Infoteca's E-Journal

An Electronic Compilation of Scientific and Cultural Information by
Sistema de Infotecas Centrales, Universidad Autónoma de Coahuila

CONTENTS

Popcorn's Dark Secret
By KAREN BARROW

Tony Cenicola/The New York Times Movie popcorn contained an alarming amount of fat, salt and calories.
Sitting in a dark movie theater with your friends and a tub of buttery popcorn sounds like a perfect way to spend a Saturday night – and it could be, if you are willing to share your popcorn with the entire row of moviegoers around you.
A review of the nutritional contents of movie-theater popcorn reveals an alarming amount of fat, salt and calories in even the smallest sizes. The study, from the Center for Science in the Public Interest, looked at popcorn from three movie theater chains and detailed the contents of all portions offered.
A large tub of popcorn at Regal Cinemas, for example, holds 20 cups of popcorn and has 1,200 calories, 980 milligrams of sodium and 60 grams of saturated fat. Adding just a tablespoon of butter adds 130 calories. And do not forget that it comes with free refills.
Not so hungry? The medium size popcorn, which comes in a bag, contains the same amount as the large. And even the small, at 11 cups, delivers 670 calories, 550 milligrams of sodium and 24 grams of saturated fat.
The findings may surprise those who choose popcorn at the concession stand because they believe it is a relatively healthy snack. In fact, plain air-popped popcorn is low in calories and free of saturated fat. Movie theater popcorn, however, is popped in oil — often coconut oil, which is 90 percent saturated fat. Add salt to the enormous portions, and your once-healthy snack turns into a health offender.
"The issue here is quantity," said Marion Nestle, a professor of nutrition at New York University. "One of those large tubs is three-fourths of a day's calories."
Even the "healthiest" sample of popcorn tested, a small size from AMC containing 6 cups of popcorn, had 370 calories, enough to justify sharing with a friend and eating one kernel at a time to make it last the length of a movie.
"If you were eating just a cup or two, it wouldn't matter nearly as much," Dr. Nestle said.
The third movie theater chain tested, Cinemark, fares slightly better than its competitors because it pops its popcorn in nonhydrogenated canola oil instead of coconut oil. Cinemark's large tub contains 17 cups of popcorn with 910 calories and 4 grams of saturated fat, as well as a whopping 1,500 milligrams of sodium — nearly enough for the entire day.
One way to make your popcorn healthier? Ask the theater to pop a portion without salt. Two of the movie theaters that had their popcorn tested said they would oblige such a request.
The best way to make your movie snack healthier, however, would be to skip the popcorn — and the concession stand — altogether.
"You could share a tub of popcorn with 10 friends," Dr. Nestle said. "Or, what a concept, watch the movie without eating anything."

http://well.blogs.nytimes.com/2009/11/19/popcorn/

You're Sick. Now What? Knowledge Is Power.

By TARA PARKER-POPE

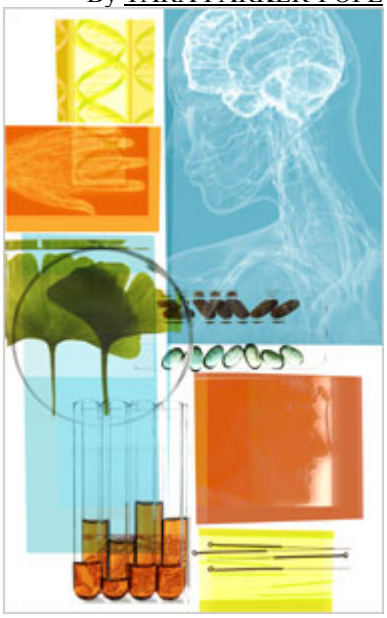


Illustration by Nola Lopez, with Anatomical Images by Bryan Christie

Are patients swimming in a sea of health information? Or are they drowning in it?
The rise of the Internet, along with thousands of health-oriented Web sites, medical blogs and even doctor-based television and radio programs, means that today's patients have more opportunities than ever to take charge of their medical care. Technological advances have vastly increased doctors' diagnostic tools and treatments, and have exponentially expanded the amount of information on just about every known disease. The daily bombardment of news reports and drug advertising offers little guidance on how to make sense of self-proclaimed medical breakthroughs and claims of worrisome risks. And doctors, the people best equipped to guide us through these murky waters, are finding themselves with less time to spend with their patients. But patients have more than ever to gain by decoding the latest health news and researching their own medical care.
"I don't think people have a choice — it's mandatory," said Dr. Marisa Weiss, a breast oncologist in Pennsylvania who founded the Web site breastcancer.org. "The time you have with your doctor is getting progressively shorter, yet there's so much more to talk about. You have to prepare for this important meeting."
Whether you are trying to make sense of the latest health news or you have a diagnosis of a serious illness, the basic rules of health research are the same. From interviews with doctors and patients, here are the most important steps to take in a search for medical answers.
Determine your information personality.
Information gives some people a sense of control. For others, it's overwhelming. An acquaintance of this reporter, a New York father coping with his infant son's heart problem, knew he would be paralyzed with indecision if his research led to too many choices. So he focused on finding the area's best pediatric cardiologist and left the decisions to the experts.
Others, like Amy Haberland, 50, a breast cancer patient in Arlington, Mass., pore through medical journals, looking not just for answers but also for better questions to ask their doctors.

"Knowledge is power," Ms. Haberland said. "I think knowing the reality of the risks of my cancer makes me more comfortable undergoing my treatment."
Dr. Michael Fisch, interim chairman of general oncology for the University of Texas M. D. Anderson Cancer Center, says that before patients embark on a quest for information, they need to think about their goals and how they might react to information overload.
"Just like with medicine, you have to ask yourself what dose you can take," he said. "For some people, more information makes them wackier, while others get more relaxed and feel more empowered."
The goal is to find an M.D., not become one.
Often patients begin a medical search hoping to discover a breakthrough medical study or a cure buried on the Internet. But even the best medical searches don't always give you the answers. Instead, they lead you to doctors who can provide you with even more information.
"It's probably the most important thing in your cancer care that you believe someone has your best interests at heart," said Dr. Anna Pavlick, director of the melanoma program at the New York University Cancer Institute. "In an area where there are no right answers, you're going to get a different opinion with every doctor you see. You've got to find a doctor you feel most comfortable with, the one you most trust."
Keep statistics in perspective.
Patients researching their health often come across frightening statistics. Statistics can give you a sense of overall risk, but they shouldn't be the deciding factor in your care.
Jolanta Stettler, 39, of Denver, was told she had less than six months to live after getting a diagnosis of ocular melanoma, a rare cancer of the eye that had spread to her liver.
"I was told there is absolutely nothing they could help me with, no treatment," said Ms. Stettler, a mother of three. "I was left on my own."
Ms. Stettler and her husband, a truck driver, began searching the Internet. She found Dr. Charles Nutting, an interventional radiologist at Swedish Medical Center in Englewood, Colo., who was just beginning to study a treatment that involves injecting tiny beads that emit small amounts of radiation. That appeared to help for about 18 months.
When her disease progressed again, Ms. Stettler searched for clinical trials of treatments for advanced ocular melanoma, and found a National Institutes of Health study of "isolated hepatic perfusion," which delivers concentrated chemotherapy to patients with liver metastases. After the first treatment, Ms. Stettler's tumors had shrunk by half.
"I don't like statistics," she said. "If this study stops working for me, I'll go find another study. Each type of treatment I have is stretching out my life. It gives me more time, and it gives more time to the people who are working really hard to come up with a treatment for this cancer."
Don't limit yourself to the Web.
There's more to decoding your health than the Web. Along with your doctor, your family, other patients and support groups can be resources. So can the library. When she found out she had Type 2 diabetes in 2006, Barbara Johnson, 53, of Chanhassen, Minn., spent time on the Internet, but also took nutrition classes and read books to study up on the disease.
"I was blindsided — I didn't know anybody who had it," said Ms. Johnson, who told her story on the American Heart Association's Web site, IKnowDiabetes.org. "But this is a disease you have to manage yourself."
Tell your doctor about your research.
Often patients begin a health search because their own doctors don't seem to have the right answers. All her life, Lynne Kaiser, 44, of Plano, Tex., suffered from leg pain and poor sleep; her gynecologist told her she had "extreme PMS." But by searching the medical literature for "adult growing pains," she learned about restless legs syndrome and a doctor who had studied it.
"I had gone to the doctors too many times and gotten no help and no results," said Ms. Kaiser, who is now a volunteer patient advocate for the Web site WhatIsRLS.org. The new doctor she found "really pushed me to educate myself further and pushed me to look for support."
Although some doctors may discourage patients from doing their own research, many say they want to be included in the process.
Dr. Fisch of M. D. Anderson recalls a patient with advanced pancreatic cancer who decided against conventional chemotherapy, opting for clinical trials and alternative treatments. But instead of sending her

away, Dr. Fisch said he kept her in the "loop of care." He even had his colleagues use a mass spectroscopy machine to evaluate a blue scorpion venom treatment the patient had stumbled on. It turned out to be just blue water.

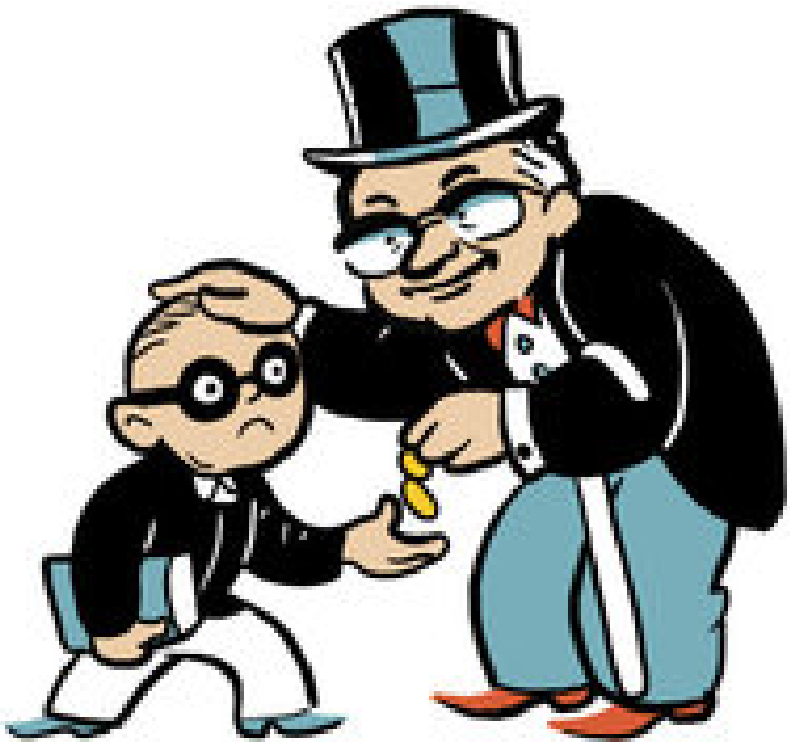
"We monitored no therapy like we would anything else, by watching her and staying open to her choices," Dr. Fisch said. "She lived about a year from the time of diagnosis, and she had a high quality of life."

Dr. Shalom Kalnicki, chairman of Radiation Oncology at the Montefiore-Einstein Cancer Center, says he tries to guide his patients, explaining the importance of peer-reviewed information to help them filter out less reliable advice. He also encourages them to call or e-mail him with questions as they "study their own case."

"We need to help them sort through it, not discourage the use of information," he said. "We have to acknowledge that patients do this research. It's important that instead of fighting against it, that we join them and become their coaches in the process."

http://www.nytimes.com/2008/09/30/health/30pati.html?ref=healthspecial

Monopoly, Milton Friedman's Way
By DAMON DARLIN



When Hasbro showed a new version of Monopoly last week at the Toy Fair, people were aghast that an infrared tower in the center of the board would squawk instructions, track players' money and make sure that everyone abided by the rules.

A generation of children may never learn to make change. They may never learn to argue about rules and change them. And they may never, as I and a group of Monopoly fanatics in college did in a great all-night game, learn important economic lessons. "There might not be the attention span for that anymore," said Mike Zelenty, one of the players.

Monopoly was taken seriously in Shorey House at the University of Chicago in the late 1970s. A room was set aside as "The Monopoly Room." But in that post-Vietnam, pre-Reagan era, all assumptions were questioned and a game our parents played was no exception. Rules were meant to be altered. The house even convened a "constitution convention" to change the official rules of the game to allow a person to build a hotel on a property without first having to own four houses. Mr. Zelenty, now a corporate lawyer in his native New Jersey, remembers holding a sign that said, "New Jersey Espouses / Hotels Without Houses."

The other thing taken as seriously in that dorm was free-market economics or, more precisely, Milton Friedman, the University of Chicago economics professor. This was a house that frequently invited Professor Friedman and his wife, Rose, to sherry hours. House members ran a snack bar in the basement of the dormitory called Tanstaafl, an abbreviation of a saying favored by Mr. Friedman, that "there ain't no such thing as a free lunch."

Mr. Zelenty owned the greatest of treasures any of us could imagine because it combined those two passions. He had asked Mr. Friedman to sign his Monopoly board at one of those sherry hours. The Nobel laureate did so, writing, "Down with" above the game's name. We didn't play on that board. No one ever played on that board. (Mr. Zelenty said he still has it and wants to donate the relic to the university one day. "It's in a place of safety more than a place of honor," he said.)

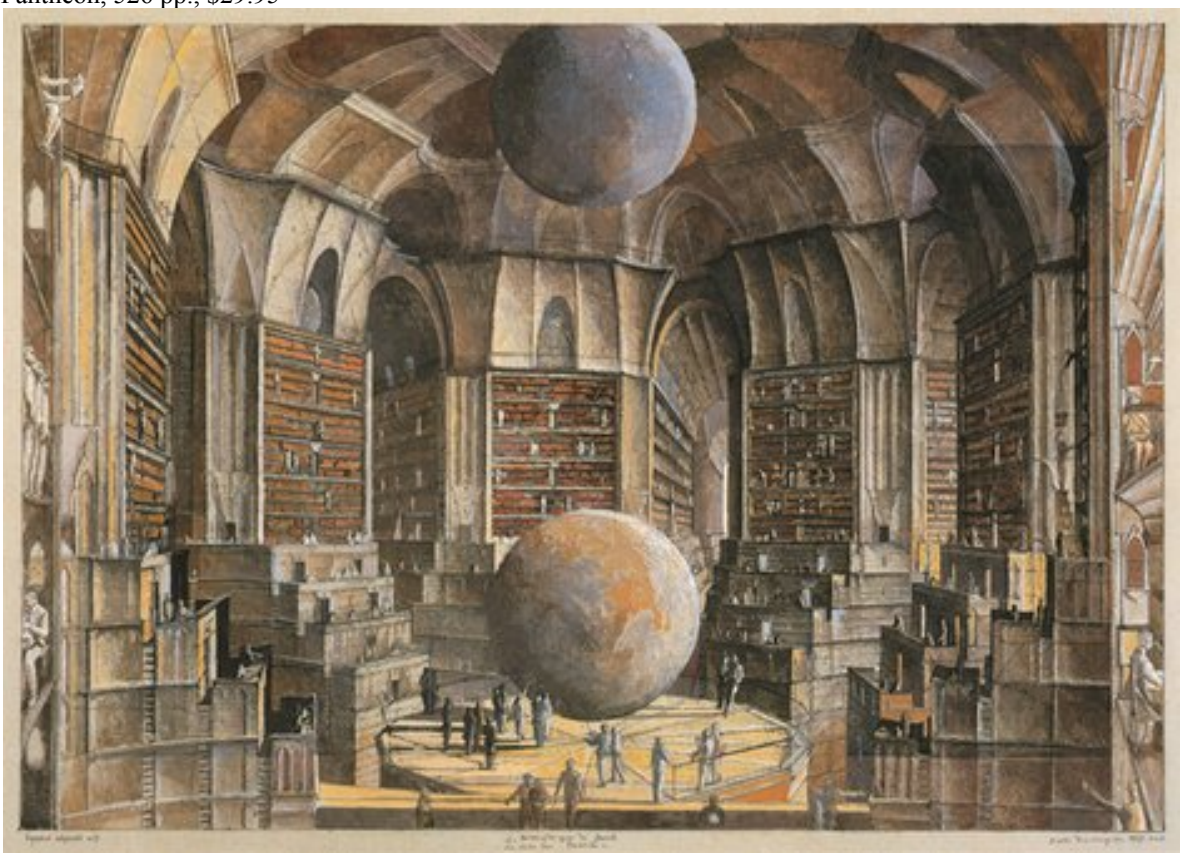
The precise details of our classic game are blurred by the alcohol consumed that night and the years that have passed since then, but this much is recalled. We decided that Monopoly was hostile to a free market because it

restricted the number of houses or hotels one could buy. We voted that a player could buy as many hotels as a property could physically bear and rents would be raised proportionally.
But the bank soon began to run out of money. So we did what any government would do. We began printing more of it, by scribbling $500 on scraps of paper. We printed a lot of money.
Prices shot up, which we all knew, even in that inebriated state, was the consequence of expanding the money supply. (After all, the great economist told us, “Inflation is always and everywhere a monetary phenomenon.”)
The inflation became so extreme that we eventually voted to alter the rules again: we’d cut the money supply. Any money we printed that came back to the bank would be taken out of circulation.
A severe depression kicked in, of course. Prices plummeted and it was a race to liquidate assets. One by one the players quickly went bankrupt, and sometime around 4 that morning the game was over.
Who won has long been forgotten, but it was one of the greatest games of Monopoly ever played because we got to change the rules.

http://www.nytimes.com/2011/02/20/weekinreview/20monopoly.html

How We Know
March 10, 2011
Freeman Dyson

The Information: A History, a Theory, a Flood
by James Gleick
Pantheon, 526 pp., $29.95



Fitch-Febvrel Gallery
Érik Desmazières: *La Salle des planètes*, from his series of illustrations for Jorge Luis Borges's story 'The Library of Babel,' 1997–2001. A new volume of Desmazières's catalogue raisonné will be published by the Fitch-Febvrel Gallery later this year. Illustration © 2011 Artists Rights Society (ARS), New York/ADAGP, Paris.

James Gleick's first chapter has the title "Drums That Talk." It explains the concept of information by looking at a simple example. The example is a drum language used in a part of the Democratic Republic of Congo where the human language is Kele. European explorers had been aware for a long time that the irregular rhythms of African drums were carrying mysterious messages through the jungle. Explorers would arrive at villages where no European had been before and find that the village elders were already prepared to meet them.

Sadly, the drum language was only understood and recorded by a single European before it started to disappear. The European was John Carrington, an English missionary who spent his life in Africa and became fluent in both Kele and drum language. He arrived in Africa in 1938 and published his findings in 1949 in a book, *The Talking Drums of Africa*.[1] Before the arrival of the Europeans with their roads and radios, the Kele-speaking Africans had used the drum language for rapid communication from village to village in the rain forest. Every village had an expert drummer and every villager could understand what the drums were saying. By the time Carrington wrote his book, the use of drum language was already fading and schoolchildren were

no longer learning it. In the sixty years since then, telephones made drum language obsolete and completed the process of extinction.

Carrington understood how the structure of the Kele language made drum language possible. Kele is a tonal language with two sharply distinct tones. Each syllable is either low or high. The drum language is spoken by a pair of drums with the same two tones. Each Kele word is spoken by the drums as a sequence of low and high beats. In passing from human Kele to drum language, all the information contained in vowels and consonants is lost. In a European language, the consonants and vowels contain all the information, and if this information were dropped there would be nothing left. But in a tonal language like Kele, some information is carried in the tones and survives the transition from human speaker to drums. The fraction of information that survives in a drum word is small, and the words spoken by the drums are correspondingly ambiguous. A single sequence of tones may have hundreds of meanings depending on the missing vowels and consonants. The drum language must resolve the ambiguity of the individual words by adding more words. When enough redundant words are added, the meaning of the message becomes unique.

In 1954 a visitor from the United States came to Carrington's mission school. Carrington was taking a walk in the forest and his wife wished to call him home for lunch. She sent him a message in drum language and explained it to the visitor. To be intelligible to Carrington, the message needed to be expressed with redundant and repeated phrases: "White man spirit in forest come come to house of shingles high up above of white man spirit in forest. Woman with yam awaits. Come come." Carrington heard the message and came home. On the average, about eight words of drum language were needed to transmit one word of human language unambiguously. Western mathematicians would say that about one eighth of the information in the human Kele language belongs to the tones that are transmitted by the drum language. The redundancy of the drum language phrases compensates for the loss of the information in vowels and consonants. The African drummers knew nothing of Western mathematics, but they found the right level of redundancy for their drum language by trial and error. Carrington's wife had learned the language from the drummers and knew how to use it.

The story of the drum language illustrates the central dogma of information theory. The central dogma says, "Meaning is irrelevant." Information is independent of the meaning that it expresses, and of the language used to express it. Information is an abstract concept, which can be embodied equally well in human speech or in writing or in drumbeats. All that is needed to transfer information from one language to another is a coding system. A coding system may be simple or complicated. If the code is simple, as it is for the drum language with its two tones, a given amount of information requires a longer message. If the code is complicated, as it is for spoken language, the same amount of information can be conveyed in a shorter message.

Another example illustrating the central dogma is the French optical telegraph. Until the year 1793, the fifth year of the French Revolution, the African drummers were ahead of Europeans in their ability to transmit information rapidly over long distances. In 1793, Claude Chappe, a patriotic citizen of France, wishing to strengthen the defense of the revolutionary government against domestic and foreign enemies, invented a device that he called the telegraph. The telegraph was an optical communication system with stations consisting of large movable pointers mounted on the tops of sixty-foot towers. Each station was manned by an operator who could read a message transmitted by a neighboring station and transmit the same message to the next station in the transmission line.

The distance between neighbors was about seven miles. Along the transmission lines, optical messages in France could travel faster than drum messages in Africa. When Napoleon took charge of the French Republic in 1799, he ordered the completion of the optical telegraph system to link all the major cities of France from Calais and Paris to Toulon and onward to Milan. The telegraph became, as Claude Chappe had intended, an important instrument of national power. Napoleon made sure that it was not available to private users.

Unlike the drum language, which was based on spoken language, the optical telegraph was based on written French. Chappe invented an elaborate coding system to translate written messages into optical signals. Chappe had the opposite problem from the drummers. The drummers had a fast transmission system with ambiguous messages. They needed to slow down the transmission to make the messages unambiguous. Chappe had a painfully slow transmission system with redundant messages. The French language, like most alphabetic languages, is highly redundant, using many more letters than are needed to convey the meaning of a message. Chappe's coding system allowed messages to be transmitted faster. Many common phrases and proper names were encoded by only two optical symbols, with a substantial gain in speed of transmission.

The composer and the reader of the message had code books listing the message codes for eight thousand phrases and names. For Napoleon it was an advantage to have a code that was effectively cryptographic, keeping the content of the messages secret from citizens along the route.

After these two historical examples of rapid communication in Africa and France, the rest of Gleick's book is about the modern development of information technology. The modern history is dominated by two Americans, Samuel Morse and Claude Shannon. Samuel Morse was the inventor of Morse Code. He was also one of the pioneers who built a telegraph system using electricity conducted through wires instead of optical pointers deployed on towers. Morse launched his electric telegraph in 1838 and perfected the code in 1844. His code used short and long pulses of electric current to represent letters of the alphabet.

Morse was ideologically at the opposite pole from Chappe. He was not interested in secrecy or in creating an instrument of government power. The Morse system was designed to be a profit-making enterprise, fast and cheap and available to everybody. At the beginning the price of a message was a quarter of a cent per letter. The most important users of the system were newspaper correspondents spreading news of local events to readers all over the world. Morse Code was simple enough that anyone could learn it. The system provided no secrecy to the users. If users wanted secrecy, they could invent their own secret codes and encipher their messages themselves. The price of a message in cipher was higher than the price of a message in plain text, because the telegraph operators could transcribe plain text faster. It was much easier to correct errors in plain text than in cipher.

Claude Shannon was the founding father of information theory. For a hundred years after the electric telegraph, other communication systems such as the telephone, radio, and television were invented and developed by engineers without any need for higher mathematics. Then Shannon supplied the theory to understand all of these systems together, defining information as an abstract quantity inherent in a telephone message or a television picture. Shannon brought higher mathematics into the game.

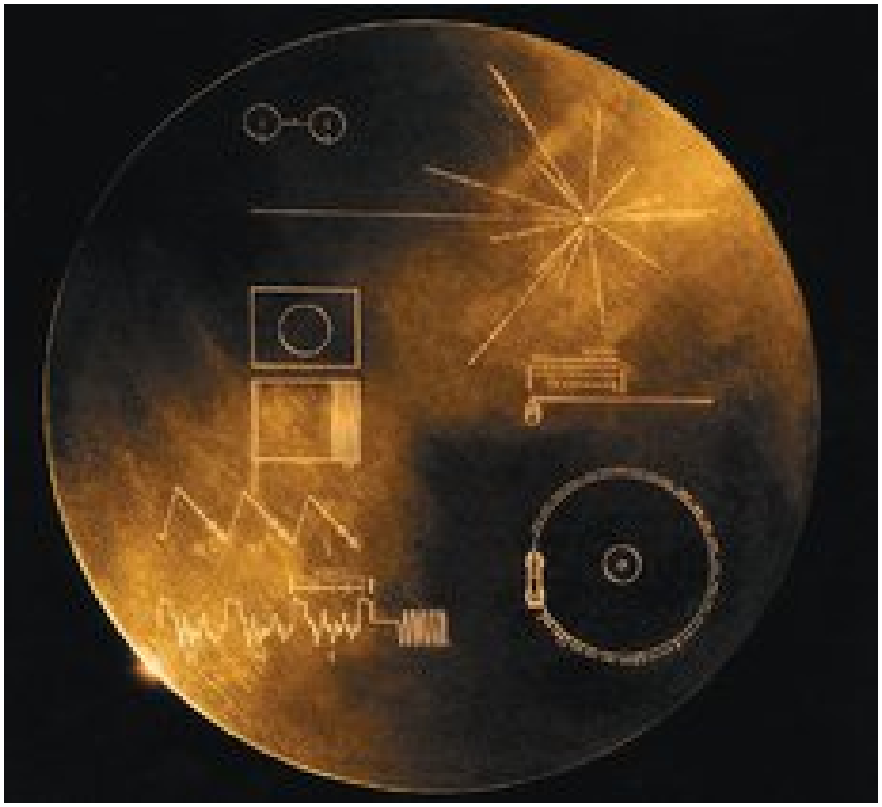
When Shannon was a boy growing up on a farm in Michigan, he built a homemade telegraph system using Morse Code. Messages were transmitted to friends on neighboring farms, using the barbed wire of their fences to conduct electric signals. When World War II began, Shannon became one of the pioneers of scientific cryptography, working on the high-level cryptographic telephone system that allowed Roosevelt and Churchill to talk to each other over a secure channel. Shannon's friend Alan Turing was also working as a cryptographer at the same time, in the famous British Enigma project that successfully deciphered German military codes. The two pioneers met frequently when Turing visited New York in 1943, but they belonged to separate secret worlds and could not exchange ideas about cryptography.

In 1945 Shannon wrote a paper, "A Mathematical Theory of Cryptography," which was stamped SECRET and never saw the light of day. He published in 1948 an expurgated version of the 1945 paper with the title "A Mathematical Theory of Communication." The 1948 version appeared in the *Bell System Technical Journal*, the house journal of the Bell Telephone Laboratories, and became an instant classic. It is the founding document for the modern science of information. After Shannon, the technology of information raced ahead, with electronic computers, digital cameras, the Internet, and the World Wide Web.

According to Gleick, the impact of information on human affairs came in three installments: first the history, the thousands of years during which people created and exchanged information without the concept of measuring it; second the theory, first formulated by Shannon; third the flood, in which we now live. The flood began quietly. The event that made the flood plainly visible occurred in 1965, when Gordon Moore stated Moore's Law. Moore was an electrical engineer, founder of the Intel Corporation, a company that manufactured components for computers and other electronic gadgets. His law said that the price of electronic components would decrease and their numbers would increase by a factor of two every eighteen months. This implied that the price would decrease and the numbers would increase by a factor of a hundred every decade. Moore's prediction of continued growth has turned out to be astonishingly accurate during the forty-five years since he announced it. In these four and a half decades, the price has decreased and the numbers have increased by a factor of a billion, nine powers of ten. Nine powers of ten are enough to turn a trickle into a flood.

The cover of the 'Golden Record,' stowed aboard the *Voyager* spacecraft and sent into space in 1977. This 'message in an interstellar bottle,' James Gleick writes in *The Information*, contained the first prelude of Bach's *Well-Tempered Clavier* and other samples of 'earthly sounds,' such as 'the clatter of a horse-drawn cart and a tapping in Morse code.'

Gordon Moore was in the hardware business, making hardware components for electronic machines, and he stated his law as a law of growth for hardware. But the law applies also to the information that the hardware is designed to embody. The purpose of the hardware is to store and process information. The storage of information is called memory, and the processing of information is called computing. The consequence of Moore's Law for information is that the price of memory and computing decreases and the available amount of memory and computing increases by a factor of a hundred every decade. The flood of hardware becomes a flood of information.



NASA/JPL-Caltech

In 1949, one year after Shannon published the rules of information theory, he drew up a table of the various stores of memory that then existed. The biggest memory in his table was the US Library of Congress, which he estimated to contain one hundred trillion bits of information. That was at the time a fair guess at the sum total of recorded human knowledge. Today a memory disc drive storing that amount of information weighs a few pounds and can be bought for about a thousand dollars. Information, otherwise known as data, pours into memories of that size or larger, in government and business offices and scientific laboratories all over the world. Gleick quotes the computer scientist Jaron Lanier describing the effect of the flood: "It's as if you kneel to plant the seed of a tree and it grows so fast that it swallows your whole town before you can even rise to your feet."

On December 8, 2010, Gleick published on the The *New York Review's* blog an illuminating essay, "The Information Palace." It was written too late to be included in his book. It describes the historical changes of meaning of the word "information," as recorded in the latest quarterly online revision of the *Oxford English Dictionary*. The word first appears in 1386 a parliamentary report with the meaning "denunciation." The history ends with the modern usage, "information fatigue," defined as "apathy, indifference or mental exhaustion arising from exposure to too much information."

The consequences of the information flood are not all bad. One of the creative enterprises made possible by the flood is Wikipedia, started ten years ago by Jimmy Wales. Among my friends and acquaintances, everybody distrusts Wikipedia and everybody uses it. Distrust and productive use are not incompatible.

Wikipedia is the ultimate open source repository of information. Everyone is free to read it and everyone is free to write it. It contains articles in 262 languages written by several million authors. The information that it contains is totally unreliable and surprisingly accurate. It is often unreliable because many of the authors are ignorant or careless. It is often accurate because the articles are edited and corrected by readers who are better informed than the authors.

Jimmy Wales hoped when he started Wikipedia that the combination of enthusiastic volunteer writers with open source information technology would cause a revolution in human access to knowledge. The rate of growth of Wikipedia exceeded his wildest dreams. Within ten years it has become the biggest storehouse of information on the planet and the noisiest battleground of conflicting opinions. It illustrates Shannon's law of reliable communication. Shannon's law says that accurate transmission of information is possible in a communication system with a high level of noise. Even in the noisiest system, errors can be reliably corrected and accurate information transmitted, provided that the transmission is sufficiently redundant. That is, in a nutshell, how Wikipedia works.

The information flood has also brought enormous benefits to science. The public has a distorted view of science, because children are taught in school that science is a collection of firmly established truths. In fact, science is not a collection of truths. It is a continuing exploration of mysteries. Wherever we go exploring in the world around us, we find mysteries. Our planet is covered by continents and oceans whose origin we cannot explain. Our atmosphere is constantly stirred by poorly understood disturbances that we call weather and climate. The visible matter in the universe is outweighed by a much larger quantity of dark invisible matter that we do not understand at all. The origin of life is a total mystery, and so is the existence of human consciousness. We have no clear idea how the electrical discharges occurring in nerve cells in our brains are connected with our feelings and desires and actions.

Even physics, the most exact and most firmly established branch of science, is still full of mysteries. We do not know how much of Shannon's theory of information will remain valid when quantum devices replace classical electric circuits as the carriers of information. Quantum devices may be made of single atoms or microscopic magnetic circuits. All that we know for sure is that they can theoretically do certain jobs that are beyond the reach of classical devices. Quantum computing is still an unexplored mystery on the frontier of information theory. Science is the sum total of a great multitude of mysteries. It is an unending argument between a great multitude of voices. It resembles Wikipedia much more than it resembles the *Encyclopaedia Britannica*.

The rapid growth of the flood of information in the last ten years made Wikipedia possible, and the same flood made twenty-first-century science possible. Twenty-first-century science is dominated by huge stores of information that we call databases. The information flood has made it easy and cheap to build databases. One example of a twenty-first-century database is the collection of genome sequences of living creatures belonging to various species from microbes to humans. Each genome contains the complete genetic information that shaped the creature to which it belongs. The genome data-base is rapidly growing and is available for scientists all over the world to explore. Its origin can be traced to the year 1939, when Shannon wrote his Ph.D. thesis with the title "An Algebra for Theoretical Genetics."

Shannon was then a graduate student in the mathematics department at MIT. He was only dimly aware of the possible physical embodiment of genetic information. The true physical embodiment of the genome is the double helix structure of DNA molecules, discovered by Francis Crick and James Watson fourteen years later. In 1939 Shannon understood that the basis of genetics must be information, and that the information must be coded in some abstract algebra independent of its physical embodiment. Without any knowledge of the double helix, he could not hope to guess the detailed structure of the genetic code. He could only imagine that in some distant future the genetic information would be decoded and collected in a giant database that would define the total diversity of living creatures. It took only sixty years for his dream to come true.

In the twentieth century, genomes of humans and other species were laboriously decoded and translated into sequences of letters in computer memories. The decoding and translation became cheaper and faster as time went on, the price decreasing and the speed increasing according to Moore's Law. The first human genome took fifteen years to decode and cost about a billion dollars. Now a human genome can be decoded in a few weeks and costs a few thousand dollars. Around the year 2000, a turning point was reached, when it became cheaper to produce genetic information than to understand it. Now we can pass a piece of human DNA through a machine and rapidly read out the genetic information, but we cannot read out the meaning of the

information. We shall not fully understand the information until we understand in detail the processes of embryonic development that the DNA orchestrated to make us what we are.

A similar turning point was reached about the same time in the science of astronomy. Telescopes and spacecraft have evolved slowly, but cameras and optical data processors have evolved fast. Modern sky-survey projects collect data from huge areas of sky and produce databases with accurate information about billions of objects. Astronomers without access to large instruments can make discoveries by mining the databases instead of observing the sky. Big databases have caused similar revolutions in other sciences such as biochemistry and ecology.

The explosive growth of information in our human society is a part of the slower growth of ordered structures in the evolution of life as a whole. Life has for billions of years been evolving with organisms and ecosystems embodying increasing amounts of information. The evolution of life is a part of the evolution of the universe, which also evolves with increasing amounts of information embodied in ordered structures, galaxies and stars and planetary systems. In the living and in the nonliving world, we see a growth of order, starting from the featureless and uniform gas of the early universe and producing the magnificent diversity of weird objects that we see in the sky and in the rain forest. Everywhere around us, wherever we look, we see evidence of increasing order and increasing information. The technology arising from Shannon's discoveries is only a local acceleration of the natural growth of information.

The visible growth of ordered structures in the universe seemed paradoxical to nineteenth-century scientists and philosophers, who believed in a dismal doctrine called the heat death. Lord Kelvin, one of the leading physicists of that time, promoted the heat death dogma, predicting that the flow of heat from warmer to cooler objects will result in a decrease of temperature differences everywhere, until all temperatures ultimately become equal. Life needs temperature differences, to avoid being stifled by its waste heat. So life will disappear.

This dismal view of the future was in startling contrast to the ebullient growth of life that we see around us. Thanks to the discoveries of astronomers in the twentieth century, we now know that the heat death is a myth. The heat death can never happen, and there is no paradox. The best popular account of the disappearance of the paradox is a chapter, "How Order Was Born of Chaos," in the book *Creation of the Universe*, by Fang Lizhi and his wife Li Shuxian.[2] Fang Lizhi is doubly famous as a leading Chinese astronomer and a leading political dissident. He is now pursuing his double career at the University of Arizona.

The belief in a heat death was based on an idea that I call the cooking rule. The cooking rule says that a piece of steak gets warmer when we put it on a hot grill. More generally, the rule says that any object gets warmer when it gains energy, and gets cooler when it loses energy. Humans have been cooking steaks for thousands of years, and nobody ever saw a steak get colder while cooking on a fire. The cooking rule is true for objects small enough for us to handle. If the cooking rule is always true, then Lord Kelvin's argument for the heat death is correct.

We now know that the cooking rule is not true for objects of astronomical size, for which gravitation is the dominant form of energy. The sun is a familiar example. As the sun loses energy by radiation, it becomes hotter and not cooler. Since the sun is made of compressible gas squeezed by its own gravitation, loss of energy causes it to become smaller and denser, and the compression causes it to become hotter. For almost all astronomical objects, gravitation dominates, and they have the same unexpected behavior. Gravitation reverses the usual relation between energy and temperature. In the domain of astronomy, when heat flows from hotter to cooler objects, the hot objects get hotter and the cool objects get cooler. As a result, temperature differences in the astronomical universe tend to increase rather than decrease as time goes on. There is no final state of uniform temperature, and there is no heat death. Gravitation gives us a universe hospitable to life. Information and order can continue to grow for billions of years in the future, as they have evidently grown in the past.

The vision of the future as an infinite playground, with an unending sequence of mysteries to be understood by an unending sequence of players exploring an unending supply of information, is a glorious vision for scientists. Scientists find the vision attractive, since it gives them a purpose for their existence and an unending supply of jobs. The vision is less attractive to artists and writers and ordinary people. Ordinary people are more interested in friends and family than in science. Ordinary people may not welcome a future spent swimming in an unending flood of information. A darker view of the information-dominated universe

was described in a famous story, "The Library of Babel," by Jorge Luis Borges in 1941.[3] Borges imagined his library, with an infinite array of books and shelves and mirrors, as a metaphor for the universe.
Gleick's book has an epilogue entitled "The Return of Meaning," expressing the concerns of people who feel alienated from the prevailing scientific culture. The enormous success of information theory came from Shannon's decision to separate information from meaning. His central dogma, "Meaning is irrelevant," declared that information could be handled with greater freedom if it was treated as a mathematical abstraction independent of meaning. The consequence of this freedom is the flood of information in which we are drowning. The immense size of modern databases gives us a feeling of meaninglessness. Information in such quantities reminds us of Borges's library extending infinitely in all directions. It is our task as humans to bring meaning back into this wasteland. As finite creatures who think and feel, we can create islands of meaning in the sea of information. Gleick ends his book with Borges's image of the human condition:
We walk the corridors, searching the shelves and rearranging them, looking for lines of meaning amid leagues of cacophony and incoherence, reading the history of the past and of the future, collecting our thoughts and collecting the thoughts of others, and every so often glimpsing mirrors, in which we may recognize creatures of the information.

