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NEWSLETTER

The following research articles can be found in their complete format at Science Daily.com. This research represents academic and clinical efforts which we believe would be of benefit for you to know and implement into your lives, as well as supporting many of the principles of Metaphorical Iconicity.

Praising Children for Their Personal Qualities May Backfire

Feb. 27, 2013 — **Praising children, especially those with low self-esteem, for their personal qualities rather than their efforts may make them feel more ashamed when they fail,** according to new research published by the American Psychological Association.

"This type of personal praise may backfire. **What may seem like common sense can sometimes lead adults astray in their attempts to help children with low self-esteem feel better about themselves,**" said lead researcher Eddie Brummelman, MS, of Utrecht University in the Netherlands. The study was published online in the *Journal of Experimental Psychology: General*.

The study found that children with low self-esteem often received praise for their personal qualities, and that type of praise can trigger greater feelings of shame from failure and may lead to a diminished sense of self-worth.

In one experiment, 357 parents in the Netherlands, ranging in age from 29 to 66, read six descriptions of hypothetical children -- three with high self-esteem (e.g., "Lisa usually likes the kind of person she is,") and three with low self-esteem (e.g., "Sarah is often unhappy with herself"). The participants were told to write down the praise they would give the child for completing an activity, such as drawing a picture. On average, the parents gave children with low self-esteem more than twice as much praise directed at personal qualities (e.g., "You're a great artist!") than they gave to children with high self-esteem. They also were more likely to praise children with high self-esteem for their efforts. (e.g., "You did a great job drawing!")

"Adults may feel that praising children for their inherent qualities helps combat low self-esteem, but it might convey to children that they are valued as a person only when they succeed," Brummelman said. "When children subsequently fail, they may infer they are unworthy."

A second experiment illustrated that point. The researchers recruited 313 children (54 percent girls) ranging in age from 8 to 13 from five public elementary schools in the Netherlands. Several days before the experiment, the students completed a standard test that measures self-esteem. For the experiment, the children were told they would play an online reaction time game against a student from another school and that a webmaster would be monitoring their performance via the Internet. In reality, the computer controlled the outcome of the game, and the children were divided into winners and losers, including groups that received praise for themselves, praise for their efforts, or no praise.

In the group where the children were praised for their personal qualities, the webmaster wrote, "Wow, you're great!" after the students completed one round of the game, whereas the children whose actions were praised were told, "Wow, you did a great job!" The group that received no praise served as a control. After a second round, the children were told they either won or lost the game, and they completed a survey about their feelings of shame. Children who lost the game experienced a sharp increase in shame if they had been praised for their personal qualities, especially if they had low self-esteem, compared to the other groups.

The researchers theorized that children who are praised for their efforts may not associate their self-worth with success, so failure is viewed as a temporary setback or a lack of effort rather than a flaw in their character. Brummelman said the study results may apply generally to children from most Western countries, including the United States, but the results may be less applicable to Eastern countries, such as China, where adults may use different approaches for praising children.

The differences between praising a person and praising his or her efforts may be very subtle, but those differences can have a big impact on children's self-esteem, said study co-author Brad Bushman, PhD, a communication and psychology professor at The Ohio State University. Therefore, parents and teachers should focus on praising children for their efforts rather than their personal qualities, he added.

"In general, it is better to praise the behavior rather than the individual," Bushman said. "If you praise the individual and he fails, it can cause shame and may inadvertently send the message, 'I am a bad person.'"

First Grade Math Skills Set Foundation for Later Math Ability

Feb. 27, 2013 — **Children who failed to acquire a basic math skill in first grade scored far behind their peers by seventh grade on a test of the mathematical abilities needed to function in adult life**, according to researchers supported by the National Institutes of Health. The basic math skill, number system knowledge, is the ability to relate a quantity to the numerical symbol that represents it, and to manipulate quantities and make calculations. This skill is the basis for all other mathematics abilities, including those necessary for functioning as

an adult member of society, a concept called numeracy. The researchers reported that **early efforts to help children overcome difficulty in acquiring number system knowledge could have significant long-term benefits**. They noted that more than 20 percent of U.S. adults do not have the eighth grade math skills needed to function in the workplace.

"An early grasp of quantities and numbers appears to be the foundation on which we build more complex understandings of numbers and calculations," said Kathy Mann Koepke, Ph.D., director of the Mathematics and Science Cognition and Learning: Development and Disorders Program at the Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD), the NIH institute that sponsored the research. "Given the national priority on education in science, technology, engineering and math fields, it is crucial for us to understand how children become adept at math and what interventions can help those who struggle to build these skills."

Senior author David C. Geary, Ph.D., of the University of Missouri, Columbia, conducted the research with colleagues Mary K. Hoard, Ph.D., and Lara Nugent, and with Drew H. Bailey, Ph.D., of Carnegie Mellon University, Pittsburgh. The study appears online in *PLoS One*.

These results are part of a long-term study of children in the Columbia, Mo., school system. Initially, first graders from 12 elementary schools were evaluated on their number system knowledge. Number system knowledge encompasses several core principles:

- Numbers represent different magnitudes (five is bigger than four).
- Number relationships stay the same, even though numbers may vary. For example, the difference between 1 and 2 is the same as the difference between 30 and 31.
- Quantities (for example, three stars) can be represented by symbolic figures (the numeral 3).
- Numbers can be broken into component parts (5 is made up of 2 and 3 or 1 and 4).

The researchers also evaluated such cognitive skills as memory, attention span, and general intelligence.

The researchers found that by seventh grade, children who had the lowest scores on an assessment of number system knowledge in first grade lagged behind their peers. They noted that these differences in numeracy between the two groups were not related to intelligence, language skills or the method students used to make their computations.

For the testing at age 13, 180 of the students took timed assessments that included multiple-digit addition, subtraction, multiplication, and division problems; word problems; and comparisons and computations with fractions. Previous studies have shown that these tests evaluate functional numeracy—skills that adults need to join and succeed in the workplace. This might include the limited understanding of algebra needed to make change such as being able to provide an answer to a question such as: "If an item costs \$1.40 and you give the clerk \$2, how many quarters and how many dimes should you get back?" Other aspects of functional numeracy include the ability to manipulate fractions, as when doubling the ingredients in a recipe (for example, adding 1 ½ cups water when doubling a recipe that calls for ¾ cups water) or finding the center of a wall when wanting to center a painting or a shelf.

The researchers' analysis showed that a low score on the assessment of number system knowledge in first grade significantly increased a student's risk of getting a low functional numeracy score as a teenager.

The researchers examined learning and found that first graders with the lowest scores also had the slowest growth in number system knowledge throughout that school year. Starting with poor number knowledge can put children so far behind that they never catch up, the researchers said.

"These findings are especially valuable for bringing attention to the idea that numeracy early in life has profound effects not only for the individual, but also for the society that individual works and lives in," Dr. Mann Koepke said.

Research Explores Factors That Impact Adolescent Mental Health

Feb. 27, 2013 — Research indicates that **half of all lifetime cases of mental illness begin by age 14, well before adulthood.** Three new studies investigate the cognitive, genetic and environmental factors that may contribute to mental health disorders in adolescence. The studies are published in *Psychological Science* and *Clinical Psychological Science*, journals of the Association for Psychological Science.

Social-Information-Processing Patterns Mediate the Impact of Preventive Intervention on Adolescent Antisocial Behavior *Kenneth A. Dodge, Jennifer Godwin, and The Conduct Problems Prevention Research Group*

Fast Track is a preventive intervention designed to help children who show aggression at an early age. The intervention addresses kids' social-cognitive processes in several ways, including **social-skill training groups, parent groups, and classroom curricula.** In this study, the researchers investigated the processes underlying this intervention's success. A total of 891 kindergarteners who were at high risk for adolescent antisocial behavior were randomly assigned to receive either the Fast Track intervention or a control program. The data revealed that children in the intervention showed decreased levels of antisocial behavior at the end of 9th grade, which was driven, in part, **by improvement on three specific social-cognitive processes.** These results suggest that **social-cognitive processes may play an important role in the development of antisocial behavior in youth.**

Published online February 13, 2013 in *Psychological Science*

A Comparison of Two Models of Urgency: Urgency Predicts Both Rash Action and Depression in Youth *Gregory T. Smith, Leila Guller, and Tamika C.B. Zapolski*

Smith and colleagues **test two competing theories concerning the trait of urgency.** One theory posits that **urgency reflects the people's tendency to act rashly or impulsively when they're emotional.** Another theory suggests that **urgency reflects a general responsiveness to emotions that can lead to rash action (such as heavy drinking or binge eating) or ill-advised inaction (which is associated with symptoms of depression).**

In previous research, Smith and colleagues found that **urgency levels in 5th grade predicted addictive behaviors (including alcohol consumption, binge eating, and smoking) in 6th grade, which is consistent with both theories.** In this study, the researchers found that **level of urgency in 5th grade also predicted higher levels of depression at the end of 6th grade.** These results support the view that **urgency can lead either to rash action or ill-advised inaction.** The researchers conclude that urgency may be an important trait in various diagnoses, across both internalizing and externalizing disorders. Published online February 15, 2013 in *Clinical Psychological Science*

Genetic and Environmental Influences on Rumination, Distraction, and Depressed Mood in Adolescence *Mollie N. Moore, Rachel H. Salk, Carol A. Van Hulle, Lyn Y. Abramson, Janet S. Hyde, Kathryn Lemery-Chalfant, and H. Hill Goldsmith*

About one in 10 adolescents will experience major depression or dysthymia by age 18. Rumination, the process of dwelling on one's feelings and problems, is an established cognitive risk factor for depression. In this study, Moore and colleagues investigated whether response styles associated with rumination might **account for some of the genetic vulnerability associated with depression.** A total of 756 adolescent twins ages 12 to 14 completed the Response Styles Questionnaire and several measures of depressive symptoms. Brooding was positively correlated with depressive symptoms, while distraction was negatively correlated with the symptoms. **About 54% of the variation in depression symptoms could be attributed to genetic variation, while 37% of the variation in reflection and 30% of the variation in distraction were accounted for by genetic variation.** Further analyses showed that **individual differences in distraction share both genetic and environmental sources of variation with depression.** Together, these results suggest that **the same genetic factors that contribute to distraction may protect against depression.**

Lipid Researcher, 98, Reports On the Dietary Causes of Heart Disease

Feb. 27, 2013 — A 98-year-old researcher argues that, **contrary to decades of clinical assumptions and advice to patients, dietary cholesterol is good for your heart -- unless that cholesterol is unnaturally oxidized (by frying foods in reused oil, eating lots of polyunsaturated fats, or smoking).**

The researcher, Fred Kummerow, an emeritus professor of comparative biosciences at the University of Illinois, has spent more than six decades studying the dietary factors that contribute to heart disease. In a new paper in the *American Journal of Cardiovascular Disease*, he reviews the research on lipid metabolism and heart disease with a **focus on the consumption of oxidized cholesterol -- in his view a primary contributor to heart disease.**

"Oxidized lipids contribute to heart disease both by increasing deposition of calcium on the arterial wall, a major hallmark of atherosclerosis, and by interrupting blood flow, a major contributor to heart attack and sudden death," Kummerow wrote in the review.

Over his 60-plus-year career, Kummerow has painstakingly collected and analyzed the findings that together reveal the underlying mechanisms linking oxidized cholesterol (and trans fats) to heart disease. Many of Kummerow's insights come from his relentless focus on the physical and biochemical changes that occur in the arteries of people with heart disease. For example, he has worked with surgeons to retrieve and examine the arteries of people suffering from heart disease, and has compared his findings with those obtained in animal experiments.

He and his colleagues first reported in 2001 that the arteries of people who had had bypass operations contained elevated levels of sphingomyelin (SFING-oh-my-uh-lin), one of several phospholipids (phosphate-containing lipids) that make up the membranes of all cells. The bypass patients also had significantly more oxidized cholesterol (oxysterols) in their plasma and tissues than people who had not been diagnosed with heart disease.

Human cells incubated with the blood plasma of the cardiac patients also picked up significantly more calcium from the culture medium than cells incubated in the plasma of healthy patients. When the researchers added oxysterols to the healthy plasma, the proportion of sphingomyelin in the cells increased, as did the uptake of calcium.

Earlier research, including studies conducted by medical pioneer Michael DeBakey, noted that the most problematic plaques in patients with heart disease occurred at the branch-points of the arteries of the heart. Kummerow followed up on these reports by looking at the phospholipid content of the arterial walls in pigs and humans. He found (and reported in 1994) that the branch points of the arteries in humans and in swine also had significantly more sphingomyelin than other regions of the same arteries.

For Kummerow, the increase in sphingomyelin was a prime suspect in the blocked and calcified arteries of the cardiac patients. He had already found that the arteries of the newborn human placenta contained only about 10 percent sphingomyelin and 50 percent phosphatidylcholine (FOSS-fuh-tih-dul-COH-lean), another important phospholipid component of cell membranes.

"But when we looked at the arteries of people who had had bypass operations, we found up to 40 percent sphingomyelin and about 27 percent phosphatidylcholine," Kummerow said. "It took us many more years to discover that when you added large amounts of oxysterols to the cells, then the phosphatidylcholine changed to sphingomyelin."

Further evidence supported sphingomyelin's starring role in atherosclerosis. When Kummerow and his colleagues compared the blocked and unblocked arteries of patients needing second bypass operations, they found that the arteries with blockages contained twice as much sphingomyelin as the unblocked arteries. The calcium content of the blocked arteries (6,345 parts per million) was also much higher than that of the unblocked arteries (182 ppm).

Other studies had demonstrated a link between increases in sphingomyelin and the deposit of calcium in the coronary arteries. The mechanism by which this occurred was unclear, however. Kummerow's team searched the literature and found a 1967 study that showed that in the presence of certain salts (in the blood, for example), lipids like sphingomyelin develop a negative charge. This explains the attraction of the positively charged calcium to the arterial wall when

high amounts of sphingomyelin are present, Kummerow said. "So there was a negative charge on the wall of this artery, and it attracted calcium from the blood until it calcified the whole artery," he said.

Oxidized fats contribute to heart disease (and sudden death from heart attacks) in an additional way, Kummerow said. He and his collaborators found that when the low-density lipoprotein (LDL, the so-called "bad cholesterol") is oxidized, it increases the synthesis of a blood-clotting agent, called thromboxane, in the platelets.

If someone eats a diet rich in oxysterols and trans fats and also smokes, he or she is endangering the heart in three distinct ways, Kummerow said. The oxysterols enhance calcification of the arteries and promote the synthesis of a clotting agent. And the trans fats and cigarette smoke interfere with the production of a compound, prostacyclin, which normally keeps the blood fluid. "And that causes 600,000 deaths in this country each year," Kummerow said.

Kummerow is the author of "Cholesterol Won't Kill You, But Trans Fats Could."

Name Your Neighborhood, Define Your Health?

Feb. 27, 2013 — Suburbs, countryside, or city. Most of us make a choice and settle down. But others, particularly **those living in poverty, don't always get to make that choice -- the choice that could actually determine our quality and length of life.**

Johns Hopkins University School of Nursing (JHUSON) PhD Candidate Laura Samuel was first intrigued by the topic of environment and health when she worked as a family nurse practitioner. Samuel could see the way **poverty was placing some of her patients at risk for disease and disability. "It didn't take long for me to realize that poverty needed to be addressed as a fundamental determinant of health,"** she says.

