Sometimes, doctors don't discover that a new drug has serious side-effects until it has been used in a large number of people or for a long time." In recent years, Miller added, the Food and Drug Administration has issued warnings about some new drugs and a few have been pulled from the market, showing how a promising new drug can later be discovered harmful.

"Physicians and medical organizations need to ask themselves if samples are doing more harm than good," Miller added. "While doctors might intend to help someone by handing them a free sample, in the long run, it could cost them more. And removing samples from a practice can help doctors focus on which medication is best for a patient, rather than which medication happens to be available for free. Patients who want to save money should ask their doctor if an effective generic medication is available for their condition instead of taking a sample. In the long run, the generic prescription will probably save them more."

Co-researchers for this study were Jonathan B. Woods, M.D., and James L. Wofford, M.D., M.S., both of Wake Forest Baptist; Richard Mansfield, M.D., M.S., of the Veterans Affairs Medical Center; and William P. Moran, M.D., M.S., of the Medical University of South Carolina.

For the Brain, Remembering Is Like Reliving

By BENEDICT CAREY

Scientists have for the first time recorded individual brain cells in the act of summoning a spontaneous memory, revealing not only where a remembered experience is registered but also, in part, how the brain is able to recreate it.

The recordings, taken from the brains of epilepsy patients being prepared for surgery, demonstrate that these spontaneous memories reside in some of the same neurons that fired most furiously when the recalled event had been experienced. Researchers had long theorized as much but until now had only indirect evidence.

Experts said the study had all but closed the case: For the brain, remembering is a lot like doing (at least in the short term, as the research says nothing about more distant memories).

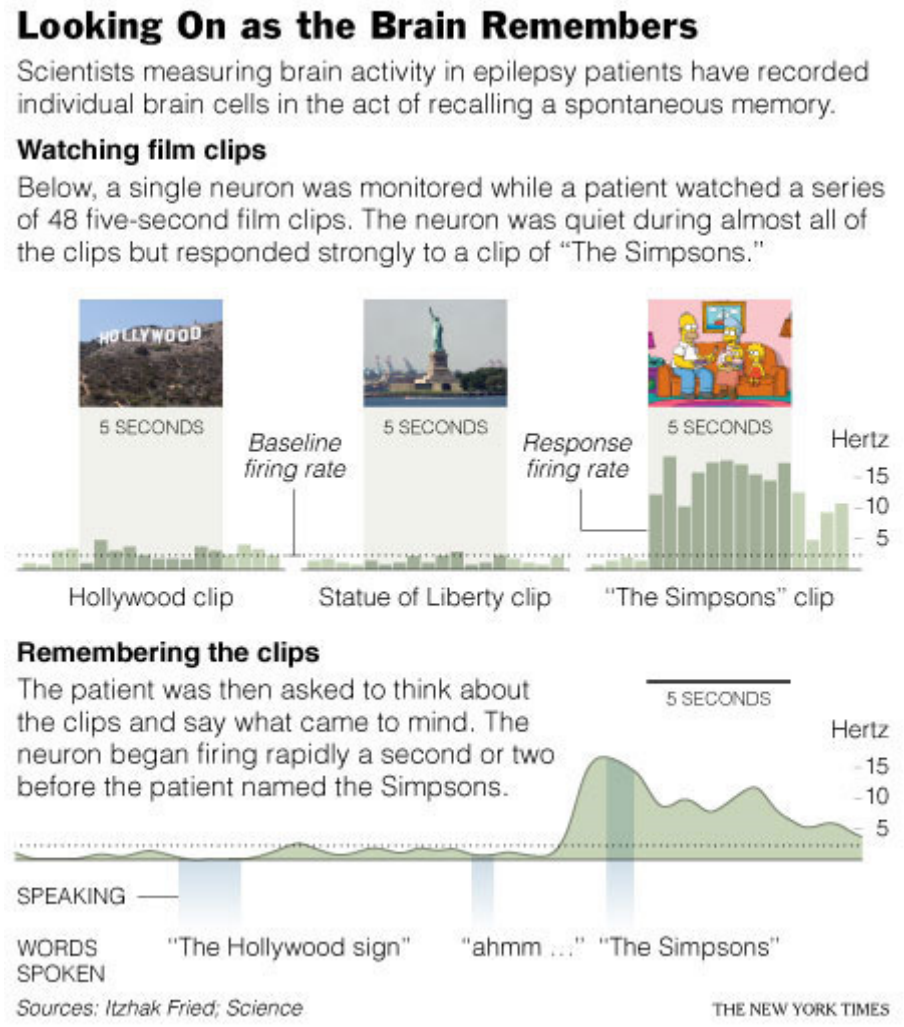
The experiment, being reported Friday in the journal Science, is likely to open a new avenue in the investigation of Alzheimer’s disease and other forms of dementia, some experts said, as well as help explain how some memories seemingly come out of nowhere. The researchers were even able to identify specific memories in subjects a second or two before the people themselves reported having them.