1. 1

   London: Carey Ringsgate, 1949. ↩

2. 2

   Singapore: World Scientific Publishing Co., 1989. ↩

3. 3

   Jorge Luis Borges, *Labyrinths: Selected Stories and Other Writings* (New Directions, 1962), p. 54. ↩

http://www.nybooks.com/articles/archives/2011/mar/10/how-we-know/?pagination=false

The Bobby Fischer Defense
March 10, 2011
Garry Kasparov
Endgame: Bobby Fischer's Remarkable Rise and Fall—from America's Brightest Prodigy to the Edge of Madness
by Frank Brady
Crown, 402 pp., $25.99

AP Images
Boris Spassky and Bobby Fischer after Spassky won the first game of the 1972 World Chess Championship, held in Reykjavík, Iceland. Fischer went on to win the championship.

It would be impossible for me to write dispassionately about Bobby Fischer even if I were to try. I was born the year he achieved a perfect score at the US Championship in 1963, eleven wins with no losses or draws. He was only twenty at that point but it had been obvious for years that he was destined to become a legendary figure. His book *My 60 Memorable Games* was one of my earliest and most treasured chess possessions. When Fischer took the world championship crown from my countryman Boris Spassky in 1972 I was already a strong club player following every move as it came in from Reykjavík. The American had crushed two other Soviet grandmasters en route to the title match, but there were many in the USSR who quietly admired his brash individuality along with his amazing talent.

I dreamed of playing Fischer one day, and we eventually did become competitors after a fashion, though in the history books and not across the chessboard. He left competitive chess in 1975, walking away from the title he coveted so dearly his entire life. Ten more years passed before I took the title from Fischer's successor, Anatoly Karpov, but rarely did an interviewer miss a chance to bring up Fischer's name to me. "Would you beat Fischer?" "Would you play Fischer if he came back?" "Do you know where Bobby Fischer is?"

Occasionally I felt as though I were playing a one-sided match against a phantasm. Nobody knew where Fischer was, or if he, still the most famous chess player in the world at the time, was out there plotting a comeback. After all, at forty-two in 1985 he was still much younger than two of the players I had just faced in the world championship qualification matches. But thirteen years away from the board is a long time. As for playing him, I suppose I would have liked my chances and I said as much, but how can you play a myth? I had Karpov to worry about, and he was no ghost. Chess had moved on without the great Bobby, even if many in the chess world had not.

It was therefore quite a shock to see the real live Bobby Fischer reappear in 1992, followed by the first Fischer chess game in twenty years, followed by twenty-nine more. Lured out of self-imposed isolation by a chance to face his old rival Spassky on the twentieth anniversary of their world championship match—and by

a $5 million prize fund—a heavy and bearded Fischer appeared before the world in a resort in Yugoslavia, a nation in the process of being bloodily torn apart.

The circumstances were bizarre. The sudden return, the backdrop of war, a shady banker and arms dealer as a sponsor. But it was Fischer! One could not believe it. The chess displayed by Fischer and Spassky in Svefi Stefan and Belgrade was predictably sloppy, although there were a few flashes of the old Bobby brilliance. But was this really a return, or would he disappear just as quickly as he had appeared? And what to make of the strange things Fischer was doing at the press conferences? America's great champion spitting on a cable from the US government? Saying he hadn't played in twenty years because he had been "blacklisted…by world Jewry"? Accusing Karpov and me of prearranging all our games? You had to look away, but you could not.

Even in his prime there were concerns about Fischer's stability, during a lifetime of outbursts and provocations. Then there were the tales from his two decades away from the board, rumors that made their way around the chess world. That he was impoverished, that he had become a religious fanatic, that he was handing out anti-Semitic literature in the streets of Los Angeles. It all seemed too fantastic, too much in line with all the stories of chess driving people mad—or mad people playing chess—that have found such a good home in literature.

One thing was certain: the old Fischer questions were back with new life. I was receiving calls before Fischer pushed a single pawn, and we ended up having a bizarre dialogue in the press as journalists relayed our responses to one another. While calling me a cheat and a liar repeatedly at the press conferences, Fischer said the first obstacle to playing a match with me was that he was owed at least $100,000 for royalties on the Soviet edition of his book. How ironic that his masterpiece, *My 60 Memorable Games*, a great influence on my chess, was presented as a sticking point.

Looking back, maybe it was a form of karmic balancing, since now Fischer was the one who had to put up with countless questions about playing me. But at least everyone knew where I was, and what could I say other than that of course I would play him? I never really believed it would happen, especially since Fischer, who still called himself the world champion, would never go through the rigorous training and preparatory events that would be required to make such an encounter competitive.

As it turned out Fischer never did play again after beating Spassky in that 1992 event. Fischer's play was rusty, and he sounded disturbed, but in chess he always saw clearly and was honest with himself. He understood that the chess Olympus was no longer his to conquer. But the ghost had renewed his license to haunt us all for a while longer.

Fischer made the headlines a few times more after that. On September 11, his obscene rant celebrating the attacks was aired on Philippine radio and then around the world on the Internet. In July 2004 he was arrested in Japan for having a revoked passport and detained for eight months until he was granted Icelandic citizenship as a way out of captivity. (Fischer had been a fugitive from US law since playing in Yugoslavia in 1992 because the country was under UN sanctions at the time. At the first press conference before the match Fischer spat on a cable from the government of George H.W. Bush warning him against playing. But he had traveled widely and freely outside the US for a dozen years and his detention in Japan surprised him as much as anyone.)

Then on January 17, 2008, he died in Reykjavík after a long illness for which he had refused treatment. Even this was somehow typical of Fischer, who grew up playing chess against himself since he had no one else to play. He had fought to the end and proven himself to be his most dangerous opponent.

Fischer's remarkable life and personality will surely produce countless more books, and probably movies and doctoral theses as well. But there is little doubt that none of the authors of those future works will be more qualified to write on Bobby Fischer than Frank Brady. A close acquaintance of the young Fischer, a "chess person," as we call them, himself, as well as an experienced biographer, Brady also wrote the first and only substantive biographical book on him, *Bobby Fischer: Profile of a Prodigy* (1965, revised edition 1973).

It is hard to imagine a more difficult subject than Bobby Fischer to present in an accurate and evenhanded fashion. He was a loner who trusted no one. His charisma attracted both starry-eyed sycophants and spiteful critics. Fischer had strong opinions of the kind that tend to create equally categorical sentiments in those who knew him—and in those who didn't. He had a very small family and both his mother, Regina Fischer, and his only sibling—older sister Joan Targ—have passed away. Fischer's general inaccessibility also led to countless rumors and outright lies about him, making the biographer's task a challenge.

With all that in mind, Brady's book is an impressive balancing act and a great accomplishment. Before even picking up the book there is no reason to doubt that Brady liked Bobby Fischer and that he has a friend's as well as a fan's rooting interest for the American chess hero. But there are few obvious traces of that in *Endgame*, which does not shy away from presenting the darker sides of Fischer's character even while it does not attempt to judge or diagnose it. What results is a chance for the reader to weigh up the evidence and come to his own conclusions—or skip judgments completely and simply enjoy reading a rise-and-fall story that has more than a few affinities with Greek tragedy.

One inaccuracy that is more of a dramatic exaggeration occurs when Brady says Fischer was unaware that his Soviet opponent at the Varna Olympiad in 1962, the great world champion Mikhail Botvinnik, had received analytical help with their adjourned game. This Soviet custom was widely known and in this case was only natural because it was a team event. It is not possible that Fischer would not have known this was happening.

Beginning with the end seems most natural since that is where the most fact and fiction have been written in the past. Why, how, could Bobby Fischer, who loved chess and only chess more than anyone before or since, quit the game as soon as he had conquered the title? This was not a case of a star wanting to go out on top; Fischer had no plans to retire. He was twenty-nine and in his prime and he finally had the fame and fortune he always knew he deserved.

Fischer returned from beating Spassky in Reykjavík—the Match of the Century—a world champion, a media star, and a decorated cold warrior. Unprecedented offers rolled in for millions of dollars in endorsement deals, exhibitions, basically anything he was willing to put his name or face to. With a few minor exceptions, he turned it all down.

Keep in mind that the chess world of the pre-Fischer era was laughably impoverished even by today's modest standards. The Soviet stars were subsidized by the state, but elsewhere the idea of making a living solely from playing chess was a dream. When Fischer dominated the Stockholm tournament of 1962, a grueling five-week qualifier for the world championship cycle, his prize was $750.

Of course it was Fischer himself who changed this situation, and every chess player since must thank him for his tireless efforts to get chess the respect and compensation he felt it deserved. He earned the nickname Spassky gave him, "the honorary chairman of our trade union." These efforts meant he was often an event organizer's worst nightmare, but that was not Bobby's concern. Ten years after Stockholm, the purse for the 1972 World Championship between Fischer and Spassky was an astronomical $250,000, plus side deals for a share of television rights.

It's barely an exaggeration to say that Fischer's impact on the chess world was as great financially as it was on the board. The world championship became a hot commodity and as we know, money talks. Chess tournaments and chess players acquired a new respectability, although it did not all outlast Fischer himself. My epic series of matches against Anatoly Karpov from 1985 to 1990 fanned the sponsorship flames into a blaze—we were not going to play only for the greater Soviet glory now that we knew there were millions of dollars to be had. We had learned more from Fischer than just chess. Last year's world championship match, in which Viswanathan Anand of India defended his title against Veselin Topalov of Bulgaria in Sofia, had a prize fund of nearly $3 million despite receiving no real publicity outside of the chess world. In spite of corrupt federations and no coherent organization among themselves, the top players today do quite well without having to also teach classes or write books while trying to work on their own chess at the same time.

Young, famous, rich, and on top of the world, Fischer first took some time off. Then a little more, then more. Big tournaments were relatively rare back then, and it didn't shock anyone that Fischer didn't play in the first year after winning the title. But a second year? The three-year world championship cycle, run by the World Chess Federation (FIDE), was already grinding along to produce the man who would be Fischer's challenger in 1975. Obviously he could not wait until then to play his first chess game since defeating Spassky.

Yet that is exactly what he did. Long before the three years were up, however, the arguments about the format of the 1975 world championship match were underway. Fischer, surprising no one, had many strong ideas about how the event should be run, including returning to the old system with no limit to the number of games. As he does with many of the chess world's eternal debates around Fischer, Brady makes this long story mercifully short, letting the reader decide whether or not Fischer's demands were extreme but fair or blatantly self-serving. FIDE would not give in to everything and for Fischer it was all or nothing. In the end, the American resigned the title.

Harry Benson
Bobby Fischer at a hot spring in Reykjavík, 1972; photograph by Harry Benson. Benson's images of Fischer, many of which have never been seen before, will be collected in his book *Bobby Fischer*, to be published by powerHouse Books in July.

This stunning news launched one of the greatest known bouts of psychoanalysis in absentia the world has ever seen. Why didn't Bobby play? Did he believe so strongly that his system for the championship was the only right one that he was willing to give up the title? Had it all been a bluff, a ploy to gain an advantage or more money? Did even he know for sure?

One theory that was not often heard was that Fischer might have been more than a little nervous about his challenger, the twenty-three-year-old leader of the new generation, Anatoly Karpov. In fact, when I proposed this possibility in my 2004 book on Fischer, *My Great Predecessors Part IV*, the hostile response was overwhelming. These were not merely the protestations of Fischer fans saying I was maligning their hero. There is a great deal of evidence to build Fischer's case as the overwhelming favorite had the match taken place. This includes testimony by Karpov himself, who said Fischer was the favorite and later put his own chances of victory at 40 percent.

Nor am I arguing that Karpov would have been the favorite, or that he was a better player than Fischer in 1975. But I do think there is a strong circumstantial case for Fischer having good reasons not to like what he saw in his challenger. Remember that Fischer had not played a serious game of chess in three years. This explains why he insisted on a match of unlimited length, played until one player reached ten wins. With draws being so prevalent at the top level, such a match would likely have lasted many months, giving Fischer time to shake off the rust and get a feel for Karpov, whom he had never faced.

Karpov was the leading product of the new generation Fischer had created. They had a different approach than all the leading players Fischer had defeated on his march to the title and he had very little experience facing this new breed. In the candidates matches Karpov had crushed Spassky and then defeated another

bastion of the older generation, Viktor Korchnoi. I can imagine Fischer going over the games from those matches, especially Karpov's meticulous play and steady hand against Spassky, and beginning to feel some doubt.

Frank Brady discards this possibility hastily, perhaps justly so since there is no way we will ever know what was in Fischer's head or, most unfortunately, what would have happened had the Fischer–Karpov match taken place. But I was surprised to read that there were contemporaries who put the blame for the match not taking place squarely on Fischer's fears. Brady quotes *New York Times* chess columnist Robert Byrne, who wrote a piece titled "Bobby Fischer's Fear of Failing" just a few days after Karpov was awarded the title. Byrne did not mention Karpov as a threat—he says he wouldn't have stood a chance—but he pointed out that Fischer had always taken great precautions against defeat, to the point of declining to play in other events as well when he felt too much was being left to chance.

Brady's dismissal of this theory misses the point: "What everyone seemed to overlook was that at the board Bobby feared no one." Yes, once *at* the board he was fine! Where Fischer had his greatest crisis of confidence was always *before* getting to the board, before getting on the plane. Fischer's perfectionism, his absolute belief that he could not fail, did not allow him to put that perfection at risk. And in Karpov, I have no doubt, especially after a three-year layoff, Fischer saw a significant risk.

One of the countless, and endless, debates around Fischer was whether his behavioral excesses were the product of an unbalanced, yet sincere, soul, or an extension of his all-consuming drive to conquer. Fischer had his strong principles, but the predator in him was well aware of the effect his antics had on his opponents. In 1972, the gentlemanly Boris Spassky was unprepared to deal with Fischer's endless postponements and protests and played well below his normal level in Reykjavík.

Karpov, meanwhile, had beaten Spassky convincingly in 1974 without any gamesmanship. There is a fair case to be made that the match with Spassky was one of Karpov's greatest-ever efforts and Fischer would not have failed to sense his challenger's quality. The shades of color in real life often baffled Fischer, but he always saw very clearly in black and white. Along with Karpov's modern play, Fischer would have seen a hard young man who had none of the older generation's romantic notions and who would not be unsettled by off-the-board sideshows. (All reports say that Fischer was scrupulously correct at the board.) No matter how sincere Fischer may have been about his protests—playing conditions, opponent's manners, and always money—they were as much a part of his repertoire as the Sicilian Defense.

The debacle of Fischer's resignation led to yet another unanswerable question. Would Fischer have played had FIDE given in to all his demands? FIDE had accepted all of his conditions but one, that should the match reach a 9–9 tie Fischer would retain the title. This meant the challenger had to win by at least a 10–8 score, a substantial advantage for the incumbent. Had FIDE agreed and had Fischer come up with yet more demands, the book could have been closed in good conscience. Instead we missed out on what would have been one of the greatest matches in history and must wonder for eternity what Fischer would have done. In that light, 10–8 hardly seems like such a disadvantage.

Ironically, after Fischer was off the scene FIDE implemented some of his suggestions, including the unlimited match. Karpov also received the protection of a rematch clause, which gave him at least as big an advantage as Fischer had demanded. The absurdity of an unlimited match was only conclusively proven when Karpov and I dueled for a record forty-eight games over 152 days before the match was abandoned without a winner. And we were playing only for six wins, not Fischer's desired ten.

Brady gives a straightforward account of Fischer's rise to stardom as the youngest US champion ever, at fourteen in 1957, who then moved onto the world stage. It defied belief that a lone American could beat the best that the Soviet chess machine could produce. But even Walt Disney would hesitate to conceive of the story of a poor single mother trying to finish her education while moving her family from place to place and her unfocused young son from school to school—all while being investigated by the FBI as a potential Communist agent.

Regina Fischer was a remarkable woman, and not only for producing a chess champion son. Despite her worries about Bobby spending too much time on a board game, she realized it was the only thing that made him happy and soon promoted his passion as her own. Struggling constantly to fund her son's chess endeavors, she once wrote a letter directly to Soviet leader Nikita Khrushchev asking him to invite Bobby to a chess festival.

As the only son of a determined mother-manager-promoter myself, I cannot help but wonder what Fischer would have been like had his family situation been different. I lost my father at an early age but, unlike Fischer, was surrounded by family. Fischer's father was not in the picture and, a little disappointingly, *Endgame* fails to clear up one of the more lurid stories circulated about Fischer in recent years, namely, the strong likelihood that German-born scientist Hans Gerhardt Fischer was not Bobby's father at all. His name was on the birth certificate issued in Chicago in 1943, but he never entered the United States after Regina moved there from Russia, via Paris, with their daughter Joan. Another scientist, a Hungarian Jew teaching in the US named Paul Nemenyi, was close to Regina and later sent money to the family for years. His photos also look tantalizingly similar to the adult Bobby Fischer. Beyond a brief mention, however, Brady is clearly uninterested in the controversy.

The focus is on Bobby and the chess, as it should be, though I was hoping for a little more meat on the topic of the nature of prodigy and Fischer's early development, beyond his own famous comment "I just got good"—but perhaps there is nothing more. The nature of genius may not be definable. Fischer's passion for puzzles was combined with endless hours of studying and playing chess. The ability to put in those hours of work is in itself an innate gift. Hard work is a talent.

Generations of artists, authors, mathematicians, philosophers, and psychologists have pondered what exactly it is that makes for a great chess player. More recently, scientists with advanced brain-scanning machines have joined the hunt, looking for hot spots of activity as a master contemplates a move. An obsessive-competitive streak is enough to create a good squash player or a good (or bad) investment banker. It's not enough to create someone like Fischer.

This is not meant to be a compliment, necessarily. Many strong chess players go on to successful careers as currency and stock traders, so I suppose there is considerable crossover in the pattern-matching and intuitive calculation skills required. But the aptitude for playing chess is nothing more than that. My argument has always been that what you learn from using the skills you have—analyzing your strengths and weaknesses—is far more important. If you can program yourself to learn from your experiences by assiduously reviewing what worked and what did not, and why, success in chess can be very valuable indeed. In this way, the game has taught me a great deal about my own decision-making processes that is applicable in other areas, but that effort has little to do with natural gifts.

Fischer's brilliance was enough to make him a star. It was his relentless, even pathological dedication that transformed the sport. Fischer investigated constantly, studying every top-level game for new ideas and improvements. He was obsessed with tracking down books and periodicals, even learning enough Russian to expand his range of sources. He studied each opponent, at least those he considered worthy of preparation. Brady recounts dining with Fischer and hearing a monologue of the teen's astonishingly deep analysis of David Bronstein's openings before the two were to meet in the Mar del Plata tournament in 1960. No one had ever prepared this deeply outside of world championship matches. Today, every game of chess ever played, going back centuries, is available at the click of a mouse to any beginner. But in the pre-computer era, Fischer's obsessive research was a major competitive advantage.

In his play, Fischer was amazingly objective, long before computers stripped away so many of the dogmas and assumptions humans have used to navigate the game for centuries. Positions that had been long considered inferior were revitalized by Fischer's ability to look at everything afresh. His concrete methods challenged basic precepts, such as the one that the stronger side should keep attacking the forces on the board. Fischer showed that simplification—the reduction of forces through exchanges—was often the strongest path as long as activity was maintained. The great Cuban José Capablanca had played this way half a century earlier, but Fischer's modern interpretation of "victory through clarity" was a revelation. His fresh dynamism started a revolution; the period from 1972 to 1975, when Fischer was already in self-exile as a player, was more fruitful in chess evolution than the entire preceding decade.

Fischer's uncompromising approach had an even greater impact on the chess world than his results. I am not referring to any "special moves," as often suspected by those unfamiliar with the game. It was simply that Fischer played every game to the death, as if it were his last. It was this fighting spirit that his contemporaries recall most about him as a chess player.

If genius is hard to define, madness is even more so. Once again I must applaud Brady's ability to navigate treacherous shoals as he presents Fischer in his own words and deeds while only rarely attempting to explain or defend them. Nor does he attempt to diagnose Fischer, who was never properly examined by a professional

but was instead declared guilty, innocent, or sick by millions of amateurs from afar. Brady also avoids the trap of arguing whether or not someone with a mental illness is responsible for his actions.

Starting in the late 1990s, Bobby Fischer began giving sporadic radio interviews that exposed a deepening pit of hatred for the world—profane anti-Semitic diatribes, exultation after September 11. Suddenly everything that had mostly been only rumors from the few people who had spent time with him since 1992 was out in the open on the Internet. It was a shattering experience for the chess community, and many tried to respond in one way or another. Fischer was ill, some said, perhaps schizophrenic, and needed help, not censure. Others blamed his years of isolation, the personal setbacks, the persecutions both real and imagined at the hands of the US government, the chess community, and, of course, the Soviets, for inspiring his vengefulness.

Clearly this full-flown paranoia was far beyond the more calculated, even principled, "madness" of his playing years, well described by Voltaire in his *Philosophical Dictionary*: "Have in your madness reason enough to guide your extravagancies; and, forget not to be excessively opinionated and obstinate." That is, purposeful and successful madness can hardly be called mad. After Fischer left chess the dark forces inside him no longer had purpose.

Despite the ugliness of his decline, Fischer deserves to be remembered for his chess and for what he did for chess. A generation of American players learned the game thanks to Fischer and he should continue to inspire future generations as a model of excellence, dedication, and achievement. There is no moral at the end of the tragic fable, nothing contagious in need of quarantine. Bobby Fischer was one of a kind, his failings as banal as his chess was brilliant.

http://www.nybooks.com/articles/archives/2011/mar/10/bobby-fischer-defense/?pagination=false

'Lowering Higher Education'

February 23, 2011

With colleges under intense pressure to find new sources of revenue, many are applying business ideas or creating closer ties to corporations. In their new book, *Lowering Higher Education: The Rise of Corporate Universities and the Fall of Liberal Education* (University of Toronto Press), James E. Côté and Anton L. Allahar call on colleges to step back and consider whether these trends result in the sacrifice of important academic values. Côté and Allahar, both professors of sociology at the University of Western Ontario, responded to e-mail questions about the book.

Q: How do you define the "corporate university"?

A: The corporate university is one that, in the face of declining government funding, is increasingly dependent on corporate sponsorship and funding to carry out its traditional tasks of teaching and research. It literally sells physical space on the campus to corporations, accept[ing] financial donations for building projects and endowments of chairs, replete with the corporate brand. In the process, the university cannot bite the hand that feeds it and so must mute criticisms of specific corporations or of the entire process of corporatization itself. In Canada, the latest controversy is over the new Munk School of Global Affairs at the University of Toronto, and a grassroots movement has begun there among students and faculty to counter these developments.

At the same time, universities are not only increasingly indebted to corporations, they are corporations themselves, run with corporate management techniques, carefully constructed brands, and aggressive sales (i.e., recruitment) staff. The annual budgets of some larger universities are greater than those of some nation states. As the marketplace takes over, learning for its own sake is replaced with a means-end market mentality, including the *caveat emptor* motto of the modern market where products (degrees supposedly leading to well-paying jobs) come with few or no guarantees. At one end of this *Edubis* spectrum are publicly funded schools that continue to recruit like crazy but spew out many empty degrees from pseudo-vocational programs for jobs that are either in short supply or nonexistent, and at the other end are private online schools that do the same but recruit more aggressively and spew out non-accredited degrees (the latter problem has been well-covered recently by *Inside Higher Ed*).

Q: Many universities have long had ties to business -- receiving grants for research, training business leaders, appointing executives to boards and so forth. Was there a key turning point when the relationship reached another level, that of the corporate university?

A: This is a sound question, but it may be difficult to pinpoint a specific turning point. Rather, the idea is to understand how the corporatization has led increasingly to the transformation of the university into a pseudo-vocational institution. Along with the wider culture of consumerism, materialism and individualism, university education is now viewed narrowly as a ticket to a job, not as a means to cultivating a well-rounded and informed citizenry. The very language of the new pseudo-vocational university emphasizes "training" over "education." The whole turn to policy-oriented teaching and research smacks of the corporate agenda, and traditional learning and research as ends in themselves are all but dead in the modern university.

The most recent turn can be located during the cultural wars that wracked universities in the late 20th century. The infighting among the old Left, postmodernists, and the Right distracted the professoriate from the university mission, allowing a corporatization of universities to go uncontested for decades, wherein pseudo-vocationalism crept unnoticed into certain hitherto liberal programs, eclipsing the citizenship function, and converting the contemporary university into an extension of the corporate world.

Q: How have these trends changed academic life for professors?

A: Younger professors have fallen into place. Indeed, they are also products of the corporate university; many have been narrowly “trained” rather than broadly educated. They are all about policy-oriented research and seek funding not from academic bodies but from corporations and other sources of private funds with vested interests. The more established professors are quite cynical about the changes they are witnessing and where ultimately they will all lead. Many of those over 55 are biding their time and showing reluctance to becoming too involved in the entire “enterprise.” The professoriate is no longer what it was held up to be even two or three decades ago and the corporate life of the professor is not being relished by many senior professors.

Q: Why do you link this trend to the disengagement of students?
A: The corporate model treats students like customers, and as customers they expect services and products for their tuition fees. The services include high grades in return for little effort. The products include guaranteed credentials with a guaranteed value. With this sense of entitlement, most will not prepare for classes, and expect all material to be told to them in simple terms in entertaining classes. What is lost here is the implicit bilateral contract of higher education for students to meet their teachers "halfway." When students put out the effort to partner with professors in the teaching/learning process, classes assume their proper place as the "tip of the iceberg" of learning rather than the "iceberg." Programs that require students to learn only in classes — thereby misleading students that classes are the "iceberg of learning" — are little more than (pseudo-) vocational high schools. We now have many universities where a "culture of disengagement" prevails and students in this culture have a sense of "entitled disengagement" never found before in institutions of higher learning (i.e., while grade inflation and disengagement can be found in the past, never have both simultaneously occurred in such proportions and been condoned by universities).
But it is not just the students who are disengaged. Many faculty members are also, and following recent savage cuts to budgets, so too are many university staff members. In *Ivory Tower Blues*, we tied disengagement to the wider culture of entitlement and empowerment. Now in *Lowering Higher Education*, we can more clearly see the disengagement on the professors' side as the corporate culture has come to eclipse what was formerly a quite special "job."
Q: How different do you see the situation of the corporate university in Canada and the United States?
A: We don't see a great deal of difference. In fact, we might even argue that the U.S. has led the way, and as in so many other economic changes, Canada is merely following in lockstep. In Canada, we are perhaps watching a process that is already more advanced in the U.S., and can therefore see its insidious nature more clearly.
Q: What should be done to bolster liberal education?
A: The conclusion of the new book speaks directly to this, listing our own recommendations for Canada and the recommendations of the Association of American Colleges and Universities (AAC&U) for both Canada and the U.S. We also provide a section concerning *what not to do*, including following the example of the U.K., where schools consciously seek out the "disengaged student market" and provide them with (pseudo-) vocational programs of dubious merit and relevance in the labor force.
In our view, restoring the liberal education is about: a return to standards; stemming the tide of grade and credential inflation; treating the university as a place and a space where politics and vote-getting have no place; removing the idea that the university credential is a ticket to a job, or a place where one goes to get "job training." Universities are not vocational institutions and should not have to answer to the same bottom line. Liberal programs that have been turned into pseudo-vocational ones need to be returned to their original missions.
— Scott Jaschik

http://www.insidehighered.com/layout/set/print/news/2011/02/23/interview_with_authors_of_new_book_on_lowering_higher_education

Would the Bard Have Survived the Web?
By SCOTT TUROW, PAUL AIKEN and JAMES SHAPIRO

ARCHAEOLOGISTS finished a remarkable dig last summer in East London. Among their finds were seven earthenware knobs, physical evidence of a near perfect 16th-century experiment into the link between commerce and culture.

When William Shakespeare was growing up in rural Stratford-upon-Avon, carpenters at that East London site were erecting the walls of what some consider the first theater built in Europe since antiquity. Other playhouses soon rose around the city. Those who paid could enter and see the play; those who didn't, couldn't.

By the time Shakespeare turned to writing, these "cultural paywalls" were abundant in London: workers holding moneyboxes (bearing the distinctive knobs found by the archaeologists) stood at the entrances of a growing number of outdoor playhouses, collecting a penny for admission.

At day's end, actors and theater owners smashed open the earthenware moneyboxes and divided the daily take. From those proceeds dramatists were paid to write new plays. For the first time ever, it was possible to earn a living writing for the public.

Money changed everything. Almost overnight, a wave of brilliant dramatists emerged, including Christopher Marlowe, Thomas Kyd, Ben Jonson and Shakespeare. These talents and many comparable and lesser lights had found the opportunity, the conditions and the money to pursue their craft.

The stark findings of this experiment? As with much else, literary talent often remains undeveloped unless markets reward it.

At the height of the Enlightenment, the cultural paywall went virtual, when British authors gained the right to create legally protected markets for their works. In 1709, expressly to combat book piracy and "for the encouragement of learned men to compose and write useful books," Britain enacted the world's first copyright law. Eighty years later, America's founders expanded on this, giving Congress the authority to enact copyright laws "to promote the progress of science and useful arts."

Copyright, now powerfully linking authors, the printing press (and later technologies) and the market, would prove to be one of history's great public policy successes. Books would attract investment of authors' labor and publishers' capital on a colossal scale, and our libraries and bookstores would fill with works that educated and entertained a thriving nation. Our poets, playwrights, novelists, historians, biographers and musicians were all underwritten by copyright's markets.

Yet today, these markets are unraveling. Piracy is a lucrative, innovative, global enterprise. Clusters of overseas servers can undermine much of the commercial basis for creative work around the world, offering users the speedy, secret transmission of stolen goods.

The Senate Judiciary Committee is holding a hearing on Wednesday on "targeting Web sites dedicated to stealing American intellectual property," and the White House has pledged to propose a new law to address rampant piracy within the year. But writers and other creative workers should still be worried.

The rise of the Internet has led to a view among many users and Web companies that copyright is a relic, suited only to the needs of out-of-step corporate behemoths. Just consider the dedicated "file-sharers" — actually, traffickers in stolen music movies and, increasingly, books — who transmit and receive copyrighted material without the slightest guilt.

They are abetted by a handful of law professors and other experts who have made careers of fashioning counterintuitive arguments holding that copyright impedes creativity and progress. Their theory is that if we severely weaken copyright protections, innovation will truly flourish. It's a seductive thought, but it ignores centuries of scientific and technological progress based on the principle that a creative person should have some assurance of being rewarded for his innovative work.

Certainly there's a place for free creative work online, but that cannot be the end of it. A rich culture demands contributions from authors and artists who devote thousands of hours to a work and a lifetime to their craft. Since the Enlightenment, Western societies have been lulled into a belief that progress is inevitable. It never has been. It's the result of abiding by rules that were carefully constructed and practices that were begun by people living in the long shadow of the Dark Ages. We tamper with those rules at our peril.

Last July, a small audience gathered at that London archaeological dig to hear two actors read from "A Midsummer Night's Dream" at the place of its debut, where theater's most valuable walls once stood. While the foundations of the Theater (as it was known) remained, the walls themselves did not. When Shakespeare's company lost its lease, the members dismantled the Theater's timber frame and moved the walls to a new site across the Thames, naming their new playhouse the Globe. Shakespeare's paywall traveled with him.

The Globe would later burn down (a cannon fired during a performance of "Henry VIII" touched off the blaze) and was quickly rebuilt. Its final end came in the mid-17th century, at the outset of a bloody civil war, when authorities ordered the walls pulled down. The regime wasn't motivated by ideals of open access or illusions of speeding progress. They simply wanted to silence the dramatists, who expressed a wide range of unsettling thoughts to paying audiences within.

The experiment was over. Dramatists' ties to commerce were severed, and the greatest explosion of playwriting talent the modern world has ever seen ended. Just like that.

Scott Turow, a novelist, is the president of the Authors Guild. Paul Aiken is its executive director. James Shapiro, a member of the guild's board, teaches Shakespeare at Columbia.

http://www.nytimes.com/2011/02/15/opinion/15turow.html?_r=1&hp

The Digital Pileup
By SHELLEY PODOLNY

SOME facts of life are just plain counterintuitive. It can be too cold to snow. Heavy things float. Martinis have calories.

Here's another one with significantly greater import: Electronic information is tangible. The apps we use, the games on our phones, the messages we incessantly tap — all of it may seem to fly through the air and live in some cloud, but in truth, most of it lands with a thump in the earthly domain.

Because electronic information seems invisible, we underestimate the resources it takes to keep it all alive. The data centers dotting the globe, colloquially known as "server farms," are major power users with considerable carbon footprints. Such huge clusters of servers not only require power to run but must also be cooled. In the United States, it's estimated that server farms, which house Internet, business and telecommunications systems and store the bulk of our data, consume close to 3 percent of our national power supply. Worldwide, they use more power annually than Sweden.

But it's not the giants like Google or Amazon or Wall Street investment banks that are responsible for creating the data load on those servers — it's us. Seventy percent of the digital universe is generated by individuals as we browse, share, and entertain ourselves.

And the growth rate of this digital universe is stunning to contemplate.

The current volume estimate of all electronic information is roughly 1.2 zettabytes, the amount of data that would be generated by everyone in the world posting messages on Twitter continuously for a century. That includes everything from e-mail to YouTube. More stunning: 75 percent of the information is duplicative. By 2020, experts estimate that the volume will be 44 times greater than it was in 2009. There finally may be, in fact, T.M.I.

Proliferating information takes a human toll, too, as it becomes more difficult to wade through the digital detritus. We're all breeding (and probably hoarding) electronic information. Insensitive to our data-propagating power, we forward a joke on a Monday that may produce 10 million copies by Friday — probably all being stored somewhere.

Despite the conveniences our online lives provide, we end up being buried by data at home and at work. An overabundance of data makes important things harder to find and impedes good decision-making. Efficiency withers as we struggle to find and manage the information we need to do our jobs. Estimates abound on how much productivity is lost because of information overload, but all of them are in the hundreds of millions of dollars yearly.

In the corporate realm, companies stockpile data because keeping it seems easier than figuring out what they can delete. This behavior has hidden costs and creates risks of security and privacy breaches as data goes rogue.

In addition, large corporations face eye-popping litigation costs when they search for information that may be evidence in a lawsuit — so-called e-discovery — that can add up to millions of dollars a year. Cases are often settled because it's cheaper to just pay up. With so many resource challenges facing them, most companies postpone the effort and cost of managing their data.

Technological innovation usually carries with it the seeds that spawn solutions. The demand for power by big and small players alike is driving development of energy alternatives and data center innovation. Artificial intelligence and other more sophisticated information retrieval processes are making a dent in the cost of e-discovery and can also help rid companies of their stockpiles. Advances in cloud computing and virtual storage will help consolidate applications and data. But it might still be a question as to whether the planet can continue to feed our digital appetite. Improvements in the digital highway usually just lead to more traffic, and we're in danger of data asphyxiation as it is.

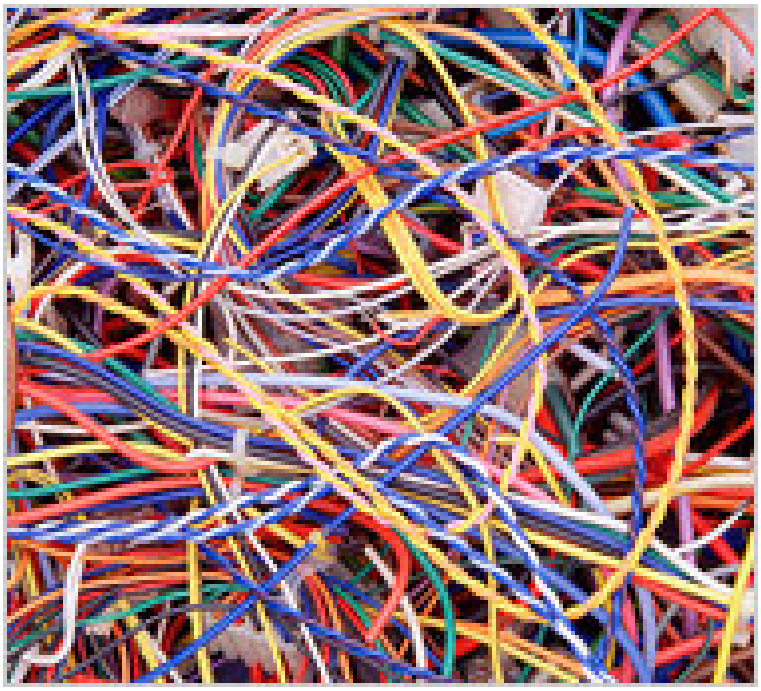
Is there anything we can do? No one wants to give up the pleasures and benefits that the digital domain provides. But we can at least wake up to the toll that it's taking and search for solutions. We can live a productive digital life without hoarding information. As stockholders and consumers, we can demand that our companies and service providers aggressively engage in data-reduction strategies. We can clean up the stockpiles of dead data that live around us, be wiser data consumers, text less and talk more. We can try hitting delete more often.

While some will be tempted to argue that it won't make much of a dent, we have to give it a shot. As with any conservation effort, it's the small actions of a large group that end up making the difference.
Shelley Podolny works for a company that advises corporations on information management.

http://www.nytimes.com/2011/03/13/opinion/13podolny.html

All the Aggregation That's Fit to Aggregate

By BILL KELLER



Getty Image

According to the list makers at Forbes, I am the 50th most powerful person in the world — not as powerful as the Pope (No. 5) but more powerful than the president of the United Arab Emirates (56). Vanity Fair, another arbiter of what matters, ranked me the 26th most influential person in the country. The New York Observer, narrowing the universe to New York, put me 15th on its latest "Power 150," a list that stretches from Michael Bloomberg to Lady Gaga. New York magazine asked Woody Allen to name the single most important person in our city; he named — aw, shucks — me.

The world conspires to convince me of my significance. A respected Hollywood screenwriter has purchased an option on my "life rights" (a Faustian-sounding transaction, yes?) so that someone can portray me in a movie. When I did a radio call-in show a while back, a media reporter considered it an event of such urgency that he live-blogged the entire hour. Whatever I do, or don't do, seems to be an event. Recently my sleepless wife sent out a midnight Twitter post — "Insomnia. Who else is awake?" — but she inadvertently sent it on my Twitter account rather than her own, prompting a global Twitter forum on my state of mind.

You may ask yourself, as I often do: What the hell? I run a newspaper. I haven't cured a disease, governed a country, built a business, discovered a galaxy or written a series of books about wizards or vampires. What makes me so important? But these days even asking the question marks you as out of touch, the kind of naïf who thinks Bill Gates's value to the human race increased when he moved from algorithms to poor children. It's a media world, kids, and media begins with Me.

My putative status as the 50th most important person on Planet Earth derives in part from a belief that the editor of an important newspaper does not merely harvest the initiative of hard-working journalists but personally directs a vast, global conspiracy. I don't. But then, I would say that, wouldn't I?

The other, more insidious reason that I have been deemed more important than the founder of Amazon (66th, says Forbes) or Hosni Mubarak (unrated, presciently) is that our fascination with capital-M Media is so disengaged from what really matters.