Taking this health challenge on as her research dissertation at the JHUSON, she is examining just how our environment and its characteristics may actually improve -- or hurt -- our health. Samuel chose to analyze how factors of social integration (neighborhood social cohesion, emotional support, loneliness) and socioeconomic status might impact people's rates of smoking, physical activity, and diet -- and ultimately change their cardiovascular health. "We know that these three behaviors are the underlying causes that account for over one-third of deaths in the U.S.," says Samuel. "But it's also important to know whether our income or our feelings of neighborhood unity or alienation can actually affect these behaviors, and in turn our quality of life."

Studies show that in many cities across the nation, life expectancy can differ by 10 years across neighborhoods -- even those side by side. So do socioeconomic and social integration factors make a difference in these numbers? That's what Samuel is hoping to find out. While there is still much research to be done, Samuel already knows that the solution won't be one size fits all. "If we really want to address socio-economic disparities, we need to tailor our interventions to specific individuals and communities. We need to consider people's social networks, their socioeconomic status, and the social context in which they live their day-to-day lives."

Study Connects Early Childhood With Pain, Depression in Adulthood

Feb. 27, 2013 — It's common knowledge that a **child who misses a meal can't concentrate in school. But what happens years down the road? Does that missed meal have any bearing on health in adulthood?** A new University of Nebraska-Lincoln study shows that **missed meals in childhood can be linked to experiencing pain and depression in adulthood.** Depression and chronic pain are experienced by 44 percent of working-aged adults and the study shows a **correlation between childhood conditions and pain and depression in adulthood.**

The study by UNL sociologist Bridget Goosby examines how childhood socioeconomic disadvantages and maternal depression increase the risk of major depression and chronic pain in working-aged adults. Goosby examined a survey of 4,339 adults from the National Comorbidity Survey Replication looking for a relationship between circumstances in childhood and physical and mental health in working-age adults. She specifically looked at data from adults 25 to 64 years old.

Goosby said she was surprised to find that experiencing hunger in childhood can lead to chronic pain and depression in adulthood. "The most robust child socioeconomic condition was experiencing hunger," Goosby said. "Kids who missed meals have a much higher risk of experiencing pain and depression in adulthood." Goosby said pain and depression are biologically linked in medical literature and childhood conditions are strongly correlated with the risk of experiencing depression.

"Childhood conditions that are strongly correlated with the risk of experiencing depression in adulthood, may in fact, also be similar to the childhood conditions that are correlated with chronic pain in adulthood," Goosby said. The study also found that maternal depression had a correlation with adults having depression later in life. "Mother's depression mattered across the board," Goosby said. "You're at a higher risk for depression and physical pain if your mother had major depression."

Goosby said she was interested in whether childhood disadvantage amplified the risk of experiencing chronic pain or depression in adulthood. In the study, Goosby noted that those who grew up with parents with less than 12 years of education had a much higher risk of experiencing chronic pain compared to adults with more highly educated parents, a disparity that becomes evident after age 42 and grew larger over time. "Adults with parents who have 12 or fewer years of education show substantially larger risks of experiencing chronic pain in adulthood compared to adults with more highly educated parents," Goosby said.

With this information, Goosby said she hopes policymakers will pay attention to creating more healthy family dynamics in society and that the study's results will give policymakers a reason to examine circumstances in early childhood more closely.

"They can use this information to say we have growing evidence that childhood circumstances affect adult health outcomes," she said. "People's choices are constrained by their environments in which they live. We need to create healthy conditions for families."

Trust Makes You Delusional and That's Not All Bad: Trusting Partners Remember Transgressions in Ways That Benefit the Relationship

Feb. 27, 2013 — **Trust fools you into remembering that your partner was more considerate and less hurtful than he or she actually was.** New research from Northwestern University and Redeemer University College (Ontario, Canada) is the first to systematically examine **the role of trust in biasing memories of transgressions in romantic partnerships.**

People who are highly trusting tended to remember transgressions in a way that benefits the relationship, remembering partner transgressions as less severe than they originally reported them to be. People low on trust demonstrated the opposite pattern, remembering partner transgressions as being more severe than how they originally reported them to be.

"One of the ways that trust is so good for relationships is that it makes us partly delusional," said Eli J. Finkel, co-author of the study and professor of psychology at Northwestern. Laura B. Luchies, lead author of the study, said the current psychological reality of your relationship isn't what actually happened in the past, but rather the frequently distorted memory of what actually happened. "You can remember your partner as better or as worse than he/she really was, and those biased memories are important determinants of how you think about your partner and your relationship," she said.

Researchers have long known that trust is crucial to a well-functioning relationship. "This research presents a newer, deeper understanding," Finkel said. "It reveals that trust yields relationship-promoting distortions of the past." Said Luchies, assistant professor of psychology at Redeemer University College: "If you talk to people who really trust their partner now, they forget some of the negative things their partner did in the past. If they don't trust their partner much, they remember their partner doing negative things that the partner never actually did. They tend to misremember."

Persistent Negative Attitude Can Undo Effectiveness of Exposure Therapy for Phobias

Feb. 26, 2013 — **Because confronting fear won't always make it go away, researchers suggest that people with phobias must alter memory-driven negative attitudes about feared objects or events to achieve a more lasting recovery from what scares them the most.**

Ohio State University psychology researchers determined that **people who retained negative attitudes about public speaking after exposure therapy were more likely to experience a return of their fear a month later than were people whose attitudes were less negative. The fear returned among those with unchanged attitudes even if they showed improvement during the treatment.**

The scientists also developed a way to evaluate attitudes immediately after the completion of exposure therapy. The tool both confirms their argument that persistent negative attitudes can undo therapy's effects and offers clinicians a way to assess whether a few more sessions of treatment might be in order.

It is well known among psychologists that the return of fear is common in the months after exposure therapy for people with phobias. The Ohio State scientists say this could be because the treatment tends to focus on building skills to fight the fear. What sometimes remains unaddressed is the automatic negative attitude that plagues the average person with a phobia.

These attitudes are based on such a powerful association between a feared object -- say, a spider -- and a negative feeling about the species so strong that a person with a phobia can't see or even think about a spider without experiencing that automatic negative reaction, which leads to avoidance behavior.

"In exposure therapy, people can learn some skills to control the negativity and fear that got automatically activated and be able to perform well despite that activation. But if that's all that happens, then the person may still very likely have a problem because there will be situations where their confidence will end up being eroded, they won't be able to manage their fear and they will have a failure experience," said Russell Fazio, professor of psychology at Ohio State and a senior author of the study.

"The other thing treatment can do is actually change the likelihood that that negativity or fear is automatically activated when one is placed in that situation. We argue that treatment will provide more persistent improvement if it succeeds in changing that attitude representation. "Overall, we'd like to see if clinicians can get people to view success in therapy not as a limited experience, but instead as an opportunity to really learn something about themselves. To the extent that we promote that generalization, we're going to promote attitude change," he said.

Phobias affect nearly 9 percent of American adults, or about 20 million people, according to the National Institute of Mental Health. The research is published in a recent issue of the journal *Behaviour Research and Therapy*.

The study involved 40 adults ranging in age from 18 to 46 years who met criteria for social anxiety disorder in the context of public speaking. Fazio and colleagues measured their fear and attitudes with a variety of questionnaires, and also recorded participants' heart rate and subjective units of distress, a rating scale from no anxiety to extreme anxiety, while they were delivering a speech at various time points in the study.

In the treatment, each participant was given three minutes to prepare a five-minute speech on two topics selected at random. They delivered the speeches without notes before a small live audience and in front of a video camera. The overall treatment included an initial discussion about public speaking anxiety and four of these exposure trials.

Participants also completed the critical assessment tool, called the Personalized Implicit Association Test, before and after treatment. The test was modified specifically for this study based on Fazio's longstanding research program on these kinds of automatic evaluations.

Essentially, the test measured the ease with which participants could associate "public speaking" with "things I like" versus "things I don't like." Researchers used the test to gauge any change in the attitude about public speaking as a result of the exposure trials. The advantage of the measurement approach, Fazio said, is that it provides a snapshot of individuals' attitudes toward public speaking without requiring them to assess and report their feelings.

Statistical analysis showed that on average, all participants' fear was reduced after completion of the treatment based on numerous measures. But one month later, an average of 49.2 percent of participants had experienced a return of their fear -- and results of the association test showed that people with persistent negative attitudes were the ones whose fear of public speaking returned.

Two measures in particular were traced to participants whose attitudes remained negative -- heart rate and anticipatory anxiety. Both measures were more likely to be elevated at the one-month follow-up in participants whose post-treatment association tests indicated that they still felt negative about public speaking.

Why is such an assessment beneficial? Fazio noted that people who devote time to a treatment program want to believe it's working. They also tend to want to please their therapists.

"There is a lot of pressure to believe and to report that it is going well," Fazio said. "Another part is people are not very well calibrated at reporting the extent to which they've improved. So there's value in having another way of getting inside the person's head."

What this study does not reveal, however, is who is more likely to retain the automatic negative attitude and whose attitude is more likely to change as a function of treatment.

Exposure therapy is considered effective because it forces people with phobias to stop avoiding what they fear and allows them to learn that they can encounter what they fear and survive. Fazio and colleagues hope to extend this work by developing supplemental components in exposure therapy that would more explicitly attack the activation of negative attitudes. This work was

supported by the National Institute of Mental Health. Co-authors include Michael Vasey, Casaundra Harbaugh, Adam Buffington and Christopher Jones, all of Ohio State's Department of Psychology.

Eat Too Much? Maybe It's in the Blood

Feb. 26, 2013 — **Bone marrow cells that produce brain-derived neurotrophic factor (BDNF), known to affect regulation of food intake, travel to part of the hypothalamus in the brain where they "fine-tune" appetite**, said researchers from Baylor College of Medicine and Shiga University of Medical Science in Otsu, Shiga, Japan, in a report that appears online in the journal *Nature Communications*.

"We knew that blood cells produced BDNF," said Dr. Lawrence Chan, professor of molecular and cellular biology and professor and chief of the division of diabetes, endocrinology & metabolism in the department of medicine and director of the federally funded Diabetes Research Center, all at BCM. **The factor is produced in the brain and in nerve cells as well. "We didn't know why it was produced in blood cells."**

Dr. Hiroshi Urabe and Dr. Hideto Kojima, current and former postdoctoral fellows in Chan's laboratory respectively, looked for BDNF in the brains of mice who had not been fed for about 24 hours. The bone marrow-derived cells had been marked with a fluorescent protein that showed up on microscopy. **To their surprise, they found cells producing BDNF in a part of the brain's hypothalamus called the paraventricular nucleus.**

"We knew that in embryonic development, some blood cells do go to the brain and become microglial cells," said Chan. (Microglial cells form part of the supporting structure of the central nervous system. They are characterized by a nucleus from which "branches" expand in all directions.) **"This is the first time we have shown that this happens in adulthood. Blood cells can go to one part of the brain and become physically changed to become microglial-like cells."**

However, these bone marrow cells produce a bone marrow-specific variant of BDNF, one that is different from that produced by the regular microglial cells already in the hypothalamus. Only a few of these blood-derived cells actually reach the hypothalamus, said Chan. "It's not very impressive if you look casually under the microscope," he said. However, a careful scrutiny showed that the branching nature of these cells allow them to come into contact with a whole host of brain cells. "Their effects are amplified," said Chan.

Mice that are born lacking the ability to produce blood cells that make BDNF overeat, become obese and develop insulin resistance (a lack of response to insulin that affects the ability to metabolize glucose). A bone marrow transplant that restores the gene for making the cells that produce BDNF can normalize appetite, said Chan. However, a transplant of bone marrow that does not contain this gene does not reverse overeating, obesity or insulin resistance.

When normal bone marrow cells that produce BDNF are injected into the third ventricle (a fluid-filled cavity in the brain) of mice that lack BDNF, they no longer have the urge to overeat, said Chan. All in all, the studies represent a new mechanism by which these bone-marrow derived cells control feeding through BDNF and could provide a new avenue to attack obesity, said Chan.

He and his colleagues hypothesize that the bone marrow cells that produce BDNF fine tune the appetite response, although a host of different appetite-controlling hormones produced by the regular nerve cells in the hypothalamus do the lion's share of the work.

"Bone marrow cells are so accessible," said Chan. "If these cells play a regulatory role, we could draw some blood, modify something in it or add something that binds to blood cells and give it back. We may even be able to deliver medication that goes to the brain," crossing the blood-brain barrier. Even a few of these cells can have an effect because their geometry means that they have contact with many different neurons or nerve cells.

He credits Urabe and Kojima (now with Shiga University of Medical Science in Japan) with doing most of the experiments involved in the research.

Sleep Reinforces Learning: Children's Brains Transform Subconsciously Learned Material Into Active Knowledge

Feb. 26, 2013 — **During sleep, our brains store what we have learned during the day – a process even more effective in children than in adults**, new research shows. It is important for children to get enough sleep. **Children's brains transform subconsciously learned material into active knowledge while they sleep -- even more effectively than adult brains do**, according to a study by Dr. Ines Wilhelm of the University of Tübingen's Institute for Medical Psychology and Behavioral Neurobiology. Dr Wilhelm and her Swiss and German colleagues have published their results in *Nature Neuroscience*.

Studies of adults have shown that sleeping after learning supports the long-term storage of the material learned, says Dr Wilhelm. During sleep, memory is turned into a form that makes future learning easier; implicit knowledge becomes explicit and therefore becomes more easily transferred to other areas.

Children sleep longer and deeper, and they must take on enormous amounts of information every day. In the current study, the researchers examined the ability to form explicit knowledge via an implicitly-learned motor task. Children between 8 and 11, and young adults, learned to guess the predetermined series of actions -- without being aware of the existence of the series itself. Following a night of sleep or a day awake, the subjects' memories were tested. The result: after a night's sleep, both age groups could remember a larger number of elements from the row of numbers than those who had remained awake in the interim. And the children were much better at it than the adults.

"In children, much more efficient explicit knowledge is generated during sleep from a previously learned implicit task, says Wilhelm. And the children's extraordinary ability is linked with the large amount of deep sleep they get at night. "The formation of explicit knowledge appears to be a very specific ability of childhood sleep, since children typically benefit as much or less than adults from sleep when it comes to other types of memory tasks."

Doing Good Is Good for You: Volunteer Adolescents Enjoy Healthier Hearts

Feb. 25, 2013 — **Giving back through volunteering is good for your heart, even at a young age**, according to University of British Columbia researchers. For their study, published February 25 in the journal *JAMA Pediatrics*, researchers from UBC's Faculty of Education and Department of Psychology wanted to find out how volunteering might impact physical health among adolescents.

"It was encouraging to see how a social intervention to support members of the community also improved the health of adolescents," says Hannah Schreier, who conducted this research during her doctoral studies at UBC.

Researchers split 106 Grade 10 students from an urban, inner-city Vancouver high school into two groups -- a group that volunteered regularly for 10 weeks and a group that was wait-listed for volunteer activities. The researchers measured the students' body mass index (BMI), inflammation and cholesterol levels before and after the study. They also assessed the students' self-esteem, mental health, mood, and empathy.

The volunteer group of students spent one hour per week working with elementary school children in after-school programs in their neighborhood. After 10 weeks they had lower levels of inflammation and cholesterol and lower BMIs than the students who were wait-listed.

"The volunteers who reported the greatest increases in empathy, altruistic behaviour and mental health were the ones who also saw the greatest improvements in their cardiovascular health," says Schreier, now a postdoctoral fellow at the Icahn School of Medicine at Mount Sinai in New York.

Cardiovascular disease is one of the leading causes of mortality in Canada and the United States. The first signs of the disease can begin to appear during adolescence. Previous studies show that psychosocial factors, such as stress, depression and wellbeing, play a role in the disease.