"This is what I would call a foundational finding," said Michael J. Kahana, a professor of psychology at the University of Pennsylvania, who was not involved in the research. "I cannot think of any recent study that's comparable.

"It's a really central piece of the memory puzzle and an important step in helping us fill in the detail of what exactly is happening when the brain performs this mental time travel" of summoning past experiences.

The new study moved beyond most previous memory research in that it focused not on recognition or recollection of specific symbols but on free recall — whatever popped into people's heads when, in this case, they were asked to remember short film clips they had just seen.

This ability to richly reconstitute past experience often quickly deteriorates in people with Alzheimer's and other forms of dementia, and it is fundamental to so-called episodic memory — the catalog of vignettes that together form our remembered past.



In the study, a team of American and Israeli researchers threaded tiny electrodes into the brains of 13 people with severe epilepsy. The electrode implants are standard procedure in such cases, allowing doctors to pinpoint the location of the mini-storms of brain activity that cause epileptic seizures.

The patients watched a series of 5- to 10-second film clips, some from popular television shows like "Seinfeld" and others depicting animals or landmarks like the Eiffel Tower. The researchers recorded the firing activity of about 100 neurons per person; the recorded neurons were concentrated in and around the hippocampus, a sliver of tissue deep in the brain known to be critical to forming memories.

In each person, the researchers identified single cells that became highly active during some videos and quiet during others. More than half the recorded cells hummed with activity in response to at least one film clip; many of them also responded weakly to others.

After briefly distracting the patients, the researchers then asked them to think about the clips for a minute and to report "what comes to mind." The patients remembered almost all of the clips. And when they recalled a specific one — say, a clip of Homer Simpson — the same cells that had been active during the Homer clip reignited. In fact, the cells became active a second or two before people were conscious of the memory, which signaled to researchers the memory to come.

"It's astounding to see this in a single trial; the phenomenon is strong, and we were listening in the right place," said the senior author, Dr. Itzhak Fried, a professor of neurosurgery at the University of California, Los Angeles, and the University of Tel Aviv.

His co-authors were Hagar Gelbard-Sagiv, Michal Harel and Rafael Malach of the Weizmann Institute of Science in Israel, and Roy Mukamel, of U.C.L.A.

Dr. Fried said in a phone interview that the single neurons recorded firing most furiously during the film clips were not acting on their own; they were, like all such cells, part of a circuit responding to the videos, including thousands, perhaps millions, of other cells.

In studies of rodents, including a paper that will also appear Friday in the journal Science, neuroscientists have shown that special cells in the hippocampus are sensitive to location, activating when the animal passes a certain spot in a maze. The firing pattern of these cells forms the animals' spatial memory and can predict which way the animal will turn, even if it makes a wrong move.

Some scientists argue that as humans evolved, these same cells adapted to register a longer list of elements - including possibly sounds, smells, time of day and chronology — when an experience occurred in relation to others.

Single-cell recordings cannot capture the entire array of circuitry involved in memory, which may be widely distributed beyond the hippocampus area, experts said. And as time passes, memories are consolidated, submerged, perhaps retooled and often entirely reshaped when retrieved later.

Though it did not address this longer-term process, the new study suggests that at least some of the neurons that fire when a distant memory comes to mind are those that were most active back when it happened, however long ago that was.

"The exciting thing about this," said Dr. Kahana, the University of Pennsylvania professor, "is that it gives us direct biological evidence of what before was almost entirely theoretical."

Functional food – delicious and healthy

Linseed is said to protect against cancer – but not everybody likes the taste. Researchers have now isolated the valuable components of the flax seeds. Incorporated in bread, cakes or dressings, they support the human organism without leaving an unpleasant aftertaste.