Much as the creative minds of Wall Street found a way to divorce investing from the messiness of tangible assets, enabling clients to buy shadows of shadows, we in Media have transcended earthbound activities like reporting, writing or picture-taking and created an abstraction — a derivative — called Media in which we invest our attention and esteem. Possibly I am old-fashioned, but in these days when actual journalists are laboring at actual history, covering the fever of democracy in Arab capitals and the fever of austerity in American capitals, the obsession with the theoretical and self-referential feels to me increasingly bloodless. Then again, I am somewhat complicit on this score; as this magazine lands on doorsteps, I am due in Austin to be interrogated once again about The Future of Journalism.

Of course I care deeply about The Future of Journalism, and I know the upheavals in our business matter a great deal. But the orgy of self-reference is so indiscriminate, so trivializing. We have flocks of media oxpeckers who ride the backs of pachyderms, feeding on ticks. We have a coterie of learned analysts — Clay Shirky, Alan Mutter, Jay Rosen, Jeff Jarvis and the rest — who meditate on the meta of media. By turning news executives into celebrities, we devalue the institutions that support them, the basics of craft and the authority of editorial judgment. (If I were vaporized by aliens tomorrow, my family would miss me, but the 1,100 journalists of The New York Times would not miss a deadline.) Some once-serious news outlets give pride of place not to stories they think important but to stories that are "trending" on Twitter — the "American Idol"-ization of news. And we have bestowed our highest honor — market valuation — not on those who labor over the making of original journalism but on aggregation.

"Aggregation" can mean smart people sharing their reading lists, plugging one another into the bounty of the information universe. It kind of describes what I do as an editor. But too often it amounts to taking words written by other people, packaging them on your own Web site and harvesting revenue that might otherwise be directed to the originators of the material. In Somalia this would be called piracy. In the mediasphere, it is a respected business model.

The queen of aggregation is, of course, Arianna Huffington, who has discovered that if you take celebrity gossip, adorable kitten videos, posts from unpaid bloggers and news reports from other publications, array them on your Web site and add a left-wing soundtrack, millions of people will come. How great is Huffington's instinctive genius for aggregation? I once sat beside her on a panel in Los Angeles (on — what else? — The Future of Journalism). I had come prepared with a couple of memorized riffs on media topics, which I duly presented. Afterward we sat down for a joint interview with a local reporter. A moment later I heard one of my riffs issuing verbatim from the mouth of Ms. Huffington. I felt so . . . aggregated.

Last month, when AOL bought The Huffington Post for $315 million, it was portrayed as a sign that AOL is moving into the business of creating stuff — what we used to call writing or reporting or journalism but we now call "content." Buying an aggregator and calling it a content play is a little like a company's announcing plans to improve its cash position by hiring a counterfeiter.

Then again, some of the great aggregators, Huffington among them, seem to be experiencing a back-to-the-future epiphany. They seem to have realized that if everybody is an aggregator, nobody will be left to make real stuff to aggregate. Huffington has therefore hired a small stable of experienced journalists, including a few from here, to produce original journalism about business and politics.

There is no question that in times of momentous news, readers rush to find reliable firsthand witness and seasoned judgment. (In the first hour after Mubarak fell, The Times's Web site had an astounding one million page views, and friends at other major news organizations tell me they enjoyed a similar surge.) I can't decide whether serious journalism is the kind of thing that lures an audience to a site like The Huffington Post, or if that's like hiring a top chef to fancy up the menu at Hooters. But if serious journalism is about to enjoy a renaissance, I can only rejoice. Gee, maybe we can even get people to pay for it.

http://www.nytimes.com/2011/03/13/magazine/mag-13lede-t.html?ref=magazine&pagewanted=print

The Face on the Canvas and Other Mysteries

By TED LOOS

Sally Ryan for The New York Times
Jim Nutt with his wife, the artist Gladys Nilsson.

Evanston, Ill.
ONE would think that the artist Jim Nutt would have a lot to say about the subject he's been painting over and over, day after day, for the last 25 years: the off-kilter face of an imaginary woman with an impossibly monumental nose, an image that is apparently never too far from his mind.
One would be wrong.
Seated in his studio on a snow-covered street in this town just north of Chicago, Mr. Nutt, 72, laughed nervously in response to nearly every inquiry about the project that has consumed him for decades. "I don't know," he said, repeatedly and reflexively.
"It seemed like a good idea at the time," Mr. Nutt allowed when asked how the series got started and what it meant back then. More uncomfortable chuckling.
Stroking the bushy mustache he has worn since his early fame as a member of the 1960s Chicago artist groups the Hairy Who and the Chicago Imagists, Mr. Nutt was always unfailingly polite and friendly, even as he evaded questions. But in an age when artists are trained to explain the point of their work succinctly — the better to market it to collectors, curators and dealers — there seemed to be something either willful or strangely innocent in Mr. Nutt's responses. Or possibly both.
Nearby, in the latest iteration of his long-running series, a small in-progress canvas showed a stylized woman's face and upper torso, with signature nose and 1940s chignon hairdo, in a palette of blues, greens and purples — except for the coral-colored lips. The relatively flat handling of paint with significant areas of pure color was typical of recent treatments of the woman.
"It's an irritating period," Mr. Nutt said of this extended phase. "I wish the paintings went faster. I probably do about one a year. If they went faster, I probably would have moved on somewhere else."
But what Mr. Nutt does produce, and what he has created over a nearly 50-year career, is anything but irritating to the art world and a handful of devoted collectors. Many of his most important works are now on view at the Museum of Contemporary Art, Chicago, in the large exhibition "Jim Nutt: Coming Into Character" (through May 29). Though not a full retrospective, the 73-work show includes some of Mr. Nutt's

more ribald early pieces, which were clearly influenced by cartoons and comic books, as well as the work it mainly focuses on, from the mid-1980s forward — the period of the mystery woman.
"The recent paintings are just beautifully done, and so fascinating in the way they quote the history of the medium," said Carter Foster, a curator at the Whitney Museum of American Art. "They make me think of Northern Renaissance portraits."
Roberta Smith, a critic for The New York Times, recently described Mr. Nutt's "cubist cuties" as examples of "fiercely loony American figure painting," a tradition that she said included Willem de Kooning and Philip Guston. And Lynne Warren, the Chicago curator who organized the current show and called Mr. Nutt "an artist's artist," reeled off a surprisingly diverse list of artists who have cited Mr. Nutt's influence: Jeff Koons, Mike Kelley, Amy Sillman and Chris Ware, among others.
Mr. Nutt's decades-long focus on one subject is unusual, but he is not art history's only repeater. The Italian painter Giorgio Morandi went back time and again to the same bottles and vases for his still lifes, and the abstractionist Richard Diebenkorn painted the view from his Santa Monica, Calif., window for 25 years and called it the "Ocean Park" series.
As with those artists, Ms. Warren argues, it's a mistake to see repetition as a problem. "He has a singular vision, but it's not the same painting," she said.
The painter Carroll Dunham, an acquaintance and admirer of Mr. Nutt, agreed. "I don't see them as symptoms of blockage," he said of the works. "They look dense and complex and beautiful. That kind of focus is the opposite of limiting."
For his part Mr. Nutt may be chagrined at his pace of production, but it hasn't prompted him to change his habits. He puts in roughly six hours a day in the studio, and over the year or so it takes to create a painting he does some drawings of the image along the way.
"I start with one thing and then try to put something else with it, meaning a nose with an eye," he said. "Then I add to that combination or change one of those two because they're not quite right. It's a constant process of adding and subtracting."
Fundamentally Mr. Nutt has always been a devoted portraitist. Even in the late 1960s, when his work was decidedly more grotesque, many of his paintings were of people. The museum's exhibition features several examples, including the scabrous "Miss T. Garmint (she pants a lot)" (1967), the blob-headed subject of which is holding cigars in each of her three hands.
"I've never really been able to understand why anybody paints a still life, even though I enjoy looking at them," Mr. Nutt said. And when it comes to people, he added, "I would much rather look at a female face and lavish attention on it than a male face. I think that's part of the reason it's ended up being a singular thing."
Mr. Nutt was born in Pittsfield, Mass., and his family moved often while he was growing up. He said that his interest in the human face dates back to the influence of a single work — a Hans Holbein the Younger portrait of a woman at the Saint Louis Art Museum, "Mary, Lady Guildford" (1527), which Mr. Nutt saw while he was a student at Washington University in the late 1950s. He was taken by the emphatic rendering of the sitter, he said. "She is a formidable woman — more like a fortress than anything else."
Mr. Nutt attended the Art Institute of Chicago in the early 1960s, where he met the woman who became his wife, the artist Gladys Nilsson; the two live in Wilmette, next door to Evanston.
The emergence of Pop Art developments made a strong impression on Mr. Nutt, who particularly recalls the work of Claes Oldenburg and Andy Warhol from that time. "It freed us up to look for other sources," he said. "You suddenly realized that comics are acceptable." (Still, he added, "Push comes to shove, I was more interested in Miró than comics.")
Mr. Foster of the Whitney said that Mr. Nutt took the influence of comics in a very different direction. "The Pop artists in New York were ironic about it," Mr. Foster said. "The Chicago artists really embraced the medium, and Jim had his own slightly more sinister and humorous take on it."
Mr. Nutt has been the subject of major solo exhibitions — notably one in 1974 that traveled to the Whitney and another in 1994 that made it to the National Gallery of Art — and he has gallery representation in New York and Chicago. But much of his fame came early, and the current exhibition is not traveling. "It's been a huge disappointment for Jim and me," Ms. Warren said. "And we tried every museum."
His diehard fans still feel that Mr. Nutt's biggest recognition may be yet to come, in part because of the recent resurgence in comics and graphic art generally. "Pictures have evolved in Jim's direction," Mr. Dunham said. "Cartoons have been collapsed into painting."

In the meantime Mr. Nutt, who professes little interest in art-world trends, chips away at his portraits. Several people have suggested that his constant subject bears a resemblance to his mother — something in the nose and hair. A picture of them together from the 1940s, when Mr. Nutt was a child, has appeared in some exhibition catalogs of his work.
Over lunch with Mr. Nutt at their favorite Italian restaurant in Wilmette, Ms. Nilsson tried to address the mommy-likeness issue. “Well, Jim hasn’t really disputed that,” she said, glancing at her husband.
Mr. Nutt just looked down at his salad and laughed.

http://www.nytimes.com/2011/03/13/arts/design/jim-nutt-and-the-face-on-his-canvases.html?ref=design

Taking on the Role of Gender in Media

By SUSAN HODARA

Lynn Hershman/Gallery Paule Anglim, San Francisco
IMAGES "The Deconstructive Impulse" showcases women's role in illuminating media messages. Above, "Seduction," by Lynn Hershman.

NEAR the entrance to "The Deconstructive Impulse," at the Neuberger Museum of Art, is Lynn Hershman's 1988 black-and-white photograph "Seduction." In it, a woman vamps for the camera as she sprawls on a bed. She wears a short black dress and high heels, but instead of her head, a television set frames her oversize, mascara-heavy, closed eyes. The photograph is one of 68 works by 22 American artists supporting the show's premise, boldly stated in its subtitle: "Women Artists Reconfigure the Signs of Power, 1973-1991."
Deconstructivism in art seeks to disassemble and recontextualize materials from the mainstream media to illuminate potentially harmful messages. Until now, the established understanding was that deconstructivism was steered by men. In mounting "The Deconstructive Impulse," the curators, Helaine Posner and Nancy Princenthal, were intent on setting the record straight.
"This is the first show to survey women's contributions to deconstructivism," Ms. Posner, the chief curator at the Neuberger, said, describing the exhibition as "a revisionist show" based on 25 years of perspective. Questions of authorship and authenticity, the dangers of stereotyping, and racism, classism and sexism in the media are addressed in prints, posters, paintings, photographs, videos and installations. Occupying three large gallery spaces, the show is organized into six sections — "Women's Experience," "Masquerade," "Appropriation," "Mass Media," "Fashion" and "Critique of Cultural Institutions" — illustrating different approaches to deconstructivism.
"What we realized was not only that women were at the forefront of this movement," said Ms. Princenthal, formerly the senior editor at Art in America, "but also that a lot of the issues they covered were motivated by feminism."
In "Women's Experience," six photographs from Laurie Simmons's "Early Color Interiors" series, from 1978 and 1979, depict elaborate dollhouse setups in which a suburban housewife doll enacts daily rituals. In "Semiotics of the Kitchen," a six-minute video made in 1975, Martha Rosler demonstrates the use of familiar kitchen tools with a particularly aggressive brand of humor.

In the "Appropriation" section, works by Sherrie Levine, whom Ms. Posner called "the most direct appropriator," use photography and painting to duplicate pieces by prominent male artists like Stuart Davis, Kasimir Malevich and Walker Evans. "She wasn't copying the original," Ms. Posner said. "She was copying reproductions in art history books, so these are actually copies of copies, which really questions the notion of originality."

Other artists use appropriation to critique the news and entertainment industries. In her video "Technology/Transformation: Wonder Woman," made in 1979, Dara Birnbaum rearranged clips from the television series to direct viewers' attention to the biased portrayal of its skimpily clad superhero. In "Verbs," Sarah Charlesworth reproduced a front page of The New York Times from 1978, but extracted everything except its verbs and images. "By making selective changes," Ms. Posner said, "she is talking about how newspapers might manipulate our understanding of the news."

"These artists were so prescient," Ms. Posner said. "We talk about media saturation in the '80s, but media has invaded our lives now in a way that's absolutely pervasive, much more so than when these artists were making their work."

Perhaps the most blatant commentary in the show is about art itself — in three posters by the Guerrilla Girls, a collective of feminist artists formed in 1985. In one — titled "Do Women Have to be Naked to Get into the Met. Museum?" — a nude reclining in a classic pose clutches a feather duster and wears a growling gorilla mask. Text in the poster replies to the title question: "Less than 3% of the artists in the Modern Art sections are women, but 83% of the nudes are female."

"Younger generations of women artists have been the beneficiaries of all the work that was done previously," Ms. Posner said. "Feminism has opened up many possibilities for them, so maybe their awareness of being women doesn't have to be as central as it was a few decades ago. Feminism really has changed the world."

"The Deconstructive Impulse: Women Artists Reconfigure the Signs of Power, 1973-1991" runs through April 3 at the Neuberger Museum of Art, 735 Anderson Hill Road, Purchase; neuberger.org or (914) 251-6100.

"Art Sandwiched-In: Deconstructive Impulse," a lunchtime examination of the show, is on March 16 at noon; free with museum admission.

"Hot and Cool: Feminism, Deconstruction and Desire," a panel discussion with the show's curators and Sarah Charlesworth, one of the exhibiting artists, is on March 17 at 6:30 p.m., and "Artist Talk: Deborah Kass," featuring another exhibiting artist, is on March 24 at 6:30 p.m.; both events are free.

http://www.nytimes.com/2011/03/13/nyregion/13artwe.html?ref=design

Midcentury Collectivism

By MARTHA SCHWENDENER

Parrish Art Museum
An exhibition in Southampton displays an artist's evolutionary path. Above, "Untitled No. 18," by Esteban Vicente.

One of the good things about art history is that it is always being rewritten. In the case of the New York School, that self-described Greatest Generation of midcentury artists, newer histories have moved past the singular, heroic-figure narrative to emphasize the era's inherent collectivism and internationalism, and the presence of women — and not just as wives or lovers.
"Esteban Vicente: Portrait of the Artist," at the Parrish Art Museum in Southampton, starts with one artist, but quickly — and thankfully — opens up into one of these broader, more inclusive chapters. Vicente (1903-2001), a Spanish-born artist who lived most of his life in New York, was best known for his collages, and a big red abstract-floral one greets visitors at the entrance. A watercolor by his contemporary Philip Pavia, "Freefall No. 2" from 1959, hangs nearby, however, turning the installation immediately into a dialogue.
The first room focuses not just on collectivity, but also on what a wall label calls "connectivity": artists gathering casually in the 1940s at a cafeteria in Greenwich Village and eventually forming the Club, which met for both social purposes and panel discussions centered on philosophy, music, poetry, literature and film. Several works here are by artists included in the historic Ninth Street Exhibition of 1951, mounted by Vicente and other Club members in a building that was slated for demolition — a kind of proto-alternative space that shifted attention away from the commercial galleries of 57th Street to the downtown artists' scene. Robert

Richenburg, one of these artists, is represented by "Silent Thoughts" from 1961, a brooding work that extends the collage conversation since it was made by ripping paper rather than applying pigment to the surface.
Many artists were using a black-and-white palette during this period. Charlotte Park's ink-on-paper work from 1952 is a good example, as is a work on paper by her husband, James Brooks.
The dense, intricate field of markings in Ms. Park's work are echoed in Alfonso Ossorio's "Couple and Progeny" from 1951 and "Playing Children" from 1949. Ibram Lassaw takes the diffused overall markings in a different direction: his untitled ink and watercolor work from 1951 is actually a finely drawn and detailed composition, rather than a characteristically spontaneous, New York School outburst.
In this setting, works by art stars like de Kooning (with whom Vicente shared a studio floor on East 10th Street in Manhattan in the early '50s), Lee Krasner, Motherwell and Pollock feel like part of a larger network of ideas and approaches rather than objects crafted by lone-wolf geniuses. And yet, they still call up works from the historical art canon. A simple 1951 ink drawing by Pollock predicts "Blue Poles (No. 11, 1952)," his last monumental painting, in which figurelike poles emerge out of the skein of drips. A diminutive de Kooning from 1966 looks back to his "Women" of the 1950s. Motherwell's ink-on-paper "Spontaneity No. 3" from 1966 centers on an oversize, vaguely Asiatic abstraction — reminiscent of his "Elegies to the Spanish Republic."
The show reaches out to include Vicente's classmates, coworkers and students. There is a quasi-religious watercolor by Dalí, who studied art in Madrid at the same time as Vicente. The Mexican artist Rufino Tamayo, represented by a 1934 gouache on paper depicting a dreamy, sleeping moon, taught art at the same private high school in Manhattan where Vicente taught Spanish.
Dorothea Rockburne, a student of Vicente's at Black Mountain College in Asheville, N.C., is represented by a luminous work on cotton and abaca (a plant fiber), "Einstein's Cross," from 1998. Slightly younger students like Chuck Close and Susan Crile worked in a figurative vein, differing with Mr. Vicente. But Ms. Crile, quoted in a wall text, says, "Esteban gave you permission to be yourself as an artist."
It is not until you reach the museum's third and final gallery that you focus on Vicente's work: large, bright abstract canvases and the collages. (An exhibition dedicated to Vicente's collages is also currently on view through March 26 at the Grey Art Gallery at New York University in Manhattan.)
Early canvases feature jagged, abstract shapes hovering in dark gray fields, like an untitled painting from 1949, or the more assured "No. 9" from 1953. Vicente's palette lightened in the '50s and '60s, with canvases like "N" from 1959, which includes passages of electric green, orange and yellow, or "Princeton No. 5" from 1966, with its vaguely biomorphic collagelike shapes vibrating in a bright field.
Even in this gallery the words and photographs of other artists are given attention. A display case includes a printout of a 1953 text, originally published in ARTnews and written by Elaine de Kooning, with photographs by the multigenre artist Rudolph Burckhardt. Ms. de Kooning, a painter and writer (more often cited as the wife of Willem de Kooning), describes how Vicente "backed into collage one Sunday in Berkeley, Calif., in 1950, because he wanted to work and his paints and brushes had not yet arrived."
The real revelation in Ms. de Kooning's article, "Vicente Paints a Collage," however, is that Vicente began his collages with charcoal drawings rather than merely arranging bits of cut or torn paper. This leads visitors back to a large charcoal drawing, "Untitled No. 18" from 1958, where you can see him sketching out vague shapes; then to several of his collages placed around the room; and finally to his paintings, which suddenly register as paintings sprung from collages, with their juxtaposed elements functioning, as Ms. de Kooning puts it, like "action caught at an impasse" to create "an art of interruption."
Ms. de Kooning circles around this idea of the "interrupted" artwork, looking to cinema, and to poetry. Vicente's work, she writes, is "caught midway in an attitude of surprise, like Marianne Moore's 'real bird in a painted tree.' " This feels like a fitting description of Vicente's abstractions. It also feels appropriate, however, as an analogy for artists lodged in the ever-shifting, painted tree of art history.
"Esteban Vicente: Portrait of the Artist," through April 10 at the Parrish Art Museum, 25 Jobs Lane, Southampton; parrishart.org or (631) 283-2118.

http://www.nytimes.com/2011/03/13/nyregion/13artsli.html?ref=design

Rachel Feinstein and John Currin, Their Own Best Creations

By DAVID COLMAN

Lee Clower for The New York Times
Rachel Feinstein and John Currin defy others' expectations of how artists should look and live

OUTSIDE, there were snowdrifts and icy sidewalks that made getting into Lever House a tricky navigational challenge for the fashionably dressed crowd on this freezing January evening. But once inside the lobby of Lever House, the modernist Park Avenue landmark, the grim reality of a seemingly never-ending New York winter was replaced by a fairy tale world of giant toy soldiers, a garden of red roses and a gaslit golden coach — and a hothouse gathering of some of the city's more notable figures from art, fashion and publishing.
The real estate magnate and art collector Aby Rosen, one of the owners of Lever House, was in his element (and a pair of jeans), maneuvering around the room in his dressed-down low-key way, pausing to chat with his fellow art collectors Peter Brant and Alberto Mugrabi. Sprucely dressed waiters tangoed through the crowded space offering Champagne to the artists Brice and Helen Marden; the New Museum director Lisa Phillips; Cynthia Rowley and her husband, the art dealer Bill Powers; Amanda Brooks, the new fashion director of Barneys, and her husband, the artist Christopher Brooks; the painter Francesco Clemente and his wife Alba; Salman Rushdie; and the director Sofia Coppola. Off in a corner, Marc Jacobs and his ex-boyfriend Lorenzo Martone (the latter dressed in knee-high wooly boots) appraised a room of mirrors hand-painted with ghostly landscapes.
But one person in particular stood out on this evening: a tall ginger-haired beauty dressed in a figure-flattering ivory velvet Marc Jacobs dress, chatting with Ms. Coppola, hugging Mr. Martone, keeping an eye on three frisky young children who hovered nearby, and occasionally joking with a blue-suited bespectacled man who cast an amused eye over the gathering.
Even if you hadn't known it was Rachel Feinstein, the sculptor who had created this fantastical art installation, you probably would have figured out rather quickly — from the way people gravitated toward her and the way she glided confidently around the room — that she was the star of the evening. And the dark-suited man at her side, the one chatting with James Frey? That was John Currin, the husband of Ms. Feinstein and the father of their three children — and arguably the most provocative and successful painter of his generation.

Individually, each is a force to be reckoned with. Mr. Currin's canvases, sensual mash-ups of Old Master figure painting and 1970s porn (which sometimes feature his wife) became certifiably blue-chip when one sold for $5.5 million at Sotheby's in 2008. She is a sculptor whose works have collected some notable collectors — Mr. Rosen and Mr. Mugrabi among them — and a warm, rosy-cheeked beauty, whose flair inspired a fashion collection by Mr. Jacobs and prompted Tom Ford to include her in the debut runway show of his new women's wear line last fall.

Together, Mr. Currin and Ms. Feinstein have become the ruling power couple in today's art world — perhaps the most potent marital pair since Jackson Pollock and Lee Krasner in the 1950s.

Both stylish dressers, sharing an irreverent humor, the two are known for a colorful life that may have more precedents in Hollywood (see Taylor-Burton, Dick and Liz) or the literary scene (see Fitzgerald, F. Scott & Zelda) than the more insular New York art world. (Fittingly, they are close friends with another high-profile couple — Mick Jagger and the model-turned-fashion designer L'Wren Scott.) As the first award presenters at the Rob Pruitt Art Awards last December, they were camera-ready, hitting their lines like George Burns and Gracie Allen.

Flouting the long-held, politically correct prohibitions against artists living amid the kind of ritzy indulgence their collectors do, Mr. Currin and Ms. Feinstein have not only mapped out a new place for the artist in society, they also hired a decorator to make it look fabulous.

And they're not ashamed to admit it.

"Visual artists like to think of themselves as more serious — you can't show off that you have good taste," said Ms. Feinstein with an exasperated shake of her head, sitting at home in the couple's SoHo loft. "We're always getting insulted. We were at a party at Anna Wintour's house, and all these people are giving John grief, telling him, 'You're not dressed like an artist, you're dressed like a banker.' And he's like: 'Give me a break, how is an artist supposed to dress, like Jackson Pollock? That was the '50s!' "

YET to see them at home on a recent Saturday morning, with Ms. Feinstein making waffles for her husband and their three children, suggests a something sort of 1950s about them. With the perfume of frying bacon drifting through the air, their two young sons, Francis and Hollis, running in and out of the kitchen, and their daughter, Flora, a toddler, proudly intoning her new word ("No!"), the parents were happy to drink coffee and bat around any topic that came to mind — the barbershop revival, the Davos summit, the television series "To Catch a Predator," symbolism of the cephalic vein, "tattoo fail" Web sites.

Homey as it sounds, the place is a loft that has been transformed into what may be the most stylish apartment south of Houston Street. Just featured in the December issue of The World of Interiors (a decision made after S. I. Newhouse, the chairman of Condé Nast, came to dinner), the apartment's many charms include a Boffi kitchen, a 14-foot-long dining table, an enormous tufted aubergine sofa (once the Duchess of Windsor's), a wealth of midcentury Italian furniture by Gio Ponti, Piero Fornasetti and Carlo Mollino, and a swath of leopard-print carpeting in the foyer.

The couple's bedroom features a massive hand-carved, custom-made gilded bed from England, extra long to accommodate Mr. Currin's 6-foot-3 frame. In their sons' bedroom is a mural done in the style of Gio Ponti; off to the side is a little barroom with malachite wallpaper, the whole thing done up with the help of the art-world decorator Ricky Clifton.

Recently, they bought a virtually unrestored town house near Gramercy Park, filled with turn-of-the-century details like a top-floor artist's studio, and are just starting to shop around for an architect.

"We're going to spend a lot of money to make it look very old-fashioned." Mr. Currin said dryly.

As acceptable as such behavior is in other worlds, it's a risky move in art. Other artists who have tried to live a more glamorous existence have had their hands rapped for it. In the 1990s, Julian Schnabel saw his reputation as a serious painter get swamped by his more popular interior designs and films. Back in 1960s, when photos of Cy and Tatiana Twombly's grand apartment in Rome were published in Vogue, his standing fell, too. In the 1930s, Salvador Dalí, who had dressed as a dandy even before his fame as an artist, was shunned by the core Surrealists for declining to champion the group's leftist politics.

"A lot of artists don't want to indulge that side of themselves in the fears that they would look less driven as artists," said Eric Boman, the photographer who shot their apartment for the magazine. "You have one life, and you should live it according to what you think a good life should be."

Even their early romance had an over-the-top, fairy tale quality. Jessica Craig-Martin, the photographer who has known them since they started dating, said she vividly remembered the two of them coming to a dinner

party and towering over everyone else — Ms. Feinstein in a pink latex dress. Their flamboyance, she said, "caught everyone's attention."

Back then, Mr. Currin, the son of a physics professor and a piano teacher who grew up in Connecticut and California, had graduated from Carnegie-Mellon and Yale's M.F.A. program and was just beginning to make a name for himself as a New York artist. He had been painting women who looked a lot like Ms. Feinstein. Though they hadn't met, Mr. Currin theorizes that he had seen her around, and one way or another, her creamy-skinned beauty stuck in his subconscious. Then, an acquaintance told him that a girl who looked just like the girl in his paintings was living in a gallery for six weeks as part of an art exhibition — in a gingerbread house she'd made, no less. He went to see her. She asked him out. Two weeks later, he invited her to come to a show of his work in Paris, and asked her to marry him. And three years later, on Valentine's Day 1997, she did.

If his career seemed to take off after they met, Mr. Currin had already exhibited his natural flair for riling people up with his first exhibition featuring racy portraits of middle-aged women, in 1992 (a Village Voice review declaring "Boycott this show!" brought him instant infamy). Though his work continued to polarize critics, by 2003 most of them were on his side for his one-man show at the Whitney Museum (although one particularly vicious review by Jed Perl in The New Republic did label it "art pollution").

Later that same year, Mr. Currin publicly and brashly left the Andrea Rosen Gallery, which had long represented him, for Gagosian. With escalating prices for his work mirroring the greater art boom, Mr. Currin came to epitomize a new attitude of artistic ambition — a characterization that has not dissipated as his prices have climbed into the millions. With a sardonic, dark wit, Mr. Currin is alert to his reputation.

"I was giving a lecture in Dallas," Mr. Currin recalled, "and during the question section, this guy gets up and says: 'Hi, I am an art collector, and you're one of the least liked people in the art world. what's that like?' It's weird to have your paranoia confirmed like that."

"I am not a very liked person," he continued. His wife, he said, is "a tremendously liked person. So probably her batting average gets worse, and I am a lot more liked because of her. She's helped my career tremendously, I would say."

Where he can be aloof and curmudgeonly, friends uniformly describe Ms. Feinstein as warm, energetic and open. "Rachel is immediately disarming," said Ms. Brooks, a longtime friend. "It's impossible not to have an instant intimacy with her. She's very affectionate and open-hearted, whereas John takes a little more investment."

The artist Cecily Brown said, "the energy in the room changes when Rachel arrives." She has known the couple socially for 10 years and said they recently became closer, as they both have toddlers. "I wish I had half of her brilliant social skills," she said. "She never seem to suffer a moment of shyness. I am usually in a stage of dread if I have to go out. But if you know Rachel's going to be there, it's nicer. You know there's going to be a warm presence."

Similarly, the couple's visibility owes much to Ms. Feinstein's enthusiasm.

"Rachel believes in saying yes to everything, and not strategizing," Mr. Currin said. "I believe in strategizing, but I'm terrible at it. So I generally go along with her thing of not strategizing, and it generally works out pretty well."

Ms. Feinstein laughed at this.

"My big problem is that I want to say yes to everything," she said. "I want to be everyone's friend. When Marc Jacobs asked me to be in his campaign a couple years ago, I didn't say yes right away. I was excited, but I knew it would come at some price, so I really thought about it. What people don't understand is that there is no gain at all for an artist to do something like that in a public eye. As a movie star or fashion designer, the more publicity you get, the consensus is that it's a good thing. But I make maybe six pieces of art a year — and the more the general public knows about me, the less it helps in the small sphere of the art world."

Yet her own public persona is in many ways an accurate reflection of her art. Born and raised in Miami, the daughter of a dermatologist, she studied religion and studio art at Columbia University. (Her chances to get into Yale's M.F.A. program were scotched, she said, after the head of the program took issue with the transparent plastic miniskirt she wore to the interview.)

In her work, she brings a perverse sensibility to the baroque kitsch fantasy-land where she grew up, along with an historian's fascination with various art forms. Her installation at Lever House, an homage to the dark, little-known Hans Christian Andersen fairy tale "The Snow Queen," is a good display of her flair for

synthesizing myriad fascinations — in this case, folk narrative, Carpenter Gothic architecture and Baroque painting — in vignette form. Lacking the provocative sexual punch and catchy visual vocabulary of her husband's work, Ms. Feinstein's more abstract and fanciful work is seen by many to pale next to Mr. Currin's. But so does the work of dozens of highly regarded artists.

"You kind of want to go knee-jerk on them and say, 'Oh they've sold their souls to the devil,' " said the New York magazine art critic Jerry Saltz. "But he's probably a really good painter. And not many people know the arc of her career. There are these artists now doing this neo-ancient, primitivistic work with the figure, like Thomas Houseago or Huma Bhabha, that Rachel was doing a long time ago. But they've eclipsed her, because there are prices to pay to being that glamorous. She's paid the bigger price, because I think Currin never took his eye off the ball, and she might have."

ADDING another wrinkle to their already complicated semipublic life is one facet of which even their close friends are dubious: their politics are several notches to the right of art-world orthodoxy. Mr. Currin loves nothing better than skewering the political correctness and liberal attitudes so common in New York — just get either of them going on the environment, multiculturalism, government funding, feminism.

"We're famous for supposedly being crazy right-wing Republicans," Ms. Feinstein said. "I've had fights with people at art openings about it. I once had an art critic say to me, 'If you get your way, it will become like "The Road" ' — that Cormac McCarthy book! I just think that in no society should there be one ruling party. And in New York, there's way too much of the Democrats — we've got to have a little bit of something else."

On a scale from 1 to 10, 1 being full-blown right-winger and 10 being full-tilt left-winger, they put themselves more or less in the middle, both of them espousing an essentially libertarian agenda. And both are quick to wonder why it's a given that an artist should have liberal leanings when, if making art is a consummately individual expression, a libertarian bent seems a natural choice.

"What we're talking about is this idea that artists are supposed to be critical of the capitalist art world and the free-market art world — that there is supposed to be some underlying shame in that. It used to be a lot worse, but these days, everyone is co-opted."

Because of their conservative stance, it's easy to think of the couple a bit old-fashioned. But Mr. Currin flatly rejected that suggestion, that his paintings were reviving a lost machismo, or similarly, that his conservative views were reactionary. Being a libertarian seems to him to be more progress than regress, he said, adding that some of his more progressive views would have him drummed out of Texas.

"I strive to be old-fashioned and fail," he said. "I would love to know about roughing it, and be that guy that hates air-conditioning, but I am not a savage in any way. I got my macho painting out of my way in art school. It wasn't me. I feel like I am one of the only feminine male artists, that I am the only one who cares about things being pretty, about elegance and other feminine qualities."

Ms. Craig-Martin said that the blur of which one has the yin and which the yang was the key to their mystique. "John seems very macho and old-fashioned, and then Rachel is super-feminine," she said. "I used to share a studio with the two of them, and my space was between them — I was the ham in the sandwich. And Rachel would be in her studio with her chainsaw going, ripping away at things with her goggles on and with this incredible macho sound. And then John on the other side, he'd be in there painting these tiny strokes with a brush with one hair. I loved that dichotomy."

http://www.nytimes.com/2011/03/13/fashion/13CurrinFeinstein.html?ref=design

Emancipating History

By EDWARD ROTHSTEIN

Anne McQuary for The New York Times
The brick slave quarters along an avenue of oak trees greet visitors to Boone Hall Plantation

CHARLESTON, S.C. — Here, in this lovely town, once one of the most prosperous in the American colonies, there is no escape.

In the Old Slave Mart Museum that opened in 2007, you read: "You're standing in the actual showroom, the place where traders sold — and buyers bought — American blacks who were born into slavery."

Or go to Drayton Hall, a local plantation hewn out of the Low Country landscape by hundreds of slaves, who also made its rice fields so profitable. At a clearing in the woods near the entrance, you see an information panel and a memorial arch: this was a "burying ground," used at least as early as the 1790s, where the plantation's slaves buried their dead.

Or drive to Boone Hall, another local plantation, which you approach through an avenue of moss-draped ancient oaks that leads visitors to the main house: you see a row of rare brick slave dwellings, placed so no visitor could have missed the immense wealth in human chattel. At one time, these one-room homes were joined by others on each side of the road, creating corridors of the enslaved, ushering guests to the master's domain.

Or walk into the almost Italianate backyard of the Aiken-Rhett House in town, in which William Aiken Jr., who served as South Carolina's governor, lived in the mid-19th century. Listen to the audio tour explaining that this was a work yard, and that such yards "were part of every town house in Charleston in the first half of the 19th century and were the domain of slaves."

The house, together with the yards, we learn, "is referred to as an urban plantation." And though Aiken was, by all accounts, an enlightened master (and an opponent of South Carolina's secession), he was also the third-largest slaveholder in South Carolina.

Slavery and its heritage are everywhere here. Charleston was one of the main colonial ports of the 18th century, dealing in rice, indigo and slaves. In 1860 South Carolina held as many slaves as Georgia and Virginia, which were at least twice its size. The genteel grace and European travels of its wealthy citizens were made possible by the enslavement of about half the population.

So on a recent visit, I searched for a public display of an understanding of that American past and its legacy. After all, is there any more vexed aspect of this country's history than its embrace and tolerance of slavery? And is there any aspect of its past that has been less well served in museums, exhibitions and memorials?
The sesquicentennial of the Civil War that is about to be commemorated means that it has been nearly 150 years since American slavery was brought to an end. But even in the North, the subject is still approached with caution, delicacy and worry. It inspires profound shame, guilt, anger, recrimination and remorse, aimed in many directions for many reasons on both sides of a racial divide.
There have been immensely valuable surveys of slavery in recent years, like the analysis of its connections to New York in two shows created by the historian Richard Rabinowitz and the New-York Historical Society. But there have also been misguided attempts to right historical wrongs, as in Philadelphia's confused exhibition at its President's House site. And even affecting commemorations — like the African Burial Ground in New York — mix important facts with overcharged analysis.
Of course, in the North slavery can seem like a distant abstraction, creating its own problems. But in Charleston all abstractions are gone. The strange thing is how long it has taken to see the substance, and how much more is yet to be shown. Several directors of the region's historical plantations and homes, which offer tours of these once-prosperous estates, told me that until the 1990s, slavery's role was generally met with silence.
At one plantation, Middleton Place, where restored 18th-century formal gardens and an exquisitely contoured landscape have won landmark status, descendants of slaves and of the plantation family have had a tradition of recalling their Middleton connections in separate gatherings. But at such gatherings, Charles Duell, the president of the nonprofit Middleton Place Foundation, which owns the plantation, has written: "Slavery was never mentioned. The subject was uncomfortable, very uncomfortable — not forgotten, but deeply sublimated."
Slavery, he adds, was "simply not discussed within the family, or by employees, or with visitors to the Gardens."
Then, in 1991, a wood-frame house in which freed slaves had lived from the 1870s was restored as Eliza's House, to show the living quarters that served generations of workers. In 2005 half of Eliza's House was used to mount an exhibition still on display that tells the history of slavery and free black labor on the plantation, complete with the names and cost of each slave — some 2,600 people in all.
The dedication of the black burial ground at Drayton Hall last October also suited a broader plan developed by the hall's executive director, George W. McDaniel. The plantation, now owned by the National Trust for Historic Preservation, does not only display its stunning Palladio-style house (which is meticulously unrestored), but also interprets the plantation with special attention to its slaveholding past.
A similar approach has been taken by the Historical Charleston Foundation, which owns the Aiken-Rhett House. The place has been so well preserved that its slaveholding records and the intact buildings provide what it describes as "one of the most complete records of an urban slave community in Charleston, and also the South."
So out of a long tradition of silence has come a belated acknowledgment of slavery's centrality and an attempt to explore it. But something more systematic is needed. The subject is far from neglected in the Charleston Museum, but neither is it fully addressed. The Avery Research Center for African American History and Culture at the College of Charleston plays an important role, but the difficulties are considerable, and not just because until recently the subject itself was not thought of as worthy of this kind of attention.
Historians of slavery must track census data and demographic information, commercial records and archaeological finds. There are few surviving objects or dwellings, and aside from important oral histories, there is scant documentation from slaves themselves.
At the beginning of the 20th century, in fact, the field was dominated by Southern historians who gave the institution of slavery a paternalistic veneer. It was only in the 1930s that the historian Frederic Bancroft began piecing together the evidence showing just how important the domestic slave trade was. And that meant, to put it mildly, that slave families and owner loyalties were far less secure than previously portrayed.
The history has evolved since then, but it is still fitting that one of the most informative sites about slavery in Charleston is, despite its modest size and resources, a museum that focuses specifically on the slave trade and is housed in a building that during slavery's last established years was one of the South's primary slave markets: The Old Slave Mart Museum.