Mouse Mothers Induce Parenting Behaviors in Fathers With Ultra-Sonic Noises

Feb. 25, 2013 — Researchers at Japan's Kanazawa University have **demonstrated the existence of communicative signalling from female mice that induces male parental behaviour**. This research is also described in the February issue of the Kanazawa University Research Bulletin. Most mammalian parents use communicative signals between the sexes, but it is uncertain whether such signals affect the levels of parental care in fathers. Scientists have long suspected that female mice play a definite role in encouraging paternal relationships between male mice and their pups.

Now, a research team at Kanazawa University led by Haruhiro Higashida in collaboration with scientists across Japan, Russia and the UK, have **proven the existence of auditory and olfactory (smell) signals produced by females which actively trigger paternal activity in males**.

Higashida and his team conducted a series of experiments with females and males living in established family groups. Pups were removed from the cage for a short time, while one or both parents remained in the nest. The pups were then returned to the cage, away from the nest. Lone females nearly always brought the pups back to the nest, but lone males were less likely to do so.

Most interestingly, the researchers showed that males were much more likely to retrieve pups when they remained with their mate. This behaviour may be related to ultra-sonic noises emitted by females under stress. These sounds are not emitted by males, pups or non-parental females, and they encouraged the males into parental behaviours. The females also released olfactory signals in the form of pheromones, which triggered the same reaction in the males.

Higashida and his team are keen to expand on their results by analyzing neural signalling in the male brain in response to these female communications.

Pain from the Brain: Diseases Formerly Known as 'Hysterical' Illnesses

Feb. 24, 2013 — **Psychogenic diseases, formerly known as 'hysterical' illnesses, can have many severe symptoms such as painful cramps or paralysis but without any physical explanation**. However, new research from the University of Cambridge and UCL (University College London) suggests that **individuals with psychogenic disease, that is to say physical illness that stems from emotional or mental stresses, do have brains that function differently**. The research was published February 25, in the journal *Brain*.

Psychogenic diseases may look very similar to illnesses caused by damage to nerves, the brain or the muscles, or similar to genetic diseases of the nervous system. However, unlike organic

diseases, psychogenic diseases do not have any apparent physical cause, making them difficult to diagnose and even more difficult to treat.

"The processes leading to these disorders are poorly understood, complex and highly variable. As a result, treatments are also complex, often lengthy and in many cases there is poor recovery. In order to improve treatment of these disorders, it is important to first understand the underlying mechanism," said Dr James Rowe from the University of Cambridge.

The study looked at people with either psychogenic or organic dystonia, as well as healthy people with no dystonia. Both types of dystonia caused painful and disabling muscle contractions affecting the leg. **The organic patient group had a gene mutation (the DYT1 gene) that caused their dystonia. The psychogenic patients had the symptoms of dystonia but did not have any physical explanation for the disease, even after extensive investigations.**

The scientists performed PET brain scans on the volunteers at UCL, to measure the blood flow and brain activity of both of the groups, and healthy volunteers. The participants were scanned with three different foot positions: resting, moving their foot, and holding their leg in a dystonic position. The electrical activity of the leg muscles was measured at the same time to determine which muscles were engaged during the scans.

The researchers found that **the brain function of individuals with the psychogenic illness was not normal. The changes were, however, very different from the brains of individuals with the organic (genetic) disease.** Dr Anette Schrag, from UCL, said: **"Finding abnormalities of brain function that are very different from those in the organic form of dystonia opens up a way for researchers to learn how psychological factors can, by changing brain function, lead to physical problems."**

Dr Rowe added: "What struck me was just how very different the abnormal brain function was in patients with the genetic and the psychogenic dystonia. Even more striking was that the differences were there all the time, whether the patients were resting or trying to move."

Additionally, the researchers found that **one part of the brain previously thought to indicate psychogenic disease is unreliable: abnormal activity of the prefrontal cortex was thought to be the hallmark of psychogenic diseases.** In this study, the scientists showed that **this abnormality is not unique to psychogenic disease, since activity was also present in the patients with the genetic cause of dystonia when they tried to move their foot.**

Dr Arpan Mehta, from the University of Cambridge, said: "It is interesting that, despite the differences, both types of patient had one thing in common -- a problem at the front of the brain. This area controls attention to our movements and although the abnormality is not unique to psychogenic dystonia, it is part of the problem."

This type of illness is very common. Dr Schrag said: "One in six patients that see a neurologist has a psychogenic illness. They are as ill as someone with organic disease, but with a different cause and different treatment needs. Understanding these disorders, diagnosing them early and finding the right treatment are all clearly very important. We are hopeful that these results might

help doctors and patients understand the mechanism leading to this disorder, and guide better treatments."

Resveratrol Shows Promise to Protect Hearing, Cognition

Feb. 20, 2013 — Resveratrol, a substance found in red grapes and red wine, may have the potential to protect against hearing and cognitive decline, according to a published laboratory study from Henry Ford Hospital in Detroit. The study shows that healthy rats are **less likely to suffer the long-term effects of noise-induced hearing loss when given resveratrol before being exposed to loud noise for a long period of time.**

"Our latest study focuses on resveratrol and its effect on bioinflammation, the body's response to injury and something that is believed to be the cause of many health problems including Alzheimer's disease, cancer, aging and hearing loss," says study lead author Michael D. Seidman, director of the Division of Otologic/Neurologic Surgery in the Department of Otolaryngology-Head & Neck Surgery at Henry Ford Hospital.

"Resveratrol is a very powerful chemical that seems to protect against the body's inflammatory process as it relates to aging, cognition and hearing loss." The study is published online this week ahead of print in the journal *Otolaryngology-Head and Neck Surgery*.

Hearing loss affects nearly one in five Americans. For most, hearing steadily declines with age. Noise-induced hearing loss, too, is a growing medical issue among American troops, with more than 12 percent returning home from Iraq and Afghanistan with significant hearing loss.

Noise-induced hearing loss not only impacts a person's ability to hear, it can cause difficulties with sleep and communication, and even raises the risk for heart disease by increasing a person's blood pressure, lipids and blood sugar.

Dr. Seidman and his colleagues have published multiple papers exploring noise-induced hearing loss, as well as the use of resveratrol, a grape constituent noted for its antioxidant and anti-inflammatory properties. The latest study focuses the inflammatory process as it relates to aging, cognition and hearing loss.

It was designed to identify the potential protective mechanism of resveratrol following noise exposure by measuring its effect on cyclooxygenase-2 (or COX-2, key to the inflammatory process) protein expression and formation of reactive oxygen species, which plays an important role in cell signaling and homeostasis.

The study reveals that acoustic over-stimulation causes a time-dependent, up-regulation of COX-2 protein expression. And, **resveratrol significantly reduces reactive oxygen species formation, inhibits COX-2 expression and reduces noise-induced hearing loss following**

noise exposure in rats. "We've shown that by giving animals resveratrol, we can reduce the amount of hearing and cognitive decline," notes Dr. Seidman.

Ultimately, these findings suggest that resveratrol may exert a protective effect from noise-induced hearing loss by the inhibition of COX-2 expression and reactive oxygen species formation, although other mechanism may also be involved. Funding: National Institute of Deafness and Communicative Disorders

Human Cognition Depends Upon Slow-Firing Neurons

Feb. 20, 2013 — **Good mental health and clear thinking depend upon our ability to store and manipulate thoughts on a sort of "mental sketch pad."** In a new study, Yale School of Medicine researchers **describe the molecular basis of this ability** -- the hallmark of human cognition -- and describe how **a breakdown of the system contributes to diseases such as schizophrenia and Alzheimer's disease.**

"Insults to these highly evolved cortical circuits impair the ability to create and maintain our mental representations of the world, which is the basis of higher cognition," said Amy Arnsten, professor of neurobiology and senior author of the paper published in the Feb. 20 issue of the journal *Neuron*.

High-order thinking depends upon our ability to generate mental representations in our brains without any sensory stimulation from the environment. These cognitive abilities arise from highly evolved circuits in the prefrontal cortex. Mathematical models by former Yale neurobiologist Xiao-Jing Wang, now of New York University, predicted that **in order to maintain these visual representations the prefrontal cortex must rely on a family of receptors that allow for slow, steady firing of neurons.** The Yale scientists show that **NMDA-NR2B receptors involved in glutamate signaling regulate this neuronal firing. These receptors, studied at Yale for more than a decade, are responsible for activity of highly evolved brain circuits found especially in primates.**

Earlier studies have shown these types of NMDA receptors are often altered in patients with schizophrenia. **The Neuron study suggests that those suffering from the disease may be unable to hold onto a stable view of the world.** Also, these receptors seem to be altered in Alzheimer's patients, which may contribute to the cognitive deficits of dementia.

The lab of Dr. John Krystal, chair of the department of psychiatry at Yale, has found that the anesthetic ketamine, abused as a street drug, blocks NMDA receptors and can mimic some of the symptoms of schizophrenia. The current study in *Neuron* shows that ketamine may reduce the firing of the same higher-order neural circuits that are decimated in schizophrenia.

"Identifying the receptor needed for higher cognition may help us to understand why certain genetic insults lead to cognitive impairment and will help us to develop strategies for treating

these debilitating disorders," Arnsten said. This research was supported by NIH grants PO1 AG030004 and RL1 AA017536 within U54RR024350.

Other Yale authors are Min Wang, Yang Yang, Nao J. Gamo, Lu E. Jin, and James A. Mazer. Authors from Mt. Sinai School of Medicine are John H. Morrison, and Ching-Jung Wang.

Has Evolution Given Humans Unique Brain Structures?

Feb. 22, 2013 — **Humans have at least two functional networks in their cerebral cortex not found in rhesus monkeys. This means that new brain networks were likely added in the course of evolution from primate ancestor to human.** These findings, based on an analysis of functional brain scans, were published in a study by neurophysiologist Wim Vanduffel (KU Leuven and Harvard Medical School) in collaboration with a team of Italian and American researchers.

Our ancestors evolutionarily **split from those of rhesus monkeys about 25 million years ago.** Since then, brain areas have been added, have disappeared or have changed in function. This raises the question, 'Has evolution given humans unique brain structures?'. Scientists have entertained the idea before but conclusive evidence was lacking. By combining different research methods, **we now have a first piece of evidence that could prove that humans have unique cortical brain networks.**

Professor Vanduffel explains: "We did functional brain scans in humans and rhesus monkeys at rest and while watching a movie to compare both the place and the function of cortical brain networks. Even at rest, the brain is very active. Different brain areas that are active simultaneously during rest form so-called 'resting state' networks. **For the most part, these resting state networks in humans and monkeys are surprisingly similar, but we found two networks unique to humans and one unique network in the monkey.**"

"**When watching a movie, the cortex processes an enormous amount of visual and auditory information. The human-specific resting state networks react to this stimulation in a totally different way than any part of the monkey brain. This means that they also have a different function than any of the resting state networks found in the monkey.** In other words, brain structures that are unique in humans are anatomically absent in the monkey and there no other brain structures in the monkey that have an analogous function. **Our unique brain areas are primarily located high at the back and at the front of the cortex and are probably related to specific human cognitive abilities, such as human-specific intelligence.**"

The study used fMRI (functional Magnetic Resonance Imaging) scans to visualise brain activity. fMRI scans map functional activity in the brain by detecting changes in blood flow. The oxygen content and the amount of blood in a given brain area vary according to a particular task, thus allowing activity to be tracked.

Parents Talking About Their Own Drug Use to Children Could Be Detrimental

Feb. 22, 2013 — Parents know that one day they will have to talk to their children about drug use. The hardest part is to decide whether or not talking about one's own drug use will be useful in communicating an antidrug message. Recent research, published in the journal *Human Communication Research*, found that **children whose parents did not disclose drug use, but delivered a strong antidrug message, were more likely to exhibit antidrug attitudes.**

Jennifer A. Kam, University of Illinois at Urbana-Champaign and Ashley V. Middleton, MSO Health Information Management, published in *Human Communication Research* their findings from surveys of 253 Latino and 308 European American students from the sixth through eighth grades. The students reported on the conversations that they have had with their parents about alcohol, cigarettes, and marijuana. Kam and Middleton were interested in determining how certain types of messages were related to the students' substance-use perceptions, and in turn, behaviors.

Past research found that teens reported that they would be less likely to use drugs if their parents told them about their own past drug use. In Kam and Middleton's study, however, Latino and European American children who reported that **their parents talked about the negative consequences, or regret, over their own past substance use were actually less likely to report anti-substance-use perceptions.** This finding means that when parents share their past stories of substance use, even when there is a learning lesson, **such messages may have unintended consequences for early adolescent children.**

Kam and Middleton's study identifies specific messages that parents can relay to their children about alcohol, cigarettes, and marijuana that may encourage anti-substance-use perceptions, and in turn, discourage actual substance use. For example, parents may talk to their kids about the negative consequences of using substances, how to avoid substances, that they disapprove of substance use, the family rules against substance use, and stories about others who have gotten in trouble from using substances.

"Parents may want to reconsider whether they should talk to their kids about times when they used substances in the past and not volunteer such information, Kam said. "Of course, it is important to remember this study is one of the first to examine the associations between parents' references to their own past substance use and their adolescent children's subsequent perceptions and behaviors."

Small Groups of Brain Cells Store Concepts for Memory Formation -- From Luke Skywalker to Your Grandmother

Feb. 22, 2013 — **Concepts in our minds** -- from Luke Skywalker to our grandmother -- **are represented by their own distinct group of neurons**, according to new research involving a University of Leicester neuroscientist. The research, by University of Leicester neuroscientist Professor Rodrigo Quian Quiroga together with Professor Itzhak Fried, of the UCLA David Geffen School of Medicine, Tel Aviv Sourasky Medical Center and Tel Aviv University, and Professor Christof Koch, of the California Institute of Technology and Allen Institute for Brain Science, Seattle, is featured in a recent article in the magazine *Scientific American*.

Recent experiments during brain surgeries have shown that **small groups of brain cells are responsible for encoding memories of specific people or objects. These neurons may also represent different variations of one thing -- from the name of a person to their appearance from many different viewpoints.** The researchers believe that single concepts may be held in as little as thousands of neurons or less -- a tiny fraction of the billion or so neurons contained in the medial temporal lobe, which is a memory related structure within the brain.

The group were able to monitor the brain activity of consenting patients undergoing surgery to treat epilepsy. This allowed the team to monitor the activity of single neurons in conscious patients while they looked at images on laptop screens, creating and recalling memories. In previous experiments, they had found that **single neurons would 'fire' for specific concepts -- such as Luke Skywalker -- even when they were viewing images of him from different angles or simply hearing or reading his name.**

They have also found that **single neurons can also fire to related people and objects -- for instance, the neuron that responded to Luke Skywalker also fired to Yoda, another Jedi from Star Wars.** They argue that relatively small groups of neurons hold concepts like Luke Skywalker and that related concepts such as Yoda are held by some but not all of the same neurons. At the same time, a completely separate set of neurons would hold an unrelated concept like Jennifer Aniston.

The group believes this partially overlapping representation of related concepts are the neural underpinnings of encoding associations, a key memory function. Professor Quian Quiroga said: "After the first thrill when **finding neurons in the human hippocampus with such remarkable firing characteristics, converging evidence from experiments we have been carrying out in the last years suggests that we may be hitting one of the key mechanisms of memory formation and recall.**

"The abstract representation of concepts provided by these neurons is indeed ideal for representing the meaning of the sensory stimuli around us, the internal representation we use to

form and retrieve memories. These concepts cells, we believe, are the building blocks of memory functions."