Cake that can ward off cancer? Noodles that lower the cholesterol level? What sounds like an advertising stunt could soon be a reality. Research scientists at the Fraunhofer Institute for Process Engineering and Packaging IVV in Freising have isolated valuable components of linseed and lupin seeds and experimentally incorporated them in various foodstuffs: the linseed in cakes, bread, dressings and sauces, the lupins in bread, rolls and pasta. The result is not only delicious, but healthy as well. "Flax is not only high in soluble fiber, but also contains lignans. These substances are phytoestrogens, so they have a similar effect to that of the isoflavones that we know from soy beans. According to the literature, they protect the organism against hormone-dependent forms of cancer – that is, breast and prostate cancer," says IVV project manager Dr. Katrin Hasenkopf. "The lupins, on the other hand, contain substances that our studies have found to have a positive impact on the cholesterol level."

But how do the researchers isolate the valuable components? "We make use of the differing solubility of the various constituents: If the pH value is acidic, the unwanted bitter substances are the first to dissolve. If the pH value is then set back to neutral, you get the valuable proteins – without the bitter taste. We are also able to separate large components from small ones by a series of filtration steps," explains Hasenkopf.

The scientists are already skilled at isolating the valuable constituents. Now they are preparing to conduct further investigations with the aim of confirming the effects they hope to see. "The healthy effects of linseed and lupin seeds are already known from literature, but so far there is a lack of conclusive scientific investigations on the subject. These substances undoubtedly have very high potential," says Hasenkopf. The researchers will be presenting the linseed and lupin foods at the Biotechnica trade fair in Hanover on October 7 through 9 (Hall 9, Stand E29). In about three years' time, the expert hopes, the new cholesterol-lowering foodstuffs will be available on supermarket shelves – maybe even including cakes, bread rolls and sauces enriched with the valuable substances obtained from flax seeds.

Patients will face delays in getting diagnostic scans due to severe shortage of imaging agents

Letter: Medical isotope supplies and nuclear medicine services

A global shortage of medical isotopes* used in over 80% of routine diagnostic nuclear imaging procedures such as heart imaging, bone scans and some cancer detection procedures, will cause delays and cancellations to diagnostic examinations across the UK and Europe in the next few weeks, predict experts on bmj.com today.

UK hospitals are receiving less than 50% of expected supplies and rations are expected to drop still further in the coming weeks, write Alan Perkins and colleagues from the British Nuclear Medicine Society.

According to the European Association of Nuclear Medicine European hospitals are already limited to only 20% of normal nuclear medical activities. The authors warn that if NHS managers in the UK aim to meet the six-week target for diagnostic waiting times by altering bookings on the basis of waiting times rather than clinical priority, some patients may receive sub-optimal treatment.

Currently Europe's three isotope production reactors are all shut down because of maintenance issues and European producers only have enough radioisotopes to last until September 8.

In addition, other reactors in Canada and South Africa have also been temporarily closed, leaving just the Australian reactor which, according to the authors, does not have enough potential to significantly increase supply to the world market.

The closure of the Canadian reactor for two months in 2007 for safety reasons affected over 50 000 patient examinations in the US.

The authors point out that this is not just a short term emergency. Most of the commercial reactors are around 40 years old and new production capacity is urgently needed to meet the increasing demands of isotopes for research, diagnosis and treatment.

They warn that urgent global investment in new reactor facilities is essential or these problems will continue and it will be the patients that suffer.

Notes to Editors:

Medical isotopes are small quantities of radioactive substances (radiopharmaceuticals) used in the imaging and treatment of disease. Radiopharmaceuticals are delivered directly to the site of diseased cells and can be tracked by imaging equipment providing additional information to procedures that just take an anatomical picture.

3T MRI leads to better diagnosis for focal epilepsy

3T MRI is better at detecting and characterizing structural brain abnormalities in patients with focal epilepsy than 1.5T MRI, leading to a better diagnosis and safer treatment of patients, according to a recent study conducted at the Oregon Health and Science University in Portland, OR. "Patients with focal epilepsy have recurrent seizures that result from a specific area of their brain, usually due to a structural brain abnormality," said Bronwyn E. Hamilton, MD, senior author of the study.

3T MRI detected 65 of 74 cases, compared to 55 of 74 cases detected by 1.5T MRI; lesions were accurately characterized in 63 of 74 cases using 3T MRI, compared to 51 of 74 cases using 1.5T MRI. "Detection refers to lesions that were found and characterization refers to how accurately we were able to determine what type of abnormality the lesion was, such as tumor versus vascular malformation versus congenital deformity," said Dr. Hamilton.

Epilepsy is a disease with serious consequences for patients and society. Surgery offers the potential for long term cure in patients, but "surgery can only be performed in patients who have a specific structural abnormality in the brain that is detected on an imaging study (usually MRI); since insurance companies may not pay for a second scan, it is preferable to obtain a 3T MRI the first go round," said Dr. Hamilton.