Under the direction of Nichole Green, and with Elaine Nichols as curator, the museum, owned by the City of Charleston, is not a repository for objects, but a place where a narrative history is adroitly and soberly told, mostly on mounted wall panels. Part of that history is reflected in the building itself.

The trans-Atlantic slave trade had been forbidden by Congress in 1807, but that meant that the domestic trade became all the more important. Between 1789 and 1865, we learn, more than a million American-born slaves were sold in the South.

In Charleston, they were mainly sold outdoors, near the Old Exchange Building . But eventually there were complaints about crowds obstructing traffic, and, more important, perhaps, as tensions with the North increased, sales of human beings were attracting critical attention. The city banned outdoor slave sales near the Exchange after July 1, 1856. That was the very day that "Ryan's Mart" opened indoors, becoming the most important showroom in Charleston.

The museum doesn't pretend to present a history of slavery, or an account of its abolition (though on the second floor, a traveling exhibition purchased from the Schomburg Center for Research in Black Culture, in New York, does address the subject). It simply chronicles the domestic trade. There is nothing here still redolent of such barter —the backyard prison, kitchen and outbuildings are long gone — but it doesn't matter. The transformation of a slave showroom into a slave-trade museum gives a poignant edge to the account, in which an auction of slaves could resemble a sale of used cars.

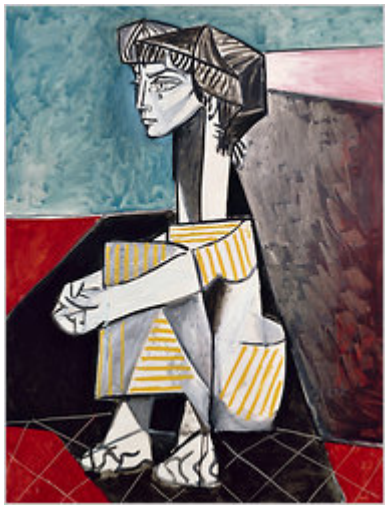
The most valuable workers sold for nearly $40,000 in 2007 dollars (a chart of costs is shown). Hundreds of slaves, it is evident, could be worth more than the plantation they worked on. We read, too, that most white Southerners didn't even own slaves. But slavery's presence was widely accepted as natural.

Spend an hour here, and it starts to seem all the more remarkable that a museum has not undertaken a more ambitious examination of the subject. That will be one of the challenges for the National Museum of African American History and Culture in Washington, which is scheduled to open in 2015. In the meantime, remnants of slavery's presence are so prevalent here that it becomes poignantly evident just how major an achievement is reflected by slavery's enduring absence.

http://www.nytimes.com/2011/03/12/arts/design/charlestons-museums-finally-chronicle-history-of-slavery.html?ref=design

What the Peripatetic Picasso Kept in His Closets

By KEN JOHNSON



Musée National Picasso, Paris, Estate of Pablo Picasso/Artist Rights Society (ARS), New York and Réunion des Musées Nationaux/Art Resource
"Jacqueline With Crossed Hands" (1954), part of the Picasso show

RICHMOND, Va. — One thing you can say for sure about Picasso is that he never got stuck. That is made beautifully clear by "Picasso: Masterpieces From the Musée National Picasso, Paris" at the Virginia Museum of Fine Arts, Richmond. Selected by Anne Baldassari, chairwoman of the Paris museum, the exhibition's 176 paintings, drawings, prints and sculptures give the impression of an artist in a constant state of creative flux and ferment from start to finish. He was nothing if not mercurial, and this viewer-friendly show captures his infectious fluidity over eight decades like no Picasso exhibition I have ever seen.
The term "masterpiece" in the title is misleading, however. There are famous works in the show, including "Celestina," the Blue Period portrait of a hooded woman with one white eye from 1904; the big, densely hatched etching "The Minotauromachy" (1935); and the 1942 "Bull's Head" made from a bicycle's handlebars and leather seat. There are at least three Cubist paintings from the early teens that would hold their own next to anything in the Museum of Modern Art's collection. But there is nothing as consequential as "Les Demoiselles d'Avignon" at MoMA, the Tate Collection's "Weeping Woman" or "Guernica" (at the Museo Reina Sofia). That is not to say that the overall quality isn't high. In fact, there is nary a dud in the show. Picasso produced works that historians and critics consider masterpieces, but he rarely set out to create one. "Guernica" was exceptional, but even in that case he had photographs of its stages made, a set of which is included in this exhibition, showing that what interested him was the trip as much as the destination.
Picasso's biography is invoked routinely to shed light on his whiplash changes. That the exhibition is drawn from a vast collection that Picasso kept for himself — which his heirs gave to the French government to settle the huge tax debt on his estate — adds to the biographical intrigue. Why did he keep these and not others off the market? We will never know in most cases.
But as autobiography or diary, his work is pretty impersonal. You don't get the discursive specifics of real life. The women he pictured in varying degrees of abstraction often vaguely resemble his real-life lovers, but they have a limited repertory of action — they weep, sit and read, lie down in states of voluptuous nudity and menace demonically. There is grief, rage, hilarity, terror and erotic arousal, but emotion in Picasso is primitive; nuance was not his thing. There is plenty of feeling, but it is more about the how of making art than its subject matter.
Picasso once told Françoise Gilot, "I've reached the moment, you see, when the movement of my thought interests me more than the thought itself." You might compare him to a musical improviser. Like a jazz saxophonist, he would take a standard theme or motif and play variations on it until its possibilities seemed

exhausted for the moment, at which point he would refresh himself by taking up a very different theme and toy with that for a while. Momentum was all. Like the shark, he had to keep moving or drown.
So, as the exhibition tells the story, after the poetic reveries of the Blue and Rose periods, he entered a time of Cubist analysis. At the end of the teens, he turned to images of women and objects rendered in a pneumatic, neo-Classical style, like the lovely picture of a pensive, sausage-fingered, seated woman in a white toga from 1920.
After "The Kiss" (1925), whose squiggly outlining, jumbled body parts, gaudy colors and ferocious sexual entanglement surely made Gorky, de Kooning and Pollock crazy with envy, he produced flattened, geometric images like "Painter With a Palette and Easel" (1928) in grays, black and off-white. In the early '30s, he painted nightmarish images of women surrealistically fragmented into balloon- and boulder-like shapes, and he made their three-dimensional cousins in grotesquely bulbous bronzes. Then he went flat again in hedonistic paintings of objects and odalisques outlined in thick loopy lines and filled in with vibrant colors. There is no linear logic to his progression. On April 21, 1933, he drew a fine-lined picture of a couple making love that looks as if made by a 6-year-old child. Two days later, he created a drypoint print of a copulating pair with bulging, Michelangeloesque anatomies. Considering the scary, weirdly misshapen heads and nudes he painted during the war years, you can see why Jung thought his art showed signs of insanity.
In the '50s and '60s, Picasso drew inspiration from famous old paintings. Far from academic or reverent, however, his acidic green and frosty white version of Manet's "Déjeuner sur l'Herbe," with its lumpy, doll-like figures in a dank glade, is dreamily primordial.
Mainstream art historians used to agree that Picasso peaked with his explorations of Analytic Cubism in the teens and that his career after World War II represents a long, sad decline into artistic senility. Lately, the exuberantly ham-fisted paintings of his last decade have been looking shockingly relevant to the enthusiasms of art today.
Made in 1970, two days after his 89th birthday and three years before his death at 92, a zany, sloppy, seven-foot-wide painting of a green-bearded guitarist serenading a reclining nude woman shows that Picasso did not age gracefully. He squawked and screeched with delirious, invigorating fury to the very end.
"Picasso: Masterpieces From the Musée National Picasso, Paris," Virginia Museum of Fine Arts, Richmond, (804) 340-1400, vmfa.museum. Through May 15.

http://www.nytimes.com/2011/03/11/arts/design/picasso-from-paris-on-exhibit-in-richmond-review.html?ref=design

Green Development? Not in My (Liberal) Backyard

By ELISABETH ROSENTHAL

Rumors

Park Slope, Brooklyn. Cape Cod, Mass. Berkeley, Calif. Three famously progressive places, right? The yin to the Tea Party yang. But just try putting a bike lane or some wind turbines in their lines of sight. And the karma can get very different.

Last week, two groups of New Yorkers who live "on or near" Prospect Park West, a prestigious address in Park Slope, filed a suit against the administration of Mayor Michael R. Bloomberg to remove a nine-month-old bike lane that has commandeered a lane previously used by cars.

In Massachusetts, the formidable opponents of Cape Wind, a proposed offshore wind farm in Nantucket Sound, include members of the Kennedy family, whose compound looks out over the body of water. In Berkeley last year, the objections of store owners and residents forced the city to shelve plans for a full bus rapid transit system (B.R.T.), a form of green mass transit in which lanes that formerly served cars are blocked off and usurped by high-capacity buses that resemble above-ground subways.

Critics in New York contend the new Prospect Park bike lane is badly designed, endangering pedestrians and snarling traffic. Cape Wind opponents argue the turbines will defile a pristine body of water. And in Berkeley, store owners worried that reduced traffic flow and parking could hurt their business.

But some supporters of high-profile green projects like these say the problem is just plain old Nimbyism — the opposition by residents to a local development of the sort that they otherwise tend to support.

"It's really pretty innocuous — it's a bike lane, for goodness' sake — their resistance has been incredibly frustrating," said Walter Hook, executive director of the Institute for Transportation and Development Policy in Manhattan and an expert on sustainable transport. He lives in Brooklyn and uses the Prospect Park West bike lane to get around.

Nimbyism is nothing new. It's even logical sometimes, perhaps not always deserving of opprobrium. After all, it is one thing to be a passionate proponent of recycling, and another to welcome a particular recycling plant — with the attendant garbage-truck traffic — on your street. General environmental principals may be at odds with convenience or even local environmental consequences.

But policymakers in the United States have been repeatedly frustrated by constituents who profess to worry about the climate and count themselves as environmentalists, but prove unwilling to adjust their lifestyles or change their behavior in any significant way.

In Europe, bike lanes crisscross cities, wind turbines appear in counties with high-priced country homes and plants that make green energy from waste are situated in even the wealthiest neighborhoods. So what is going on here?

Robert B. Cialdini, an emeritus professor at Arizona State University who studies environmental behaviors, points to two phenomena:

Humans hew to the "normative" behaviors of their community. In places where bike lanes or wind turbines or B.R.T. systems are seen as an integral part of society, people tend not protest a new one; if they are not the norm, they will. Second, whatever feelings people have about abstract issues like the environment, in practice they react more passionately to immediate rewards and punishments (like a ready parking space) than distant consequences (like the threat of warming).

Test yourself: When a sign in a hotel bathroom exhorts you to reuse your towel for the sake of the planet, do you nonetheless tend to throw it on the floor to get a new one? (Me: Guilty.) “I’m a persuasion researcher, and here you have convenience and luxury working against you — just like in the bike-lane issue, “ Professor Cialdini said.

Professor Cialdini’s research has found that the best way to get a guest to reuse towels is to inform him that a majority of the previous guests in that room did not switch towels daily. Likewise, in a study to determine how to get people to reduce home energy use, conducted with Wesley Schultz, Professor Cialdini found that people were most likely to comply if told that all the neighbors were doing it — rather than informed that saving energy would save money or was good for the planet.

“People need to be in alignment with their contemporaries,” he said. “It validates them. It becomes something they should do and can do.”

Has Mayor Bloomberg’s rapid expansion of bike lanes simply outpaced the otherwise progressive norms of Park Slope’s most upscale street? The Bloomberg administration says that according to polls, nearly three-quarters of people in Brooklyn support the bike lane, which has resulted in fewer accidents and lower car speeds on Prospect Park West. The opponents, who note that bicyclists could just as well use a bike lane within the park, contend that the city is manipulating the data and failed to conduct follow-up studies on safety.

In interviews with pedestrians and motorists on Prospect Park West, opponents stridently criticized the bike lane — though (this being Park Slope) nearly everyone made a point of saying they generally approved of cycling. (One of the groups bringing the lawsuit is called Neighbors for Better Bike Lanes; the group opposed to Cape Wind is called the Alliance to Protect Nantucket Sound.)

Brian Williamson, a 39-year-old accountant who was picking up his children in a minivan, said that crossing the two-way bike lane was hazardous because the cyclists sped and had no red lights. “I really despise it — it has had a really negative impact on anyone who uses a car,” he said.

But, of course, that is partly the point: As a matter of environmental policy, a principal benefit of bike lanes is that they tip the balance of power away from driving and toward a more sustainable form of transportation.

So what will happen to the Park Slope bike path or the Cape Wind turbines or the Berkeley B.R.T.? Will bike paths become as much the norm in New York as they are in Copenhagen, where some 30 percent of all trips are on two wheels? Will we get used to looking out for cyclists as we do for cars? Will we become so accustomed to views of wind turbines that we no longer “see” them any more than we do phone lines now?

I recall last year interviewing Hans Rast, a retired engineer who lives in an elegant suburb of Copenhagen, whose backyard sits just several hundred meters from the gate of a huge plant that converts garbage to green heat and electricity. With dozens of such waste-to-energy plants in Denmark, new buyers in his development are usually O.K. with the hulking neighbor behind their homes, he said, adding, “What they like is they look outside and see the forest.”

http://www.nytimes.com/2011/03/13/weekinreview/13nimby.html?ref=science

Give Up Familiar Light Bulb? Not Without Fight, Some Say

By EDWARD WYATT

Charlie Archambault for The New York Times
Amy Ridenour, with her son Jonathan, who is autistic, is stockpiling incandescent bulbs.

WASHINGTON — American protests against the encroachment of government have been spurred by many causes — tea, of course, and guns, frequently. The latest catalyst: light bulbs.

A 2007 bill, passed overwhelmingly by both houses of Congress and signed into law by George W. Bush, will make the familiar incandescent bulb subject to strict efficiency standards next year.

The effect will be to make current 100-watt bulbs obsolete — and that has sent conservative lawmakers, libertarians, some environmental activists and owners of Easy-Bake Ovens into a frenzy of activity to get the law repealed or, at least, to stockpile the bulbs before they disappear from store shelves.

"I do care about my carbon footprint, not to mention my light bill," said Dana Carpender, a cookbook author in Bloomington, Ind. "But unless something dramatic happens to bring down the cost of alternatives, I will be stashing away a pile of incandescents."

The law does not outlaw incandescent bulbs or dictate that consumers must use the spiral-shaped compact fluorescent lights that have become increasingly popular in recent years. Rather, it sets standards for the amount of light emitted per watt of power used. Current 100-watt bulbs must become 25 percent more efficient, and makers are designing new bulbs.

To Representative Joe Barton, the Texas Republican who has sponsored a bill to reverse the new guidelines, that nevertheless means Congress is dictating what types of light Americans can use in their homes.

"From the health insurance you're allowed to have, to the car you can drive, to the light bulbs you can buy, Washington is making too many decisions that are better left to you and your family," Mr. Barton said when he introduced his bill in January.

Opponents of the regulations say the fluorescent bulbs are too expensive, flicker annoyingly and are health hazards because they contain mercury.

While they are not unanimous on the issue, some environmental activists counter that by saying the mercury in a single fluorescent bulb is less than what some power plants throw into the atmosphere while generating the electricity it takes to light one incandescent bulb.
Makers of appliances and light bulbs, meanwhile, support the federal standards because they do not want to have to make scores of products to meet individual state regulations.
But to many Americans, the 100-watt bulb has become a cause célèbre.
Tea Party campaigners have adopted it; Representative Michele Bachmann of Minnesota, who introduced a bill to repeal the light bulb law in 2008 and again this year, talked about the issue in her response to the president's State of the Union message in January. And this week, Senator Rand Paul of Kentucky said not only did he resent the light bulb standards but he also blamed the government for poorly working toilets in his house because of the regulations on how much water they should use.
The light bulb regulations already have affected the American economy. Last fall, General Electric closed its last major United States plant producing the old-style incandescent bulbs, in Winchester, Va.
Nearly all compact fluorescent bulbs are made in Asia, although some United States manufacturers are retooling former factories to make other energy-efficient bulbs.
Several companies in the United States are working on light-emitting diode, or LED, bulbs, and on energy-efficient halogen incandescent bulbs, which use a halogen element enclosed in a traditional glass bulb.
The Energy Department says the energy savings are significant. Kathleen Hogan, deputy assistant secretary for energy efficiency at the department, told a Senate committee this week that by meeting the new lighting standards, consumers could save nearly $6 billion in 2015.
A household that upgrades 15 current incandescent bulbs could save about $50 a year, Ms. Hogan said, even after accounting for the higher cost of the fluorescent bulbs, which average above $1 each, versus about 35 cents for incandescent.
Halogen incandescent bulbs now cost about $1.50 each, and LED bulbs, which have only begun to be introduced, can cost $20 or more each, though they can last 10 years or more. Three-way bulbs, appliance bulbs and a few other specialty products are excluded from the new standards.
All of which serves to convince some people that the government should not dictate light bulb standards.
Amy Ridenour, president of the National Center for Public Policy Research, a conservative group, said she already had about 100 old-style incandescent light bulbs stored in her basement in Laurel, Md., and she hoped to have several hundred by the time the new standards go into effect on Jan. 1.
Ms. Ridenour said that she opposed the government interference, but that her hoarding was primarily driven by concerns about the mercury in the compact fluorescent bulbs. Her middle child, a 10-year-old son, is autistic, Ms. Ridenour said. "He's knocked over quite a few lamps," she said, and broken plenty of light bulbs in the process.
The Environmental Protection Agency issues detailed instructions on how to clean up a broken fluorescent bulb because of the potential for spilling mercury. Each bulb contains about four milligrams of mercury, compared with 500 milligrams in old-style glass thermometers.
Nevertheless, the E.P.A. recommends recycling used fluorescent bulbs rather than disposing of them in household garbage.
Unknown, so far, is the economic impact of the retooling of the Easy-Bake Oven, the source of an unimaginable number of forced smiles summoned by parents after tasting a child's cookies and cakes. The oven, a member of the National Toy Hall of Fame, uses a 100-watt bulb as its heat source, so Hasbro must give it a makeover. This fall, it will introduce the new Easy-Bake Ultimate Oven, which will use a different, so far undisclosed, heating element.

http://www.nytimes.com/2011/03/12/business/energy-environment/12bulb.html?ref=science

Simon van der Meer, Nobel Laureate, Dies at 85

By KENNETH CHANG

Associated Press
Simon Van Der Meer, left, and his colleague Carlo Rubbia shared a Nobel Prize in 1984 for advances in particle physics.

Simon van der Meer, who shared the Nobel Prize in Physics in 1984 for a technological advance that was crucial to the discovery of fundamental building blocks of the universe, died March 4 in Geneva. He was 85. His death was announced by CERN, the particle physics laboratory in Switzerland where he worked for more than 30 years.

In the 1980s, physicists were looking to fill in missing elementary particles predicted by their so-called Standard Model, the suite of theories that has ruled particle physics for a generation and explains all the forces of nature except gravity. To find them, however, researchers needed collisions more energetic than what could be produced by particle accelerators.

Mr. van der Meer's advance was finding a way to generate intense beams of a particular particle, antiprotons, that were needed for the experiments. By slamming antiprotons and protons together, physicists achieved higher-energy collisions that revealed constituents of the universe never before seen.

"It was a completely revolutionary technique that made something possible that was completely impossible without it," said John Marriner, a senior scientist at the Fermi National Accelerator Laboratory, more commonly known as Fermilab, outside Chicago.

After coming up with the technique, Mr. van der Meer helped lead the team that applied it using an accelerator at CERN called the Super Proton Synchrotron.

In 1983, CERN reported that proton-antiproton collisions in the synchroton had created particles known as W and Z bosons, key components of the so-called weak force.

The weak force is one of the four fundamental forces of the universe, the others being gravity, electromagnetism and the strong force, which holds atomic nuclei together.

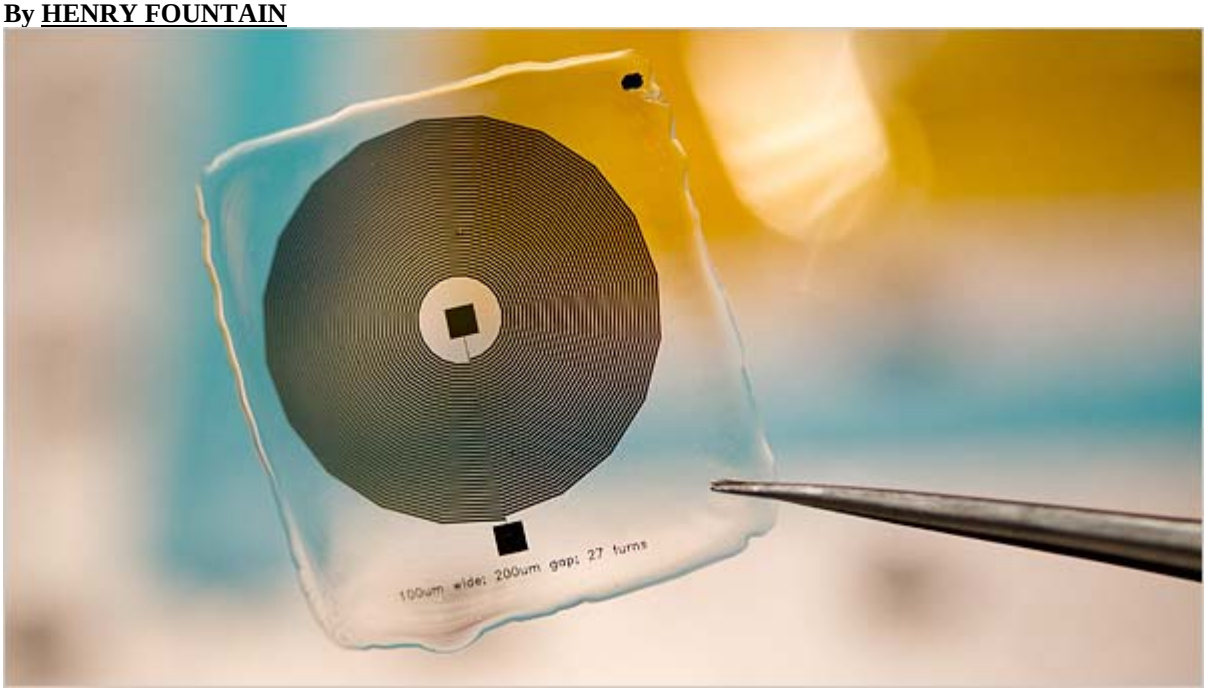
The weak force is of no consequence at the scale of everyday objects. But for subatomic particles, it is a major influence. For instance, the weak force enables the sun to shine by allowing hydrogen atoms to fuse together, releasing heat and light. The W and Z bosons convey the weak force in much the same way photons — particles of light — convey electromagnetism.

The next year, Mr. van der Meer and his CERN colleague Carlo Rubbia, an Italian physicist, were awarded the physics Nobel for "their decisive contributions to the large project, which led to the discovery of the field particles W and Z, communicators of weak interaction."
Simon van der Meer was born Nov. 24, 1925, in The Hague, the Netherlands. After graduating with an engineering degree from the University of Technology in Delft, he worked on high-voltage equipment for electron microscopes at Philips Research Laboratory in Eindhoven.
In 1956, he joined CERN, developing methods to corral and guide various particles.
Beginning in the 1960s, Mr. van der Meer and others started working on a technique called stochastic cooling, which measures charged particles as they pass by and then applies an electric field to nudge them in the desired direction.
In a statement, Rolf-Dieter Heuer, director general of CERN, and Stephen Myers, director of accelerators and technology at the laboratory, said stochastic cooling was typical of Mr. van der Meer's inventions: "deceptively simple at first sight, but to anyone who truly understands accelerators it was nothing less than a stroke of genius."
For the weak force experiments, physicists needed high-speed collisions between a proton, a particle found in the nucleus of atoms, and its antimatter doppelganger, the antiproton.
Since protons exist in every atom, making beams of them is easy. But an antiproton is rare, and it annihilates the moment it touches a proton. Particle accelerators can create sprays of antiprotons with high-energy proton collisions, but the antiprotons fly out in different directions with not enough left for the experiments. With stochastic cooling, the spray of antiprotons could be shepherded into a tight beam.
The beam of antiprotons was then collided with a beam of protons traveling in the opposite direction. In the ensuing subatomic carnage, CERN physicists spotted clear signs of W and Z bosons.
Mr. van der Meer retired from CERN in 1990. He is survived by his wife of 44 years, Catherine van der Meer-Koopman; a daughter, Esther van der Meer; a son, Mathijs; a sister, Gay van der Meer; and a granddaughter.
Building on Mr. van der Meer's work, Fermilab added stochastic cooling to its more powerful Tevatron collider, leading to the discovery in 1994 of the top quark, the final piece of matter in the Standard Model. "That was a key technology," Dr. Marriner said. "We copied his ideas."

http://www.nytimes.com/2011/03/12/science/12vandermeer.html?ref=science

The Reinvention of Silk

By HENRY FOUNTAIN



Bryce Vickmark for The New York Times
NEW USES Silk creations by Tufts University researchers include a coil made of silk substrate and gold that can help tell when food goes bad

As some silk researchers see it, if spiders were gregarious vegetarians, the world might be a different place. For spiders are nature's master silk makers, and over millions of years of evolution have developed silks that could be useful to people — from sticky toothpastelike mush to strong and stretchy draglines.
"There's not just one kind of material we're talking about," said Cheryl Hayashi, who studies the evolutionary genetics of spider silk at the University of California, Riverside. "You can look in nature, and there are a lot of solutions already made. You want a glue? There's a silk that's already a glue."
For years there has been talk of the bright promise of spider silk: that it might one day be used to make cables that are stronger than those of steel, for example, or bulletproof vests that are more effective than those made of Kevlar.
There has been a big fly in the ointment, however: spiders cannot spin enough of the stuff. Although a typical spider can produce five types of silk, it does not make much of any of them. Obtaining commercial quantities is a practical impossibility — spiders are loners and require a diet of live insects; some are cannibals. In other words, spider ranching is out of the question.
Researchers have worked to overcome this fundamental limitation by trying to unlock the secrets of the spider's silk-making abilities so silk could be made in the laboratory, or by genetically transferring those abilities to other organisms that could produce silk in quantity. But so far the materials produced lack the full strength, elasticity and other qualities of the real thing.
Some scientists are making an end run around the spider problem and working on reinventing the one silk that is plentiful — that of silkworms. They are reconstituting it to make materials that have the potential to go far beyond the dream of bulletproof vests.
Among these researchers are David Kaplan and others at Tufts University, whose creations have potential applications in medicine and other fields. "Here's a material that's been around for 5,000 years and used in sutures for about that long," Dr. Kaplan said. "Yet there's this untapped territory."
Dr. Kaplan's group and colleagues at the University of Illinois and University of Pennsylvania have recently produced electrode arrays, for example, that are printed on flexible, degradable films of silk. The arrays — so

thin they can conform to the nooks and crannies of the surface of the brain — may one day be used to treat epilepsy or other conditions without producing the scarring that larger implanted electrodes do.

For centuries, beginning in China, commercial silk has been produced by cultivating silkworms — the larvae of a moth, Bombyx mori — which, unlike spiders, are content to loll about cheek by jowl, munching on mulberry leaves, spinning the material in quantities large enough to be harvested.

"The advantage of silkworms is that they're easy to grow," Dr. Hayashi said. "They're vegetarians. And they produce silk conveniently in this cocoon."

"But if you look at a silkworm, it only has one kind of spinneret," she added. "Only one kind of fiber can come out of it. Spiders have this whole toolbox."

Efforts to make analogues of spider silks, however, have resulted in materials that are not much different from other polymers, said David Porter, a scientist at the University of Sheffield in England who works with a group at Oxford that studies the biology of silk making.

"The consensus is that almost anybody can make a reasonable silk," Dr. Porter said. "But you really can't differentiate it from a good nylon."

"To differentiate the natural product, really you've got to get the advantages that nature builds in," he added.

Silk is a fibrous protein, produced in glands within the spider or silkworm and some insects. What these creatures do is something no laboratory has been able to achieve: control the chemistry so exquisitely that the silk, which is a liquid inside the organism, becomes a solid upon leaving it.

Chief among the advantages of natural silk is the way the proteins are organized. They are folded in complex ways that help give each silk its unique properties. Scientists have not been able to replicate that intricate folding.

"We're still not getting at the complexity of what's going on in inside an individual spider," Dr. Hayashi said. "There's no lab anywhere in the world where somebody has an artificial silk gland."

Producing spider-silk proteins in other organisms — bacteria, goats, plants and, most recently, silkworms themselves are among those that have been genetically engineered — has limitations because the process of reconstituting the proteins ruins any folding pattern. "As soon as you extract the silk, you basically randomize the protein structure," Dr. Porter said. "You destroy all the capacity of that material to do what it wants."

At Tufts, Dr. Kaplan thinks that eventually, genetically modified plants will produce useful spider-based silk that could be harvested like cotton. Until then, however, he is working with reconstituted silkworm silk, making novel films and other materials.

Dr. Kaplan has been researching silk for 21 years — "sad but true," he joked — and spent much of the first decade learning about the fundamental mechanisms by which silk assembles.

"We learned how important water is," he said. "It may sound trivial, but the entire process has been built around controlling water content."

Over the past decade, Dr. Kaplan's group has focused on biomedical applications in fields like tissue engineering. In 2005, a postdoctoral researcher in his laboratory developed a water annealing process, reconstituting the silks slowly in a humid environment. "We got these films that were crystal-clear," Dr. Kaplan said. "No one had ever seen this before with silk."

That led to thoughts about how to make an artificial cornea from silk. But a cornea has to be permeable, so Dr. Kaplan got the idea to involve a laser scientist down the hall, Fiorenzo Omenetto.

"I said, 'Take it down to Fio and have him poke some holes in it,' " Dr. Kaplan recalled. "That led to a whole optical platform based on silk."

It also led to a long collaboration with Dr. Omenetto, who has developed ways to pattern silk films, making diffraction gratings and other structures. The grating can act as a substrate for other proteins or compounds, raising the possibility that silk films could be used for implantable biosensors or in drug delivery, with the silk dissolving in the body at a controlled rate to release the drug.

One advantage with silk, Dr. Omenetto said, is that the process of making films or other structures is "green" — water-based and at low temperatures. "You can make incredibly sophisticated diffraction gratings out of glass or plastic," he said. "But those are made at high temperatures or in a very harsh chemical environment," conditions that would make it difficult to incorporate drugs or other compounds.

Researchers elsewhere have further developed the idea of using silk films for medical applications. At the Georgia Institute of Technology, Eugenia Kharlampieva experimented with depositing silver nanoparticles on films of silk as a way of strengthening them.

"Silk is a wonderful material because it's biocompatible," said Dr. Kharlampieva, who is continuing her research at the University of Alabama, Birmingham. "The main drawback is it's soft. If you want to use it for optical applications, you need to reinforce it."
The films she uses are extremely thin, and she layers them. "We make this nanocomposite which is flexible, still soft, but mechanically stronger."
Because the films remain flexible, Dr. Kharlampieva is experimenting with fashioning them into tiny capsules that could contain minute quantities of drugs. Potentially as small as blood cells, they could be used to deliver drugs through the bloodstream.
At Tufts, Dr. Omenetto's work on patterning silk has led to even more exotic potential applications. Among the latest, developed with colleagues at Boston University, is the idea of using silk as the basis for metamaterials, which can manipulate light or other electromagnetic radiation in ways that nature ordinarily cannot. By producing intricate structures in the films and depositing metal on them, metamaterial antennas may be produced that could be used inside the body as a means of monitoring health — the signal from the antenna changing as conditions inside the body change.
Such applications may be far off, Dr. Omenetto said, but the potential is vast — a fact he realized when he was first asked to poke holes in silk. "It looked like a cool optical material," he said. "And I haven't been sleeping that much ever since."

http://www.nytimes.com/2011/03/08/science/08silk.html

Lifestyles of the Natives Off Southern California

By SINDYA N. BHANOO

J. Erlandson
Projectile points and crescents used for hunting on the Channel Islands.

Inhabitants of California's Channel Islands 12,000 years ago had a diverse sea-based economy that included shellfish, seals, geese and fish, archaeologists say in the current issue of the journal Science.
The researchers discovered three archaeological sites on the islands off Southern California containing projectile points and crescents for hunting purposes.
"They are thin and delicate and were used for a variety of maritime purposes — like fishing and bird hunting," said Todd Braje, of Humboldt State University. The crescents were probably hurled at flocks of birds, and other projectiles were used for near shore and kelp forest fishing, he said.
Although archaeologists have a lot of information about prehistoric Paleo-Indians who lived in the North American interior (the Clovis people), little has been discovered about the lifestyle of coastal communities until now.
Researchers had theorized that the Clovis people were the first to colonize America and the original ancestors of Native American populations. That theory was negated when a 14,000-year-old pre-Clovis site was found in Chile in the 1970s.
But the question of who the first American colonizers were and how they arrived is still an open one, Dr. Braje said. Learning more about coastal communities could provide a piece of that puzzle. "These sites are not older than Clovis, but these people were in the new world very early," he said.
He and his colleagues are nowsearching for even older sites on the Channel Islands, which could indicate that coastal populations were part of the initial peopling of the Americas.

http://www.nytimes.com/2011/03/08/science/08obsea.html?ref=science

Chilly Times for Chinese Dinosaurs: Abundance of Feathered Dinosaurs During Temperate Climate With Harsh Winters

Fragment of a jaw bone of a ceratopsian dinosaur, Archaeoceratops, from the Lower Cretaceous (Gansu province, China). (Credit: Copyright Romain Amiot)

ScienceDaily (Mar. 11, 2011) — Dinosaurs did not always enjoy mild climates. New findings show that during part of the Early Cretaceous, north-east China had a temperate climate with harsh winters. They explain the abundance of feathered dinosaurs in fossil deposits of that period.

The discovery was made by an international collaboration coordinated by Romain Amiot of the Laboratoire de géologie de Lyon: terre, planètes et environnement (CNRS/ENS de Lyon/Université Lyon 1).

Their work is published in the *Proceedings of the National Academy of Sciences*.

It has long been thought that the climate of the Mesozoic, the age of the dinosaurs, was generally warm across the planet. However, a recent study challenges this theory. The work focuses on a region of north-east China where the Jehol fauna developed during part of the Early Cretaceous (between 125 and 110 million years ago). The fossils found in this deposit include many dinosaurs covered with filamentous structures similar to bird feathers (such structures can take on various forms, ranging from filaments, down and 'protofeathers' to true feathers). But is this feature due simply to excellent conditions of preservation or to the adaptation of such species to environmental conditions? Since these dinosaurs were unable to fly, several scientists have suggested that their feathers acted as thermal insulation.

A team of paleontologists from France, China, Japan and Thailand examined the issue and tried to determine the temperatures at that time. Teeth and bones from dinosaurs, mammalian reptiles, crocodiles, turtles and freshwater fish from fossil deposits containing the Jehol fauna were collected. This selection of samples was then completed by fossil remains from contemporary deposits in other regions of China, Japan and Thailand. The scientists analyzed the oxygen isotopic composition of each sample. They based their analysis on the principle that the average local air temperature determines the relative quantity of oxygen isotopes contained in the rainwater drunk by the animals. This isotope record is passed on and stored within the bones and teeth of animals as they grow. Since the oxygen contained in the mineralized tissue is preserved during fossilization, the researchers were able to reconstruct the prevailing air temperatures in the environment of Asian dinosaurs during the Early Cretaceous.

The results show that average temperatures in this period of the Early Cretaceous were very similar to those of today at equivalent latitudes (such as the climate in Beijing today). The Jehol fauna therefore lived in a cool temperate climate characterized by harsh winters during which cold-blooded reptiles (turtles and lizards) had to hibernate, whereas the down, feathers and fur of warm-blooded animals (mammals, birds and dinosaurs) enabled them to maintain sustained activity in winter. "These results do not prove in any way that feathers appeared because of their insulating characteristics. They show that feathers would have given the dinosaurs of the Jehol fauna a physiological advantage over their fellow animals with scales," points out Amiot, lead author of the paper and currently a CNRS researcher at the Laboratoire de géologie de Lyon (ENS de Lyon/Université de Lyon 1/CNRS).

This work helps us to better understand the Early Cretaceous period, of which there are few geological records, and sheds new light on existing theories about Earth at the time of the dinosaurs.

The laboratories involved are: Laboratoire de géologie de Lyon: terre, planètes et environnement (CNRS/Université Lyon 1/ENS de Lyon); Laboratoire de géologie de l'École normale supérieure (CNRS/ENS Paris); Institut de physique du globe de Paris (CNRS/UPMC/Université Paris Diderot); and the Institute of Vertebrate Paleontology and Paleoanthropology , Beijing, China.

Story Source:
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **CNRS (Délégation Paris Michel-Ange)**.

Journal Reference:

1. R. Amiot, X. Wang, Z. Zhou, X. Wang, E. Buffetaut, C. Lecuyer, Z. Ding, F. Fluteau, T. Hibino, N. Kusuhashi, J. Mo, V. Suteethorn, Y. Wang, X. Xu, F. Zhang. **Oxygen isotopes of East Asian dinosaurs reveal exceptionally cold Early Cretaceous climates**. *Proceedings of the National Academy of Sciences*, 2011; DOI: 10.1073/pnas.1011369108

http://www.sciencedaily.com/releases/2011/03/110311173104.htm

Mouse Nose Nerve Cells Mature After Birth, Allowing Bonding, Recognition With Mother

Wild-type mouse pups prefer their biological mother (upper), while the olfactory marker protein knockout mice do not show a preference between their mother and an unrelated, lactating female. (Credit: Minghong Ma, PhD, University of Pennsylvania School of Medicine)

ScienceDaily (Mar. 13, 2011) — For rodent pups, bonding with mom isn't hard-wired in the womb. It develops over the first few weeks of life, which is achieved by their maturing sense of smell, possibly allowing these mammals a survival advantage by learning to identify mother, siblings, and home.

Blended electrophysiological, biochemical, and behavioral experiments, Minghong Ma, PhD, an associate Professor of Neuroscience at the University of Pennsylvania School of Medicine, led a study published in a recent issue of the *Journal of Neuroscience*. With students Anderson Lee and Jiwei He, she demonstrated that neurons in the noses of mice mature after birth.

Using patch-clamping -- a technique that measures electrical signals at the cellular level -- Ma's team found that between birth and day 30 of development, normal neurons become six times more sensitive to their sibling's scent, in this case, a fragrance called lyral. In addition, the mice transition from a relative indiscriminate response to different odors to being highly attuned to one specific smell. They also respond to that specific odor with a faster speed over time.