Why Some Soldiers Develop PTSD While Others Don't

Feb. 21, 2013 — **Pre-war vulnerability is just as important as combat-related trauma in predicting whether veterans' symptoms of post-traumatic stress disorder (PTSD) will be long-lasting**, according to new research published in *Clinical Psychological Science*, a journal of the Association for Psychological Science.

Researcher Bruce Dohrenwend and colleagues at Columbia's Mailman School of Public Health and the New York State Psychiatric Institute **found that traumatic experiences during combat predicted the onset of the full complement of symptoms, known as the PTSD "syndrome," in Vietnam veterans. But other factors -- such as pre-war psychological vulnerabilities -- were equally important for predicting whether the syndrome persisted.**

The researchers re-examined data from a subsample of 260 male veterans from the National Vietnam Veterans Readjustment Study. All of the veterans in the subsample had received diagnostic examinations by experienced clinicians that included information about the onset of the disorder and whether it was still current 11 to 12 years after the war ended.

Dohrenwend and colleagues **focused on the roles of three primary factors: severity of combat exposure (e.g., life-threatening experiences or traumatic events during combat), pre-war vulnerabilities (e.g., childhood physical abuse, family history of substance abuse), and involvement in harming civilians or prisoners.**

The data indicated that **stressful combat exposure was necessary for the onset of the PTSD syndrome, as 98% of the veterans who developed the PTSD syndrome had experienced one or more traumatic events. But combat exposure alone was not sufficient to cause the PTSD syndrome.**

Of the soldiers who experienced any potentially traumatic combat exposures, only 31.6% developed the PTSD syndrome. When the researchers limited their analysis to the soldiers who experienced the most severe traumatic exposures, there was still a substantial proportion -- about 30% -- that did not develop the syndrome. This suggests that there were other factors and vulnerabilities involved for the minority of exposed who did end up developing the PTSD syndrome.

Among these factors, **childhood experiences of physical abuse or a pre-Vietnam psychiatric disorder other than PTSD were strong contributors to PTSD onset. Age also seemed to play an important role: Men who were younger than 25 when they entered the war were seven times more likely to develop PTSD compared to older men. The researchers also found that**

soldiers who inflicted harm on civilians or prisoners of war were much more likely to develop PTSD.

The combined data from all three primary factors -- combat exposure, prewar vulnerability, and involvement in harming civilians or prisoners -- revealed that **PTSD syndrome onset reached an estimated 97% for veterans high on all three.** While severity of combat exposure was the strongest predictor of whether the soldiers developed the syndrome, **pre-war vulnerability was just as important in predicting the persistence of the syndrome over the long run.** The researchers conclude that these findings have important implications for policies aimed at preventing cases of war-related PTSD.

Given the seemingly potent interaction between combat exposure and pre-war vulnerability, these results emphasize the need to keep the more vulnerable soldiers out of the most severe combat situations. Dohrenwend and colleagues also point out that the recent conflicts in Iraq and Afghanistan, like the Vietnam War, are "wars amongst the people," and they underline the need for research examining the circumstances in which harm to civilians and prisoners is likely to occur. Such research could provide important clues for preventing such devastating violations of the rules of war.

In addition to Dohrenwend, co-authors on this research include Thomas Yager and Ben Adams at the Mailman School of Public Health at Columbia University; and Melanie Wall of the Mailman School of Public Health and Department of Psychiatry at Columbia University, and the New York State Psychiatric Institute.

The research was supported by the National Institute of Mental Health (Grant R01-MH059309) and by grants from the Spunk Fund, Inc. and a Ruth L. Kirschstein National Research Service Award from the National Institute of Mental Health.

Particle Physics Research Sheds New Light On Possible 'Fifth Force of Nature'

Feb. 21, 2013 — In a breakthrough for the field of particle physics, Professor of Physics Larry Hunter and colleagues at Amherst College and The University of Texas at Austin have **established new limits on what scientists call "long-range spin-spin interactions" between atomic particles. These interactions have been proposed by theoretical physicists but have not yet been seen. Their observation would constitute the discovery of a "fifth force of nature" (in addition to the four known fundamental forces: gravity, weak, strong and electromagnetic) and would suggest the existence of new particles, beyond those presently described by the Standard Model of particle physics.**

The new limits were established by considering the interaction between the spins of laboratory fermions (electrons, neutrons and protons) and the spins of the electrons within Earth. To make this study possible, the authors created the first comprehensive map of electron polarization within Earth induced by the planet's geomagnetic field.

Hunter -- along with emeritus Amherst physics professor Joel Gordon; postdoctoral fellow Stephen Peck; student researcher Daniel Ang '15; and Jung-Fu "Afu" Lin, associate professor of geosciences at UT Austin -- co-authored a paper about their work that appears in this week's issue of the journal *Science*. **The highly interdisciplinary research relies on geophysics, atomic physics, particle physics, mineral physics, solid-state physics and nuclear physics to reach its conclusions.**

The paper describes how the team combined a model of Earth's interior with a precise map of the planet's geomagnetic field to produce a map of the magnitude and direction of electron spins throughout Earth. Their model was based in part on insights gained from Lin's studies of spin transitions at the high temperatures and pressures of Earth's interior.

Every fundamental particle (every electron, neutron and proton, to be specific), explained Hunter, has the intrinsic atomic property of "spin." Spin can be thought of as a vector -- an arrow that points in a particular direction. Like all matter, Earth and its mantle -- a thick geological layer sandwiched between the thin outer crust and the central core -- are made of atoms. The atoms are themselves made up of electrons, neutrons and protons that have spin. Earth's magnetic field causes some of the electrons in the mantle's minerals to become slightly spin-polarized, meaning the directions in which their spins point are no longer completely random, but have some net orientation.

Earlier experiments, including one in Hunter's laboratory, explored whether their laboratory spins prefer to point in a particular direction. "We know, for example, that a magnetic dipole has a lower energy when it is oriented parallel to the geomagnetic field and it lines up with this particular direction -- that is how a compass works," he explained. "Our experiments removed this magnetic interaction and looked to see if there might be some other interaction that would orient our experimental spins. One interpretation of this 'other' interaction is that it could be a long-range interaction between the spins in our apparatus, and the electron spins within the Earth, that have been aligned by the geomagnetic field. This is the long-range spin-spin interaction we are looking for."

So far, no experiment has been able to detect any such interaction. But in Hunter's paper, the researchers describe how they were able to infer that such so-called spin-spin forces, if they exist, must be incredibly weak -- as much as a million times weaker than the gravitational attraction between the particles. At this level, the experiments can constrain "torsion gravity" -- a proposed theoretical extension of Einstein's Theory of General Relativity. Given the high sensitivity of the technique Hunter and his team used, it may provide a useful path for future experiments that will refine the search for such a fifth force. If a long-range spin-spin force is found, it not only would revolutionize particle physics but might eventually provide geophysicists with a new tool that would allow them to directly study the spin-polarized electrons within Earth.

"If the long-range spin-spin interactions are discovered in future experiments, geoscientists can eventually use such information to reliably understand the geochemistry and geophysics of the planet's interior," said Lin.

Possible future discoveries aside, Hunter said that he was pleased that this particular project enabled him to work with Lin. "When I began investigating spin transitions in the mantle, all of the literature led to him," he explained. "I was thrilled that he was interested in the project and willing to sign on as a collaborator. He has been a good teacher and has had enormous patience with my ignorance about geophysics. It has been a very fruitful collaboration."

Lin had his own take: "The most rewarding and surprising thing about this project was realizing that particle physics could actually be used to study the deep Earth."

Scientists Make Older Adults Less Forgetful in Memory Tests

Feb. 21, 2013 — Scientists at Baycrest Health Sciences' Rotman Research Institute (RRI) and the University of Toronto's Psychology Department have **found compelling evidence that older adults can eliminate forgetfulness and perform as well as younger adults on memory tests.**

Scientists used a distraction learning strategy to help older adults overcome age-related forgetting and boost their performance to that of younger adults. Distraction learning sounds like an oxymoron, but a growing body of science is showing that **older brains are adept at processing irrelevant and relevant information in the environment, without conscious effort, to aid memory performance.**

"Older brains may be doing something very adaptive with distraction to compensate for weakening memory," said Renée Biss, lead investigator and PhD student. **"In our study we asked whether distraction can be used to foster memory-boosting rehearsal for older adults. The answer is yes!"**

"To eliminate age-related forgetfulness across three consecutive memory experiments and help older adults perform like younger adults is dramatic and to our knowledge a totally unique finding," said Lynn Hasher, senior scientist on the study and a leading authority in attention and inhibitory functioning in younger and older adults. **"Poor regulation of attention by older adults may actually have some benefits for memory."**

The findings, published online February 21 in *Psychological Science*, ahead of print publication, have intriguing implications for designing learning strategies for the mature, older student and equipping senior-housing with relevant visual distraction cues throughout the living environment that would serve as rehearsal opportunities to remember things like an upcoming appointment or medications to take, even if the cues aren't consciously paid attention to.

The study

In three experiments, healthy younger adults recruited from the University of Toronto (aged 17-27) and healthy older adults from the community (aged 60 -- 78) were asked to study and recall a list of words after a short delay and again, on a surprise test, after a 15-minute delay.

During the delay period, half of the studied words occurred again as distraction while people were doing a very simple attention task on pictures. Although repeating words as distracters had no impact on the memory performance of young adults, it boosted older adults' memory for those words by 30% relative to words that had not repeated as distraction.

"Our findings point to exciting possibilities for using **strategically-placed relevant distraction as memory aids for older adults** -- whether it's in classroom, at home or in a long term care environment," said Biss. While older adults are watching television or playing a game on a tablet, boosting memory for goals (such as remembering to make a phone call or send a holiday card) could be accomplished by something as simple as running a stream of target information across the bottom of their tablet or TV.

The study was supported by a grant from the Canadian Institutes of Health Research and the Natural Sciences and Engineering Research Council of Canada.

Aspirin and Omega-3 Fatty Acids Work Together to Fight Inflammation

Feb. 21, 2013 — **Experts tout the health benefits of low-dose aspirin and omega-3 fatty acids found in foods like flax seeds and salmon, but the detailed mechanisms involved in their effects are not fully known.** Now researchers reporting in the February 21 issue of the Cell Press journal *Chemistry & Biology* show that **aspirin helps trigger the production of molecules called resolvins that are naturally made by the body from omega-3 fatty acids. These resolvins shut off, or "resolve," the inflammation that underlies destructive conditions such as inflammatory lung disease, heart disease, and arthritis.**

"In this report, we found that one resolvin, termed resolvin D3 from the omega-3 fatty acid DHA, persists longer at sites of inflammation than either resolvin D1 or resolvin D2 in the natural resolution of inflammation in mice," explains senior author Dr. Charles Serhan of Brigham and Women's Hospital and Harvard Medical School. "This finding suggests that this late resolution phase resolvin D3 might display unique properties in fighting uncontrolled inflammation."

The researchers also confirmed that aspirin treatment triggered the production of a longer acting form of resolvin D3 through a different pathway. "Aspirin is able to modify an inflammatory enzyme to stop forming molecules that propagate inflammation and instead produce molecules from omega-3 fatty acids, like resolvin D3, that help inflammation to end," explains coauthor Dr. Nicos Petasis of the University of Southern California.

The team went on to reveal detailed information about resolvin D3. "We were able to produce by chemical synthesis both resolvin D3 and aspirin-triggered resolvin D3 in pure form, which allowed us to establish their complete structures and biological activities," says Dr. Petasis. When administered to human cells, both of these resolvins demonstrated potent anti-

inflammatory actions. When given to mice, the compounds also stimulated the resolution of inflammation in the body.

"We also identified the human receptor that is activated by resolvin D3, which is critical in understanding how resolvin D3 works in the body to resolve inflammation," says Dr. Serhan. "With this new information, investigators will now also be able to study the pro-resolving and anti-inflammatory actions of resolvin D3 in other systems." In addition, researchers will be interested in determining which inflammation-associated diseases might be treated with this newly identified resolvin.

How to Kill an Asteroid? Get out a Paint Spray Gun

Feb. 21, 2013 — There is research that is off the wall, some off the charts and some off the planet, such as what a Texas A&M University aerospace and physics professor is exploring. **It's a plan to deflect a killer asteroid by using paint, and the science behind it is absolutely rock solid, so to speak, so much so that NASA is getting involved and wants to know much more.**

Dave Hyland, professor of physics and astronomy and also a faculty member in the aerospace engineering department at Texas A&M and a researcher with more than 30 years of awards and notable grants, says one possible way to avert an asteroid collision with Earth is by using a process called "**tribocharging powder dispensing**" -- as in **high pressured -- and spreading a thin layer of paint on an approaching asteroid**, such as the one named DA14 that came within 17,000 miles on Feb. 15.

What happens is that **the paint changes the amount by which the asteroid reflects sunlight, Hyland theorizes, producing a change in what is called the Yarkovski effect (which was discovered by a Russian engineer in 1902). The force arises because on a spinning asteroid, the dusk side is warmer than the dawn side and emits more thermal photons, each photon carrying a small momentum. The unequal heating of the asteroid results in a net force strong enough to cause the asteroid to shift from its current orbit, Hyland further theorizes.** The kind of paint used is not the kind found at your local hardware store, Hyland explains. "It could not be a water-based or oil-based paint because it would probably explode within seconds of it entering space," he notes.

"But a powdered form of paint could be used to dust on the asteroid and the sun would then do the rest. It cures the paint to give a smooth coating, and would change the unequal heating of the asteroid so that it would be forced off its current path and placed on either a higher or lower orbit, thus missing Earth.

"I have to admit the concept does sound strange, but the odds are very high that such a plan would be successful and would be relatively inexpensive. The science behind the theory is sound. We need to test it in space."

As for getting the paint on the asteroid, a practical way to do this was discovered by a former student of Hyland's, Shen Ge, who has since started a new space company. The "tribocharging powder dispenser" would spray a mixture of inert gas and charged dry-paint powder at the asteroid that would attract the powder to its surface through electrostatics. Then solar wind and UV radiation would cure the powder, giving a smooth, thin coat on the surface.

Getting the paint in the asteroid's path in a timely manner will certainly be a challenge, Hyland observes. "The tribocharged powder process is a widely used method of painting many products," he says. "It remains only to adapt the technology to space conditions."

NASA has approached Hyland for developing such a project to test the theory, and Earth may need it quickly. An asteroid called Apophis is due in 2029 and will come closer than many communications satellites in orbit right now. It will fly by on April 13 (Friday the 13 to be exact) of 2029 and make a return trip in 2036, and it's estimated to be more than 1,000 feet in length and is appropriately named for an evil Egyptian god of chaos and destruction. There is no chance of its hitting Earth in 2029, but a small chance in the next close approach in 2036, Hyland notes.

Asteroids have hit Earth before. One hit off the Yucatan coast of Mexico about 65 million years ago and is believed to have caused the eventual extinction of the dinosaurs. And in 1908, the fabled "Tunguska event" occurred in Siberia in which an asteroid or meteor exploded several miles above Earth, flattening trees and killing livestock over 800 square miles. The explosion is now estimated to have been 1,000 times more powerful than the A-bomb dropped on Hiroshima. "There are thousands of asteroids out there, and only a small percentage of them are known and can be tracked as they approach Earth," Hyland adds.

"The smaller ones, like DA14 are not discovered as soon as others, and they could still cause a lot of damage should they hit Earth. It is really important for our long-term survival that we concentrate much more effort discovering and tracking them, and developing as many useful technologies as possible for deflecting them."