"I, and most of my radiology colleagues, in conjunction with the neurologists who specialize in epilepsy at our institution, feel that a patient with focal epilepsy is incompletely assessed without a 3T MRI, and will re-image patients with prior negative 1.5T MRI in order to feel more certain an abnormality has not been missed. We have had a number of patients who had gone undiagnosed with prior negative MRI scans who later underwent 3T MRI at our institution that either disclosed a structural brain abnormality or better characterized it for the surgeon," said Dr. Hamilton.

This study appears in the September issue of the American Journal of Roentgenology. For a copy of the full study, please contact Heather Curry via email at hcurry@arrs.org.

Snap-happy dieters reap benefits

* 05 September 2008

WATCHING what you eat really does help, at least if you do it through a camera lens. That's the conclusion of a study of dieters' eating habits comparing the effect of written food diaries with taking a snapshot of each meal.

Food diaries track food consumption during weight loss programmes, but now taking a snapshot of each meal is replacing the laborious task of writing down everything you eat. To see if photos might also prompt healthier eating, Lydia Zepeda and David Deal at the University of Wisconsin-Madison told 43 people to record what they ate for one week in words and as pictures.

When they quizzed the volunteers, photo diaries seemed to be the most effective. Not only did they provide powerful visual documentation of snack binges, they also triggered critical evaluation at just the right time - before the food was eaten *(International Journal of Consumer Studies, DOI: 10.1111/j.1470-6431.2008.00725.x).* "I had to think more carefully about what I was going to eat because I had to take a picture of it," was a typical response.

In contrast, written diaries are often completed long after the meal and do not create as powerful a reminder of the quantity and quality of the food that was eaten.

"Nutritionists see diaries as recording tools. Now they should explore the role of photo diaries as intervention tools," says Zepeda.

Study challenges routine use of MRI scans to evaluate breast cancer

Test is linked to delays in treatment, increase in mastectomy rates

WASHINGTON, DC -- A new study suggests women with newly-diagnosed breast cancer who receive an MRI after their diagnosis face delays in starting treatment and are more likely to receive a mastectomy. The study, presented today at the 2008 ASCO Breast Cancer Symposium, also shows that despite lack of evidence of their benefit, the routine use of MRI scans in women newly diagnosed increased significantly between 2004 and 2005, and again in 2006.

"We have yet to see any evidence that MRI improves outcomes when used routinely to evaluate breast cancer, and yet more and more women are getting these scans with almost no discernable pattern," said Richard J. Bleicher, M.D., F.A.C.S., a specialist in breast cancer surgery at Fox Chase Cancer Center. "For most women, an MRI scan prior to treatment is unnecessary. MRI can be of benefit because it's more sensitive, but with the high number of false positives and costs associated with the test, more studies are needed to determine whether MRI can improve outcomes in women with breast cancer."

Bleicher and his colleagues reviewed the records of 577 breast cancer patients seen in a multidisciplinary breast clinic where they were evaluated by a radiologist, pathologist, and a surgical, radiation, and medical oncologist. Of these patients, 130 had MRIs prior to treatment.

"Those who received an MRI had a three-week delay in the start of their treatment," said Bleicher. "In addition to the treatment delay, we're concerned that the well-documented false-positive rate with MRIs may be leading – or misleading – women into choosing mastectomies."

Bleicher said many of the women would have been candidates for a lesser procedure known as a lumpectomy. "There are a few reasons why we may be seeing higher mastectomy rates when MRIs are performed. An MRI scan is very sensitive, leading to a high number of false-positive findings. Rather than having a biopsy to see if those findings are real, women and their doctors may choose mastectomy out of an abundance of caution. Other studies have demonstrated that this often represents over-treatment because many of the mastectomies are later proven by pathology to have been unnecessary."

The study also revealed that younger women were more likely to have an MRI. "In our analysis, that trend didn't correspond with various breast cancer risk factors, such as a family history of breast or ovarian cancer, nor with the characteristics of their disease," explained Bleicher.

Another research conclusion included the failure of MRIs to help surgeons decrease positive margins during surgery, another hypothesized benefit of MRI.

"MRI is a valuable tool in some women, but without evidence that routine pre-treatment MRI improves a woman's outcome, its disadvantages suggest that it should not be a routine part of patient evaluation for treatment," said Bleicher. "Greater efforts to define MRI's limitations and use are needed."