The olfactory marker protein (OMP) likely mediates this developmental maturation. In olfactory sensory neurons lacking OMPs, response fails to speed up over 30 days as compared to normal neurons. The authors suggest this could be due to altered intracellular communication, since loss of the protein is associated with decreased phosphorylation of an associated enzyme called adenylate cyclase, a key player in the chemical signaling underlying the sense of smell.

The team also used a novel behavioral assay to illustrate one consequence of mistakes in this cellular maturation process. Normal mouse pups, given the choice between their mother and an unrelated, lactating female, will choose to huddle with or suckle their mother 78 percent of the time. But in the absence of OMP, newborn mice fail to make that distinction.

According to Ma, the maturation of olfaction in early development could offer animals that need nursing and care for a long time before maturing (altricial species, including some mammals) a survival advantage. Rather

than being hard-wired at birth, Ma says, they learn to identify their surroundings and their family. "They actually learn to find their mother, home, and siblings, and to stay alive," she says. But whether the same is true of human infants, of course, remains an open question.
One key question yet to be addressed, Ma says, is the mechanism underlying this olfactory tuning process. How, for instance, do the cells develop a faster response speed? How do they get so good at focusing on just one odorant to the exclusion of all others? And can this process be modulated by early experience? The answers to those questions, she says, could possibly provide tools to influence the bonding between mother and child in early development, and even promote social interactions in autistic children.
The article was funded by the National Institute on Deafness and Other Communication Disorders, National Institutes of Health.

Story Source:
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University of Pennsylvania School of Medicine**.

Journal Reference:

1. A. C. Lee, J. He, M. Ma. **Olfactory Marker Protein Is Critical for Functional Maturation of Olfactory Sensory Neurons and Development of Mother Preference**. *Journal of Neuroscience*, 2011; 31 (8): 2974 DOI: 10.1523/JNEUROSCI.5067-10.2011

http://www.sciencedaily.com/releases/2011/03/110311165223.htm

Giftedness Linked to Prenatal Exposure of Higher Levels of Testosterone

A longstanding debate as to whether genius is a byproduct of good genes or good environment has an upstart challenger that may take the discussion in an entirely new direction. University of Alberta researcher Marty Mrazik says being bright may be due to an excess level of a natural hormone. (Credit: iStockphoto/Vasiliy Yakobchuk)

ScienceDaily (Mar. 12, 2011) — A longstanding debate as to whether genius is a byproduct of good genes or good environment has an upstart challenger that may take the discussion in an entirely new direction. University of Alberta researcher Marty Mrazik says being bright may be due to an excess level of a natural hormone.

Mrazik, a professor in the Faculty of Education's educational psychology department, and a colleague from Rider University in the U.S., have published a paper in *Roeper Review* linking giftedness (having an IQ score of 130 or higher) to prenatal exposure of higher levels of testosterone. Mrazik hypothesizes that, in the same way that physical and cognitive deficiencies can be developed in utero, so, too, could similar exposure to this naturally occurring chemical result in giftedness.

"There seems to be some evidence that excessive prenatal exposure to testosterone facilitates increased connections in the brain, especially in the right prefrontal cortex," said Mrazik. "That's why we see some intellectually gifted people with distinct personality characteristics that you don't see in the normal population."

Mrazik's notion came from observations made during clinical assessments of gifted individuals. He and his fellow researcher observed some specific traits among the subjects. This finding stimulated a conversation on the role of early development in setting the foundation for giftedness.

"It gave us some interesting ideas that there could be more to this notion of genius being predetermined from a biological perspective than maybe people gave it credit for," said Mrazik. "It seemed that the bulk of evidence from new technologies (such as Functional MRI scans) tell us that there's a little bit more going on than a genetic versus environmental interaction."

Based on their observations, the researchers made the hypothesis that this hormonal "glitch" in the in-utero neurobiological development means that gifted children are born with an affinity for certain areas such as the arts, math or science. Mrazik cautions that more research is needed to determine what exact processes may cause the development of the gifted brain.

He notes that more is known about what derails the brain's normal development, thus charting what makes gifted people gifted is very much a new frontier. Mrazik hopes that devices such as the Functional MRI scanner will give them a deeper understanding of the role of neurobiology in the development of the gifted brain.

"It's really hard to say what does put the brain in a pathway where it's going to be much more precocious," he said. "The next steps in this research lay in finding out what exact stimuli causes this atypical brain development."

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University of Alberta**, via EurekAlert!, a service of AAAS.

Journal Reference:

1. Martin Mrazik, Stefan Dombrowski. **The Neurobiological Foundations of Giftedness**. *Roeper Review*, 2010; 32 (4): 224 DOI: 10.1080/02783193.2010.508154

http://www.sciencedaily.com/releases/2011/03/110311153549.htm

Keys to Long Life? Not What You Might Expect

People working. "Don't work too hard, don't stress," doesn't work as advice for good health and long life. Subjects who were the most involved and committed to their jobs did the best. Continually productive men and women lived much longer than their more laid-back comrades. (Credit: iStockphoto/Daniel Laflor)

ScienceDaily (Mar. 12, 2011) — Cheer up. Stop worrying. Don't work so hard. Good advice for a long life? As it turns out, no. In a groundbreaking study of personality as a predictor of longevity, University of California, Riverside researchers found just the opposite.

"It's surprising just how often common assumptions -- by both scientists and the media -- are wrong," said Howard S. Friedman, distinguished professor of psychology who led the 20-year study.

Friedman and Leslie R. Martin , a 1996 UCR alumna (Ph.D.) and staff researchers, have published those findings in "The Longevity Project: Surprising Discoveries for Health and Long Life from the Landmark Eight-Decade Study" (Hudson Street Press, March 2011).

Friedman and Martin examined, refined and supplemented data gathered by the late Stanford University psychologist Louis Terman and subsequent researchers on more than 1,500 bright children who were about 10 years old when they were first studied in 1921. "Probably our most amazing finding was that personality characteristics and social relations from childhood can predict one's risk of dying decades later," Friedman concluded.

The Longevity Project, as the study became known, followed the children through their lives, collecting information that included family histories and relationships, teacher and parent ratings of personality, hobbies, pet ownership, job success, education levels, military service and numerous other details.

"When we started, we were frustrated with the state of research about individual differences, stress, health and longevity," Friedman recalled. "It was clear that some people were more prone to disease, took longer to recover, or died sooner, while others of the same age were able to thrive. All sorts of explanations were being proposed -- anxiety, lack of exercise, nerve-racking careers, risk-taking, lack of religion, unsociability, disintegrating social groups, pessimism, poor access to medical care, and Type A behavior patterns." But none were well-studied over the long term. That is, none followed people step-by-step throughout their lives.

When Friedman and Martin began their research in 1991, they planned to spend six months examining predictors of health and longevity among the Terman participants.

But the project continued over the next two decades -- funded in part by the National Institute on Aging -- and the team eventually involved more than 100 graduate and undergraduate students who tracked down death certificates, evaluated interviews, and analyzed tens of thousands of pages of information about the Terman participants through the years.

"We came to a new understanding about happiness and health," said Martin, now a psychology professor at La Sierra University in Riverside. "One of the findings that really astounds people, including us, is that the Longevity Project participants who were the most cheerful and had the best sense of humor as kids lived shorter lives, on average, than those who were less cheerful and joking. It was the most prudent and persistent individuals who stayed healthiest and lived the longest."

Part of the explanation lies in health behaviors -- the cheerful, happy-go-lucky kids tended to take more risks with their health across the years, Friedman noted. While an optimistic approach can be helpful in a crisis,

"we found that as a general life-orientation, too much of a sense that 'everything will be just fine' can be dangerous because it can lead one to be careless about things that are important to health and long life. Prudence and persistence, however, led to a lot of important benefits for many years. It turns out that happiness is not a root cause of good health. Instead, happiness and health go together because they have common roots."
Many of the UCR findings fly in the face of conventional wisdom. For example:

- Marriage may be good for men's health, but doesn't really matter for women. Steadily married men -- those who remained in long-term marriages -- were likely to live to age 70 and beyond; fewer than one-third of divorced men were likely to live to 70; and men who never married outlived those who remarried and significantly outlived those who divorced -- but they did not live as long as married men.
- Being divorced is much less harmful to women's health. Women who divorced and did not remarry lived nearly as long as those who were steadily married.
- "Don't work too hard, don't stress," doesn't work as advice for good health and long life. Terman subjects who were the most involved and committed to their jobs did the best. Continually productive men and women lived much longer than their more laid-back comrades.
- Starting formal schooling too early -- being in first grade before age 6 -- is a risk factor for earlier mortality. Having sufficient playtime and being able to relate to classmates is very important for children.
- Playing with pets is not associated with longer life. Pets may sometimes improve well-being, but they are not a substitute for friends.
- Combat veterans are less likely to live long lives, but surprisingly the psychological stress of war itself is not necessarily a major health threat. Rather, it is a cascade of unhealthy patterns that sometimes follows. Those who find meaning in a traumatic experience and are able to reestablish a sense of security about the world are usually the ones who return to a healthy pathway.
- People who feel loved and cared for report a better sense of well-being, but it doesn't help them live longer. The clearest health benefit of social relationships comes from being involved with and helping others. The groups you associate with often determine the type of person you become -- healthy or unhealthy.

It's never too late to choose a healthier path, Friedman and Martin said. The first step is to throw away the lists and stop worrying about worrying.
"Some of the minutiae of what people think will help us lead long, healthy lives, such as worrying about the ratio of omega-6 to omega-3 fatty acids in the foods we eat, actually are red herrings, distracting us from the major pathways," Friedman said. "When we recognize the long-term healthy and unhealthy patterns in ourselves, we can begin to maximize the healthy patterns."
"Thinking of making changes as taking 'steps' is a great strategy," Martin advised. "You can't change major things about yourself overnight. But making small changes, and repeating those steps, can eventually create that path to longer life."

Story Source:
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University of California - Riverside**.

http://www.sciencedaily.com/releases/2011/03/110311153541.htm

Reading in Two Colors at the Same Time: Patterns of Synesthesia Brain Activity Revealed

New research reveals the patterns of brain activity that allow some people to experience the sensation of "seeing" two colors at the same time. (Credit: iStockphoto/Burak Pekakcan)

ScienceDaily (Mar. 11, 2011) — People with synesthesia often report perceiving letters as appearing in different colors. But how do their brains accomplish this feat?

The Nobel prize-winning physicist Richard Feynman once wrote in his autobiographical book (*What do you care what other people think?*): "When I see equations, I see letters in colors -- I don't know why […] And I wonder what the hell it must look like to the students." This neurological phenomenon is known to psychologists as synesthesia, and Feynman's experience of "seeing" the letters in color was a specific form known today as "grapheme-color" synesthesia. What is perhaps most puzzling about this condition is that people actually claim to see two colors simultaneously when reading letters or numbers: the real color of the ink (e.g. black) and an additional -- synesthetic -- color.

Now a new study, published in the March 2011 issue of Elsevier's *Cortex*, has revealed the patterns of brain activity that allow some people to experience the sensation of "seeing" two colors at the same time. A group of researchers in Norway used functional magnetic resonance imaging (fMRI) to investigate the brain activity patterns of two grapheme-color synesthetes, as they looked at letters written in different colors, presented on a screen while inside an MRI scanner. The participants had previously been asked to indicate the synesthetic colors that they associated with given letters and were then presented with single letters whose physical color sometimes corresponded to the synesthetic color and other times was clearly different.

Prof. Bruno Laeng from the University of Oslo, along with colleagues Kenneth Hugdahl and Karsten Specht from the University of Bergen, had reasoned that increasing the similarity between the physical and synesthetic colors should affect the level of activity seen in areas of the brain known to be important for color processing, and their results confirmed this expectation, revealing that the strength of the observed brain activity was correlated with the similarity of the colors.

The authors concluded that the same brain areas that support the conscious experience of color also support the experience of synesthetic colors, allowing the two to be "seen" at the same time. This supports the view that the phenomenon of color synesthesia is perceptual in nature.

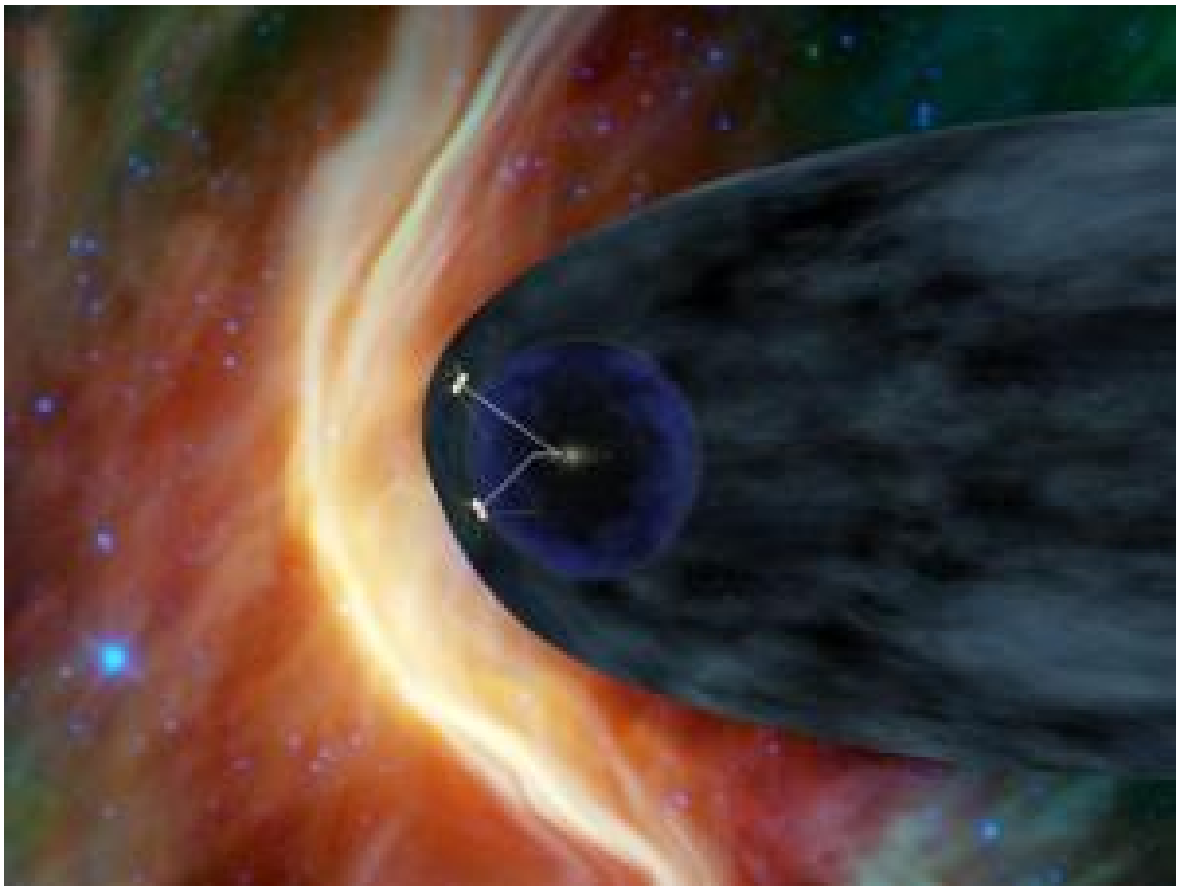
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Elsevier**, via AlphaGalileo.

Journal Reference:

1. Bruno Laeng, Kenneth Hugdahl, Karsten Specht. **The neural correlate of colour distances revealed with competing synaesthetic and real colours**. *Cortex*, 2011; 47 (3): 320 DOI: 10.1016/j.cortex.2009.09.004

http://www.sciencedaily.com/releases/2011/03/110309082341.htm

Voyager Seeks the Answer Blowin' in the Wind



This artist's concept shows NASA's two Voyager spacecraft exploring a turbulent region of space known as the heliosheath, the outer shell of the bubble of charged particles around our sun. (Credit: NASA/JPL-Caltech)

ScienceDaily (Mar. 10, 2011) — In which direction is the sun's stream of charged particles banking when it nears the edge of the solar system? The answer, scientists know, is blowing in the wind. It's just a matter of getting NASA's Voyager 1 spacecraft in the right orientation to detect it.

To enable Voyager 1's Low Energy Charged Particle instrument to gather these data, the spacecraft performed a maneuver on March 7 that it hadn't done for 21 years, except in a preparatory test last month.

At 9:10 a.m. PST (12:10 p.m. EST), humanity's most distant spacecraft rolled 70 degrees counterclockwise as seen from Earth from its normal orientation and held the position by spinning gyroscopes for two hours, 33 minutes. The last time either of the two Voyager spacecraft rolled and stopped in a gyro-controlled orientation was Feb. 14, 1990, when Voyager 1 snapped a family portrait of the planets strewn like tiny gems around our sun (http://photojournal.jpl.nasa.gov/catalog/PIA00451).

"Even though Voyager 1 has been traveling through the solar system for 33 years, it is still a limber enough gymnast to do acrobatics we haven't asked it to do in 21 years," said Suzanne Dodd, Voyager project manager, based at NASA's Jet Propulsion Laboratory in Pasadena, Calif. "It executed the maneuver without a hitch, and we look forward to doing it a few more times to allow the scientists to gather the data they need."

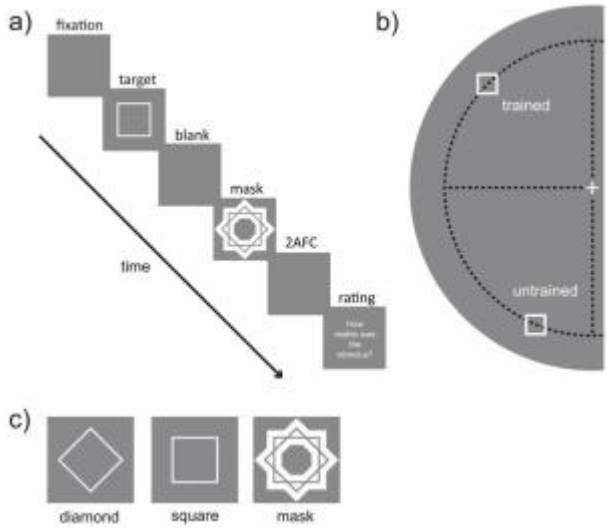
The two Voyager spacecraft are traveling through a turbulent area known as the heliosheath. The heliosheath is the outer shell of a bubble around our solar system created by the solar wind, a stream of ions blowing radially outward from the sun at a million miles per hour. The wind must turn as it approaches the outer edge

of the bubble where it makes contact with the interstellar wind, which originates in the region between stars and blows by our solar bubble.
In June 2010, when Voyager 1 was about 17 billion kilometers (about 11 billion miles) away from the sun, data from the Low Energy Charged Particle instrument began to show that the net outward flow of the solar wind was zero. That zero reading has continued since. The Voyager science team doesn't think the wind has disappeared in that area. It has likely just turned a corner. But does it go up, down or to the side?
"Because the direction of the solar wind has changed and its radial speed has dropped to zero, we have to change the orientation of Voyager 1 so the Low Energy Charged Particle instrument can act like a kind of weather vane to see which way the wind is now blowing," said Edward Stone, Voyager project manager, based at the California Institute of Technology, Pasadena. "Knowing the strength and direction of the wind is critical to understanding the shape of our solar bubble and estimating how much farther it is to the edge of interstellar space." Voyager engineers performed a test roll and hold on Feb. 2 for two hours, 15 minutes. When data from Voyager 1 were received on Earth some 16 hours later, the mission team verified the test was successful and the spacecraft had no problem in reorienting itself and locking back onto its guide star, Alpha Centauri.
The Low Energy Charged Particle instrument science team confirmed that the spacecraft had acquired the kind of information it needed, and mission planners gave Voyager 1 the green light to do more rolls and longer holds. There will be five more of these maneuvers over the next seven days, with the longest hold lasting three hours 50 minutes. The Voyager team plans to execute a series of weekly rolls for this purpose every three months.
The success of the March 7 roll and hold was received at JPL at 1:21 a.m. PST (4:21 a.m. EST) on March 8. But it will take a few months longer for scientists to analyze the data. "We do whatever we can to make sure the scientists get exactly the kinds of data they need, because only the Voyager spacecraft are still active in this exotic region of space," said Jefferson Hall, Voyager mission operations manager at JPL. "We were delighted to see Voyager still has the capability to acquire unique science data in an area that won't likely be traveled by other spacecraft for decades to come."
Voyager 2 was launched on Aug. 20, 1977. Voyager 1 was launched on Sept. 5, 1977. On March 7, Voyager 1 was 17.4 billion kilometers (10.8 billion miles) away from the sun. Voyager 2 was 14.2 billion kilometers (8.8 billion miles) away from the sun, on a different trajectory.
The solar wind's outward flow has not yet diminished to zero where Voyager 2 is exploring, but that may happen as the spacecraft approaches the edge of the bubble in the years ahead.
The Voyagers were built by NASA's Jet Propulsion Laboratory in Pasadena, Calif., which continues to operate both spacecraft. JPL is a division of the California Institute of Technology in Pasadena. The Voyager missions are a part of the NASA Heliophysics System Observatory, sponsored by the Heliophysics Division of the Science Mission Directorate. For more information about the Voyager spacecraft, visit: http://www.nasa.gov/voyager.

Story Source:
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **NASA/Jet Propulsion Laboratory**.

http://www.sciencedaily.com/releases/2011/03/110308144446.htm

Learning to See Consciously: Scientists Show How Flexibly the Brain Processes Images



Training for conscious perception: A. Subjects are presented with geometric forms in rapid succession. After 10 milliseconds the forms were masked to render them invisible. The task of the subjects was to judge their visibility. B. Location of form and mask on the screen. C. A square and a diamond serve as the visual cues, a star as a mask. (Credit: Copyright PNAS Early Edition, doi: 10.1073/pnas.1009147108)

ScienceDaily (Mar. 10, 2011) — Our brains process many more stimuli than we become aware of. Often images enter our brain without being noticed: visual information is being processed, but does not reach consciousness, that is, we do not have an impression of it. Then, what is the difference between conscious and unconscious perception, and can both forms of perception be changed through practice? These questions are important not only for basic research, but also for the treatment of patients with perceptual deficits due to brain lesions e.g. following a stroke. Scientists at the MPI for Brain Research in Frankfurt/Main could now show that seeing can be trained.

Their tests revealed that the brain regions underlying the learning effects on conscious perception are different than the ones underlying the learning effects on the mere processing of stimuli.

Visual stimuli undergo a series of processing stages on their journey from the eye to the brain. How conscious perception can arise from the activity of neurons is one of the mysteries that the neurophysiologists at the MPI for Brain Research seek to solve. "Today, we know that the processing of stimuli in the cortex remains extremely plastic, or malleable, even in adults," explains Caspar Schwiedrzik who investigates the neural mechanisms of visual perception with his Max Planck colleagues Wolf Singer and Lucia Melloni. In their current study, the scientists examined whether perception can be influenced by long-term and systematic training and whether such training does not only change the processing, but also affects whether the stimulus can be consciously perceived.

It is known from clinical studies that some stroke patients who suffer partial blindness as a result of damage to the visual cortex can discriminate between stimuli that fall into their blind visual field. This unconscious discrimination ability can be improved through training. Nevertheless, the patients report that they do not see the images. In a few cases, however, conscious perception of the stimuli could be improved with training. Is it maybe possible to learn to "see consciously"?

To investigate this question in healthy subjects, the Frankfurt scientists developed an experimental set up with which different learning effects on perception could be measured. The subjects were shown images of two different geometric forms -- a square and a diamond -- on a screen in rapid succession and in a random sequence, and were asked to discriminate between them. The visibility of the images was limited by presenting a mask shortly after each image, which rendered the shape invisible.

The experiment was designed such that the subjects could initially not discriminate between the images and that they were also subjectively invisible. The subjects were then trained for several days. Each round of the training involved the presentation of images followed by the mask. As soon as the subject indicated by pressing a button which form had been shown and how clearly he or she had seen the form, the next stimulus and the next mask were shown. This process was repeated 600 times per day. After several days, the subjects could better discriminate between the target stimuli. From the ratings of the visibility of the stimuli, the scientists could further conclude that the participants' subjective perception had increased as well: the images now entered consciousness. Thus, the scientists succeeded in demonstrating that it is also possible to learn to see consciously.
The question remained, however, as to how objective and not necessarily conscious processing of stimuli and their subjective, conscious perception are linked. To gain a better understanding of the individual processing steps and to localize them in the brain, the experiment was repeated once more. This time, the image and mask were shown on a different part of the screen, and were thus processed by a different part of the brain.
"The results were revealing," explains Lucia Melloni: "While the learning effect for the pure processing of the stimuli, that is the discrimination of the shape, was lost with the spatial rearrangement of the stimuli, the clearer visibility of the images, that is the learning effect in terms of conscious seeing, remained." Therefore, objective processing and subjective perception of the stimuli seem to be less closely linked than previously assumed. The two training effects appear to be based on two different areas of the brain.
"Our experiments have shown that the neuronal processes that underlie conscious perception are very flexible," Schwiedrzik concludes. The findings provide important insights for medical applications, in particular for the rehabilitation of people suffering from perceptual deficits caused by brain lesions.

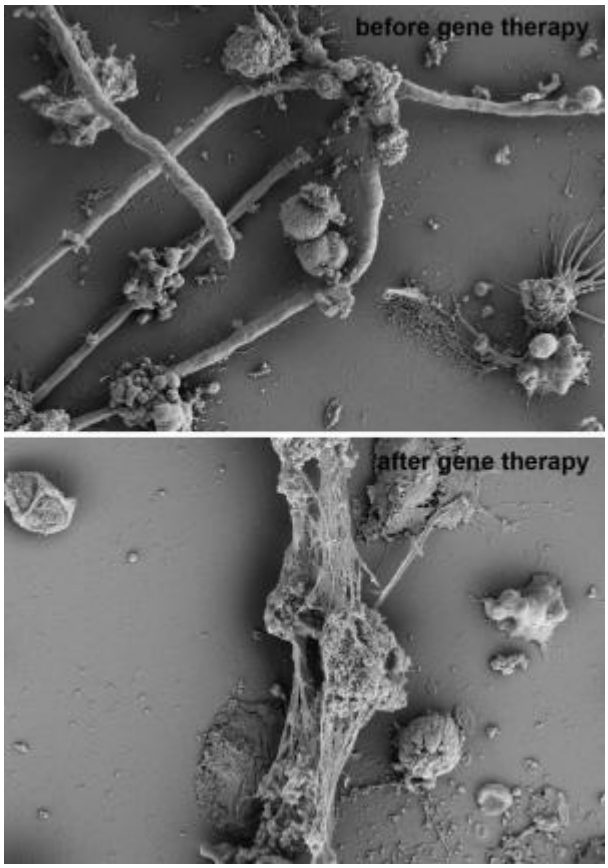
Story Source:
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Max-Planck-Gesellschaft**.

Journal Reference:

1. C. M. Schwiedrzik, W. Singer, L. Melloni. **Subjective and objective learning effects dissociate in space and in time**. *Proceedings of the National Academy of Sciences*, 2011; DOI: 10.1073/pnas.1009147108

http://www.sciencedaily.com/releases/2011/03/110309125031.htm

New Clues to Help Patients With Immune Deficiency Disease



Scanning electron microscopy of neutrophils infected with Aspergillus nidulans. The neutrophils are from the same patient before and after gene therapy. Before treatment the neutrophils are unable to form extracellular traps and after therapy this ability is restored. (Credit: Picture by Matteo Bianchi)

ScienceDaily (Mar. 10, 2011) — Infection researchers at Umeå University have uncovered a new disease mechanism in patients with Chronic Granulomatous Disease (CGD) in an international clinical collaboration with the Children's Hospital in Zurich.

Their new findings are published in the *Journal of Allergy and Clinical Immunology.*

Fungal infections can cause life-threatening health problems for patients with immune deficiency. Their health is weakened by infections and they cannot undergo the treatment or surgery they need to survive. An example is Aspergillus infection which is life threatening for these patients. In this condition, the immune system is not able to kill the pathogen and the mould propagates from the lungs and respiratory tract into the whole body.

Chronic Granulomatous Disease (GDC) is a heritable severe immune deficiency disease that occurs at a frequency of one in 200,000 humans per year worldwide. Children with CGD often suffer life-threatening microbial infections with bacteria and fungi and die at young age without treatment. Particularly, infections with Aspergilli fungi often kill CGD patients, before bone marrow transplantations or gene therapy can be performed.

Scientists at the Swedish Laboratory for Molecular Infection Medicine (MIMS) in Umeå have now found new treatment of CGD patients.

While healthy individuals' white blood cells, also called neutrophils, release oxygen intermediates to kill and digest invading pathogens, the immune cells in CGD patients lack the ability to kill the microbes.

Constantin Urban, research group leader at the MIMS laboratory in Umeå is studying mechanisms of fungi infections. In earlier studies of Candida infections, he found with his colleagues that neutrophils form extracellular structures, called neutrophil extracellular traps or NET, which catch microbes and fungi.
"NET is a very smart tool," says Urban. "It is comparable with a spider's web, catching and killing the trapped pathogen. We found in earlier studies that these web-like structures are made of chromatin and decorated with antimicrobial proteins. They also release oxygen intermediates and an antifungal substance called calprotectin."
In collaboration with clinical researchers at the Children's Hospital in Zurich, the scientists from Umeå found new details behind CGD. They compared the function of a CGD patient's neutrophils before and after gene therapy.
"Our results clearly show that calprotectin is also important for the neutrophils immune defence against Aspergillus infection," says Constantin Urban.
Together with PhD student Maria Joanna Niemiec in his group at MIMS and medical doctors in Zurich, Constantin Urban found that neutrophils from the CGD patient did not form NETs trap and were not able to release calprotectin. This was the reason why the neutrophils were not able to kill and digest Aspergillus cells anymore.
"We found that after gene therapy the neutrophils could produce calprotectin at a normal level and even the NET structure was formed again," says Maria Joanna. "Our experiment showed that calprotectin is a key player for the neutrophils' defence against Aspergillus infection. We are now convinced that calprotectin can be used as a "molecular support" to compensate the neutrophils cell defect in CGD patients."
"We are confident that our study may lead to new treatment of CGD patients in the beginning of their life and prevent them from infections until they have the possibility to receive gene therapy or bone marrow transplantation, which are more sustainable treatments," says Constatin Urban. "This possible treatment for CGD patients may also be an opportunity in the future for patients with other immune deficiency diseases."

Story Source:
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Umeå universitet**.

Journal Reference:

1. Matteo Bianchi, Maria J. Niemiec, Ulrich Siler, Constantin F. Urban, Janine Reichenbach. **Restoration of anti-Aspergillus defense by neutrophil extracellular traps in human chronic granulomatous disease after gene therapy is calprotectin-dependent**. *Journal of Allergy and Clinical Immunology*, 2011; DOI: 10.1016/j.jaci.2011.01.021

http://www.sciencedaily.com/releases/2011/03/110310082134.htm

Irrigation Telecontrol System Created That Saves Up to 20 Percent of Water Per Harvest

ScienceDaily (Mar. 10, 2011) — Neiker-Tecnalia (the Basque Institute of Agricultural Research and Development) has been working with Arson engineering company in the creation of an irrigation telecontrol system which will enable saving up to 20 % of water for each harvest, compared to traditional irrigation methods. With this technology, known as Aquarson, the programming of the irrigation shifts and the consumption of water are controlled in a centralised way, enabling a management based on hydraulic and energy criteria which increase the efficiency of use of the irrigation system.

The project is an initiative to improve management of water resources. With this aim, the knowledge of Arson Basque company on remote engineering and the knowledge of Neiker-Tecnalia on agronomy and crop water needs have been joined. To put this into practice, the cooperation of the Community of Irrigators of Zambrana (in the Basque province of Araba-Álava, Spain) was asked. They facilitated the installation of a pilot plant for automatic irrigation control in their land, comprising part of the plumbing in an area over 500 hectares. This area was divided into about 500 plots allocated to irrigation of many food crops such as potatoes and beet, the most representative products of the region.

Operation

The advanced technology of Aquarson enables the establishment of a network of remote units communicated by radiofrequency and which, connected to a management software and centralised control, sends instructions for irrigation to the hydrants. Also, it gathers information about the irrigation tasks carried out and the hydraulic operation of the installation. The instruction for irrigation is sent from a management and control application tool, expressly designed for managing irrigation systems and installed in a computer located in the Community of Irrigators offices.

The Aquarson remote system that was installed in Zambrana consists of 20 remote communication units distributed in 40 farmlands. Each device has autonomy to handle more than one plot and besides enforcing the watering it can extract detailed information about each point of culture.

The equipment has remote units connected through wireless technology at each hydrant communicating by radiofrequency to a computer located at the head office of the Community of Irrigators. The system helps to make the management of the irrigated lands (subject to strict weekly shifts) more flexible, as the quantity of water supplied to the land is controlled online. An order is emitted from the central control activating the irrigation points in each plot of land, being controlled through advanced software, with its settings established according to the agronomic criteria of the professionals. On making a decision about when and how much water should be supplied, the hydric needs of the terrain at that moment is taken into account, as well as the quota of supply assigned to the community, and the water tariffs.

Three types of simultaneous communication

Outstanding amongst the benefits provided by this pioneering technology is the possibility of combining various methods of communication. The system is capable of establishing its communications combining GPRS, radiofrequency and cable technology (amongst others) in order to adapt to the needs of each

installation, according to the type of handling and management required, the size of the irrigated plot and its orography.
Moreover, Aquarson enables the installation of sensors at key points of the system, transmitting information to the Irrigation Control Centre, thus detecting possible cracks in the pipes and controlling weather factors that might influence irrigation (strong winds or heavy rainfall).

Water savings

Among the most notable advantages are savings in the amount of water consumed per operation, reaching up to between 15 % and 20 % in comparison with other, more conventional systems.
In the case of the province of Araba-Álava, where the amount of water available is usually less than the hydric needs of the crops, the system enables increasing the efficiency in the use of water. In other words, it enables increasing production using the same volume of water. Also, in the case of a community of irrigators in which pumps consuming large quantities of electrical energy are required, the system enables increasing efficiency through reducing energy consumption.
Besides all these quantitative benefits, there is another more qualitative advantage that affects the farmers' quality of life. The intelligent irrigation system enables farmers to programme the irrigation required without having to travel in person to the irrigation water outlets. The technology also facilitates greater flexibility when assigning irrigation shifts. Until now this task was undertaken without clear parameters of optimisation and without the precise control of the surface irrigated. With this automated system, an enhanced monitoring of water use is achieved, the goal being to avoid a lack of water resulting in harmful hydric stress.
Finally, the programme favours the increase in profitability of the land, which optimises the distribution of water throughout the plots depending on economic criteria, such as the price of water and of the crops.

Advising farmers

Together with the implementation of this advanced technology, researchers of Neiker-Tecnalia began a targeted advice to farmers, with the aim of offering practical advice when making the water supply to crops. For this reason, the technological centre has developed models for optimising the management of water supplies for crops. These models are based on meteorological parameters (such as wind speed, rainfall and solar radiation) and economic criteria (such us the price of water and its turnover by each community), as they all are factors that determine crop irrigation.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Elhuyar Fundazioa**.

http://www.sciencedaily.com/releases/2011/03/110310070455.htm

Ultra High Speed Film

Laser system for generating ultra short x-ray pulses which is used in the experiment to make the recordings. (Credit: Rohwer et al., Copyright: CAU)

ScienceDaily (Mar. 10, 2011) — How fast an intense laser pulse can change the electrical properties of solids is revealed by researchers from Kiel University in the current edition of *Nature*.

Professor Michael Bauer, Dr. Kai Roßnagel and Professor Lutz Kipp from the Institute of Experimental and Applied Physics, together with colleagues from the University of Kaiserslautern and the University of Colorado in Boulder, U.S.A., are following the course of electronic switching processes which occur within fractions of a second (femtoseconds). The results of their research may trigger future developments of custom-made and ultra fast opto-electronic components in order to increase data transmission rates or to accelerate optical switches, to name just one example of potential areas of application.

"These techniques that we have developed enables us to record films of extremely fast processes in a much more comprehensive manner than it was previously possible with similar techniques," Bauer explains. "We are able to, for example, directly track phase transitions in solids or catalytic reactions on surfaces." To record the films, the Kiel scientists used ultra short flashes of light in the soft x-ray spectral region generated with a specific laser system. Bauer: "The amount of information gained from our pictures when played back in slow motion is vast. We will get completely new insights into most relevant electronic properties of solids which are important for a variety of current and future technologies, for example, in telecommunications."

The Christian-Albrechts-Universität zu Kiel (CAU) has proven international expertise as a North German research university in the field of nanosciences and surface science, for example, in the German Research Foundation's Collaborative Research Centre 855 "Magnetoelectric Composites -- Future Biomagnetic Interfaces." Furthermore, the CAU is applying for the current round of the Excellence Initiative with the excellence cluster "Materials for Life."

Background information:

Femto means "one part in a thousand million million." When, for example, molecules react with one another or when the switching states in electronic components change, processes at the atomic length scale are involved which take place on time scales of femtoseconds. Ultra short laser pulses in the so-called "soft x-ray

spectral region" -- i.e. light with very short wavelengths -- enables one to make snapshots of the electronic states which are transiently formed during a switching process, for example. The shots are combined in series to deliver a film depicting such switching processes with a level of detail and a temporal resolution which could previously not be achieved.

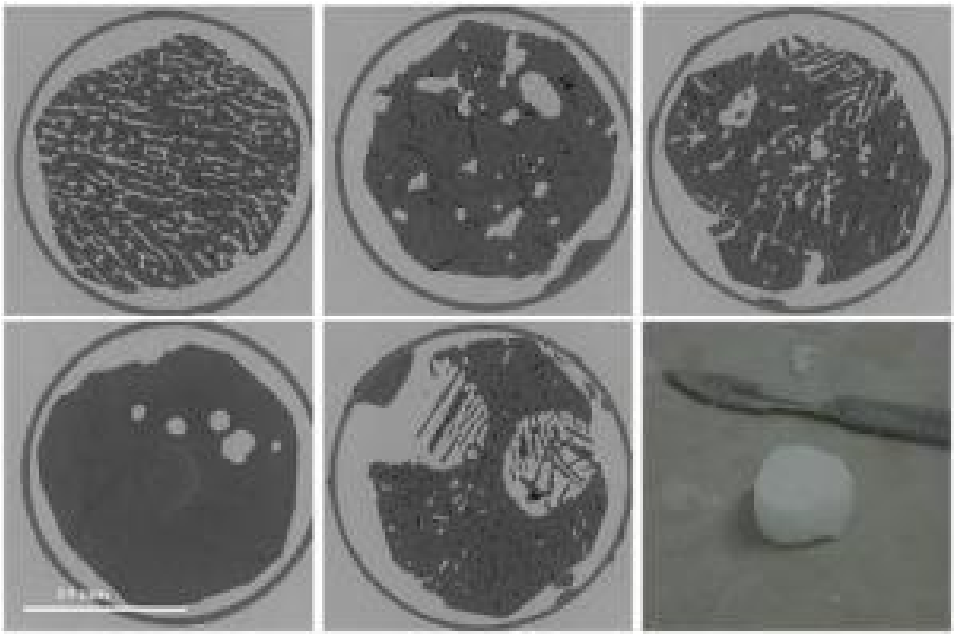
Story Source:
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Christian-Albrechts-Universitaet zu Kiel**.