Scientists Unveil Secrets of Important Natural Antibiotic

Feb. 21, 2013 — An international team of scientists has discovered how **an important natural antibiotic called dermcidin, produced by our skin when we sweat, is a highly efficient tool to fight tuberculosis germs and other dangerous bugs.** Their results could contribute to the development of new antibiotics that control multi-resistant bacteria. Scientists have **uncovered the atomic structure of the compound, enabling them to pinpoint for the first time what makes dermcidin such an efficient weapon in the battle against dangerous bugs.**

Although about 1700 types of these natural antibiotics are known to exist, scientists did not until now have a detailed understanding of how they work. The study, carried out by researchers from the University of Edinburgh and from Goettingen, Tuebingen and Strasbourg, is published in *Proceedings of the National Academy of Sciences*.

Sweat spreads highly efficient antibiotics on to our skin, which protect us from dangerous bugs. If our skin becomes injured by a small cut, a scratch, or the sting of a mosquito, antibiotic agents secreted in sweat glands, such as dermcidin, rapidly and efficiently kill invaders.

These natural substances, known as antimicrobial peptides (AMPs), are more effective in the long term than traditional antibiotics, because germs are not capable of quickly developing resistance against them. **The antimicrobials can attack the bugs' Achilles' heel -- their cell wall, which cannot be modified quickly to resist attack.** Because of this, AMPs have great potential to form a new generation of antibiotics.

Scientists have known for some time that dermcidin is activated in salty, slightly acidic sweat. The molecule then forms tiny channels perforating the cell membrane of bugs, which are stabilised by charged particles of zinc present in sweat. As a consequence, water and charged particles flow uncontrollably across the membrane, eventually killing the harmful microbes.

Through a combination of techniques, scientists were able to determine the atomic structure of the molecular channel. They found that it is unusually long, permeable and adaptable, and so represents a new class of membrane protein.

The team also discovered that dermcidin can adapt to extremely variable types of membrane. Scientists say this could explain why active dermcidin is such an efficient broad-spectrum antibiotic, able to fend off bacteria and fungi at the same time.

The compound is active against many well-known pathogens such as tuberculosis, *Mycobacterium tuberculosis*, or *Staphylococcus aureus*. Multi-resistant strains of *Staphylococcus aureus*, in particular, have become an increasing threat for hospital patients. They are insensitive towards conventional antibiotics and so are difficult to treat. *Staphylococcus aureus* infections can lead to life-threatening diseases such as sepsis and pneumonia. The international team of scientists hopes that their results can contribute to the development of a new class of antibiotics that is able to attack such dangerous germs.

Dr Ulrich Zachariae of the University of Edinburgh's School of Physics, who took part in the study, said: "Antibiotics are not only available on prescription. Our own bodies produce efficient substances to fend off bacteria, fungi and viruses. Now that we know in detail how these natural antibiotics work, we can use this to help develop infection-fighting drugs that are more effective than conventional antibiotics."

Bullied Children Can Suffer Lasting Psychological Harm as Adults

Feb. 20, 2013 — **Bullied children grow into adults who are at increased risk of developing anxiety disorders, depression and suicidal thoughts**, according to a study led by researchers at Duke Medicine. The findings, based on more than 20 years of data from a large group of

participants initially enrolled as adolescents, are the most definitive to date in establishing the long-term psychological effects of bullying. Published online Feb. 20, 2013, in *JAMA Psychiatry*, **the study belies a common perception that bullying, while hurtful, inflicts a fleeting injury that victims outgrow.**

"We were surprised at how profoundly bullying affects a person's long-term functioning," said William E. Copeland, PhD, assistant clinical professor in the Department of Psychiatry and Behavioral Sciences at Duke University and lead author of the study. **"This psychological damage doesn't just go away because a person grew up and is no longer bullied. This is something that stays with them. If we can address this now, we can prevent a whole host of problems down the road."**

A previous longitudinal study of bullied children, conducted in Finland, found mixed results, concluding that boys had few lasting problems, while girls suffered more long-term psychological harm. That study, however, relied on registry data in the health system that didn't fully capture psychiatric records.

Copeland and colleagues had a much richer data set. Using the Great Smoky Mountain Study, the research team tapped a population-based sample of 1,420 children ages 9, 11 and 13 from 11 counties in western North Carolina. Initially enrolled in 1993, the children and their parents or caregivers were interviewed annually until the youngsters turned 16, and then periodically thereafter.

At each assessment until age 16, the child and caregiver were asked, among other things, whether the child had been bullied or teased or had bullied others in the three months immediately prior to the interview. A total of 421 child or adolescent participants -- 26 percent of the children -- reported being bullied at least once; 887 said they suffered no such abuse. Boys and girls reported incidents at about the same rate. Nearly 200 youngsters, or 9.5 percent, acknowledged bullying others; 112 were bullies only, while 86 were both bullies and victims.

Of the original 1,420 children, more than 1,270 were followed up into adulthood. The subsequent interviews included questions about the participants' psychological health. **As adults, those who said they had been bullied, plus those who were both victims and aggressors, were at higher risk for psychiatric disorders compared with those with no history of being bullied. The young people who were only victims had higher levels of depressive disorders, anxiety disorders, generalized anxiety, panic disorder and agoraphobia.**

Those who were both bullies and victims had higher levels of all anxiety and depressive disorders, plus the highest levels of suicidal thoughts, depressive disorders, generalized anxiety and panic disorder. Bullies were also at increased risk for antisocial personality disorder. The researchers were able to sort out confounding factors that might have contributed to psychiatric disorders, including poverty, abuse and an unstable or dysfunctional home life.

"Bullying is potentially a problem for bullies as well as for victims," said senior author E. Jane Costello, PhD, associate director of research at Duke's Center for Child and Family Policy. "Bullying, which we tend to think of as a normal and not terribly important part of childhood,

turns out to have the potential for very serious consequences for children, adolescents and adults." Costello and Copeland said they would continue their analysis, with future studies exploring the role sexual orientation plays in bullying and victimization.

In addition to Costello and Copeland, study authors include Adrian Angold of Duke and Dieter Wolke of the University of Warwick, Coventry, England. The work received support from the National Institute of Mental Health (MH63970, MH63671, and MH48085); the National Institute on Drug Abuse (DA/MH11301); the Brain and Behavior Research Foundation; and the William T. Grant Foundation.

Cure for Common Hangover? 'Pill' Mimics Action of Human Liver in Fighting Alcohol Intoxication

Feb. 20, 2013 — In a discovery that could promise a quick fix to the common hangover, a team of researchers led by UCLA engineers has **identified a method for speeding up the body's reaction to the consumption of alcohol.**

In a paper published online Feb. 17 in the peer-reviewed journal *Nature Nanotechnology*, Yunfeng Lu, a professor of chemical and biomolecular engineering at the UCLA Henry Samueli School of Engineering and Applied Science, and his colleagues describe **successfully placing two complementary enzymes in a tiny capsule to speed up the elimination of alcohol from the body. The enzyme combination within the capsule essentially processes alcohol the way the liver does.** Lu, the principal investigator, said **the enzyme combination could be ingested as a pill, chemically altering alcohol in the digestive system, even as the liver does its work.**

"The pill acts in a way extremely similar to the way your liver does," Lu said. "With further research, this discovery could be used as a preventative measure or antidote for alcohol intoxication."

Naturally occurring enzymes within cells often work in tandem to transform molecules or eliminate toxins. Lu's group assembled multiple enzymes to mimic the natural process. An enzyme known as an alcohol oxidase, for example, can promote the oxidization of alcohol but also produces hydrogen peroxide, which is toxic. Another type of enzyme, a catalase, prompts the decomposition of hydrogen peroxide into water and oxygen. Placing the two enzymes next to each other can effectively remove alcohol.

The researchers placed the two enzymes in a polymer capsule measuring just tens of nanometers in diameter. The wall of the polymer capsule is only one nanometer thick -- about 100,000 times thinner than a strand of human hair. The capsule protects the enzymes and allows them to freely enter an alcohol molecule. In this way, the nanocapsule mimics an organelle, a structure found in cells that spurs chemical reactions.

The researchers used a mouse model to test how well the enzyme package worked as an antidote after alcohol was consumed. They found that blood alcohol levels in mice that received the enzyme package fell more quickly than in mice that did not. Blood alcohol levels of the antidote test group were 15.8 percent lower than the control group after 45 minutes, 26.1 percent lower after 90 minutes and 34.7 percent lower after three hours.

In a test of how well the enzyme delivery system worked as a prophylactic when consumed at the same time as alcohol, the researchers found that blood alcohol levels in the mice that received the enzymes were 10.1 percent lower than in control-group mice after 45 minutes, 31.8 percent lower after 90 minutes and 36.8 percent lower after three hours.

"Considering the vast library of enzymes that are currently or potentially available," the authors write, "novel classes of enzyme nanocomplexes could be built for a broad range of applications."

The study's lead authors included Yang Liu and Juanjuan Du of UCLA Engineering's chemical and biomolecular engineering department.

Additional authors of the research include Wei Wei of UCLA Engineering; Ming Yan of UCLA Engineering and the UCLA Department of Microbiology, Immunology and Molecular Genetics; Mo Yin Lau, Jay Hu, Hui Han and Cheng Ji of the Keck School of Medicine at the University of Southern California; Dr. Otto O. Yang of the David Geffen School of Medicine at UCLA; Sheng Liang and Hui Wang of Xinhua Hospital, affiliated with China's Shanghai Jiao Tong University; Jianmin Li and Wei Chen of China's Beijing Institute of Biotechnology; Xinyuan Zhu of Shanghai Jiao Tong University; and Linqi Shi of China's Ministry of Education and Nankai University.

The research was partially supported by the Defense Threat Reducing Agency, the National Institutes of Health, the National Natural Science Foundation of China, and the National Basic Research Program of China.

Being Stoic for the Spouse's Sake Comes at a High Cost

Feb. 20, 2013 — Among life's many tragedies, the death of a child is one that is perhaps the greatest for parents. No matter what the age of the child or the cause of death, the irrefutable fact of the loss is one that shatters the normal cycle of life, leaving parents traumatized and often incapacitated by grief.

Research on coping with bereavement has focused primarily on the individual, despite the fact that family and married relationships are all profoundly disrupted by the loss. But in the wealth of studies about parental grief, **little attention has been paid to precisely how couples relate to each other as they struggle to come to terms with the death of a child.**

A new research article published in *Psychological Science*, a journal of the Association for Psychological Science, **addresses this gap in bereavement research by focusing on the way that couples together process the grief of losing a child.**

"Scientific literature focused on individual rather than interdependent processes in coping with bereavement, despite the fact that bereaved people do not grieve alone and the way one person grieves likely influences another," says psychological scientist Margaret Stroebe, who conducted the research with her colleagues at the Utrecht University and VU University Amsterdam.

In this study, the researchers interviewed 219 couples that had lost a child. The parents were from 26 to 68 years old, and the causes of their children's death ranged from stillbirth, to illness, accident, SIDS, suicide or homicide. They were asked to rate how much they agreed with statements like "I stay strong for my partner," "I hide my feelings for the sake of my partner," or "I try to spare my partner's feelings." The researchers collected the data at three different timepoints: six, thirteen and twenty months after the loss.

These questions examined a phenomenon they referred to as Partner-Oriented Self-Regulation (POSR), which captures the way in which couples either avoided discussion of their loss or attempted to remain strong for the sake of the partner. Many husbands and wives believe that these two strategies help to alleviate grief, but Stroebe and her colleagues found that the strategies actually exacerbated the problems of grieving. They found that POSR was not only associated with an increase in the person's own grief but also with an increase in the partner's grief. Moreover, these relationships persisted over time.

There is a paradox, Stroebe says, **"While parents seek to protect their partners through POSR, this effort has the opposite effect, and it is associated with worse adjustment over time. Surprisingly, our results suggest that POSR has costs, not benefits, and not only for the partner but also for the self."**

These surprising results may be explained by the role of self-regulation in the grieving process. Our ability to self-regulate is essential for dealing with the world, but exerting excessive efforts to contain our emotions and regulate our feelings, thoughts, and behavior exact important interpersonal and individual costs. Like a muscle that becomes exhausted after exertion, too much self-regulation actually depletes our ability to self-regulate in various domains including physical health and goal accomplishment.

Ultimately, these attempts at self-regulation may prevent partners from coping with the loss of their child. Suppressing emotions can have adverse effects on grief between couples. One partner may think that painful feelings aren't accepted, for example, or a partner might misinterpret no apparent grief as a lack of actual grief.

"One important implication of this research is that, in cases where professional help is indicated, clinicians can -- when appropriate -- guide bereaved clients away from POSR and toward sharing their grief, thereby easing their suffering," Stroebe says.

Healthy Rivalry Could Boost Sport and Business Performance

Feb. 20, 2013 — **New research shows that people can recover from poor performance when rivals comment on their failures.** The research, to be published in the *Journal of Experimental Social Psychology*, shows that **while criticism from team members sends individuals into downward performance spirals, external criticism can be a trigger that boosts performance as people try to prove the outsiders wrong.**

The research carried out by the University of Exeter, Amherst College and the University of Stirling **offers a method of improving performance following setbacks and can be applied both in the workplace and in sport to avoid poor performance snowballing out of control.**

Lead author Dr Tim Rees of Sport and Health Sciences at the University of Exeter said: **"Careful management of performance following failure is of key importance in a range of areas such as sport and business. The study shows that simple, low cost, measures that exploit the effects of intergroup dynamics can reverse downward performance spirals by encouraging a 'them and us' mentality."**

During the study blindfolded participants threw darts at a dartboard and then received poor performance feedback either from a university-affiliated researcher or from an external researcher from a rival university. Participants who received this feedback from a university-affiliated researcher seemed to believe it and enact it: if it was discouraging, they failed at the next attempt, but if it was encouraging, they improved. **Receiving encouragement from a member of an external team following poor performance did not help individuals improve at their next attempt. Yet those who received the poor performance feedback from an outsider were motivated to recover from the poor performance in an attempt to prove them wrong.**

"Downward performance spirals can be readily observed in every domain of human performance," said co-author Jessica Salvatore of Amherst College. "Our research shows that the **'us-versus-them' mindset isn't always a destructive force -- sometimes it can be the key to re-motivating yourself and turning your performance around.**"

Co-author Pete Coffee from the University of Stirling said: "The research not only highlights ways to improve performance but also demonstrates the positive and negative impact that encouragement and criticism from fellow group members can have. This work points to the need for people like sports coaches and business leaders to think carefully about the way they deliver performance-related feedback."

Powerful People Are Looking out for Their Future Selves

Feb. 19, 2013 — **Would you prefer \$120 today or \$154 in one year? Your answer may depend on how powerful you feel**, according to new research in *Psychological Science*, a journal of the Association for Psychological Science.

Many people tend to forego the larger reward and opt for the \$120 now, a phenomenon known as temporal discounting. But research conducted by Priyanka Joshi and Nathanael Fast of the University of Southern California Marshall School of Business suggests that **people who feel powerful are more likely to wait for the bigger reward, in part because they feel a stronger connection with their future selves.**

In the first of four experiments, the researchers randomly assigned participants to be a team manager (high-power role) or a team worker (low-power role) in a group activity. Afterwards, the participants were asked to make a series of choices between receiving \$120 now or increasing amounts of money (\$137, \$154, \$171, \$189, \$206, \$223, and \$240) in one year.