This study was supported by a U.S. Public Health Service grant and by an appropriation from the Commonwealth of Pennsylvania. In addition to Bleicher, other authors include Robin M. Ciocca, D.O.; Brian L. Egleston, Ph.D.; Linda Sesa, N.P.; Kathryn Evers, M.D.; and Elin Sigurdson, M.D., Ph.D., of Fox Chase Cancer Center, and Monica Morrow, M.D., of Memorial Sloan-Kettering Cancer Center. The authors report no disclosures.

Steins: A diamond in the sky

The first images from Rosetta's OSIRIS imaging system and VIRTIS infrared spectrometer were derived from raw data this morning and have delivered spectacular results.

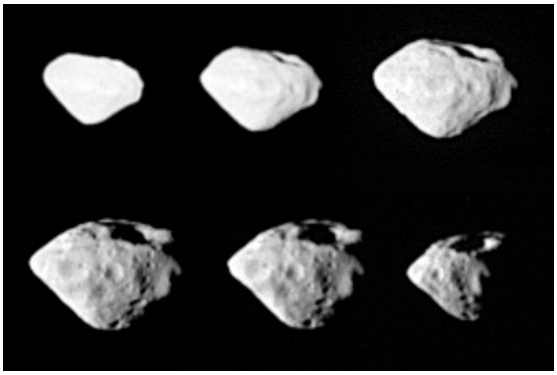
"Steins looks like a diamond in the sky," said Uwe Keller, Principal Investigator for the OSIRIS imaging system from the Max Planck Institut Fuer Sonnensystemforschung, Lindau.

Visible in the image are several small craters on the asteroid, and two huge ones, one of which is 2 km in diameter, indicating that the asteroid must be very old.

The images are 50 to 60 pixels in diameter, enough to characterise the shape and other characteristics of the body of the asteroid.

Rita Schulz, Rosetta Project Scientist, said, "In the images is a chain of impact craters, which must have formed from recurring impact as the asteroid rotated. The impact may have been caused by a meteoroid stream, or fragments from a shattered small body."

The chain is composed of about 7 craters. To determine the age of the asteroid, a count of the craters on the asteroid's surface has been started (the more the number of craters, the older the asteroid). So far, 23 craters have been spotted.



Steins getting closer (click for animation)

From the images, scientists will try and understand why the asteroid is unusually bright, and how fine grains of the surface regolith are. This will tell them more about how the asteroid formed.

Gerhard Schwehm, Mission Manager for Rosetta said, "It looks like a typical asteroid, but it is really fascinating how much we can learn from just the images. This is our first science highlight; we certainly have a lot of promising science ahead of us. I'm already looking forward to encountering our next diamond in the sky, the much bigger Lutetia."

The OSIRIS imaging system's Wide Angle Camera (WAC) worked perfectly through the fly-by.

The OSIRIS team expects that the images that they will retrieve from the Narrow Angle Camera (NAC) will be of comparable resolution. This will add to the detailed colour information and hence to knowledge of the surface composition.

Science team members noted that the Narrow Angle Camera (NAC) appears to have switched to safe mode a few minutes before closest approach, but switched back on after a few hours. The software is programmed to switch to safe mode when certain parameter thresholds are crossed to protect the camera. The team will concentrate investigating the reasons for this anomaly once the science data has been analysed.

After analysis of the Rosetta data, Steins will be one of the best-characterised asteroids so far.

Chauvinists less unnerving than ambiguous men

* 07 September 2008
* NewScientist.com news service

CHAUVINISTIC men can be petty and infuriating, but that might be as far as it goes. Women are more unnerved by not knowing a man's views than by overt sexism - so much so that they perform worse in exams.

Rodolfo Mendoza-Denton at the University of California, Berkeley, asked 170 female undergraduates to take a written test. Before the test they were randomly assigned to one of three empty offices, which they were told belonged to their male examiner. The fictional offices were furnished in one of three ways to allow the students to infer the examiner's view of women. They either had "progressive" decor such as a breast-cancer awareness banner, overtly sexist posters of women, or neutral objects such as a stack of papers.

Students who were sensitive to sexism, as measured by a separate questionnaire, scored worse if they had been in the supposedly neutral office. They were not fazed, though, by the chauvinist office, scoring better than less-sensitive peers (Journal of Experimental Social Psychology, DOI: 10.1016/j.jesp.2008.08.017).

"Ironically, if you 'know thy enemy', you've got a better chance of dealing with it than if you are constantly wondering if you will be judged unfairly," says Mendoza-Denton.

Indeed, previous studies suggest that black people prefer dealing with overtly racist whites than with those who behave ambiguously. Because overt racism and sexism has become socially unacceptable, prejudice has become more subtle, he concedes.