Journal Reference:

1. Timm Rohwer, Stefan Hellmann, Martin Wiesenmayer, Christian Sohrt, Ankatrin Stange, Bartosz Slomski, Adra Carr, Yanwei Liu, Luis Miaja Avila, Matthias Kalläne, Stefan Mathias, Lutz Kipp, Kai Rossnagel, Michael Bauer. **Collapse of long-range charge order tracked by time-resolved photoemission at high momenta**. *Nature*, 2011; DOI: 10.1038/nature09829

http://www.sciencedaily.com/releases/2011/03/110310070453.htm

Sea Ice Holds Deep Secrets



A synchrotron X-rayed section of a cylindrical ice sample. Ice structure depends on its age and the conditions under which it forms. Bottom right: a prepared sample to be X-rayed. (Credit: Copyright The Research Council Norway)

ScienceDaily (Mar. 10, 2011) — Research scientist Sönke Maus has used funding under the Research Council's Programme on Synchrotron Research (SYNKROTRON) to develop a method of taking samples from polar ice without altering its extremely fragile microstructure. He has also laid the foundation for determining how molecular structure affects the mechanical properties of ice. This knowledge is vital for predicting the impact of ice on future activities in the Arctic Ocean.

Biologists and climatologists are among the beneficiaries of this basic research. Industry players with activities in ice-covered waters, such as petroleum and shipping companies, will also need the best possible information about the properties of ice.

3D observations of ice structures

"Nearly five per cent of the world's oceans are covered with sea ice," explains Dr Maus. "It plays an important role in the Arctic and global climate and ecosystems, yet we know very little about what it looks like at the microscopic level. The physical structure of sea ice is affected by elements such as how sunlight penetrates the ice, how it cracks and melts, how it presses against boats and platforms, and how it hosts microorganisms."

There were no previous three-dimensional observations of ice structures at the microscopic level, but Dr Maus has achieved them using ultra-high-energy X-rays known as synchrotron beamlines.

Stresses on ice

In the coming years, sea ice in the Arctic Basin may melt due to climate change. Nations with territorial claims there as well as petroleum companies will want to take advantage of this by exploring for and recovering potential petroleum resources. Meanwhile, new shipping lanes will be opened, shortening routes between Asia and Europe via the Northeast Passage (along Russia's northern coast) and the Northwest Passage (through the waters of northern Canada).

Young sea ice and icing problems will nevertheless remain, causing wear and tear on ships and installations. It will be crucial for companies involved to know as much as possible about the tensile strength of ice and its other mechanical properties. "Now we can compile data to combine with previous experience to give us much more fundamental knowledge of ice physics," says Dr Maus.

Climate and biology

His project also advances knowledge about microchannels in ice structures. Plankton live in these channels and pores, so the ice serves as a major biotope for vast numbers of living organisms -- a critical function in the Arctic Ocean ecosystem. The research project is generating new knowledge about the salinity of ice, another vital parameter. Besides revealing how old the ice is, salinity affects the vertical ocean currents so fundamental to our climate patterns.
Dr Maus believes that this X-raying method also holds major potential for the food industry in assessing how the freezing process affects food quality. "So synchrotron-based cryotomography and chemical analysis have an important general application," he asserts.

Demanding method development

Dr Maus reveals that developing the physical method was one of the greatest challenges in the project. "Taking samples of Arctic ice is simple, but shipping the ice to the synchrotron facility (the Swiss Light Source at the Paul Scherrer Institute) in Switzerland without disturbing its microstructure demands real care. In the end, we solved it by centrifuging the water out of the ice, keeping the temperature constant during transport, and building a specialised instrument at the synchrotron facility for extracting samples."
Using synchrotron beamlines, Dr Maus was able to take high-resolution photographs with high brilliance over a very short time span. "We were also able to focus large, individual salt crystals on a scale of microns in order to find out how the structures form."

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **The Research Council of Norway**.

http://www.sciencedaily.com/releases/2011/03/110310070451.htm

'Singing' Mice: The Ongoing Debate of Nature Vs. Nurture

Laboratory mice. (Credit: iStockphoto/Brandon Laufenberg)

ScienceDaily (Mar. 9, 2011) — What happened to being "quiet as a mouse"? Researchers have recently shown that, rather than being the silent creatures of popular belief, mice emit ultrasonic calls in a variety of social contexts, and these calls have song-like characteristics. So if mice sing, where do they get their music? Are they born with the songs fully formed in their heads, or do they learn them from their peers?

These questions are of great interest to scientists as, while many organisms produce genetically regulated vocalizations, only a select few species (such as ourselves) can actually learn these vocalizations. If it turns out that mice can indeed learn new songs, it would provide a very convenient mammalian model of vocal learning.

Whether or not mouse song involves learning either through auditory imitation or behavioral feedback (e.g., from the mother), however, is a subject of hot debate, and the answer is proving elusive. To highlight the difficulties facing researchers, two studies published on March 9, 2011 in the open-access journal *PLoS ONE* have come to differing conclusions about whether mouse vocalization patterns are innate or learned.

In the first study, researchers from Northeastern Ohio Universities Colleges of Medicine and Pharmacy and the MRC Institute of Hearing Research conducted a study to understand developmental changes in mouse song that would allow parents to distinguish older mice from younger mice. They found that many features of mouse song changed with age. For example, the pattern of syllables within songs became more complex. According to lead author Jasmine Grimsley, "We concluded that the increased complexity of song suggests that mice may be capable of vocal learning, but we also recognized that other factors besides learning, such as genetically controlled neuromuscular development, might explain the increased complexity. We conducted our study in normal hearing, CBA/CaJ mice, and we intend to use the results to understand how the brain codes the meaning of these sounds."

The second study, a collaboration among Azabu University, the RIKEN Brain Science Institute, and the Okanoya Emotional Information Project used a cross-fostering experiment to test whether the vocalization patterns were more strongly influenced by genetics or environment. The researchers used males from two mouse strains, C57BL/6 and BALB/c, which emit different vocalizations. Males from each strain were raised in litters of the opposite strain until weaning. Vocalization patterns were recorded at 10-20 weeks of age, and the researchers compared vocalizations of cross-fostered mice to control mice reared by genetic parents. According to first author Takefumi Kikusui, "We first showed that two strains of mice, BALB and B6, sing strain-unique song types. We then showed that rearing BALB by B6 parents do not change the BALB characteristics of the song, and vise-versa. The fact that the cross-fostered animals sang songs similar to those of their genetic parents suggests that the structure of this courtship sound is under strong genetic control."

When asked about the results from the other study, corresponding author Dr. Kazuo Okanoya noted that, "they demonstrate substantial developmental changes in social vocalizations with age. They also characterized complex behavioral phenotypes of mice vocalizations. However, in our opinion, developmental and phonotypical complexities of mice vocalizations are not related with whether or not the vocalizations are learned."

Dr Grimsley said of the Japanese research, "while we believe that the study by Kikusui et al. indicates that some aspects of mouse songs are genetically driven, the conclusion that vocal learning does not occur in mice is too strong for the experiments that they performed. In our opinion, the jury is still out regarding whether mice do, or do not, exhibit vocal learning."
Which is it then, nature or nurture? It appears that it is still too early to say for sure, and we do not yet know whether the mating songs of mice are genetically determined or learned from their parents. What is certain, however, is that even carefully performed scientific research does not always produce straight-forward answers.

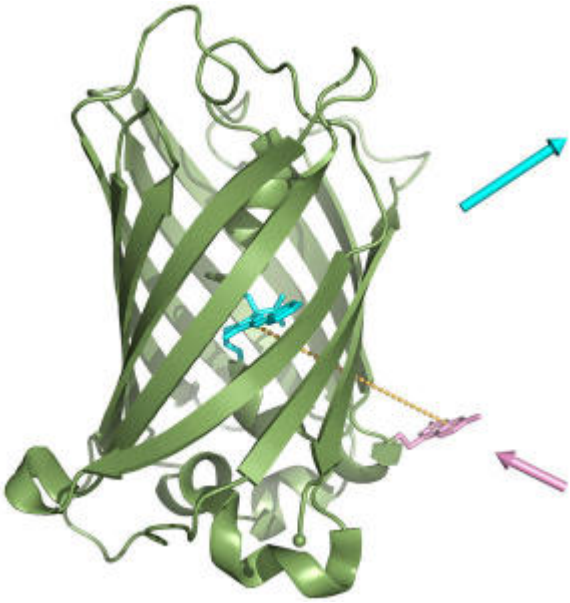
Story Source:
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Public Library of Science**, via EurekAlert!, a service of AAAS.

Journal References:

1. Takefumi Kikusui, Kaori Nakanishi, Ryoko Nakagawa, Miho Nagasawa, Kazutaka Mogi, Kazuo Okanoya. **Cross Fostering Experiments Suggest That Mice Songs Are Innate**. *PLoS ONE*, 2011; 6 (3): e17721 DOI: 10.1371/journal.pone.0017721
2. Jasmine M. S. Grimsley, Jessica J. M. Monaghan, Jeffrey J. Wenstrup. **Development of Social Vocalizations in Mice**. *PLoS ONE*, 2011; 6 (3): e17460 DOI: 10.1371/journal.pone.0017460

http://www.sciencedaily.com/releases/2011/03/110309182656.htm

Synthetic Biology: Novel Kind of Fluorescent Protein Developed



Interplay of two dyes in the biosynthetic fluorescent protein. (Credit: Graphics: A. Skerra / TUM)

ScienceDaily (Mar. 9, 2011) — Proteins are the most important functional biomolecules in nature with numerous applications in life science research, biotechnology and medicine. So how can they be modified in the most effective way to attain certain desired properties? In the past, the modifications were usually carried out either chemically or via genetic engineering.

The team of Professor Arne Skerra from the TUM Chair of Biological Chemistry has now developed a more elegant combined solution: By extending the otherwise universal genetic code, the scientists are able to coerce bacterial cells to produce tailored proteins with synthetic functional groups. To put their idea to the test, they set out to crack a particularly hard nut: The scientists wanted to incorporate a non-natural amino acid at a specific site into a widely used natural protein.

In bioresearch this protein is commonly known as "GFP" (= green fluorescent protein). It emits a bright green glow and stems originally from a jellyfish that uses the protein to make itself visible in the darkness of the deep sea. The team chose a pale lavender coumarin pigment, serving as side chain of a non-natural amino acid, as the synthetic group. The scientists "fed" this artificial amino acid to a laboratory culture of Escherichia coli bacteria -- the microorganism workhorses of genetic engineering, whose natural siblings are also found in the human intestine. Since the team had transferred the modified genetic blueprints for the GFP to the bacteria -- including the necessary biosynthesis machinery -- it incorporated the coumarin amino acid at a very specific site into the fluorescent protein.

This spot in the GFP was carefully chosen, explains Professor Skerra: "We positioned the synthetic amino acid at a very close distance from the fluorescence center of the natural protein." The scientists employed the principle of the so-called Foerster resonance energy transfer, or FRET for short. Under favorable conditions, this process of physical energy transfer, named after the German physical chemist Theodor Foerster, allows energy to be conveyed from one stimulated pigment to another in a radiation-less manner.

It was precisely this FRET effect that the scientists implemented very elegantly in the new fluorescent protein. They defined the distance between the imported chemical pigment and the biological blue-green (cyan, to be more precise) pigment of the jellyfish protein in such a way that the interplay between the two dyes resulted in a completely novel kind of fluorescent chimeric biomolecule. Because of the extreme proximity of the two luminescent groups the pale lavender of the synthetic amino acid can no longer be detected; instead, the typical blue-green color of the fluorescent protein dominates. "What is special here, and different from the natural GFP, is that, thanks to the synthetically incorporated amino acid, the fluorescence can be excited with a commercially available black-light lamp in place of an expensive dedicated LASER apparatus," explains Sebastian Kuhn, who conducted these groundbreaking experiments as part of his doctoral thesis.

According to Skerra, the design principle of the novel bio-molecule, which is characterized by a particularly large and hard to achieve wavelength difference between excitation and emitted light, should open numerous interesting applications: "We have now demonstrated that the technology works. Our strategy will enable the preparation of customized fluorescent proteins in various colors for manifold future purposes." This research project was financially supported by the German Research Foundation (DFG) as part of the Excellence Cluster "Munich Center for Integrated Protein Science" (CIPS-M).

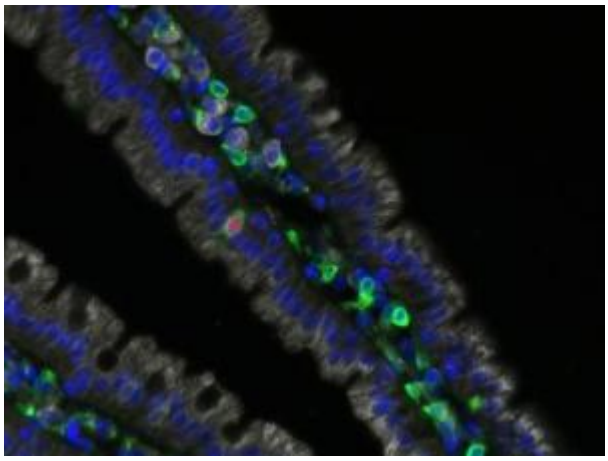
Story Source:
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Technische Universitaet Muenchen**.

Journal Reference:

1. Sebastian M. Kuhn, Marina Rubini, Michael A. Müller, Arne Skerra. **Biosynthesis of a Fluorescent Protein with Extreme Pseudo-Stokes Shift by Introducing a Genetically Encoded Non-Natural Amino Acid outside the Fluorophore**. *Journal of the American Chemical Society*, 2011; : 110225040126039 DOI: 10.1021/ja1099787

http://www.sciencedaily.com/releases/2011/03/110309112900.htm

New Type of Secretory Cell in the Intestine



Gerbe et al. define tuft cells as a new secretory lineage in the intestine. These rare cells can be distinguished from the four other main cell types of the intestinal epithelium by their co-expression of SOX9 (red) and COX1 (green). Microtubules are shown in white. (Credit: François Gerbe)

ScienceDaily (Mar. 9, 2011) — The intestinal epithelium consists of four main specialized cell lineages: absorptive enterocytes and three secretory cell types known as enteroendocrine, Paneth, and goblet cells. But a rare, fifth type of intestinal cell called tuft cells also exists. Defined by the thick brush of long microvilli that project from their apical surface, tuft cells are seen in several epithelial tissues, yet little is known about their function due to a lack of tuft cell-specific markers.

In the March 7 issue of The *Journal of Cell Biology*, a team of French researchers led by Philippe Jay identified a unique "signature" of proteins expressed by tuft cells. Like other intestinal cell types, tuft cells turned over rapidly and were replaced by the differentiation of proliferative stem cells' progeny in the intestinal crypts. This differentiation was blocked in the absence of ATOH1 -- a transcription factor required for the development of all intestinal secretory lineages. Yet tuft cell differentiation didn't require other transcription factors that specify enteroendocrine, Paneth, and goblet cells, suggesting that tuft cells represent a distinct lineage of intestinal secretory cells.

The team found that tuft cells secrete opioids and produce enzymes that synthesize prostaglandins. The latter observation suggests that tuft cells may promote inflammation and tumorigenesis. Indeed, the researchers identified tuft cell-like cells in several early stage intestinal tumors. To really understand tuft cells' function, however, Jay hopes to identify transcription factors uniquely required for their development in order to generate mice that specifically lack tuft cells from their intestinal epithelium.

Story Source:

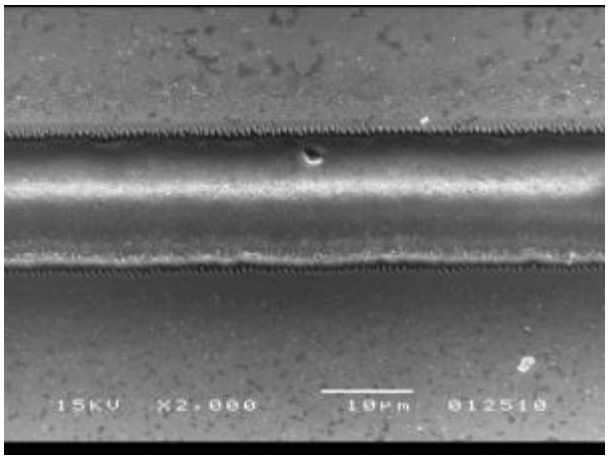
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Rockefeller University Press**, via EurekAlert!, a service of AAAS.

Journal Reference:

1. Gerbe, F., et al. **Distinct ATOH1 and Neurog3 requirements define tuft cells as a new secretory cell type in the intestinal epithelium**. *J. Cell Biol.*, vol. 192 no. 5 767-780 DOI: 10.1083/jcb.201010127

http://www.sciencedaily.com/releases/2011/03/110307124516.htm

Ultrafast Laser 'Scribing' Technique to Cut Cost, Hike Efficiency of Solar Cells



This image, taken with a scanning electron microscope, shows a microchannel that was created using an ultrafast-pulsing laser. (Credit: Purdue University School of Mechanical Engineering image/Yung Shin)

ScienceDaily (Mar. 9, 2011) — Researchers are developing a technology that aims to help make solar cells more affordable and efficient by using a new manufacturing method that employs an ultrafast pulsing laser. The innovation may help to overcome two major obstacles that hinder widespread adoption of solar cells: the need to reduce manufacturing costs and increase the efficiency of converting sunlight into an electric current, said Yung Shin, a professor of mechanical engineering and director of Purdue University's Center for Laser-Based Manufacturing.

Critical to both are tiny "microchannels" needed to interconnect a series of solar panels into an array capable of generating usable amounts of power, he said. Conventional "scribing" methods, which create the channels mechanically with a stylus, are slow and expensive and produce imperfect channels, impeding solar cells' performance.

"Production costs of solar cells have been greatly reduced by making them out of thin films instead of wafers, but it is difficult to create high-quality microchannels in these thin films," Shin said. "The mechanical scribing methods in commercial use do not create high-quality, well-defined channels. Although laser scribing has been studied extensively, until now we haven't been able to precisely control lasers to accurately create the microchannels to the exacting specifications required."

The researchers hope to increase efficiency while cutting cost significantly using an "ultrashort pulse laser" to create the microchannels in thin-film solar cells, he said.

The work, funded with a three-year, $425,000 grant from the National Science Foundation, is led by Shin and Gary Cheng, an associate professor of industrial engineering. A research paper demonstrating the feasibility of the technique was published in *Proceedings of the 2011 NSF Engineering Research and Innovation Conference* in January. The paper was written by Shin, Cheng, and graduate students Wenqian Hu, Martin Yi Zhang and Seunghyun Lee.

"The efficiency of solar cells depends largely on how accurate your scribing of microchannels is," Shin said. "If they are made as accurately as possibly, efficiency goes up."

Research results have shown that the fast-pulsing laser accurately formed microchannels with precise depths and sharp boundaries. The laser pulses last only a matter of picoseconds, or quadrillionths of a second. Because the pulses are so fleeting the laser does not cause heat damage to the thin film, removing material in precise patterns in a process called "cold ablation."

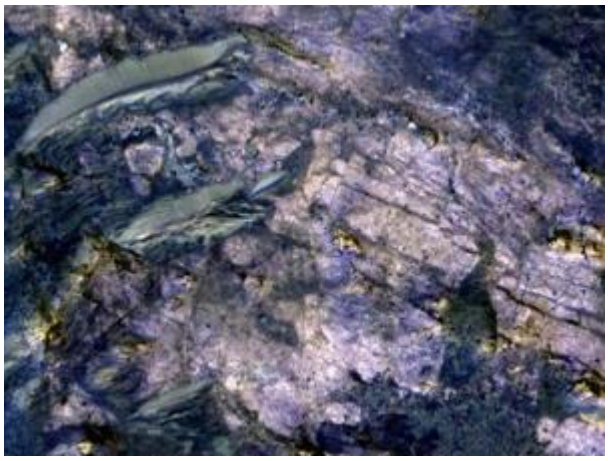
"It creates very clean microchannels on the surface of each layer," Shin said. "You can do this at very high speed, meters per second, which is not possible with a mechanical scribe. This is very tricky because the laser must be precisely controlled so that it penetrates only one layer of the thin film at a time, and the layers are extremely thin. You can do that with this kind of laser because you have a very precise control of the depth, to about 10 to 20 nanometers."

Traditional solar cells are usually flat and rigid, but emerging thin-film solar cells are flexible, allowing them to be used as rooftop shingles and tiles, building facades, or the glazing for skylights. Thin-film solar cells account for about 20 percent of the photovoltaic market globally in terms of watts generated and are expected to account for 31 percent by 2013.
The researchers plan to establish the scientific basis for the laser-ablation technique by the end of the three-year period. The work is funded through NSF's Civil Mechanical and Manufacturing Innovation division.
Information about photovoltaic cells is available from the U.S. Department of Energy's National Renewable Energy Laboratory at http://www.nrel.gov/learning/re_photovoltaics.html

Story Source:
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Purdue University**.

http://www.sciencedaily.com/releases/2011/03/110308173244.htm

Some of Mars' Missing Carbon Dioxide May Be Buried



This image from orbit covers an area about 460 meters (about 1,500 feet) across, in which carbonate minerals have been identified from spectrometer observations. Fractures and possible layers are visible in the light-toned rock exposure containing the carbonates. (Credit: NASA/JPL-Caltech/Univ. of Arizona)

ScienceDaily (Mar. 9, 2011) — Rocks on Mars dug from far underground by crater-blasting impacts are providing glimpses of one possible way Mars' atmosphere has become much less dense than it used to be.

At several places where cratering has exposed material from depths of about 5 kilometers (3 miles) or more beneath the surface, observations by a mineral-mapping instrument on NASA's Mars Reconnaissance Orbiter indicate carbonate minerals.

These are not the first detections of carbonates on Mars. However, compared to earlier findings, they bear closer resemblance to what some scientists have theorized for decades about the whereabouts of Mars' "missing" carbon. If deeply buried carbonate layers are found to be widespread, they would help answer questions about the disappearance of most of ancient Mars' atmosphere, which is deduced to have been thick and mostly carbon dioxide. The carbon that goes into formation of carbonate minerals can come from atmospheric carbon dioxide.

"We're looking at a pretty lucky location in terms of exposing something that was deep beneath the surface," said planetary scientist James Wray of Cornell University, Ithaca, N.Y., who reported the latest carbonate findings March 8 at the Lunar and Planetary Science Conference near Houston. Huygens crater, a basin 467 kilometers (290 miles) in diameter in the southern highlands of Mars, had already hoisted material from far underground, and then the rim of Huygens, containing the lifted material, was drilled into by a smaller, unnamed cratering event.

Observations in the high-resolution mode of the Compact Reconnaissance Imaging Spectrometer for Mars (CRISM) instrument on the Mars Reconnaissance Orbiter show spectral characteristics of calcium or iron carbonate at this site. Detections of clay minerals in lower-resolution mapping mode by CRISM had prompted closer examination with the spectrometer, and the carbonates are found near the clay minerals. Both types of minerals typically form in wet environments.

The occurrence of this type of carbonate in association with the largest impact features suggests that it was buried by a few kilometers (or miles) of younger rocks, possibly including volcanic flows and fragmented material ejected from other, nearby impacts.

These findings reinforce a report by other researchers five months ago identifying the same types of carbonate and clay minerals from CRISM observation of a site about 1,000 kilometers (600 miles) away. At that site, a meteor impact has exposed rocks from deep underground, inside Leighton crater. In their report of that discovery, Joseph Michalski of the Planetary Science Institute, Tucson, Ariz., and Paul Niles of NASA Johnson Space Center, Houston, proposed that the carbonates at Leighton "might be only a small part of a much more extensive ancient sedimentary record that has been buried by volcanic resurfacing and impact ejecta."

Carbonates found in rocks elsewhere on Mars, from orbit and by NASA's Spirit rover, are rich in magnesium. Those could form from reaction of volcanic deposits with moisture, Wray said. "The broader compositional

range we're seeing that includes iron-rich and calcium-rich carbonates couldn't form as easily from just a little bit of water reacting with igneous rocks. Calcium carbonate is what you typically find on Earth's ocean and lake floors."

He said the carbonates at Huygens and Leighton "fit what would be expected from atmospheric carbon dioxide interacting with ancient bodies of water on Mars." Key additional evidence would be to find similar deposits in other regions of Mars. A hunting guide for that search is the CRISM low-resolution mapping, which has covered about three-fourths of the planet and revealed clay-mineral deposits at thousands of locations.

"A dramatic change in atmospheric density remains one of the most intriguing possibilities about early Mars," said Mars Reconnaissance Orbiter Project Scientist Richard Zurek, of NASA's Jet Propulsion Laboratory, Pasadena, Calif. "Increasing evidence for liquid water on the surface of ancient Mars for extended periods continues to suggest that the atmosphere used to be much thicker."

Carbon dioxide makes up nearly all of today's Martian air and likely was most of a thicker early atmosphere, too. In today's thin, cold atmosphere, liquid water quickly freezes or boils away.

What became of that carbon dioxide? NASA will launch the Mars Atmosphere and Volatile Evolution Mission (MAVEN) in 2013 to investigate processes that could have stripped the gas from the top of the atmosphere into interplanetary space. Meanwhile, CRISM and other instruments now in orbit continue to look for evidence that some of the carbon dioxide in that ancient atmosphere was removed, in the presence of liquid water, by formation of carbonate minerals now buried far beneath the present surface.

The Johns Hopkins University Applied Physics Laboratory, Laurel, Md., provided and operates CRISM, one of six instruments on the Mars Reconnaissance Orbiter. JPL, a division of the California Institute of Technology in Pasadena, manages the Mars Reconnaissance Orbiter project and the Mars Exploration Program for the NASA Science Mission Directorate, Washington. For more about CRISM, see http://crism.jhuapl.edu . For more about the Mars Reconnaissance Orbiter, visit http://www.nasa.gov/mro .

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **NASA/Jet Propulsion Laboratory**.

http://www.sciencedaily.com/releases/2011/03/110308144338.htm

Enzymes from Garden Compost Could Favour Bioethanol Production

Researcher Nadia Skorupa Parachin. (Credit: Image courtesy of Lund University)

ScienceDaily (Mar. 9, 2011) — Today, bioethanol is primarily made from glucose. If xylose -- which is found in straw, willow and other fast-growing plant species -- could also be used efficiently, then ethanol production could increase significantly. A researcher in applied microbiology is well on the way to making this a reality. The researcher in question is Nadia Skorupa Parachin and the secret of her technique is enzymes that she extracted from garden soil. If ethanol can be successfully made from xylose then ethanol production could increase by over 20 per cent -- to the benefit of cheaper environmentally friendly fuel.

Ethanol is manufactured by fermenting sugars from plant material. At present, xylose is not used, despite being the second most common type of sugar found in nature. Succeeding with xylose requires good, quick enzymes that can get the yeast to also ferment the less appetising xylose.

Nadia Skorupa Parachin has tested her enzymes and the first results show that her enzymes bind xylose more efficiently than those that have been tested previously.

"In order for carbohydrates in forestry, plant and waste products to be used for ethanol production, enzymes are required in the yeast that 'eat up' the sugar and convert it into ethanol. If we just want to make use of the glucose then normal baker's yeast is sufficient. However, if the xylose is also to be converted to ethanol, then genetic modifications have to be made to the yeast," explains Ms Skorupa Parachin, who has recently patented her newly discovered enzymes.

Nadia Skorupa Parachin began by extracting DNA from a soil sample, then she cut it into small pieces. She was then able to build up a DNA library. After that she identified the most appropriate genes by coupling enzyme activity to growth on xylose.

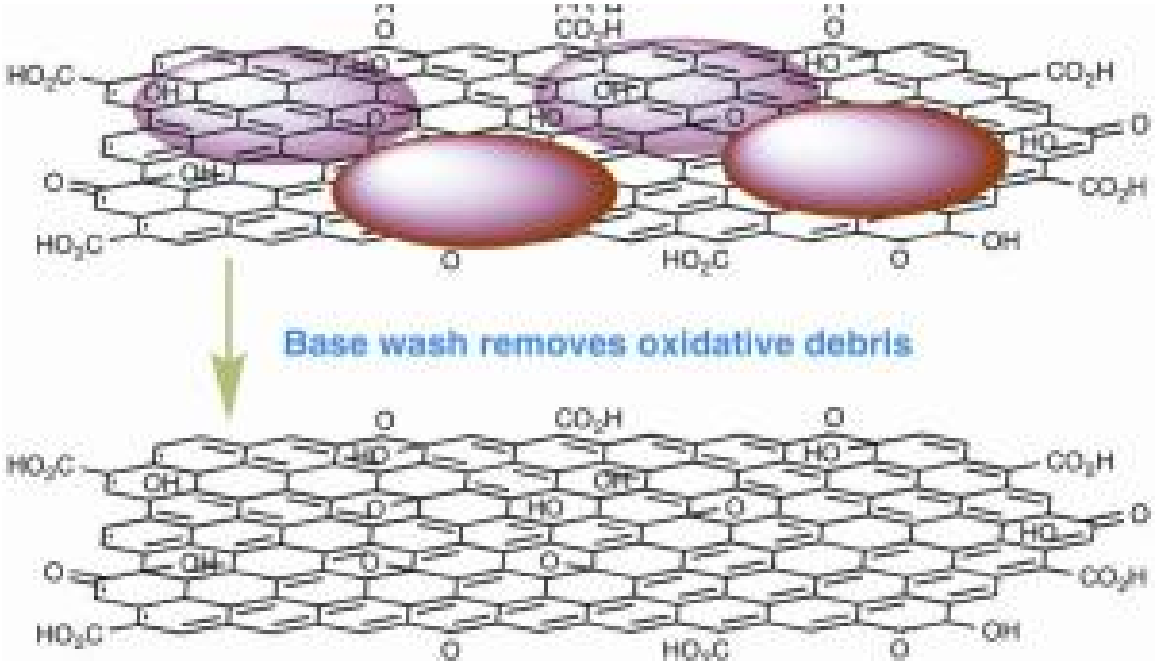
Ms Skorupa Parachin's decision to use soil is quite simply due to the fact that soil is considered the most diverse habitat on Earth.

"One gram of soil contains ten billion bacteria! Enzymes and other proteins are found in almost unlimited numbers and can have all sorts of unexplored properties. I collected the soil sample from a garden in Höör, but any soil can be used," she points out.
The reason why no researcher has previously identified new enzymes for xylose in this way is because it is not all that easy. Marie Gorwa-Grauslund, who is Nadia Skorupa Parachin's supervisor, was the first person to realise that this genetic technique could work in this specific context. The technique, known as metagenomics, was originally used in environmental studies.
"The most interesting part is really the method itself. We have reasoned along entirely new lines. In fact, it has taken several months to develop the method for use in this area," explains Professor Gorwa-Grauslund.
The Lund researchers will now also take the chance to apply their modified metagenomics technique in other areas, for example, to isolate enzymes that allow microorganisms to cope with difficult industrial conditions, such as high temperatures and high acid levels.
"Robust microorganisms are very important if biological production is to be economically viable," says Marie Gorwa-Grauslund.
Ms Skorupa Parachin has now returned to her home country, Brazil. However, two or three other young researchers will continue to work on the technique. During the spring they will have chance to evaluate the new enzymes better.
"There are still a number of pieces of the jigsaw that must be put in place if ethanol production from xylose is to become financially viable. The process must be speeded up. But we hope that in the long term our method can help to make bioethanol production more efficient," says Marie Gorwa-Grauslund.

Story Source:
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Lund University**.

http://www.sciencedaily.com/releases/2011/03/110308075519.htm

Graphene Oxide's Solubility Disappears in the Wash



Graphic showing result of washing with base. (Credit: Image courtesy of University of Warwick)

ScienceDaily (Mar. 9, 2011) — Graphene oxide has had a scrum of researchers fall upon it as it retains much of the properties of the highly valued super material pure graphene, but it is much easier, and cheaper, to make in bulk quantities; easier to process; and its significant oxygen content appears to make it soluble in water. However new research led by University of Warwick Chemist Dr Jonathan P. Rourke and Physicist University of Warwick Physicist Dr Neil Wilson, has found that that last assumption is incorrect and unfortunately graphene oxide's solubility literally comes out in the wash.

Drs Rourke and Wilson's team made their discovery when treating the graphene oxide with sodium hydroxide (NaOH) in an attempt to increase the usefulness of the oxygen containing functional groups believed to be bound to the graphene. Unfortunately it seemed to make things worse rather than better. Indeed at high enough concentrations of NaOH Dr Rourke was left with a black suspension.

The Warwick led researchers recalled that it had been shown that oxidation debris adheres to carbon nanotubes but the weak nature of the connection of this oxidation debris to the carbon nanotubes meant that a wash with a base can simply remove the oxidative debris. Experiments showed that in that particular case oxidative debris was found to make up almost a quarter of the mass of the "oxidized carbon nanotubes." The researchers felt a similar process maybe happening in the graphene oxide they were studying.

The results may also help explain the inordinately high levels of oxygen people were claiming to find in graphene oxide. Chemists were already struggling to identify enough plausible carbon to oxygen bonds to accommodate the amounts of oxygen believed to form part of graphene oxide.

On centrifuging the black liquid the Warwick team were left with a pile of black powder that turned out to be graphene oxide that may once have been soluble before the application of the base but which refused to show any significant sign of being easily soluble again in its current state. The black material was found to shown to be very similar to graphene itself; in particular it was shown to consist of very large sheets of electrically conducting carbon atoms, unlike the insulating "graphene oxide."

The remaining liquid was also dried to give a white powder that the Warwick researchers showed contained the "oxidative debris" or OD; the OD was shown to be made up exclusively of small, low molecular weight compounds (i.e. less than 100 atoms)

The graphene oxide recovered from washing process formed about 64% of the mass of the "graphene oxide" at the start of the process. The recovered OD or oxidative debris formed at least 30% of the weight of the mass of the original "graphene oxide."
Drs Rourke and Wilson's team believe this shows that much of the oxygen that was believed to be closely bonded to the carbon in the graphene oxide was actually not bonded at all but simply lying on top of the grapheme sheets, loosely connected to them as "oxidative debris." This oxidative debris contained a large quantity of oxygen that simply came out in the wash when the graphene oxide was treated with sodium hydroxide.
This creates a significant problem for researchers depending on an easily soluble form of graphene oxide as the level of solubility found so far was directly dependent on the high quantities of oxygen believed to be bound to the carbon in the graphene oxide. If much of that oxygen so easily falls away, so will the levels of solubility.
Drs Rourke and Wilson say "Our results suggest that models for the structure of graphene oxide need revisiting. These results have important implications for the synthesis and application of chemically modified graphene particularly where direct covalent functionalization of the graphene lattice is required."

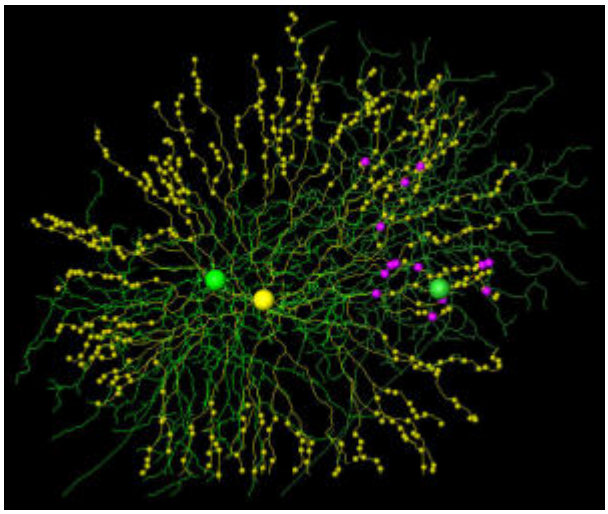
Story Source:
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University of Warwick**.

Journal Reference:

1. Jonathan P. Rourke, Priyanka A. Pandey, Joseph J. Moore, Matthew Bates, Ian A. Kinloch, Robert J. Young, Neil R. Wilson. **The Real Graphene Oxide Revealed: Stripping the Oxidative Debris from the Graphene-like Sheets**. *Angewandte Chemie International Edition*, 2011; DOI: 10.1002/anie.201007520

http://www.sciencedaily.com/releases/2011/03/110308075513.htm

New Microscope Decodes Complex Eye Circuitry



Cells and synapses reconstructed from serial block face electron microscopy data. A single starburst amacrine cell (yellow, note synaptic varicosities) and two direction-selective ganglion cells (green). Even though there is substantial dendritic overlap with both cells, all connections (magenta) go to the right ganglion cell. (Credit: Copyright Kevin Briggman)

ScienceDaily (Mar. 9, 2011) — The properties of optical stimuli need to be conveyed from the eye to the brain. To do this efficiently, the relevant information is extracted by pre-processing in the eye. For example, some of the so-called retinal ganglion cells, which transmit visual information to the brain via the optic nerve, only react to light stimuli moving in a particular direction. This direction selectivity is generated by inhibitory interneurons that influence the activity of the ganglion cells through their synapses.

Using a novel microscopy method developed at the Institute, scientists from the Max Planck Institute for Medical Research in Heidelberg have now discovered that the distribution of the synapses between ganglion cells and interneurons follows highly specific rules. Only those dendrites that extend from the cell body of the amacrine cell in a direction opposite to the preferred direction of the ganglion cell connect with the ganglion cell.

The sensory cells in the retina of the mammalian eye convert light stimuli into electrical signals and transmit them via downstream interneurons to the retinal ganglion cells which, in turn, forward them to the brain. The interneurons are connected to each other in such a way that the individual ganglion cells receive visual information from a circular area of the visual field known as the receptive field. Some ganglion cells are only activated, for example, when light falls on the centre of their receptive fields and the edge remains dark (ON cells). The opposite is the case for other ganglion cells (OFF cells). And there are also ganglion cells that are activated by light that sweeps across their receptive fields in a particular direction; motion in the opposite (null-) direction inhibits activation.

Starburst amacrine cells, which modulate the activity of the ganglion cells through inhibitory synaptic connections, play an important role in this direction selectivity. The same research group at the Max Planck Institute in Heidelberg demonstrated a number of years ago that starburst amacrine cells are activated by moving stimuli. Each branch in the circular dendrite tree reacts preferentially to stimuli that move away from the cell body; movements in the opposite direction, towards the cell body, inhibit its activity. In the central area around the cell body dendrites function only as receivers of synaptic signals, while the dendrites on the periphery act as transmitters as well -- and, therefore, double as axons. Whether these dendrites cause the direction selectivity in the ganglion cells or whether the ganglion cells "compute" it using other signals was unclear up to now.