On average, low-power team workers were only willing to take the future reward if it was at least \$88 more than the immediate one. High-power team managers, on the other hand, were willing to wait for future rewards that were only \$52 more than the immediate one.

Joshi and Fast speculated that **power holders may be willing to wait for the larger rewards because they feel more connected with their future selves, a consequence of experiencing less uncertainty about their futures along with an increased tendency to see the big picture.**

In line with their hypothesis, the second experiment showed that the relationship between power and reduced temporal discounting could be explained, at least in part, by participants' connectedness to their future selves. **A third study showed that powerful people also show this pattern with non-monetary rewards.**

In the final study, Joshi and Fast took their research outside the laboratory, asking dozens of people about how powerful they feel in their everyday jobs and how much money they have socked away. After accounting for various factors including total income and socioeconomic status, the researchers found that **people who felt more powerful at work and who felt more connected with their future selves had amassed greater lifetime savings.**

While powerful people may feel more connected with their future selves and are therefore more likely to save money, they also tend to be overconfident decision-makers. "It is important to foster awareness of all of power's effects," the researchers conclude, "otherwise, the power holder may make overly risky -- albeit well-intentioned -- decisions on behalf of their future self."

Identifying Trends in 60 Years of Oscar Speeches

Feb. 19, 2013 — Who is most likely to cry at this month's Academy Awards? Does everyone actually thank the Academy, or does it just seem like they do? Which person is more popular than God at the Oscars?

Georgia Tech master's student Rebecca Rolfe (Digital Media) found those answers and more while analyzing 60 years of Academy Awards acceptance speeches as part of a research project that focused on gratitude. **Rolfe watched more than 200 speeches from 1953, the first year the awards ceremony was televised, to 2012, and has outlined the trends and patterns on an interactive website. She has also determined the anatomy of an Academy Awards speech, or at least the one that winners tend to give.**

Rolfe focused on five categories: actor/actress in a leading role, actor/actress in a supporting role and best director. Because the Academy of Motion Picture Arts and Sciences hasn't posted every video on its YouTube channel, Rolfe was able to watch 207 of the 300 speeches since 1953.

While every speech is unique, Rolfe noticed a certain pattern that is used by winners.

"Winners tend to start their speeches broadly by thanking the Academy or fellow nominees, then gradually make it more personal," Rolfe said. "After reflecting on the win's significance, they typically thank their peers, colleagues and sometimes even their lawyer before mentioning family." Nearly every speech (79 percent) closes with some version of "thank you." I'd like to thank the Academy... is one of the most famous phrases in Oscar history, but less than half of the winners (40 percent) actually say it.

Unsurprisingly, leading actresses are almost twice as likely to cry than leading actors. However, crying is a recent trend. Seventy one percent of tears have been shed since 1995, including 12 of the last 15 best actresses. Rolfe can only guess why.

"Much like the movies, acceptance speeches are a type of performance," she says. "I believe the tears are real, but perhaps, maybe even subconsciously, actresses know what is expected of them when they accept the honor. Maybe the public has come to expect an emotional speech, so actresses are more emotional than they would be otherwise."

Only one director has ever choked up: Steven Spielberg for "Schindler's List" at the 1993 ceremony. Among the other findings: you might see a man hoist Oscar into the air with one hand (26 percent), while nearly 60 percent of winning actresses cradle the statue with both hands, like a baby. Almost half of winners thank their family. Only 5 percent (11 total mentions) thank God, who loses out to Hollywood power player Harvey Weinstein. The co-founder of Miramax has been thanked the most times (12) in Oscar history.

Speeches have become considerably longer over the years. In the 1960s, a typical speech was about 40 seconds long. Now it averages nearly two minutes, although the orchestra has only cut off nine winners in these prestigious categories.

Rolfe's website allows users to compose their own speech, which is then compared to actual speeches given throughout the history of the ceremony. She focused on the Academy Awards because the announcement-acceptance format has basically remained unchanged through the years, providing her a consistent way to study gratitude and identify trends.

"In a way, we see a part of ourselves on stage at the Oscars," Rolfe explained. "While judging speeches each year, we shape the trends and customs society expects and accepts. Some of them, like length and crying, change over time. Hopefully this project is another tool for researchers as they analyze gratitude, an historically understudied field." The research project was funded by the AP-Google Journalism and Technology Scholarship Program, which is overseen by the Online News Association.

It's Off to Work We Go

Feb. 18, 2013 — In a large city like Montreal, public transit provides us with options for getting to work or school and back home again. In deciding to choose traffic jams over metro delays, or to pay for parking rather than buy a monthly pass, you weigh the pros, cons and costs of your options, and **your mental calculations are more complicated than they may appear at first glance.**

In a paper recently published in *The Journal of Transportation and Land Use*, Zachary Patterson, an assistant professor in Concordia University's Department of Geography, Planning, and Environment, discovered that **decisions about where to live and how to get from home to work happen simultaneously. What's more, your commuting choices depend not only on cost and travel time, but also on who you are and where you live.**

With the help of colleagues at McGill University and Université Laval, Patterson crunched the numbers to determine which Montrealers are most likely to take public transit and which are more likely to drive. Previous studies have shown that **people who live in neighbourhoods with a high population density and a mix of residential and commercial land use prefer public transit.** It's also clear that when the cost of parking increases, fewer people drive. But Patterson's study is the first to **analyze how these factors interact with residential self-selection -- the fact that individuals choose their neighbourhoods because they prefer one commuting option over another.**

Patterson and his co-authors believe that **"household location and transit mode choice are intimately linked," and the findings of their study support this hypothesis.** A commuter living closer to downtown -- in a part of the city with higher population density, a mix of residential and commercial land use, and good access to public transit -- is 13 to 14% more likely to use public transit than someone living further away who is the same gender and age and has the same income.

Patterson's research proves that Montrealers under 35 are more likely to live where public transit is most accessible. What's more, the study also reveals that women are more than twice as likely to choose public transit than men.

The conclusions drawn from Patterson's study are readily applicable: when urban planners know more about who chooses public transit and why, they can make decisions that will encourage more people to leave their cars at home. The results suggest that increasing the cost of parking in downtown Montreal would appear to be one option, but decreasing public transit fares or travel times might work equally well. On a larger scale, says Patterson, "strategies that promote densification, increase land use mix, and improve transit accessibility would have a positive influence on downtown transit commuting."

Males' Superior Spatial Ability Likely Is Not an Evolutionary Adaptation; Testosterone 'Side Effect'?

Feb. 19, 2013 — Males and females differ in a lot of traits (besides the obvious ones) and some **evolutionary psychologists have proposed hypotheses to explain why**. Some argue, for example, that **males' slight, but significant, superiority in spatial navigation over females -- a phenomenon demonstrated repeatedly in many species, including humans -- is probably "adaptive," meaning that over the course of evolutionary history the trait gave males an advantage that led them to have more offspring than their peers. A new analysis published in *The Quarterly Review of Biology* found no support for this hypothesis.**

The researchers, led by University of Illinois psychology professor Justin Rhodes, looked at 35 studies that included data about the territorial ranges and spatial abilities of 11 species of animals: cuttlefish, deer mice, horses, humans, laboratory mice, meadow voles, pine voles, prairie voles, rats, rhesus macaques and talastuco-tucos (a type of burrowing rodent). Rhodes and his colleagues found that in eight out of 11 species, males demonstrated moderately superior spatial skills to their female counterparts, regardless of the size of their territories or the extent to which males ranged farther than females of the same species.

The findings lend support to an often-overlooked hypothesis, Rhodes said. The average superiority of males over females in spatial navigation may just be a "side effect" of testosterone, he said. (Previous studies have shown that women who take testosterone tend to see an improvement in their spatial navigation skills, he said.)

The analysis adds a new dimension to an ongoing debate about the evolutionary significance of some baffling human traits. **Rhodes and his colleagues object to "creation stories" that seek to explain sexual phenomena like the female orgasm, rape or menopause by hypothesizing that they evolved because they provided an evolutionary advantage. Some evolutionary psychologists describe rape, for example, as an alternate mating strategy for males who otherwise are reproductively unsuccessful. Others say menopause evolved in women to**

enhance the survival of their genes by increasing the time spent nurturing their grandchildren. Some of these hypotheses seem intuitive, Rhodes said. "But these stories generally are not testable."

Researchers tend to overlook the fact that **many physical and behavioral traits arise as a consequence of random events, or are simply side effects of other changes that offer real evolutionary advantages, he said.**

"For example, women have nipples because it's an adaptation; it promotes the survival of their offspring," Rhodes said. "Men get it because it doesn't harm them. So if we see something that's advantageous for one sex, the other sex will get it because it's inheriting the same genes -- unless it's bad for that sex."

Similarly, scientists who claim that the different spatial skills in men and women are adaptive must explain why women failed to inherit the superior spatial skills of their navigationally enhanced fathers, Rhodes said.

"The only way you will get a sex difference (in an adaptive trait) is where a trait is good for one sex and bad for the other," he said. "But how is navigation bad for women? This is a flaw in the logic." "When people hear arguments made or stories told, particularly about human behaviors being products of adaptation, I think they should ask the question: 'Where is the evidence?'" Rhodes said. Rhodes is an affiliate of the Beckman Institute for Advanced Science and Technology at Illinois. The research team also included a philosopher from the University of Wisconsin at Madison and a scientist from the University of California at Riverside.

Sports, Shared Activities Are 'Game Changers' for Dad/Daughter Relationships

Feb. 19, 2013 — **The most frequent turning point in father-daughter relationships is shared activity -- especially sports -- ahead of such pivotal events as when a daughter marries or leaves home,** according to a study by Baylor University researchers.

"This is the masculine style of building closeness -- called 'closeness in the doing' -- whereas the feminine orientation is talking, 'closeness in the dialogue,'" said Mark T. Morman, Ph.D., a professor of communication in Baylor's College of Arts & Sciences. An article about the findings by Morman and former Baylor graduate student Elizabeth Barrett is published in the *Journal of Human Communication*.

When asked what key experiences changed closeness in their relationships, fathers and daughters who were study participants mentioned **events typical of those that help cement masculine friendships.** Morman noted that the study is qualitative -- based on written responses by participants rather than by a statistical analysis. But it reveals meaningful markers of when relationships changed, regardless of whether they became closer or more distant, he said.

The 43 fathers and 43 daughters in the study were not related to one another but were asked to pinpoint in writing a crucial moment of change in their own father-daughter relationships. Daughters in the study were required to be at least age 22, while fathers ranged from 45 to 70. Adoptive and step-family relationships were among those included. "These (turning points) . . . were independent of some type of family history," Morman said.

Most frequently mentioned of 14 relationship changes by daughters were engaging activities with their fathers, their marriages and physical distance from their fathers. Fathers most frequently mentioned joint activities, a daughter's marriage and the beginning of a daughter's dating.

Other pivotal times noted by both fathers and/or daughters in the study were adolescence, a family crisis, parents' divorce, a daughter's financial independence, giving birth, entering elementary school, high school graduation, a daughter's developing outside friendships, a daughter's maturation/beginning a friendship with her father and poor decisions on a daughter's part.

Daughters weigh in on turning points

-- Shared Activities:

Sports, working together and vacationing together were the shared activities most frequently mentioned. Many daughters said they became closer to their fathers when they began to play a sport, an intimacy in which the father is the "primary playmate" as daughters learn to compete, take risks and stand up for themselves. Sports gave daughters a chance to be the center of their dad's attention. "It made me feel really important," one woman wrote. Another said that "I used to love it when my dad would take off work to come coach my softball team."

Working together was another life-changing shared activity. "Growing up, I didn't see much of my dad because he was at the office," one daughter wrote. But through working together, "now I know him on so many different levels." A third shared activity was vacationing, several daughters said. "The first time I really talked with my dad, I was 6 years old. We took a road trip together and talked about everything," one woman wrote.

-- Marriage:

A daughter's marriage was the second most frequently reported turning point -- sometimes bringing them closer together, usually due to gaining a father's approval of their husbands -- but many reported the marriage distanced them somewhat because the father was no longer the protector and provider.

--Leaving Home:

The third most mentioned shift for daughters was when they left home for the first time, often to attend college. Some felt they lost touch; others felt a strain was lifted as they had their own

space and developed a friendship with their dad rather than viewing him as a provider, adviser and disciplinarian.

Fathers' Perspectives

-- Shared Activities:

Sports was the most frequently mentioned activity by fathers, with some saying it gave them a bond their daughter did not have with her mother or siblings. Others said it opened the lines of communication to talk about other subjects. Additional activities fathers mentioned were church functions, household projects and teaching their daughters to drive. One father even learned how to sing so he could be in a school talent show with his daughter.

--Marriage:

Marriage, the second most frequent turning point mentioned by fathers, was crucial, regardless of whether it strengthened or weakened the relationship. Said one father: "She became dependent on her husband instead of me, and I determined not to interfere to the point of driving a wedge between her husband and me."

On the flip side, one father said that being involved in her daughter's wedding plans gave him a reason to talk regularly to her.

--Daughter Begins Dating:

Fathers attempted to fiercely protect their daughters during this time, worrying constantly about them, and as a whole, their closeness lessened. "She communicated more with her mother about personal matters and less with me," one man reported. As their "little girls" grew into young women, fathers realized they could not shelter them forever and were forced to begin "letting go."

Memory Appears Susceptible to Eradication of Fear Responses

Feb. 18, 2013 — **Fear responses can only be erased when people learn something new while retrieving the fear memory.** This is the conclusion of a study conducted by scientists from the University of Amsterdam (UvA) and published in the journal *Science*.

Researchers Dieuwke Sevenster MSc, Dr Tom Beckers and Prof. Merel Kindt have **developed a method to determine whether an acquired fear response is susceptible to modification. By doing so, they have revealed the circumstances under which an acquired fear response can be eradicated.** In order to measure whether a person actually learnt something new, the researchers used a measure for Prediction Error -- in other words, the discrepancy between a person's anticipation of what is going to happen and what actually happens.

No fear response

Cognitive Behavioural Therapy is currently the most common and effective type of treatment for people suffering from anxiety disorders. However, the effects are often short-lived and the fear returns in many patients. One major finding of Van Kindt's research lab is that when participants were **given propranolol, a beta blocker, while retrieving a specific fear memory, the acquired fear response was shown to be totally erased a day or month later.** The researchers repeatedly found that **the fear did not come back, despite the use of techniques specifically aimed to make it return. This indicates that the fear memory was either fully eradicated, or could no longer be accessed.** One crucial finding was that while participants could still remember the association with the fear, that particular memory no longer triggered the former fear response.

Fear conditioning

For their study the researchers used a fear conditioning procedure in which a specific picture was followed by a nasty painful stimulus. While the participants viewed the pictures, the researchers measured the anticipation of the painful stimulus as well as the more autonomous fear response on the basis of the startle reflex.

The current findings will contribute to the further development of more effective and efficient therapies for patients suffering from excessive anxiety disorders, such as trauma victims. There was no independent measure to indicate whether the memory is susceptible to modification up until now. The researchers have shown that the fear response can be eradicated completely, provided that the person concerned actually learns something new while retrieving the fear memory.

Gut Bacteria Linked to Cholesterol Metabolism

Feb. 18, 2013 — Researchers at the Sahlgrenska Academy, University of Gothenburg, Sweden, show that **cholesterol metabolism is regulated by bacteria in the small intestine.** These findings may be important for the development of new drugs for cardiovascular disease.

It is well established that cholesterol is the major risk factor for cardiovascular disease. **Cholesterol -- which is mainly synthesized in the body but also obtained from dietary sources --** is converted to bile acids in the liver, which are then secreted into the intestine and either removed from the body or recycled back to the liver.