Max Planck researchers Kevin Briggman, Moritz Helmstaedter and Winfried Denk have now discovered that, although the cells themselves are symmetrical, the synapses between retinal ganglion cells and starburst amacrine cells are distributed asymmetrically: seen from the ganglion cell, the starburst cell dendrites

connected with it run in the direction opposite to the preferred direction of motion. "Ganglion cells prefer amacrine-cell dendrites that run along the null-direction," says Winfried Denk.
According to previous studies by Winfried Denk and his research group, the electrical characteristics of the dendrites, which emerge starlike from the cell bodies of amacrine cells, play a crucial role here. The further they are located from the centre of the cell toward the edge, the easier they are to excite; therefore, stimuli are transmitted preferentially in this direction. This mechanism does not require but is helped by inhibitory influences between neighbouring amacrine cells, known as lateral inhibition. "A ganglion cell can thus differentiate between movements from different directions simply by making connections with certain starburst amacrine cell dendrites -- namely those that prevent activation of the ganglion cell in null-direction through their inhibitory synapses. These are precisely the amacrine cell dendrites that run along this direction," explains Winfried Denk.

Functional and structural analysis

This discovery was made possible by combining two different microscopy methods. The scientists succeeded, first, in determining the preferred motion direction of the ganglion cells using a two-photon fluorescence microscope. A calcium-sensitive fluorescent dye indicated in response to which stimuli calcium flows into the cells -- a process that signals electrical activity in cells.
They then measured the exact trajectory of all of the dendrites of these ganglion cells and those of connected amacrine cells with the help of a new electron microscopy method known as serial block face electron microscopy. This process enabled them to produce a volumetric image by repeatedly scanning the surface of a tissue sample using the electron beam of a scanning electron microscope. A thin "slice" is shaved off the sample surface after each scan is complete, using an extremely sharp diamond knife. These slices are thinner than 25 nanometers, just about one thousandth of the thickness of a human hair.
The high three-dimensional resolution of this method enabled the scientists to trace the fine, densely packed branched dendrites of retinal neurons and clearly identify the synapses between them. The complete automation of the imaging process enables them to record data sets with thousands and even tens of thousands of sections "while on holiday or attending a conference," says Winfried Denk. "For the first time, minute cell structures can now be viewed at a high resolution in larger chunks of tissue. This procedure will also play an indispensable role in the clarification of the circuit patterns of all regions of the nervous system in the future."

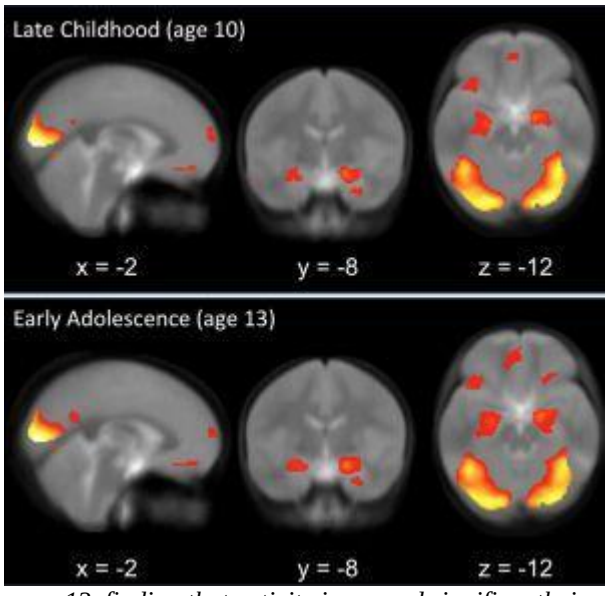
Story Source:
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Max-Planck-Gesellschaft**.

Journal Reference:

1. Kevin L. Briggman, Moritz Helmstaedter, Winfried Denk. **Wiring specificity in the direction-selectivity circuit of the retina**. *Nature*, 2011; 471 (7337): 183 DOI: 10.1038/nature09818

http://www.sciencedaily.com/releases/2011/03/110309132013.htm

In Adolescence, the Power to Resist Blooms in the Brain



Researchers compared the fMRI results from age 10 to age 13, finding that activity increased significantly in the ventral striatum and the ventral medial portion of the prefrontal cortex over this three-year period. (Credit: Image courtesy of University of Oregon)

ScienceDaily (Mar. 9, 2011) — Just when children are faced with intensifying peer pressure to misbehave, regions of the brain are actually blossoming in a way that heighten the ability to resist risky behavior, report researchers at three West Coast institutions.

The findings -- detailed in the March 10 issue of the journal *Neuron* -- may give parents a sigh of relief regarding their kids as they enter adolescence and pay more attention to their friends. However, the research provides scientists with basic insight about the brain's wiring, rather than direct clinical relevance for now.

In the study, 24 girls and 14 boys from ethnically and socioeconomically diverse backgrounds underwent functional magnetic resonance imaging (fMRI) scans twice, at ages 10 and 13, the latter representing when children have moved into early adolescence. Each time, they were presented with photos of faces making neutral, angry, fearful, happy and sad emotional expressions.

Non-invasive fMRI, when focused on the brain, measures blood flow changes using a magnetic field and radio frequency pulses, producing detailed images that provide scientists with information about brain activity or help medical staff diagnose disease.

Researchers compared the fMRI results from age 10 to age 13, finding that activity increased significantly in the ventral striatum and the ventral medial portion of the prefrontal cortex over this three-year period. In addition to the scans, the researchers considered the children's self-reports on their ability to resist peer influences and engagement in risky or delinquent behavior.

The most enhanced response occurred in the ventral striatum, a brain region most frequently associated with reward-related processing. Over time, increases in brain activity there correlated with increases in children's resistance to peer influence.

"This is a complex point, because people tend to think of adolescence as the time when teenagers are really susceptible to peer pressure," said Jennifer H. Pfeifer, professor of psychology at the University of Oregon. "That is the case, but in addition to that added susceptibility they are also improving their ability to resist it. It's just that peer pressure is increasing because they spend a lot more time with peers during this time and less time with family. So it is a good thing that resistance to such influences is actually strengthening in their brains."

This study, which researchers believed to be the first to report longitudinal fMRI findings about changes in the way the brain processes emotion during this critical time of brain development, appears to fit into a

growing body of evidence that ventral striatum development during early adolescence is critical to emotional regulation carried out by the brain's prefrontal circuitry, the researchers concluded.
"This is basic research that hopefully is laying the foundation for future studies with even more clinical relevance," said Pfeifer, director of the Developmental Social Neuroscience Lab. "We really have a lot to learn about how the brain responds to really basic emotional stimuli across development."
There was a surprise finding that deserves more study, though, Pfeifer said. Responses in the amygdala -- a small almond-shaped mass centrally located deep in the brain -- showed significant increases during this period only to the sad faces.
The amygdala plays a major role in emotional reactivity and indexing the salience of things in the environment. It's possible, Pfeifer said, that this response to sad faces could somehow be tied to the emergence of depression, especially in girls.
"This response in the amygdala raises questions we hope to pursue," she said. "The span from age 9 to 13 is critical in pubertal development. How do individual differences apply here? Identifying this response to 'sadness' in the amygdala opens the door to thinking about how changes in emotional reactivity might be related to the increase in depression that we see as kids enter puberty. Rates of depression are particularly enhanced for teen girls. Is this increased response to sad faces somehow part of that?"
Based on results of the new study, she added, "I think what we know about the ventral striatum may be poised to undergo a transformation over the next several years."
Six co-authors on the study with Pfeifer were: Carrie L. Masten of the Center for Mind and Brain at the University of California, Davis; William E. Moore III and Tasha M. Oswald, both doctoral students in the UO psychology department; John C. Mazziotta of the Ahmanson-Lovelace Brain Mapping Center at the University of California, Los Angeles; and Marco Iacoboni and Mirella Dapretto, both colleagues of Mazziotta and also with the FPR-UCLA Center for Culture, Brain, and Development at UCLA.
The National Center for Research Resources of the National Institutes of Health supported the research through three grants to the collaborating scientists.

Story Source:
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University of Oregon**.

Journal Reference:

1. Jennifer H. Pfeifer, Carrie L. Masten, William E. Moore, Tasha M. Oswald, John C. Mazziotta, Marco Iacoboni, Mirella Dapretto. **Entering Adolescence: Resistance to Peer Influence, Risky Behavior, and Neural Changes in Emotion Reactivity**. *Neuron*, Volume 69, Issue 5, 1029-1036, 10 March 2011 DOI: 10.1016/j.neuron.2011.02.019

http://www.sciencedaily.com/releases/2011/03/110309125147.htm

Pi day: Celebrate pi by eating pies

- 15:26 14 March 2011 by **Jacob Aron**

Mmm... pi (Image: Delft University of Technology, applied physics, seismics and acoustics)

Find out more about pi in our Pi day special, including fabulous pi facts, Alice's adventures in algebra, and more mathemagical trickery

Pi day has rolled around once more: the day when mathematics fans everywhere – particularly in the US, where the date is written 3.14 – celebrate everyone's favourite mathematical constant.

If you are wondering about the best time of day to celebrate, unfortunately you have already missed it. The first few digits, 3.14159, translates this year into March 14 at 1:59 am. It will be at a more sociable hour in four years' time, when the festivities should kick off on 3.14.15 at 9:26:53.

Don't let the niceties of timing put you off, though. Princeton University has already celebrated with an extended weekend of events, culminating in a celebration of Pi day itself. The four-day event included pi recitations, pie eating contests, and pi shopping deals for $3.14 or $31.40. Today is also Albert Einstein's birthday, leading to the inevitable creation of the Einstein Pie.

But don't worry if you can't make it to a pi party in person. You can still dial in. Pi fan Christopher Poole has set up a pi phone – call the US telephone number 253 243-2504 to hear the digits read out. Don't listen for too long, though: since pi goes on forever, who knows how much it could add to your phone bill.

Musical pi

If that sounds a bit dry, you might prefer Michael John Blake's transformation of pi's digits into music (see video above). And while you are on a musical tip, you might enjoy entertainer David C. Perry's tribute Talking Pi, which features "the most unsingable chorus ever".

Too jocular? Perhaps you would prefer a more cerebral challenge. The Pi day challenge, now in its fourth consecutive year, offers 30 logical puzzles to put your pi knowledge to the test. Last year, nearly 100,000 participants from 120 countries solved more than 150,000 puzzles; maybe this year you will be among them.

Did we say that pi was everyone's favourite constant? Not quite. Even constants have enemies. Earlier this year physicist Michael Hartl told *New Scientist* that pi's iron grip on our affections is blinding us to the fact that it's not the most natural choice of "circle constant".

Hartl says we would be better off using tau (equal to two pi), which allows geometric relationships to be stated more elegantly and comprehensibly. But Hartl's no party pooper: you can simply celebrate Half Tau day instead.

http://www.newscientist.com/article/dn20238-pi-day-celebrate-pi-by-eating-pies.html?full=true&print=true

Pi day: Five tasty facts about the famous ratio

- 17:31 12 March 2010 by **Jacob Aron**

Putting on a spread for Pi day (Image: Steph Goralnick/Getty)

Mathematics enthusiasts will this weekend be celebrating Pi day, which falls on 14 March in honour of the famous ratio's first few digits, 3.14. You probably know that pi is the circumference of a circle divided by its diameter, but here are some less familiar facts about the mathematical constant. We did consider giving you 3.14 facts but alas we had five…

Pi really is in the sky…

The stars overhead inspired the ancient Greeks, but they probably never used them to calculate pi. Robert Matthews of the University of Aston in Birmingham, UK, combined astronomical data with number theory to do just that.

Matthews used the fact that for any large collection of random numbers, the probability that any two have no common factor is $6/pi^2$. Numbers have a common factor if they are divisible by the same number, not including 1. For example, 4 and 15 have no common factors, but 12 and 15 have the common factor 3.

Matthews calculated the angular distance between the 100 brightest stars in the sky and turned them into 1 million pairs of random numbers, around 61 per cent of which had no common factors. He got a value for pi of 3.12772, which is about 99.6 per cent correct.

… as well as the rivers back on Earth

Back on Earth, pi controls the path of winding rivers from the Amazon to the Thames. A river's meandering is described by its sinuosity – the length along its winding path divided by the distance from source to ocean as the crow flies. It turns out the average river has a sinuosity of about 3.14.

Pi is the only number to have inspired a literary genre

In his upcoming book *Alex's Adventures in Numberland*, journalist Alex Bellos describes how pi has inspired a particularly tricky form of creative "constrained" writing called Pilish. These are poems – or "piems" – where the number of letters of successive words is determined by pi.

One of the most ambitious piems is the *Cadaeic Cadenza* by Mike Keith. It begins with the lines: *One/A poem/A raven*, corresponding to 3.1415, and continues for 3835 word-digits. Keith has also written a 10,000-word book using the technique.

You can find pi in your front room

The current record for finding the value of pi stands at just under 2700 billion digits, set by Fabrice Bellard late last year. He used a computer, but you can also calculate pi at home with some needles and a sheet of lined paper.

Drop the needles on the paper and calculate the percentage that fall on a line. With enough attempts, the answer should be the needle length divided by the width between lines, all multiplied by 2/pi.

This is known as Buffon's needle problem, after the French mathematician Georges-Louis Leclerc, Comte de Buffon, who first proposed it in 1733. The theory was put to the test in 1901 by Mario Lazzarini, a

mathematician who dropped 3408 needles to get a value of 3.1415929…, correct to the first six decimal places. Subsequent examination of his results suggests he might have fiddled the numbers, as Lazzarini just happened to choose numbers for the needle length and line width that gave the answer 355/113, a well-known approximation to pi.

Your bank details can be found in pi

Pi is an irrational number, which means its decimal representation goes on forever. This means that potentially every possible number you can think of is hidden somewhere in pi – your date of birth, phone number, or even your bank details. What's more, using a code that converts numbers into letters would let us find the Bible, the complete works of Shakespeare, or indeed every book ever written, if we looked at enough digits.

There's one catch: for this to be true, pi would have to be a "normal" number, and we don't yet know if it is. If it's normal, the numbers 0 to 9 will appear equally often in its decimal representation. That means any single-digit number occurs one-tenth of the time, any two-digit number one-hundredth of the time, and so on.

The probabilities get vanishingly small when you start looking for the huge numbers of digits corresponding to the Bard, but just like those infinite monkeys and their typewriters, you'd get there in the end.

Until mathematicians figure out whether pi is normal or not, why not try searching the first 200 million digits yourself?

http://www.newscientist.com/article/dn18649-pi-day-five-tasty-facts-about-the-famous-ratio.html?full=true&print=true

Evolving Higher Ed Hubs

March 11, 2011
HONG KONG -- In the global economy, many nations want to be known as a "higher ed hub." Singapore, Malaysia, Hong Kong and several countries in the Middle East are all striving to attract some combination of local and international universities that would make them a regional center for education and research. The theory goes that some of the top student talent from the area may stay at home rather than rushing off to the United States, Britain or elsewhere. And that talent will then become an educated work force, providing key services and starting businesses.
In many discussions of hubs, they are mentioned as if they are interchangeable. Qatar has Cornell University and Carnegie Mellon University; Abu Dhabi has New York University and the Sorbonne.
But at a session here today at Going Global, the British Council's annual international education conference, educators from Qatar and the UAE pointed to the very different paths these two hubs have taken -- and to evolutions on both of those roads. Generally, the UAE has taken a much more decentralized approach to the development of higher education, but is now taking a series of steps to promote higher levels of quality. Qatar is known for a highly strategic approach that has attracted numerous top universities to Education City there. But an official of the Qatar Foundation, which provides the leadership for the effort, said that it's time to move beyond strictly national definitions of hubs.

Beyond the Single Nation Hub

Ahmad Hasnah, associate vice president for higher education of the Qatar Foundation, spoke with pride of the universities that have been drawn to Qatar's Education City and of the intellectual community that has been created there.
But Hasnah suggested that there may be flaws with the model of expecting a single nation to build up a true hub -- even if Qatar has done so. In many countries, he said, "a lot of the spending has not been in the right places," and there can be a false sense that any country can achieve excellence across a wide range of fields. In reality, he said, "you don't have to be excellent in everything."

Further, he said that it may not be wise to "depend on one government for funding," given that the interests of governments change. He suggested that it is time to focus more on regional hubs, with countries supporting efforts that cross borders. Such an approach can be difficult, he acknowledged, as universities value their autonomy and countries tend to be picky about when money "can cross borders." But noting that the Qatar Foundation works with universities all over the world, and that many other countries provide scholarships for students to study in Education City, he said this goal is attainable.
Hasnah also encouraged the many academics present from would-be education hubs to consider a financing model associated with the United States -- endowments -- and to possibly consider tweaking it. Hasnah said that top American universities have achieved their excellence in part because of the "financial stability" provided by endowments.
In many countries, Hasnah said, it may be difficult to get wealthy donors to make sizable permanent donations, so he suggested something of a loan system in which individuals would be persuaded to part with large sums of money for a defined period of time so that universities could earn the interest, but then return the initial gift at a specified time.
The idea of hubs that aren't focused on a single country seemed to captivate many in the audience -- and the concept was endorsed by some questioners, even as they wondered if governments would share Hasnah's views. "There's a kind of orthodoxy that education hubs are the way to go," said one audience member. "But a dependence on national and state governments is folly."

A Federal System

The UAE has captured attention of late with deals to start up campuses in Abu Dhabi by NYU and others. While Abu Dhabi has gone with this high profile approach, it is but one of the emirates in the UAE, which has a higher education system that is young and decentralized.
Consider that United Arab Emirates University -- the nation's oldest and largest university -- was founded only in 1976.
Wyatt R. Hume, the provost there, noted that for half of the institution's history, it was the only university in the country. While dozens have been created recently, only three are part of the federal system -- the

remainder are affiliated with one emirate or another, with very different educational philosophies. Dubai has taken an approach of encouraging experimentation. Abu Dhabi has gone after some big players abroad.

The nation's universities also reflect a mix of sensitivity to local traditions and some challenges to them, Hume said. He noted that his institution was created to serve men and women -- not a sure thing at the time it was founded. But it was also created with separate programs for men and women. Today, 80 percent of students are women, he said. There will be challenges ahead, he said, because the country's leaders want more of their students educated at universities that, like his, do much of their teaching in English. But many high school students aren't provided an education that would make them able to pursue such an education, he said.

The UAE has turned to accreditation to try to ensure that there are floors on academic quality and to encourage efforts that address national goals, not just institutional objectives.

The Commission for Academic Accreditation reviews both institutions and individual programs -- and there are 71 licensed institutions there at last count, said Bruce Taylor, a commissioner. He described numerous steps taken to encourage frank reviews of institutions and programs, including the use only of review panels of academics from outside the country.

These reviews extend to international institutions setting up branches in the country. Generally, Taylor said, the UAE welcomes the branches and the interest, and the main concern is about whether all of these new programs will have "staying power." (In recent years, both George Mason University and Michigan State University have pulled the plug on campuses in the country.)

The accrediting commission is now embarking on a series of efforts to promote higher quality, Taylor said. First, it is working with other government agencies to establish "a national qualifications framework" so different degrees from different institutions will signify similar competencies (comparable efforts are fairly advanced in Europe and in more embryonic forms in the United States). Second, it is organizing efforts to bolster selected areas of the educational offerings, for example by promoting a "foundation year" for those who graduate from high school but need remedial education to succeed in college, and by looking for ways on the other end of the spectrum to grow doctoral education in the country. The commission is also looking to expand collaboration with universities and accrediting agencies in other countries.

Taylor said that he sees several ways to build higher education hubs. The efforts can be led directly by investments by governments, by individual institutions or by corporate interests. He said that the best approach must involve the government at some level, although not necessarily by shaping all the decisions. He noted favorably the extent to which the UAE has let individual institutions and emirates advance in their own ways. But he said that the commission's efforts point to the government role of "setting parameters."

— Scott Jaschik

http://www.insidehighered.com/news/2011/03/11/experts_consider_the_evolution_of_higher_education_hubs

Slugging — The People's Transit

In Washington, D.C., commuters have taken thousands of cars off highways via a homegrown rideshare system known as "slugging." Can the government create more slugs — without stepping on any?

By Emily Badger

Every day, an estimated 10,000 people in the Washington, D.C., area are participating in a rideshare program they've created called "slugging." (Monica Lopossay)

Workers who have come down from the surrounding high-rise offices begin to line up on a sidewalk in downtown Arlington, Va., across the Potomac from the nation's capital, about 3:30 in the afternoon. They stand in a perfect queue, iPods and newspapers in hand, and they look, by all indications, like they're waiting for the bus.

Public transit never shows. But, eventually, a blue Chrysler Town & Country does. The woman behind the wheel rolls down her window and yells a kind of call-and-response.

"Horner Road?"

"Horner Road?" repeats the first woman in line.

"Horner Road!"

And two women get in the van, heading, presumably, for Horner Road. Several more cars pull up: a Ford Explorer, a Toyota Camry, a Saturn minivan. Each collects a pair of passengers and pulls out past the intersection for the on-ramp onto State Route 110, which leads three miles to the south, past the Pentagon and onto Interstate 395/95 and its glorious 28 miles of uninterrupted, controlled-access, high-occupancy vehicle lanes.

The queue of cars eventually backs up around the corner, and the line of passengers on the sidewalk ebbs. In a few minutes, the balance shifts again. Within half an hour, nearly 50 cars will have come through, capped by a dusty Ford F-250 pickup truck.

"I don't care where we go," yells the driver. "I just need two people!"

And off the three go toward the highway — and the suburbs — complete strangers, with not the least concern for personal safety, trying to shave 20 or 30 minutes, maybe more, off their afternoon trip home. "People are *cooperating* … to *commute*?" says Marc Oliphant, underscoring the novelty of what is going on here. "It's like the opposite of road rage!"

Oliphant has brought a dozen local and federal transportation officials to the sidewalk here to gawk at the commuters. No one would believe this sight unseen: People here have created their own transit system using their private cars. On 13 other corners, in Arlington and the District of Columbia, more strangers — Oliphant estimates about 10,000 of them every day — are doing the same thing: "slugging."

Their culture exists almost nowhere else. San Francisco has a similar casual-carpooling system, and there's a small one in Houston. But that's it. Even in D.C., slugging exists along only one of the city's many arteries, I-95 and 395, where the nation's first HOV lanes were completed in 1975.

Every morning, these commuters meet in park-and-ride lots along the interstate in northern Virginia. They then ride, often in silence, without exchanging so much as first names, obeying rules of etiquette but having no formal organization. No money changes hands, although the motive is hardly altruistic. Each person benefits in pursuit of a selfish goal: For the passenger, it's a free ride; for the driver, a pass to the HOV lane, and both get a faster trip than they would otherwise. Even society reaps rewards, as thousands of cars come off the highway.

"To me," marvels Oliphant, a facilities planner with the Navy, "it's an illustration of the ideal for government."

He's drawn to slugging as a creative vision that would begin to ease the eternal mess of urban gridlock. Society always reaches first for the infrastructure fix — the costly highway expansion, the new route for the metro rail. But what if government could just nudge more people to do what they've done here, creating their own commuting cure within the existing system? Federal Highway Administration studies suggest that free-flowing traffic can be restored on a clogged highway simply by removing 10 percent of its cars.

To get more drivers into a self-sustaining casual carpool, though, officials would have to confront slugging's built-in complication. They'd have to figure out how to stimulate slugging elsewhere without spoiling its defining feature: Government is not involved, or at least it looks not to be.

Slugging — The People's Transit from Miller-McCune on Vimeo.

Oliphant, a trim and animated 30-year-old, spent six months on loan from the Navy last year thinking about just this question as a Federal Highway Administration transportation policy fellow. He began studying slugs three years earlier for a master's thesis at Virginia Tech. ("Slugging is not most interesting for what it can teach about carpooling," he wrote, but rather for the trust among strangers it requires and its leaderless organization. "Slugging is a contradiction to the everyday culture of America.")

"Whenever I meet someone new, all I have to do is ask about their commute, which I'm often very interested in," he says. "And I get an immediate emotional response. Especially for people in urban areas, it's like this universal problem. No one likes how they get to work."

Including him. He used to bike from his home in Virginia to his office at the Navy Yard in Southeast Washington. But last summer was even hotter than the usual D.C. steam bath, and his new office had no shower. His wife tried dropping him off by car (20 minutes door to door), with a return trip home at night by metro (1 hour, 10 minutes door to door). On mornings when Oliphant uses public transit, he gets on a bus about a block from his house, rides to the local metro stop, takes a subway into the city, transfers once, then walks 10 minutes on the other end to his office. In more than an hour, he covers about six miles.

The benefits of slugging: For the passenger, it's a free ride; for the driver, a pass to the HOV lane, and both get a faster trip than they would otherwise. (Monica Lopossay)

But a driver who hops on the HOV from Horner Road, 23 miles south of the city, can cover that distance in about 30 minutes.

"The way the entire transportation system in this country is set up is to support people traveling by their own car," he says. "So parking is subsidized. The incentive with lots of different laws and programs is to drive as much as possible."

In America, he says, cars have become an extension of houses. Most people would no sooner think to let a stranger into the back seat than they would let the same stranger into their living rooms. Americans drive cars everywhere because gas relatively cheap (half what it costs in Europe), because only 6 percent of the interstate highway system requires tolls, because insurance rates are unrelated to how many miles people drive. We pay for the land we live on, but we expect the parking spot out front to come free of charge. The federal government has lately encouraged drivers with tax breaks to buy, variously: a new car, a hybrid or clean-diesel vehicle, a truck or SUV weighing more than 6,000 pounds, or any upgrade from a "clunker."

Then, regardless of what we drive, the IRS invites lucrative tax deductions for work travel, now at 50 cents a mile.

Go ahead, all the signs (and car ads) seem to suggest: Buy your own car — and ride in it alone!

"I think your average Joe or Jane who doesn't know anything about transportation thinks things are the way they are because that's what society wants," Oliphant says glumly. "And that's not really the case."

What if, instead of one bus with a capacity of 50 that came along every 30 minutes, five cars came along every few minutes, each with a capacity to carry five people? Looked at broadly, Oliphant says, slugging *is* a kind of public transit, because public subsidies pay to pave and restrict the HOV lanes on which slugging relies.

What the people using HOV lanes really want, apparently, is not to enjoy their own company in a stylish and spacious single-occupancy vehicle. People who become slugs just want to get to work and home to dinner as painlessly as possible.

In late July, Oliphant organized a symposium on slugging in a conference room of the Arlington County Commuter Services office. The topic had been, until now, a fringe curiosity, largely ignored by local officials and transportation academics. The few paying attention had never talked to each other, but the meeting drew three dozen people: a local politician, a researcher from the University of Maryland, officials from the district and staffers from the Virginia Department of Transportation and the Federal Highway Administration.

Oliphant introduced them all to David LeBlanc, a retired Army officer best described as a folk hero to the slugging community.

"This guy has basically been running a small public transit system for the last 10 years!" Oliphant said, making LeBlanc blush. He is frequently in the awkward position of explaining that he doesn't *lead* the slugs. Slugs organize themselves.

When LeBlanc moved to the area in the mid-1990s, slugging was already entrenched. It was born alongside the I-395 HOV in the 1970s. According to the slugs' creation story, drivers quickly realized they could get people in their cars and qualify for the new lanes by poaching waiting passengers from bus stops. Bitter bus drivers are credited with coining the term "slug," originally a derogatory reference that has been amiably reappropriated.

The first organized slug line is thought to have formed in the parking lot of Bob's Big Boy restaurant, now a Shoney's, in Springfield, Va. Its destination — as with most early slug lines — was the largest single employment center in the country: the Pentagon. There are 25,000 people who work there, and the site is a hub for two underground Metro lines and exponentially more bus routes.

LeBlanc moved to town from Missouri, where he drove four minutes to work each morning and parked in a spot right out front. A friend in Washington warned him. "He said one of the biggest issues in D.C. is where you're going to live and how you're going to commute," LeBlanc says. "A lot of people, they try to figure out the commute first."

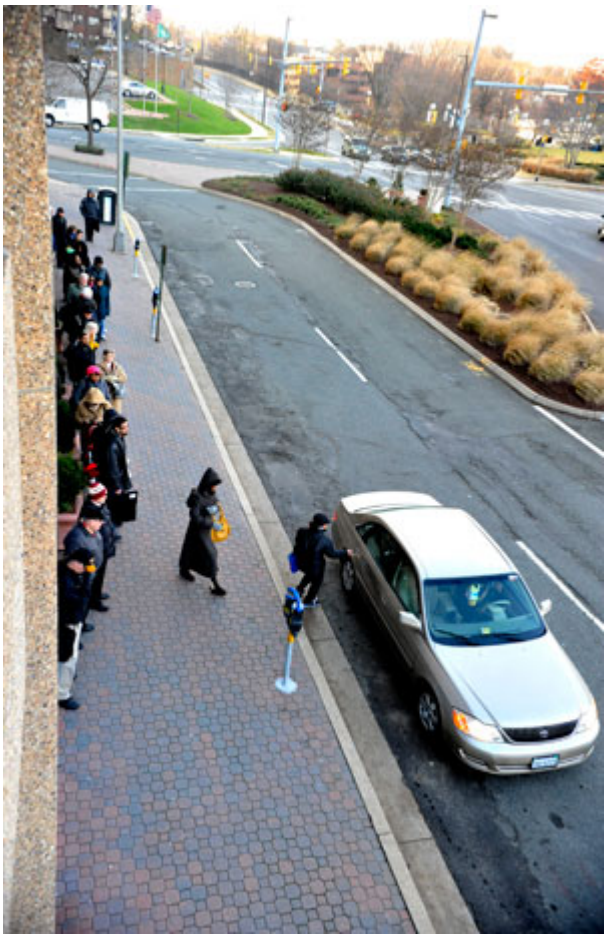
The friend suggested slugging. LeBlanc balked at the idea. For several weeks, he rode the bus 25 miles from Woodbridge, catching it each morning in the same commuter lot where strangers were hopping into each others' cars. Oliphant often wonders about what pushes people into that position for the first time.

For LeBlanc, it was a morning in the winter of 1996.

"The light bulb went off," he says. "Here I am standing in the rain, in February, it's really cold, I'm waiting for a mode of transportation that's going to get me to work slower and cost me money. And I could just walk across the street, and maybe that would get me to work faster, easier. Let me just try it this one time; give it a try."

Of course, he never went back. Cars in the HOV lane regularly travel above the speed limit through a corridor where the average speed during congestion is 14 miles an hour. Once you've been in that lane, your whole quality of life changes.

LeBlanc slugged to the Pentagon for months, using the subway to hop two stops north to his office in Rosslyn. Eventually, he learned there was a slug line there, too. Up to that time, the slugging culture had sustained itself for 20 years entirely by word of mouth. You could only learn about the system from people inside it, and even after you joined a particular slug line, you might not know about others.



LeBlanc decided slugs needed a book, one that would identify all the lines and the unwritten rules for how to use them. In 1999, he self-published 1,000 copies of *Slugging: The Commuting Alternative for Washington, D.C.* (Today, a "collectible" signed copy sells on Amazon for $88.65.) "I wrote this book," he explains in an introduction, "because I don't want others to have to learn about slugging the way I did … through the school of hard knocks." But he put his book out of business with its corresponding website.

A decade later, slug-lines.com is the hive of community wisdom. LeBlanc posts a code of etiquette, and the denizens have their message boards where they swap tales of all who violate it. The rules are intricate, if unenforceable: Passengers don't speak unless spoken to; no talk of religion, politics or sex; no cell phones, no money offered, no smoking; no asking to change the radio station or to adjust the thermostat; and never, ever leave a female slug waiting in line alone. Also frowned upon is something called "body snatching" — cruising a parking lot for passengers to avoid waiting in the orderly first-come, first-served car queue. And, it should go without saying, no one wants to watch you put on your makeup or eat your Egg McMuffin.

One of the more curious slugging behaviors does not appear on LeBlanc's list: Most cars pull up to a slug line and, regardless of its length, pick up two passengers — and only two.

Jim Cech, who also attended the symposium, gets agitated about the Pentagon parking lot. He pulls out a legal notepad and begins to sketch a diagram: Here are the bus bays, the parking spots, the police directing traffic. There are also eight slugging queues at the Pentagon, heading to more than 15 destinations. The scene is chaotic and not, as Cech fumes, as efficient as it could be.

"Single points of failure drive me crazy," he says.

To improve the slugging situation at the Pentagon, last year Cech started a side business in his basement. He has been driving slugs for nearly 20 years and figured he could shave a few more minutes off his commute with a sign mounted to the roof of his car, instantly communicating his destination. Currently, each driver must negotiate out the window with each potential passenger to find the right match. Cech's business, RUGoingMyWay, would eliminate those interactions.

He found a company in China to produce his acrylic signs, another in Canada to make the roof-mount magnets, an outlet in Florida to print the stickers, and a webmaster in India to host his site.

"It's become an international business," he jokes, "all designed to help me get to work faster!"

Cech's labor, like LeBlanc's, speaks to a key element of the system: Absent any real organization, slugging thrives on the compulsion of individuals who are extremely interested in finding small efficiencies. This is, not coincidentally, what Cech also does by day as an engineering consultant working on naval radars. (Like LeBlanc, he is also retired military.)

"My day job is trying to eke out seconds and miles and bytes," he says from his office near the Navy Yard. "In order for the system I'm working on to be more effective, the radar's got to search quicker, the missile's got to fly straighter, the time to solve the solution has got to go quicker, the data rate has got to be more efficient. The errors have got to be reduced. It's the same kind of thing, trying to address a systems problem."

He explains that slugs are, above all, motivated by time saved, not money pocketed — and certainly not by any regard for the environment. A Prius is a rare sight pulling into a slug line. Those ostensibly eco-conscious drivers don't need slugs to reach a three-person HOV threshold; hybrid owners in Virginia are eligible for a special clean-fuel license plate that gives them a free pass into the HOV.

"Lots of people will pay money for the gas, they'll pay the money for the tolls," Cech says. Some of them will even pay to risk the HOV as a single-occupancy vehicle. The first infraction costs $150, and it quickly escalates to $1,000. "The thing you can't buy," Cech says, "is time."

He concedes that he's not likely to recoup in minutes saved in the Pentagon parking lot all the hours he has invested in his basement business. He took on the project after retiring as the president of his homeowners association. RUGoingMyWay has become, in place of that responsibility, something of a personal challenge.

Cech's understanding of the psychology of slugging mirrors one of the startling findings of Oliphant's thesis. Oliphant surveyed 284 participants and asked them, among other things, what they liked least about slugging. Only 31 people mentioned "riding with strangers." In the three-decade history of the activity, there has not been a single known incidence of violence or crime. When safety was cited as a concern, slugs worried about safe drivers, not personal attacks.

The homogeneity of Washington's work force may play a role in this casual acceptance of strangers in cars. With so many federal employees and military personnel, people here even look alike, sporting uniform haircuts, black briefcases and government IDs. "If you're a government employee or in the military, you're taught 'the group,' not individualism," suggests Donald Vankleeck, a civilian on his way to Bolling Air Force Base one morning in September at 80 miles an hour. "So it's nothing to get in a stranger's car. You may have been all over the world serving with people whose first names you never knew."

Where apprehension does exist, Cech recasts it in oddly bureaucratic terms: "It's not fear for safety; it's fear for time," he says. "Are you going to be held hostage to someone else's agenda by riding with them?"

What if a driver swings by the Dunkin' Donuts drive-through before getting on the highway?

The casual-carpooling system that thrives across the country in San Francisco betrays any notion that slugging could exist only in Washington. The Bay Area network grew up in similarly organic fashion in the 1970s, although more as a response to public transit service disruptions and rising gas prices.

Today, slugging exists on the HOV corridor on Interstate 80 between the East Bay and, across the Bay Bridge, San Francisco. In addition to time savings, commuters scored an additional advantage: Most cars crossing the Bay Bridge westbound into the city paid a $4 toll. Carpools passed through for free — until last summer.

On July 1, the Metropolitan Transportation Commission changed the toll structure in a way that dramatically disrupted the local slugging ecosystem. Now, everyone must pay a toll to cross the Bay Bridge. Three-person carpools owe $2.50, which must be paid through an electronic transponder usable only in the HOV lane. Everyone else pays a variable rate — $6 per car during rush hour and $4 during the off-peak times. Carpools without the transponder must stop and pay the full rate, in cash, at a toll booth.

"Despite the fact we had all this messaging — we were trying to talk about it for months leading up to July 1 — people still just didn't get it," says Susan Heinrich, the commission's rideshare and bicycling coordinator. Local news stations filmed bewildered drivers pulling into the wrong toll lanes and trying to back out of them, then waving cash at automated transponders.

Back in the East Bay commuter lots, where casual carpools form each morning, more confusion ensued. The new tolls still give carpools crossing the bridge a financial incentive, but the existence of any toll at all where once none existed has dislodged a central tenet of slugging: No money changes hands. Without tolls, slugging is a perfectly equal exchange between riders and drivers.

Since July 1, the discussion board at ridenow.org — the West Coast equivalent of David LeBlanc's cyberhub — has been dominated by hundreds of comments on the topic of who pays for the toll. Should passengers each offer up a dollar? Does the burden lie with the driver or the rider to broach the issue? Should drivers who expect a donation advertise that in a window sign? The debate has thrust the whole premise of slugging into question: Who, after all, is providing the service here?

"Certainly the contentiousness that exists here on the discussion board must carry over into our carpools in the morning," one commenter laments. "This is not good for the community."

"We don't know exactly how all of this is going to play out yet," Heinrich says. Transit officials did know, however, that one month after the toll's implementation, carpooling was down 26 percent on all area bridges.

Heinrich suspects that the community will eventually settle into a détente, with the driver paying the toll. Drivers still earn a discount thanks to the added bodies. And, most important, they still reap the time savings on the HOV.

The toll crisis, however, highlights the delicate balance of interests essential for a slugging ecosystem to exist — and why this activity thrives in so few places. In Oliphant's view, HOV-4 — that is, a requirement that a car have four occupants to drive in the high-occupancy vehicle lane — doesn't work, but HOV-3 does. HOV-3 lends a sense of security in numbers that HOV-2 never could. The lanes, preferably separated by physical barrier from the rest of traffic, must be long enough for time savings to accrue. The fines for violating them must be steep enough to force compliance. Parallel public transit must exist as a reliable backup. And employment nodes must be situated just so, creating dense, communal urban epicenters that draw workers from across suburbia.

Back on the East Coast, Gabriel Ortiz, the transportation demand management coordinator for Alexandria, has been trying to do what no municipal official has done in the area's slugging history — create a slug line from scratch, artificially. Washington's slug lines have expanded over the years, always in response to the demand of the community and with the initiative of some of its members.

But slugs have never had a government body create a new line for them, and the proposition entails both logistical and philosophical dilemmas. LeBlanc, whom Ortiz enlisted as a consultant to the project, warned that he would have to achieve just the right balance of drivers and passengers in the experiment's first phase to make the new line stick. Downtown Alexandria isn't located immediately off the HOV, as destinations in Arlington and the district are. So Ortiz was toying with the idea of temporary perks, maybe Starbucks gift cards, to incentivize people where slugging's natural conditions don't already exist.

Once a slug himself, Ortiz knew he'd also have to contend with the community's deep distaste for meddling. Many slugs told Oliphant that they thought any type of intervention — the very idea Oliphant is devoted to encouraging in urban areas outside Washington — would "ruin" the system. (Cech points out that there is an irony here, or perhaps just a depressing commentary on the state of government competence: Many of the slugging proponents who abhor government involvement work, well, for the government.)