The influence of gut bacteria on human health and disease is a rapidly expanding research area. Fredrick Bäckhed's research group is a leader in this field and is investigating how gut bacteria are linked to lifestyle diseases such as obesity, diabetes and cardiovascular disease.

In a study published in the journal *Cell Metabolism*, they show that **gut bacteria reduce bile acid synthesis in the liver by signaling through a specific protein, known as the FXR receptor, in the small intestine.**

'Drugs that reduce cholesterol levels have, in recent years, greatly reduced deaths from cardiovascular disease. Our study is a step forward because we have shown how gut bacteria regulate the formation of bile acids from cholesterol', says Sama Sayin, medical doctor and PhD student at the Sahlgrenska Academy, University of Gothenburg, and the study's first author. The FXR receptor not only affects cholesterol metabolism but is also involved in the body's sugar and fat metabolism.

'If future research can identify the specific bacteria that affect FXR signaling in the gut, this could lead to new ways to treat diabetes and cardiovascular disease', says Fredrik Bäckhed, professor at the Sahlgrenska Academy, University of Gothenburg, who led the study.

Calcium Is Initial Trigger in Our Immune Response to Healing

Feb. 14, 2013 — **For the first time scientists studying the cellular processes underlying the body's response to healing have revealed how a flash of calcium is the very first step in repairing damaged tissue.** The findings, published in *Current Biology*, could lead to new therapies that speed up the healing process following injury or surgery.

Until recently, very little was known about how damaged tissue activates and attracts the first white blood cells to the wound -- the first stage in the healing process. However, researchers from the University of Bristol's School of Biochemistry in collaboration with a team from the University of Bath, have shown that **the very first trigger in this process is a flash of calcium which spreads like a wave back from the wound edge through gap junctions that connect all the cells.**

This flash of calcium signal goes on to activate an enzyme known as DUOX that **synthesises hydrogen peroxide, which, in turn, attracts the first white blood cells to the wound.** This white blood cell invasion, which is initiated during our inflammatory responses, is needed to kill off invading microbes and stop the onset of septicaemia following tissue damage. The findings indicate that the wound-induced calcium flash represents the earliest identified signal following wounding and might therefore orchestrate the rapid recruitment of immune cells.

To assess the impact of a reduced calcium flash upon the inflammatory response the team used *Drosophila* (fruit fly) embryos because they are translucent which makes it easy to image the inflammatory response and because of their simple genetics. The team found that blocking the calcium flash inhibited H₂O₂ release at the wound site leading to a reduction in the number of immune cells migrating to the wound.

Paul Martin, Professor of Cell Biology and an expert in wound healing at the University, said: "White blood cells are a little like 'Jekyll and Hyde' in that they help us heal but are also the reason behind why we scar so we really need to know how they are regulated at wounds in order to learn how to control their behaviours for future therapeutic intervention."

Will Razzell, the lead PhD researcher on this study, added: "We are more than ever understanding the pathways that lead to immune cell attraction to wounds. As calcium represents the immediate inflammatory signal, we now have a good foundation to investigate this complicated process further."

Bilingual Babies Know Their Grammar by 7 Months

Feb. 14, 2013 — **Babies as young as seven months can distinguish between, and begin to learn, two languages with vastly different grammatical structures**, according to new research from the University of British Columbia and Université Paris Descartes.

Published February 14 in the journal *Nature Communications* and presented at the 2013 Annual Meeting of the American Association for the Advancement of Science (AAAS) in Boston, the study shows that **infants in bilingual environments use pitch and duration cues to discriminate between languages -- such as English and Japanese -- with opposite word orders**. In English, a function word comes before a content word (the dog, his hat, with friends, for example) and the duration of the content word is longer, while in Japanese or Hindi, the order is reversed, and the pitch of the content word higher.

"By as early as seven months, babies are sensitive to these differences and use these as cues to tell the languages apart," says UBC psychologist Janet Werker, co-author of the study. Previous research by Werker and Judit Gervain, a linguist at the Université Paris Descartes and co-author of the new study, showed that babies use frequency of words in speech to discern their significance.

"For example, in English the words 'the' and 'with' come up a lot more frequently than other words -- they're essentially learning by counting," says Gervain. "But babies growing up bilingual need more than that, so they develop new strategies that monolingual babies don't necessarily need to use."

"If you speak two languages at home, don't be afraid, it's not a zero-sum game," says Werker. "Your baby is very equipped to keep these languages separate and they do so in remarkable ways."

Does 'I Love You' Mean Your Relationship Is in Trouble?

Feb. 14, 2013 — Cuddling, kissing and holding hands are the kinds of behavior you might expect to see this time of year. **So why do the days that follow Valentine's Day mark the largest spike on the calendar for breakups?** Affectionate behavior is not all that it seems, according to relational communication expert Sean Horan, an assistant professor at DePaul University in the College of Communication. "**Gestures such as hand holding, kissing and cuddling could be indicators that your partner is mad at you,**" explained Horan.

In the study "Understanding the Routine Expression of Deceptive Affection in Romantic Relationships," forthcoming in *Communication Quarterly*, co-author Horan examined how and

why deceptive affectionate behavior occurs. **Deceptive affection means that an individual in a romantic relationship chooses to express affection he or she does not actually feel, according to the findings.**

Horan, along with co-author Melanie Booth-Butterfield, a professor at West Virginia University, discovered that **non-married individuals expressed deceptive affection about three times a week to romantic partners.** "Couples use deceptive affection because they feel negatively about their partner and want to save face, avoid embarrassing their partner or sidestep a situation that may land them in hot water," said Horan.

Examples of this kind of deception include **lying about one's own feelings or feelings about a partner and expressing affection instead of negative feelings,** he noted.

One participant confessed she didn't want to hug or cuddle her boyfriend because she was in a bad mood but did so anyway. Another told his girlfriend he loved her to get off the phone faster so he could watch a basketball game. And when one woman's boyfriend asked if she liked his new haircut, she lied and said she did, in order to spare his feelings.

According to the study's findings, couples use verbal and non-verbal affection in hopes that a sweet caress or profession of love will mask their true feelings. However, don't let paranoia kick in and assume your love will wilt faster than Valentine's Day roses. Horan noted that this isn't necessarily negative behavior. "Using affection to lie appears to be a regular activity in romantic relationships that most people don't seem to mind," he said. "In fact, deceptive affection might actually help maintain a relationship."

Life Experiences Put Their Stamp On the Next Generation: New Insights from Epigenetics

Feb. 14, 2013 — The 18th century natural philosopher Jean-Baptiste Lamarck proposed that the necks of giraffes lengthened as a consequence of the cumulative effort, across generations, to reach leaves just out of their grasp. This view of evolution was largely abandoned with the advent of modern genetic theories to explain the transmission of most important traits and many medical illnesses across generations.

However, there has long been the impression that major life events, like psychological traumas, not only have effects on individuals who directly experience these events, but also have effects on their children. For example, cross-generational effects have been well-documented in the children of Nazi death camp survivors. Similar issues have been reported in the context of mood disorders and addiction. Until recently, these trans-generational effects were attributed to changes in the way that parents treated their children or the child's reaction to learning about the parent's history.

In the most recent issue of *Biological Psychiatry*, Swiss researchers from the University of Zurich and Swiss Federal Institute of Technology, led by Dr. Isabelle Mansuy, discuss how the

emergence of the field of epigenetics has introduced a new component to this discussion -- the trans-generational transmission of changes in the regulation of gene expression.

"The question of the inheritance of acquired traits has puzzled biologists and clinicians for decades. **Although it has been consistently observed as early as in the 18th century**, the time has now come that **sufficiently strong and convincing evidence has accumulated to firmly accept it,"** said Mansuy.

The genetic transmission of traits reflects alterations in genetic structure, i.e., the base pairs that form DNA. Epigenetics, on the other hand, involves cellular processes that do not alter the structure of DNA. Instead, epigenetic mechanisms, including the methylation of DNA or of specific residues on histone "supporter" proteins, influence the extent to which individual genes are converted into messenger RNA. These changes can occur in any cell of the body, but when they occur in the germ cells (sperm or eggs) the changes may be passed to the next generation.

The changes in DNA structure are random events that acquire functional significance in the context of Darwin's "natural selection" process. In contrast, the epigenetic reactions to specific environments are designed to enable that organism to cope with that context. When these traits are passed to the next generation, it is as if the newborn arrives prepared for that specific environment. **Problems arise when the epigenetic processes give rise to traits that are not adaptive for the offspring, such as heightened stress reactivity, or when the environment has changed.**

"This is a remarkable story with far-reaching implications," commented Dr. John Krystal, Editor of *Biological Psychiatry*. "There is a suspicion that epigenetic processes may be reversed more easily than genetic traits, exemplified by the development of HDAC inhibitors. This is a rapidly evolving research area that has captured a great deal of attention."

The article is "Transgenerational Epigenetic Effects on Brain Functions" by Johannes Bohacek, Katharina Gapp, Bechara J. Saab, and Isabelle M. Mansuy. The article appears in *Biological Psychiatry*, Volume 73, Issue 4 (February 15, 2013), published by Elsevier.

Cracking the Semantic Code: Half a Word's Meaning Is 3-D Summary of Associated Rewards

Feb. 13, 2013 — We make choices about pretty much everything, all the time -- "Should I go for a walk or grab a coffee?"; "Shall I look at who just came in or continue to watch TV?" -- and to do so we need something common as a basis to make the choice. Dr John Fennell and Dr Roland Baddeley of Bristol's School of Experimental Psychology followed a hunch that **the common quantity, often referred to simply as reward, was a representation of what could be gained,**

together with how risky and uncertain it is. They proposed that these dimensions would be a unique feature of all objects and be part of what those things mean to us.

Over 50 years ago, psychologist **Charles Osgood developed an influential method, known as the 'semantic differential', that attempts to measure the connotative, emotional meaning of a word or concept. Osgood found that about 50 per cent of the variation in a large number of ratings that people made about words and concepts could be captured using just three summary dimensions: 'evaluation' (how nice or good the object is), 'potency' (how strong or powerful an object is) and 'activity' (whether the object is active, unpredictable or chaotic). So, half of a concept's meaning is simply a measure of how nice, strong, and active it is.** The main problem is that, until now, no one knew why.

Dr Baddeley explained: "Over time, **we keep a running tally of all the good and bad things associated with a particular object. Later, when faced with a decision, we can simply choose the option that in the past has been associated with more good things than bad.** This dimension of choice sounds very much like the 'evaluation' dimension of the semantic differential."

To test this, the researchers needed to estimate the number of good or bad things happening. At first sight, estimating this across a wide range of contexts and concepts seems impossible; someone would need to be observed throughout his or her lifetime and, for each of a large range of contexts and concepts, the number of times good and bad things happened recorded. Fortunately, a more practical solution is provided by the recent phenomenon of internet blogs, which describe aspects of people's lives and are also searchable. Sure enough, after analysing millions of blog entries, the researchers found that **the evaluation dimension was a very good predictor of whether a particular word was found in blogs describing good situations or bad.**

Interestingly, they also found that **how frequently a word was used was also a good predictor of how much we like it. This is a well-known effect -- the 'mere exposure effect' -- and a mainstay of the multi-billion dollar advertising industry.** When comparing two options we just choose the option we like the most -- **and we like it because in the past it has been associated with more good things.**

Analysing the data showed that **'potency' was a very good predictor of the probability of bad situations being associated with a given object: it measured one kind of risk.**

Dr Fennell said: "This kind of way of quantifying risk is called 'value at risk' in financial circles, and the perils of ignoring it have been plain to see. Russian Roulette may be, on average, associated with positive rewards, but the risks associated with it are not for everyone!"

It is not the only kind of risk, though. In many situations, **'activity' -- that is, unpredictability, or more importantly uncontrollability -- is a highly relevant measure of risk:** a knife in the hands of a highly trained sushi chef is probably safe, a knife in the hands of a drunk, erratic stranger is definitely not.

Dr Fennell continued: "Again, this different kind of risk is relevant in financial dealings and is often called volatility. It seems that the mistake that was made in the credit crunch was not ignoring this kind of risk, but to assume that you could perfectly guess it based on how unpredictable it had been in the past."

Thus, the researchers propose that **half of meaning is simply a summary of how rewarding, and importantly, how much of two kinds of risk is associated with an object.** Being sensitive not only to rewards, but also to risks, is so important to our survival, that it appears that **its representation has become wrapped up in the very nature of the language we use to represent the world.**

Red Brain, Blue Brain: Republicans and Democrats Process Risk Differently, Research Finds

Feb. 13, 2013 — A team of political scientists and neuroscientists has shown that **liberals and conservatives use different parts of the brain when they make risky decisions, and these regions can be used to predict which political party a person prefers.** The new study suggests that **while genetics or parental influence may play a significant role, being a Republican or Democrat changes how the brain functions.**

Dr. Darren Schreiber, a researcher in neuropolitics at the University of Exeter, has been working in collaboration with colleagues at the University of California, San Diego on research that explores the differences in the way the brain functions in American liberals and conservatives. The findings are published Feb. 13 in the journal *PLOS ONE*.

In a prior experiment, participants had their brain activity measured as they played a simple gambling game. Dr. Schreiber and his UC San Diego collaborators were able to look up the political party registration of the participants in public records. Using this new analysis of 82 people who performed the gambling task, the academics showed that **Republicans and Democrats do not differ in the risks they take. However, there were striking differences in the participants' brain activity during the risk-taking task.**

Democrats showed significantly greater activity in the left insula, a region associated with social and self-awareness. Meanwhile Republicans showed significantly greater activity in the right amygdala, a region involved in the body's fight-or-flight system. These results suggest that liberals and conservatives engage different cognitive processes when they think about risk.

In fact, brain activity in these two regions alone can be used to predict whether a person is a Democrat or Republican with 82.9% accuracy. By comparison, the longstanding traditional model in political science, which uses **the party affiliation of a person's mother and father to predict the child's affiliation, is only accurate about 69.5% of the time.** And another model

based on the differences in brain structure distinguishes liberals from conservatives with only 71.6% accuracy.

The model also outperforms models based on differences in genes. Dr. Schreiber said: "Although genetics have been shown to contribute to differences in political ideology and strength of party politics, the portion of variation in political affiliation explained by activity in the amygdala and insula is significantly larger, suggesting that affiliating with a political party and engaging in a partisan environment may alter the brain, above and beyond the effect of heredity."

These results may pave the way for new research on voter behaviour, yielding better understanding of the differences in how liberals and conservatives think. According to Dr. Schreiber: "The ability to accurately predict party politics using only brain activity while gambling suggests that investigating basic neural differences between voters may provide us with more powerful insights than the traditional tools of political science."

Rewiring the Serotonin System

Feb. 13, 2013 — An interdisciplinary team of researchers from the University of Texas Medical Branch at Galveston and the University of Houston has **found a new way to influence the vital serotonin signaling system** -- possibly leading to more effective medications with fewer side effects.

Scientists have linked malfunctions in serotonin signaling to a wide range of health issues, everything from depression and addictions to epilepsy and obesity and eating disorders. Much of their attention has focused on complex proteins called serotonin receptors, which are located in the cell membrane. Each receptor has a so-called "active site" specially suited to bond with a serotonin molecule; when that bond is formed, the receptor changes shape, transmitting a signal to the cell's interior.

Traditional drug discovery efforts target interactions that take place at such active sites. But a receptor's behavior can also be changed by additional proteins that bind to the receptor at locations quite distant (in molecular terms) from the active site, in a process called "**allosteric regulation**" -- the mechanism examined by the UTMB-UH team for one specific and highly significant kind of serotonin receptor, designated the 5-HT_{2C}.

"This is a whole new way of thinking about this system, targeting these interactions," said UTMB professor Kathryn Cunningham, senior author of a paper on the research now online in the *Journal of Neuroscience*. "**Basically, we've created a new series of molecules and validated that we can use them to change the way the receptor functions both in vitro and in vivo, through an allosteric effect.**"

The UTMB-UH group's approach centers on the natural interaction between the 5-HT_{2C} receptor, serotonin, and another molecule called PTEN. Like serotonin, PTEN controls 5-HT_{2C} receptor function; because it does so at a location distant from the active site, it's possible -- and

in fact common -- for a receptor to bind to serotonin and PTEN simultaneously. When this happens, an allosteric effect is produced: serotonin signaling is weakened.

"We want to maintain signaling through 5-HT_{2C} receptors to gain therapeutic benefits, and to do that we had to reduce the number of receptors that were binding to PTEN molecules," said UH professor Scott Gilbertson, another senior author on the paper. "One way to do that is to develop an inhibitor that competes with the receptor for binding to PTEN."

The candidate inhibitor chosen by the researchers was a fragment of the receptor itself -- specifically, the part of the receptor where PTEN attaches. Such sub-protein structures are known as "peptides"; this one was previously dubbed "3L4F." Test-tube and cell-culture experiments showed that 3L4F boosted 5-HT_{2C} response significantly; that it acted by binding to PTEN; and that it had no effect at all on another type of serotonin receptor, designated 5-HT_{2A}. Behavioral studies in laboratory rats also indicated that 3L4F increased 5-HT_{2C} responses.

"We looked at both human cells and rats because ultimately we want to translate this research into therapeutics," said UTMB postdoctoral fellow Noelle Anastasio, lead author of the paper. "The idea of targeting these interactions to produce drug and research tools is truly new and has great potential."

The team took a step toward realizing that potential by trimming 3L4F down to a peptide roughly half its size that retains similar efficacy. Using computational molecular modeling, they determined which elements of this peptide were important to bonding with PTEN -- information they will use to design smaller molecules with the same or better activity.

"We've got the basics down now, so we can use the chemistry to make new molecules that we think might be potentially useful for treatment of addictions, for example," Cunningham said. "But there's also an intense interest in figuring out the biology of this interaction between 5-HT_{2C} and PTEN, what it means in terms of disease states like the addictions, alcoholism, depression and obesity and eating disorders. I think in a broader sense this is really going to help us understand the neurobiology of these disorders."

Other authors of the paper from UTMB include research development coordinator Marcy Bubar, research associates Nicole Bremer, Sonja Stutz and Robert Fox, research scientists Thressa Smith and Yowjiun Jeng, graduate assistant Sarah Swinford, senior scientific manager Patricia Seitz, assistant professor Fernanda Laezza and professor Cheryl Watson. Authors from UH include research scientist Anton Agarkov, postdoctoral fellows Marc Charendoff and John Craft and associate professor James Briggs.

Support for this research was provided by the Klarman Family Foundation, the Foundation for Prader-Willi Research and the National Institute on Drug Abuse.

Threat Bias Interacts With Combat, Gene to Boost PTSD Risk

Feb. 13, 2013 — **Soldiers preoccupied with threat at the time of enlistment or with avoiding it just before deployment were more likely to develop post-traumatic stress disorder (PTSD), in a study of Israeli infantrymen. Such pre-deployment threat vigilance and avoidance, interacting with combat experience and an emotion-related gene, accounted for more than a third of PTSD symptoms that emerged later,** say National Institutes of Health scientists, who conducted the study in collaboration with American and Israeli colleagues.

"Since biased attention predicted future risk for PTSD, computerized training that helps modify such attention biases might help protect soldiers from the disorder," said Daniel Pine, M.D., of the NIH's National Institute of Mental Health (NIMH). Pine, Yair Bar-Haim, Ph.D., of Tel Aviv University, and colleagues, report their findings, Feb. 13, 2013, in the journal *JAMA Psychiatry*.

Bar-Haim's team tracked 1085 male Israeli soldiers from recruitment through combat deployment during 2008-2010, to pinpoint how shifting attitudes toward threat interact with other factors to predict symptoms that develop after exposure to dangers. They expected that the more soldiers paid attention to avoiding threats just before and during deployment, the more they would suffer PTSD symptoms.

Researchers measured threat attention biases over the course of soldiers' first year of service: at the time of recruitment, about six months later -- just before deployment to combat -- and six months after deployment. Data from all three time points was collected for 487 of the soldiers.

Soldiers performed a computerized task that required paying attention to locations of neutral words, such as "data" or threatening words, such as "dead." A faster reaction time for identifying the location of threat words indicated increased threat vigilance. Slower reaction times to such word locations indicated attention away from threat, or threat avoidance.

The study also examined how threat attention bias vulnerability might be moderated by other factors, including the gene that codes for the protein on neurons that recycles the brain chemical messenger serotonin from the synapse. Versions of this serotonin transporter gene had been previously linked to PTSD risk. Evidence suggests that people with gene versions that result in less efficient recycling may be overly vigilant toward threats under normal circumstances. Yet there is also evidence that having these low-efficiency versions may help people cope with dangerous conditions, when such heightened vigilance may be adaptive.

As expected, soldiers who experienced higher combat exposure -- e.g., served in units operating outside Israel's security fence -- tended to show more threat vigilance than those with less stressful assignments. Compared to soldiers who were neither vigilant nor avoidant, soldiers with greater vigilance at recruitment or avoidance at six months -- on the eve of deployment -- had more PTSD symptoms at the end of their first year of service.

Although serotonin gene type had no direct effect on symptoms, the low efficiency gene version, combined with high threat vigilance, appeared to confer some protection to soldiers who experienced high combat exposure.

"Their natural tendency to attend to threats may lead to less adaptive emotional responses and elevated anxiety when environmental conditions are safe and stable, but to perfectly normal and adaptive responses in combat, where vigilance toward minor threats is crucial for survival," explained Pine.

Bias toward threats showed no such association with PTSD symptoms in those with the high efficiency version of the gene. Nor did gene type interact with threat bias to predict PTSD in soldiers with low combat exposure. Similarly, among the low combat exposure group, a history of traumatic experiences, self-reported combat experience, threat bias or gene type had no bearing on PTSD symptoms.

Higher pre-deployment PTSD symptoms and failure to complete high school also predicted higher post-deployment PTSD risk.

"Extreme adaptation challenges, such as those arising from soldiers' shifting exposures to relatively safe and acutely hostile environments, may produce shifting psychological and behavioral symptoms of hyper-vigilance and avoidance," explained the researchers.

They propose that computer-based attention bias modification techniques (see below) be tested in both soldiers prior to deployment as well as in PTSD patients, in combination with evidence-based cognitive therapies.

Cellular Renewal Process May Underlie Benefits of Omega Fatty Acids

Feb. 13, 2013 — **A search for genes that change their levels of expression in response to nutrient deprivation has uncovered potential clues to the mechanism underlying the health benefits of omega fatty acids.** In the Feb. 15 issue of *Genes & Development*, Massachusetts General Hospital (MGH) researchers describe finding that **feeding omega-6 fatty acids to *C. elegans* roundworms or adding them to cultured human cells activates a cellular renewal process called autophagy, which may be deficient in several important diseases of aging.** A process by which defective or worn-out cellular components and molecules are broken down for removal or recycling, **autophagy is also activated in metabolically stressful situations, allowing cells to survive by self-digesting nonessential components.**

"Enhanced autophagy implies improved clearance of old or damaged cellular components and a more efficient immune response," says Eyleen O'Rourke, PhD, of MGH Molecular Biology, lead author of the report. "It has been suggested that **autophagy can extend lifespan by maintaining cellular function, and in humans a breakdown in autophagic function may involved in**

diseases including inflammatory bowel disease, Parkinson's disease, and in a more complex way in cancer and metabolic syndrome."

O'Rourke is a research fellow in the laboratory of MGH investigator Gary Ruvkun, PhD, whose team investigates the development, longevity and metabolism of *C.elegans*. Ruvkun and other researchers have discovered that simple mutations in genetic pathways conserved throughout evolution can double or triple the lifespan of *C. elegans* and that similar mutations in the corresponding mammalian pathways also regulate lifespan. Many of these mutations also make animals resistant to starvation, suggesting that common molecular mechanisms may underlie both response to nutrient deprivation and the regulation of lifespan.

To find these mechanisms O'Rourke searched genomic databases covering many types of animals for shared genes that respond to fasting by changing their expression. She found that expression of the *C. elegans* gene *lipl-4* increases up to seven times in worms not given access to nutrients. A transgenic strain that constantly expresses elevated levels of *lipl-4*, even when given full access to food, was found to have increased levels of arachidonic acid (AA), an omega-6, and eicosapentanoic acid (EPA), an omega-3 fatty acid and to resist the effects of starvation.

Following the implication that omega fatty acids stimulate a process leading to starvation resistance, the researchers found that feeding AA and another omega-6 fatty acid, but not EPA, activated autophagy in non-transgenic *C. elegans* with full access to nutrients. Since activation of autophagy has been shown to increase lifespan in several genetic models, the authors tested the effect of omega-6 fatty acids on *C. elegans* lifespan and found that roundworms consuming a full normal diet supplemented with omega-6 fatty acids lived 20 to 25 percent longer than usual.

Since dietary supplementation with both omega-3 and omega-6 fatty acids has been shown to prevent or improve several human health conditions, the researchers tested the response of cultured human cells to omega fatty acid supplementation. As in *C. elegans*, the human cells responded to supplementation with the omega-6 acids, but not to EPA, by activation of autophagy, measured by levels of marker proteins. That result suggests that omega-6 acids induce autophagy across the full range of multicellular animal species. The researchers then showed that the lifespan-increasing properties of omega-6 fatty acids in *C. elegans* depend on the presence of genes required for autophagy.

"Almost all the mechanisms of lifespan extension studied until now -- sterility, insulin insensitivity, and caloric restriction -- have been shown to depend on activation of autophagy," says O'Rourke. "Our finding that omega-6 supplementation activated roundworms' cellular response to fasting -- namely autophagy -- even though the worms were eating normally suggests that consumption of omega-6 fatty acids may provide the benefits of caloric restriction without the need to limit food consumption. It also suggests that the reported benefits of omega-6 acids could depend in part on activation of an evolutionarily ancient program for surviving food deprivation."

O'Rourke and her co-authors note that many investigators and clinicians believe that omega-6 fatty acids -- commonly found in meats, poultry and vegetable oils -- may increase the risk of cardiovascular disease, despite epidemiologic evidence that omega-6 consumption actually

reduces cardiovascular risks. "We hope that our findings -- made by investigating the cellular responses of a 1-millimeter roundworm -- will lead the scientific and medical community to look back at all the epidemiologic, basic and clinical research data and to study the effects of omega-6 fatty acids on multiple types of human cells and live animals in order to gain better knowledge on how balanced intake of these nutrients benefits human health," she says.

Helicopter Parenting Can Violate Students' Basic Needs

Feb. 12, 2013 — When is it time for parents to back away? A new study shows that **college students with overcontrolling parents are more likely to be depressed and less satisfied with their lives. This so-called helicopter parenting style negatively affects students' well-being by violating their need to feel both autonomous and competent.** The work, by Holly Schiffrin and colleagues from the University of Mary Washington in the United States, is published online in Springer's *Journal of Child and Family Studies*.

Parental overinvolvement may lead to negative outcomes in children, including higher levels of depression and anxiety. Studies also suggest that children of overinvolved or overcontrolling parents may feel less competent and less able to manage life and its stressors. In contrast, evidence suggests that some parental involvement in children's lives facilitates healthy development, both emotionally and socially.

Children's need for autonomy increases over time as they strive to become independent young adults. Among college administrators, concern is shared that parents do not adjust their level of involvement and control as their child grows up and, instead, practice helicopter parenting.

Schiffrin and her team examined how parenting behaviors affect the psychological well-being of children by looking at college students' self-determination. A total of 297 American undergraduate students, aged 18-23 years, answered an online survey. They were asked to describe their mothers' parenting behaviors, rate their own perceptions of their autonomy, competence, and relatedness (i.e., how well they get along with other people). The researchers also assessed the students' overall satisfaction with life, their level of anxiety, and whether or not they suffered depressive symptoms.

Overall, an inappropriate level of parental behavioral control was linked to negative well-being outcomes for students. Helicopter parenting behaviors were related to higher levels of depression and decreased satisfaction with life. In addition, helicopter parenting behaviors were associated with lower levels of perceived autonomy, competence, and relatedness. And those who perceived they had less autonomy and competence were also more likely to be depressed.

The authors conclude that helicopter parenting is a highly involved, intensive, and hands-on method of parenting. Their research suggests that intense involvement is considered by some parents to be supportive, whereas it may actually be perceived as controlling and undermining by their children. "Parents should keep in mind how developmentally appropriate their involvement

is and learn to adjust their parenting style when their children feel that they are hovering too closely."

Vitamin D Potency Varies Widely in Dietary Supplements, Analysis Finds

Feb. 11, 2013 — Vitamin D supplement potency varies widely, and the amount of vitamin D in over-the-counter and compounded supplements does not necessarily match the amount listed on the label, according to a research letter published in the journal *JAMA Internal Medicine*. The analysis showed that the amount of vitamin D in these supplements ranged from 9 percent to 146 percent of the amount listed on the label. Not only was there variation among different brands and manufacturers, but also among different pills from the same bottle.

"We were surprised by the variation in potency among these vitamin D pills," says Erin S. LeBlanc, MD, MPH, lead author and investigator with the Kaiser Permanente Center for Health Research in Portland, Ore. "The biggest worry is for someone who has low levels of vitamin D in their blood. If they are consistently taking a supplement with little vitamin D in it, they could face health risks."

According to a recent editorial in the *New England Journal of Medicine*, more than 100 million Americans spend a combined \$28 billion on vitamins, herbs and supplements each year. The U.S. Food and Drug Administration is considering new safety guidelines for some supplements but, for the most part, the industry remains unregulated.

Some manufacturers participate in a voluntary quality verification program operated by the U.S. Pharmacopeial Convention -- an independent, nonprofit organization that sets public standards for the quality of dietary supplements. **In order to receive the USP verification mark, manufacturers' facilities undergo annual good manufacturing-practice audits, and their products are tested for quality, potency and purity. Dr. LeBlanc and her colleagues included one supplement from a USP Verified manufacturer in their sample. They found the amount of vitamin D in pills from that bottle was generally more accurate than the other bottles tested.**

"The USP verification mark may give consumers some reassurance that the amount of vitamin D in those pills is close to the amount listed on the label," said Dr. LeBlanc. "There are not many manufacturers that have the USP mark, but it may be worth the extra effort to look for it."

The researchers tested 55 bottles of over-the-counter vitamin D from 12 different manufacturers. The over-the-counter vitamin D pills used in the analysis were purchased at five different stores in Portland, Ore. The compounded vitamin D was made by a compounding pharmacy in Portland. The analysis was conducted by an independent lab in Houston.

Authors of the letter include Erin S. LeBlanc, MD, MPH, Nancy Perrin, PhD, and Teresa Hillier, MD, from the Kaiser Permanente Center for Health Research in Portland, Ore.; and Jeffery D. Johnson, Jr., PhD, and Annie Ballatore, from Eagle Analytical Services in Houston.