"Slugging is its own thing, and I don't want to have a heavy hand in saying 'Here's City Hall doing this!'" Ortiz says. "We want to keep things kind of low-key."

Chris Hamilton, the Arlington County Commuter Services bureau chief, understands this better than anyone. Sitting in the 11th-floor office where he hosted Oliphant's symposium two months earlier, he confesses that Arlington has been quietly funding LeBlanc's website with an annual $10,000 grant. For 10 years. The site doesn't disclose the connection, and Hamilton seldom does.

"It's not public knowledge because we don't want people to know; it works fine the way it is — that people think it's just this little slugging community," he says. "The slugging community has always had that idea about themselves, that this is their own thing, and they've created it, and they don't need anybody else to muck it up."

The $10,000 is not much in Arlington's $8 million commuter services budget. A model for urban smart growth atop a public transit corridor, the city has 50 people who work in this office trying to prod residents and commuters into alternative transportation. The city promotes the Metro, carpooling, bike lanes and walkable development.

Some officials continue to harbor the suspicion that slugging siphons riders — and fares — from public transit (and not from single-occupancy vehicles). But Hamilton says he doesn't care how people get to the city, as long as they don't drive. He also shakes off the suggestion that a city takes on legal liability the moment it encourages people to ride in cars with strangers. If the city also promotes buses and bike lines, and someone is injured using those, is Arlington at fault?

"Slugging is kind of like a dream come true for someone like Chris Hamilton," Oliphant says. "His job is to give people information, to basically convince them to do anything other than drive their own car. This is like a miracle to him, because he has to spend all this time and energy going, 'Here's the bus, here's how you do it!' In slugging, people are lining up on their own to do it; you don't have to do a thing."

Oliphant always chuckles at slugs' insistence that government stay out of the way. The whole system wouldn't work if it weren't for a crucial official outlay: If law enforcement didn't police the HOV lanes, there would be no incentive for scofflaws to stay out of it, and no time savings for the carpoolers who go so far out of their way to get in.

Government is also responsible for the free, sprawling park-and-ride lots that dot the I-95 corridor, several of which have flyovers directly onto the HOV. Government is, of course, also responsible for designating the carpool lanes. In short, it has had a hand in creating every element of infrastructure that gives rise to slugging in the first place. At the Pentagon and in Arlington, officials have even put up signs for each slug-line destination ("Horner Road," "Tackett's Mill").

"There are more creative ways to generate beneficial behaviors than the direct heavy-handed ways," Oliphant says. "I see it as: Give people lots of choices, subsidize the beneficial ones and tax the non-beneficial ones."

This idea resonates increasingly as the funding for heavy-handed transportation solutions — road expansions, for example — dries up, and as the available space to construct them in dense urban areas disappears. Transportation officials could work with what they have, identifying more HOVs, or converting existing HOV-2s into HOV-3s. They could open more carpool lots in collar counties and build rain shelters to accommodate waiting carpool passengers in the city.

The district is now contemplating this last option in a bid to relocate slugs off of 14th Street, a congested north-south thoroughfare through the city (this, after an outbreak of moving violations incurred the wrath of the slug community). District officials have now smartly offered to solicit community input through LeBlanc's website and have held several meetings with the slugs.

"Ten, 11 years ago when I first got involved, nobody from government would even talk to you about it," LeBlanc says. "The dynamics have changed a lot over the years."

Heinrich and Susan Shaheen, a transportation researcher at the University of California, Berkeley, suspect the change has a lot to do with new technology. With the ubiquity of smart phones, real-time ridesharing — a close cousin of the casual carpool — suddenly has much greater appeal to transportation officials and academics. Theoretically, a driver with a GPS application could spot passengers standing on any street corner in the city.

Several companies are already deploying pilot programs, although the arrival of proprietary smart phone technology brings an added complication. Firms are testing micro-payments between driver and passenger (some of which companies would skim for profit), criminal background checks and reward systems.

But all of those ideas make slugging appear that much more elegant in its simplicity. The system is location-based, not data-driven. You don't have to tell anyone a thing about yourself — only where you're heading. And ultimately, personal goals align with the group dynamic in a rare exception to the principle that we often pursue our own interests at the expense of someone else's (or at the expense of society or the environment).

"It's like anarchy or chaos, but it actually works," Oliphant says, road-testing the catchphrase that might carry this idea elsewhere. "It actually works!"

http://www.miller-mccune.com/culture-society/slugging-the-peoples-transit-28068/?utm_source=Newsletter151&utm_medium=email&utm_content=0308&utm_campaign=newsletters

The Invisible Hate Crime

Hate crimes against people with disabilities are widespread and often involve extraordinary levels of sadism. The first step in combating these shameful incidents is an acknowledgment that they exist.

By Jack Levin

Few Americans are aware of the special vulnerability of people with emotional, intellectual and physical disabilities to extraordinary violence. (Illustration by Jeff Bennett)

In February 2010, Jennifer Daugherty, a 30-year-old, mentally challenged woman from Greensburg, Pa., was brutally murdered by six people pretending to be her good friends. Holding her hostage for days, the perpetrators allegedly tortured Daugherty, shaving her head, binding her with Christmas decorations, beating her with a towel rack and vacuum cleaner, feeding her detergent, urine and various medications and then forcing her to write a suicide note, before stabbing her to death.

The sadistic attack on Daugherty was anything but unique. Still, few Americans are aware of the special vulnerability of people with emotional, intellectual and physical disabilities to extraordinary violence. Thinking of crimes inspired by hate or bias, most people conjure an image of a burning cross on the lawn of a black family, or swastikas scrawled on the walls of a synagogue. They may recall the name of James Byrd, the black American in Jasper, Texas, who was dragged for miles to his death behind a pickup truck by three white supremacists, or they might think of Matthew Shepard, the gay college student who was viciously beaten and then tied to a fence, left to die in the desert outside of Laramie, Wyo.

But the same Americans may have legal and emotional "tunnel vision," not seeing a hate crime in the brutal murder of Jennifer Daugherty, even though she was apparently singled out only because of her intellectual deficit.

Thirty-two states have hate crime statutes to protect people who have disabilities, but 18 states still do not. At the end of October 2009, President Obama signed the Matthew Shepard and James Byrd, Jr. Hate Crimes Prevention Act, bringing a uniform approach to the protection of hate crime victims that was not possible when matters were left to the states. The Shepard/Byrd legislation expanded federal hate crimes law to include offenses motivated by a victim's disability, gender, sexual orientation and gender identity. In addition, the new law eliminated a requirement that hate crime victims be engaged in a federally protected activity — for example, the right to live in the residence of your choice — to qualify for protection.

Still, attacks on people with disabilities are often overlooked because many people are not aware of the extreme vulnerability to maltreatment that accompanies such disorders as cerebral palsy, autism, multiple sclerosis, learning disabilities and mental illness — even though, according to anonymous victim accounts

from the Bureau of Justice Statistics, the 54 million Americans with disabilities experience serious violence at a rate nearly twice that of the general population. Their risk of being a victim of sexual assault is at least four times higher than that of people without disabilities. In 2008 alone, Americans with disabilities were victims of about 47,000 rapes, 79,000 robberies, 114,000 aggravated assaults and 476,000 simple assaults. Adding to the trauma of victimization, people with disabilities are much less likely than able-bodied victims to seek medical treatment for their injuries, often choosing, instead, to suffer in silence.

Over the years, police departments around the country have increased their sensitivity to hate crimes based on race, religion or sexual orientation, but they still may not recognize bias against disabilities as a motivation for an assault. For the year 2009, just 97 or about 1 percent of the 7,789 hate crimes recognized by the police in FBI data reportedly targeted people with disabilities. (Of that total, 72 reports were designated as anti-mental disability crimes, and 25 were anti-physical disability crimes). This appears to represent a tremendous underestimate. When it surveyed nationally representative individuals anonymously about their experiences with crimes — even offenses not reported to the police — the Department of Justice determined that more than 11 percent of all hate crimes targeted people with disabilities. In other words, by asking victims rather than the police, the Justice Department found the number of disablist attacks numbered in the thousands.

And that's not to mention another problem: Hate offenses are underreported, generally.

The FBI hate crime count is based on a voluntary reporting system that many local police jurisdictions refuse to support. In 2009, for example, only nine hate crimes were reported for the entire state of Alabama, which would reflect just one such crime per 523,190 citizens, according to Census Bureau population estimates. By contrast, other states have typically reported a much higher rate of hate crimes — for example, Massachusetts reported 322 in 2009, a rate of one for every 20,476 citizens, and New Jersey had 549 reported hate crimes, reflecting a 1-in-16,000 rate. It is hard to imagine such a huge divergence in rates arising out of anything but different reporting standards — and, perhaps, different levels of enthusiasm for reporting hate crimes at all.

Hate crimes are also underreported because motivation is a central element, and motives are often difficult to prove. The perpetrators might not have used a slur or written hate graffiti on a wall or sidewalk; they might never have confided their intent to the police or an acquaintance.

(Source: Crime Victimization Survey, U.S. Department of Justice)

In July 2006, for example, Steven Hoskin, a 39-year-old man with severe learning difficulties who lived in a small English village, was violently tortured for hours in July 2006 by five people — three young adults and two teenagers — before he was forced to take dozens of painkillers and then pushed from a viaduct to his death. Pretending to be Hoskin's friends for several months before the fatal incident occurred, the five young perpetrators bullied their victim into submission on a number of occasions. The victim became convinced that he was being included as a member of a "gang" and was willing to endure pain and suffering to remain in good standing with his "good friends." The torture and murder of Steven Hoskin had no economic motive. The crime would have been impossible if Hoskin had had normal intellect. But proving that the attack was motivated by the victim's disability is not easy to do.

For many reasons, victims are themselves underreporters of hate offenses. Based on a history of animosity, black and Latino victims may see law enforcement as an "army of occupation"; immigrants may identify the police with a tyrannical regime in their home country or be concerned about being deported; gays and lesbians may perceive, rightly or not, that police officers are generally homophobic.

But violence against people with disabilities differs in important ways from other hate crimes, making attacks even less likely to be reported or acknowledged. Unlike racially and religiously motivated offenses, attacks against people with disabilities tend to be committed not by strangers but, more often, by family members, neighbors, employees and friends who may also be caregivers.

In January 1999, eight men and women tortured a 23-year-old man with learning disabilities who worked as a cook at a fast-food restaurant in Tinton Falls, N.J. Apparently imitating the horror movie *Scream*, which they had recently viewed, the group persuaded the victim to attend a "party" and, when he arrived, tormented him for almost three hours. They stripped their victim to his underwear, slapped and kicked him and taped him to a chair that they dragged around the room. One perpetrator attempted to shave the victim's eyebrows and head with a razor; another completed the job with electric hair clippers. Members of the group then whipped him with rope knotted with a series of plastic beads, so his naked back, face and chest were covered by a network of cuts and bruises.

Cutting their victim out of the chair, they forced him to wear a bra and a woman's suit and dragged him into a van, driving him into the woods. Upon reaching a desolate area, they repeatedly punched him and slammed him to the ground. Finally, the victim was able to escape. He staggered to a nearby property, where he convinced a security guard to summon the police, who drove him to a local hospital where he was treated and released.

The victim wanted desperately to be accepted by his tormentors. Two weeks earlier, he had attended a party with the same perpetrators, who abused him and held him hostage for the evening. But he didn't file charges at the time and instead was willing to attend a second party with the same group a couple of weeks later. Even after charges of kidnapping and aggravated charges were brought against his tormentors, the victim didn't seem to appreciate the brutality of the attack, telling reporters that he "just wanted to make friends with these people."

Victims with disabilities are often extremely reluctant to report attacks out of fear that their tormentors will retaliate. They may have psychiatric or intellectual deficits that seriously interfere with their capacity to recognize false friendships or to report crime. Or they may assume a position of dependence in a relationship with caretakers who conceal their sadistic urges in the high credibility of their institutional roles. In October 2008, for example, five staff members in a Louisiana psychiatric facility were arrested for allegedly battering their patients with hand weights and inserting bleach into their open wounds. The victimized patients had complained bitterly but were perceived to be out of touch with reality and undeserving of being taken seriously.

Ignoring such hate offenses is particularly unfortunate because the level of sadism and brutality is frequently greater than in their racial and religious counterparts, and their perpetrators often engage in the sort of overkill not usually found in attacks based on other kinds of bias.

Slurs used by offenders represent the most widely employed evidence for establishing the commission of a hate attack. Racial and religious epithets are widely recognized, even by those individuals who themselves would never use them and are repulsed by those who do. The nasty labels placed on people with disabilities are just as hurtful as their racial and religious counterparts but are not recognized to the same extent. People with disabilities have been referred to as invalids (i.e., not valid persons), handicapped (capable only of begging, cap in hand) or disabled (incompetent). Other hurtful labels include crippled, deformed, feeble-minded, idiot, moron, imbecile, insane, lunatic and maniac. Often, people who wouldn't dream of using the N-word feel free to refer to an intellectually challenged individual as a "retard."

As a cultural phenomenon, racist preferences apparently find inspiration early in life, as children begin to develop the biases that they have learned from dinner table conversations, family members, friends and television programs. In an early study by social psychologists Kenneth and Mamie Clark, preschool children were asked to choose either a black or a white doll to play with. The majority of both white and black children preferred to play with the white doll, indicating the early impact of racial subordination and segregation on the psyche of countless minority youngsters. Testimony about the Clark and Clark study was given in the landmark 1954 Supreme Court decision in ***Brown v. Board of Education***, which mandated the desegregation of America's schools.

Negative perceptions of disability are also, it seems, formed very early in life. Most children aged 3 to 6 are already aware of physical disabilities and have already attributed negative characteristics to those who are not physically able-bodied. Writing in the journal ***Mental Retardation***, researcher Laura Nabors notes that when able-bodied preschool children were shown pictures of persons with and without disabilities, the preschoolers showed a marked preference for able-bodied playmates and an aversion to their physically challenged counterparts. Children are more likely to learn about psychiatric and intellectual deficits later, when their cognitive abilities have developed enough to think of people who are developmentally different in unflattering terms.

Over time, what began as an aversion may easily be transformed into outright prejudice and hate. From the viewpoint of a perpetrator, the members of an out-group — defined by their physical or developmental differences — may represent a threat to his or her economic well-being, to cultural or religious values, to neighborhood composition, to educational opportunities and even to physical survival. What we might view as a hate crime is therefore often regarded by a perpetrator as *self-defense*. Hate attacks, therefore, usually occur after some precipitating event — a gay rights rally, the first Latino in a college dormitory, a

developmentally delayed student mainstreamed into a regular classroom — that is seen as calling for a "last resort" response.

As with members of racial and religious groups, individuals with disabilities have often been the victims of such "defensive" hate crimes. A couple in suburban Chicago, both of whom were dependent on wheelchairs, planned to install a ramp at the entrance of their single-family residence — until neighbors threw rocks through their windows and sent threatening letters saying, "Your kind won't last here." The couple gave up and moved away. They might have stayed in their home had they received support and encouragement from neighbors and the police; they did not.

Many hate crimes are committed by groups of young people — teenagers or young adults — who, bored and idle, are looking for a little excitement at someone else's expense. Such *thrill* hate attacks bring few practical gains to their perpetrators. Instead, they get an intangible benefit: bragging rights with friends who think that hate and violence are pretty cool. Thrill crimes are usually directed by a sadistic leader who has tremendous influence over a group of friends who may not be hate-filled but are all too eager to be accepted.

In May 2010, a 19-year-old high school student with a developmental disability was brutally attacked on a busy Boston street, in broad daylight, by a group of nine young people, ages 15 to 21. The bloodied victim, who later described himself to police as "slow and challenged," screamed and pleaded for help, then curled up on the ground, as the perpetrators repeatedly kicked, beat and choked him. The victim later told police that "the kids up the street had jumped him." He had known his assailants from the Dorchester Youth Collaborative — an agency for high-risk teenagers — and they did not like him. But the youthful perpetrators used their shared animosity as a bonding exercise. The more they shared in bashing their victim, the more cohesive their friendships became.

Some of the most dangerous hate crimes have a retaliatory motive, encouraging "tit for tat" in an exchange of violence. When the motive is retaliatory, an original attack by the members of one group is met by a retaliatory attack, often on a random basis, by the members of the victim's group. In other words, the victim becomes the villain.

On Jan. 19, 2007, John Odgren stabbed to death his 15-year-old schoolmate — a random victim — in a restroom at Lincoln-Sudbury Regional High School in Massachusetts. The 16-year-old killer had been diagnosed, early on, with major depression, Asperger's Syndrome, attention deficit hyperactivity disorder and obsessive-compulsive disorder. Because of his disabilities, Odgren had a long history of having been bullied and having sought to retaliate violently. In third grade, he threatened to shoot some girls who had harassed him. In fourth grade, he jabbed a pencil into another student's chest. He was bullied repeatedly as he bounced from school to school and finally got even with his mainstreamed peers by killing an innocent victim. For taking the life of his schoolmate, Odgren was tried, convicted of first-degree murder and sentenced to life in prison without parole eligibility.

It is important to acknowledge that some organized hate groups overtly display their hostility to disabled people in a manner that encourages nonmembers to become violent. In early November 2002, for example, the white supremacist group Stormfront allocated a section of its Web discussion forum to eugenics. Among the comments presented online was the following: "We must put into place social and economic systems that encourage the best genes to dominate in numbers as well as power."

But only a very small minority of hate crimes — perhaps 5 percent — directly involve organized hate groups. Disability hate crimes are no different in this respect.

Victims of disablist violence learn to respond in any of a number of ways to the maltreatment they are forced to endure in their day-to-day lives. In the face of widespread bias, some people with disabilities come to accept the nasty stereotypes being communicated widely about them and suffer a profound loss of self-esteem. They may see themselves as inferior, incompetent, totally disabled. Rather than regard their disability as only one of many characteristics they possess, they may instead come to define themselves totally by their most serious disadvantage and give up the struggle for self-improvement, sinking deeply into depression, drug abuse or alcoholism.

Other people with disabilities refuse to accept the nasty stereotypes that invade their lives, instead seeking to avoid the nastiest implications of their maltreatment by segregating themselves in terms of friendship, employment and dating. Rather than give up, they attempt to insulate themselves from the insulting behavior of the able-bodied.

Still others seek collectively to change the maltreatment they have suffered because of their disabilities. Since the 1970s, members of the disability rights movement have instituted boycotts, blocked traffic and engaged in a variety of protests, marches and sit-ins. Closely mirroring the civil rights and women's movements of the 1960s, organized efforts have aided in the passage of disability-rights laws and the blockage of policies that would have been hurtful to people with disabilities. In the last couple of years, hundreds of people in wheelchairs have demonstrated on the streets of Atlanta, Chicago, Washington D.C., and Nashville. In August 2008, the Special Olympics and 21 other disability groups called for a nationwide boycott of the Ben Stiller-directed film *Tropic Thunder* because of what the organizations considered a "negative portrayal" of the developmentally disabled.

Such collective efforts are important as models for what the victims of hate violence might be able to achieve in the future. For now, however, such demonstrations are typically designed to reduce employment discrimination or to discourage cuts in government budgets. The hate crime response has not yet occurred. We don't have to change the law on hate crimes against people with disabilities — that has already happened — but we must change the thinking of ordinary people who consider only race, religion or sexual orientation as grounds for bigotry. Many people with disabilities are harmed more by the way others treat them than by their intellectual, psychiatric or physical disadvantages. This unfortunate fact has been widely ignored by otherwise decent Americans, who, when they think of hate crimes, tend to focus on people wearing sheets, armbands, steel-toe boots or Nazi tattoos. It is easy to forget that hate begins in the silence of ordinary people.

http://www.miller-mccune.com/legal-affairs/the-invisible-hate-crime-27984/

Wording Change Softens Global Warming Skeptics

New research finds Republicans scoff at "global warming," but are much more receptive to the notion of "climate change."

By Tom Jacobs

In a survey, researchers found 44 percent of Republicans endorsed the notion that "global warming" is real, but 60.2 percent said the same of "climate change."(yenwen/istockphoto)

Are you convinced climate change is real? What about global warming?
Yes, that second question is redundant. But new research finds the two labels, which are widely used interchangeably, evoke remarkably different responses among self-described Republicans.
Writing in the journal *Public Opinion Quarterly,* a research team led by University of Michigan psychologist Jonathon Schuldt reports Republicans are far more skeptical of "global warming" than of "climate change." In an experiment conducted as part of a large survey, the researchers found 44 percent of Republicans endorsed the notion that "global warming" is real, but 60.2 percent said the same of "climate change."
In contrast, 86 to 87 percent of Democrats endorsed the reality of a changing climate, no matter which descriptive phrase was used. This means the partisan divide over the issue is either overwhelmingly enormous or potentially bridgeable, depending upon the terminology one uses.
Schuldt and his co-authors, Sara Konrath and Norbert Schwarz, inserted a question into the 2009 American Life Panel survey, conducted by the RAND Corporation. Most of the 2,261 panelists were recruited from respondents to the Survey of Consumer Attitudes conducted by the University of Michigan.
Half responded to this statement: "You may have heard about the idea that the world's temperature may have been going up over the past 100 years, a phenomenon sometimes called 'global warming.' What is your personal opinion regarding whether or not this has been happening?"
The other half were presented with that exact same statement, except the words "going up" were replaced by "changing," and the term "global warming" was replaced by "climate change." All then reported their belief on a seven-point scale, from "Definitely has not been happening" to "Definitely has been happening."
Overall, 74 percent of respondents either definitely or tentatively believed "climate change" was real, but that number went down to 67.7 percent when the "global warming" wording was used.
The researchers found this difference was driven almost entirely by self-described Republicans. For Democrats, the difference was nearly nonexistent, with 86.4 percent endorsing climate change and 86.9

percent acknowledging global warming. Among Independents, 74 percent endorsed climate change, while 69.5 percent acknowledged global warming.

Why do the two labels provoke such different reactions among a specific subset of the population? Schuldt and his colleagues propose some possible answers.

"Global warming entails a directional prediction of rising temperatures that is easily discredited by any cold spell," they note, "whereas 'climate change' lacks a directional commitment and easily accommodates unusual weather of any kind."

This is an important point: A separate study, which we recently described, found belief in global warming is greater among people who are experiencing warm temperatures at the moment the question is asked — even if they're indoors.

"Moreover, 'global warming' carries a stronger connotation of human causation, which has long been questioned by conservatives," the researchers add. "Both of these aspects make 'global warming' a more appealing frame for those who favor the status quo in climate policy."

These findings point to a problem for pollsters, whose "choice of term seems somewhat haphazard" when surveying public opinion on the topic. Any polls that suggest swings of public opinion on this topic should be read with caution, taking note of the specific terminology that was used.

In addition, the findings have obvious implications for climate scientists and others who are trying to influence public opinion. They suggest "global warming" has got to go.

Either by design (the researchers found conservative think tanks prefer "global warming" to "climate change") or because of how our minds processes the terms ("global warming" seems to lead to an expectation of noticeably higher temperatures here and now), the concept of "global warming" meets significantly more resistance than "climate change."

What's in a name? In this case, a more approachable way to frame an all-important argument.

http://www.miller-mccune.com/science-environment/global-warming-skeptics-believe-in-climate-change-28772/

The Farm School: Growing Organic Farmers

At The Farm School, students learn the nuts, bolts and economics of organic farming, and the spiritual side isn't ignored, either. Garlic plantings may get blessed.

By Colleen Shaddox

Students from The Farm School in Athol, Mass., work on fencing off a section of pasture for the school's sheep. (Gale Zucker Photography)

No one arrives at The Farm School by accident, because it's not around the corner from, or on the way to, much of anything. You drive increasingly narrow, winding and erratically paved roads through the Berkshire Mountains of western Massachusetts until the only signs are historical markers for battles that old Yankees fought against the British or Native Americans. But Emily DeFeo knows exactly where The Farm School is. "Over the rainbow," she says with a gentle smile.

DeFeo is one of 14 students paying for the privilege of spending a year living on and working a 183-acre organic farm. Today's lessons will include using hand tools, building fencing and tending pregnant cattle. Students come from around the United States with different backgrounds — soldier, rabbi, waitress — and different ambitions. They share a passion for using sustainable methods to produce what they all seem to call "beautiful food."

Two oversized pots of cabbage soup are simmering on the stove of the large communal kitchen. It's DeFeo's turn to prepare lunch with the farm's bounty, while her classmates are out harvesting fennel. Before enrolling here, she was working as a certified nursing assistant en route to becoming a registered nurse. "It's a wonderful profession," she says. "I loved my patients, but I couldn't see myself inside all day."

Since childhood, she'd dreamed of having a farm. When she found out about the program, that dream got some flesh on it. DeFeo has taken to Pride, a milk cow, and hopes to work on a dairy farm someday. "My hands get very tired milking, but I still love to do it," she says and, to illustrate why, fills a jelly jar with raw milk, golden as the October sunshine that streams into this kitchen. "It's beautiful, isn't it?"

The lifestyle she's embracing is rare. Only about 2 percent of Americans live on farms, according to the U.S. Department of Agriculture, and the average age of farmers is rising. Larger, more mechanized operations are providing most of the food we eat. In 2007, farms with $1 million or more in annual sales accounted for 59 percent of U.S. agricultural production.

Ben Holmes, who founded the school, wants to see his students buck that trend. So the faculty members teach the nuts and bolts of running an organic farm, as well as the economics that make such an enterprise viable. Students will leave knowing how to write a business plan, negotiate for land and market their goods directly to consumers.

The Farm School began by serving much younger students. The operation still includes a one-room middle school, The Chicken Coop School, and welcomes student groups from throughout the region for three-day experiences. In 2003, Holmes started the adult program on a parcel called Maggie's Farm.

That's a tip of the hat not to Bob Dylan but Maggie Rouleau. When she inherited the land from her parents, Rouleau was beset with offers from developers who wanted to subdivide the farm her great-grandfather started. "My roots go so deep, I couldn't give them up, I guess," she remembers. So she "leased" the farm to Holmes gratis while he got the program going. The Farm School purchased the land in 2008, and the program has about 60 graduates now. "The vast majority do farm," Holmes says, but he's equally proud of the lawyer who spent a year on the farm and went off to be a chef. "I do think the things that interest me most are the things I didn't intend," he says.

Holmes sees The Farm School as a counterweight in a world that's tipping toward the virtual. What would that old New Englander Robert Frost's "Mending Wall" mean to someone who's never repaired a stone wall — or at least seen one? So much of culture is "based on the tactile," Holmes explains, but our daily lives are more and more removed from it. "Our poetry doesn't make sense to us."

That's not a slam on technology. Holmes uses online tools for fundraising. Four of his students are blogging about their experiences. But information technology is not omnipresent here. Cell phones stay in the students' bedrooms during the workday. The only sounds that punctuate the morning as Kiyoshi Mino battles invasive grass in the kitchen garden are the gossip of roaming chickens and an occasional stomp or snort from the quarter horses in a nearby pen.

After graduating from Amherst College, Mino wanted adventure and enlisted in the Army. He was deployed to a remote region of Afghanistan, where he anticipated that life would be a grim business. The agrarian community he encountered defied those expectations. "Wow, these people really have a cool life," he says he thought. "Meanwhile, we were going in there saying, 'You need help.'" After his stint in the Army, he returned to Afghanistan as an international development worker but was dismayed at how little of his project's resources actually reached people in need.

Mino describes himself as becoming cynical about the usual channels for making a difference in the developing world. At the same time, he was reflecting on the high-consumption American lifestyle and its global impact. Perhaps he could make a difference simply by living — simply.

Meanwhile, his wife, Emma Lincoln, was working as a preservationist at the Library of Congress. Washington, D.C., was not her cup of tea. "I found I didn't have patience for the crowdedness, the dirt, the noise," she says. She liked the idea of buying some land and starting a farm but knew that neither she nor Mino had the skills to pull it off. Their research, she says, led them to The Farm School, "the least risky way to see if we can really do this as a living."

How well the students learn in this one year will have much to do with how successful they eventually are as farmers. So there is great earnestness in all that the students do, whether it's coming up with a fence design for a homework assignment or learning how to care for farm animals. They huddle around a veterinarian who's come in to tend the cattle and do some teaching while he's at it. He is up to his armpit in a cow and explaining how he's determined she has ovarian cysts. The students are rapt.

"How can you tell if a cow is pregnant?" one asks.

"You feel it."

"How do you keep from getting kicked?"

"I've done this thousands of times," the vet says. "It almost never happens. They actually kind of like it."

The students exchange doubtful looks and laughter. Most have had experience gardening, if not actually farming, before enrolling, but dealing directly with livestock is generally a new experience. Andrew Currie graduated from the program last year and has stayed on as a staffer. Lambing has been one of the most powerful experiences of his time here, he says. Sheep, so long domesticated, sometimes have trouble giving birth unassisted. When a ewe is expected to go into labor, students take turns watching her. Currie was on duty last spring when a lamb came into the world. He had to intercede when it had trouble latching on to

nurse. While all this was going on, he was also roasting a lamb in an outdoor stone oven. Currie did enjoy his dinner that evening but "in a different way than I'd enjoyed any leg of lamb prior to that."
Though the days are active, pensive reflections like Currie's are common. Elisabeth Stern is a rabbi who decided to spend a sabbatical year here devoted to "the interaction with the miracle of life." She is interested in a modern interpretation of ***kashrut***, the system of Jewish dietary laws. Many scholars are discussing other ethical principles that might be incorporated into *kashrut*, such as the humane treatment of farm animals. "I'm the only one I know who's actually tugging beets out of the ground," she says with a smile.
She's not alone in seeing a spiritual dimension to farming. Yesterday, the students planted a large field with garlic bulbs. When they were done, their instructor invited them to lie down on the ground they'd just sown and "send warm thoughts" to the garlic. Naturally, Stern laid down and blessed the plantings, but the 57-year-old woman of the cloth had doubts that all her 20-something classmates, so intent on starting real farms, would do the same.
"Is everybody doing this?" she asked herself. Opening her eyes, she scanned the field. Each student was down on the earth, wishing it well. "It was," she says, "the most perfect thing."

http://www.miller-mccune.com/science-environment/the-farm-school-growing-organic-farmers-27886/

Cybercop Fights Organized Internet Crime

Steve Santorelli gets computing experts and law enforcers to cooperate in a global fight against organized Internet crime.

By Risha Gotlieb

Steve Santorelli of Team Cymru has devoted his career to identifying, tracking and apprehending cybercriminals. (Thomas Alleman)

It was August 2005, and Steve Santorelli had recently left Scotland Yard to join Microsoft's Internet Crimes Investigation Team. He was camping in the forest near Redmond, Wash., with some of his team members, trying to escape their technology-dominated existence, when a call came in from the Microsoft lab. Other team members had just cracked the code to the notorious Zotob computer virus.

"At the campsite, I overheard one of the guys mention the nickname C0der, and uniquely spelled C-Zero-D-E-R, being identified as the author of this virus. I almost choked on my coffee," Santorelli says. "I knew exactly who it was. It was someone we'd been tracking."

At the time, Zotob was making international headlines. Among other things, it had infected the computer services of major news organizations and governmental institutions, including ABC News, *The New York Times*, the U.S. Senate, the Centers for Disease Control and Prevention, and U.S. Immigration and Customs Enforcement, where, Wired.com reported, the U.S. border screening system was slowed to a crawl and some computers rebooted themselves every five minutes. In an ironic twist, as news of the virus was being reported on CNN, the screen behind an anchor went blank. Zotob had overtaken the broadcaster's computer network on live TV.

Zotob hit during a transitional period when the first truly malicious and widespread botnets — that is, networks of computers infected by a virus that calls "home" to a central command-and-control server run by the botnet's creator — were being unleashed on the Internet, Santorelli says. In an effort to crack down on them, the Microsoft team had devised a decoy, a technological undercover agent. "It was like the classic vice-squad sting where a cop dresses up like a call girl to entice a john, and in this case, an infection," he explains. Simply put, the Microsoft investigators created a computer network in the lab at Redmond that no red-blooded botnet could resist. Once infected with Zotob, the Microsoft team's double-agent computer would routinely call out to the botnet's commander, asking for directions.

"It just sat there in our lab like any of the genuinely infected machines around the world," Santorelli says. "Eventually, when a human being logged in to issue his commands to his botnet, Microsoft was very discreetly in the background eavesdropping — which is when we identified the suspect C0der along with a second suspect, who went by the online handle Diabl0."

After rushing back from the campsite, Santorelli and his team raced to track down the location of the suspects before the electronic trail they'd left behind evaporated. It took two weeks of 20-hour days, Santorelli says, but his team finally was able to send the FBI a detailed, 30-page report. From there, the case went from cyberchase to FBI manhunt, with agents boarding Lear jets and, with the assistance of local authorities, arresting 18-year-old Farid Essebar in Morocco and 21-year-old Atilla Ekici in Turkey.

As a detective with Scotland Yard, as an investigator for Microsoft and now as an executive at a nonprofit cybersecurity firm, Santorelli has devoted his career to identifying, tracking and apprehending cybercriminals in a new cyber-environment in which police chases are clocked at light speed and villains drive on a global superhighway congested with 1.8 billion law-abiding commuters. Through his efforts, Santorelli has become recognized internationally as one of the most vocal proponents of a unified stance that would improve Internet security and fight the efforts of organized crime on the Internet around the world.

"Since everyone in the security business knows Steve, he has become an integral person to bring the right people together and lead them in the right direction. He is a valuable and crucial part of the small global group of people who take the fight against cybercrime seriously," says Bernhard Otupal, who, until recently, was an executive with the Financial and High Tech Crime Sub-Directorate at the General Secretariat of Interpol in Lyon, France. "Without him and others with a similar mindset, the statistics of cybercrime would look much worse than they already do."

The son of a Reuters journalist, Santorelli found himself uprooted with each of his father's postings. Born in the U.S., he was raised in London and Australia, and the expat experience may have helped hone his diplomacy skills at a tender age. Fascinated with exploration, Santorelli's higher education revolved around studying the final frontier. "I studied physics and space science at Southampton University, fully expecting this would be my life's work," he says.

But space became a mere hobby when he was introduced to his real passion: the chase. "I was on summer break from university when I got an opportunity to spend two weeks with my uncle, who was a senior detective with an East London police station," he says. "I was hooked."

After graduating from the police academy in London, Santorelli joined Scotland Yard. It was 1994. "Hackney was my first beat, a neighborhood in East London notorious for crack cocaine, violence and murder," he says. "We called it 'murder mile' because it had the highest rate of fatal shootings in the country." After two years as a street cop, he went on to hone his detective skills in several branches of Scotland Yard, joining the Computer Crime Unit in 1999. His work there garnered recognition from international law enforcement agencies and judges. It also caught the attention of Microsoft, which eventually lured him away from Scotland Yard.

In 2004, Santorelli moved with his family from London to Redmond, Wash., Microsoft's global headquarters. There, he devoted the next three years to countering cybercrime, particularly the proliferation of botnets. He played a key role in the creation of the International Botnet Task Force, a business organization made up of law enforcement and industry professionals from 35 countries who share best practices and case studies. In 2007, Santorelli quit Microsoft to join Team Cymru Inc. (pronounced kum-ree), an Internet security research firm that engages in both nonprofit and for-profit activities; he's now director of global outreach for the firm. Although the organization is headquartered in Burr Ridge, Ill., team members are stationed around the globe and include former U.S. and European law enforcement agents, as well as attorneys, information technology engineers and software writers.

Team Cymru Chief Executive Officer Rob Thomas worked with Santorelli on several cases when he was with Scotland Yard and sought him out to join the Cymru team. "As the team's director of global outreach, Steve has a natural knack for bringing together like-minded people," Thomas says. "But more important, he gets organizations that perceive themselves to be at odds to communicate and cooperate."

Santorelli and Thomas are cautious about sharing details of Team Cymru's activities, but they do acknowledge that it has relationships with police forces in more than 60 countries, including Interpol and the FBI. The team, they say, is available around the clock to respond to major cyberthreats anywhere in the

world. "We disrupt Internet criminality on a massive scale," Santorelli says, "and in a way that government, law enforcement and software vendors on their own couldn't possibly hope to do."
Team Cymru also provides technical services to the exclusive cadre of specialists who operate and govern the backbone of the Internet and to the credit card, banking and security software industries. "For this we charge; it's what keeps the lights on," Santorelli says. "But we also have an altruistic side."
That side of the operation — the nonprofit Team Cymru Research NFP — can spend weeks tracking the computers and individuals behind a cyber-attack and putting together an intelligence report to turn over to law enforcement. And the team knows there will be no billable client at the end of the chase. Santorelli says the organization's focus on doing good is what attracted him to Team Cymru and its collection of computer experts, who have the ability "to design the next great video game or operating system and garner fame and fortune. Instead, they're using their proficiencies to advance the greater good."
The common wisdom about hacking and cybercrime is, in Santorelli's view, severely out of date. He says cybercriminals aren't lone wolves; they are financed and directed by international criminal syndicates. Joe Menn, author of *Fatal System Error*, a book that traces the evolution of cybercrime, agrees, contending that the Russian and Italian mobs, the MS-13 (also known as *Mara Salvatrucha*) in Central America, Japan's Yakuza and the Chinese Triads are all now active in a wide variety of cybercrimes. These groups are stealing huge sums of money by penetrating personal, corporate and government computers using traditional computer-hacking tools with colorful names: Trojans, keyloggers, malware, botnets and phishing expeditions. But Santorelli says they have something that yesterday's thrill-seeking hacker never possessed: an army of foot soldiers able to intimidate victims in the real world. Organized crime also has vast resources derived from its traditional operations to finance the hiring of quality hackers around the world. There is even evidence that some syndicates are investing in research and development, looking to create proprietary, next-generation hacking tools, Santorelli says.
Organized crime has moved onto the Internet in a big way, Santorelli says, because that's where the money is. Prosecutors' filings in federal court in Brooklyn claim that associates of New York's reputed Gambino crime family were involved in cyberfraud that generated more than $650 million in just seven years. Part of the scheme involved a pornographic website that offered visitors a free tour — as long as they could prove they were adults by providing credit card numbers. But in fact the credit card numbers were repeatedly put through and charged for services, using merchant numbers that the crime syndicate routinely changed, keeping one step ahead of credit card companies' fraud-detection systems. They laundered their profits and hid their tracks through 64 mob-controlled shell companies and a host of foreign bank accounts.
Santorelli says this kind of money laundering expertise is what makes organized crime syndicates such a force on the Internet. "Unlike the early hackers who could only boast about their take," he says, "these guys are able to convert massive amounts of virtual Internet dollars into real euros, pesos, yen or any other currency, and then launder it through the global economy."
The impact of cybercrime is huge, but exactly how huge is much debated. Valerie McNiven, a consultant to the U.S. Treasury, has said that revenue from cybercrime exceeds international drug trafficking and is now the No. 1 source of revenue for organized crime. That claim has been a target of high ridicule from critics who note that if she were correct, cybercrime's take would be bigger than the entire information technology industry's, and almost double the gross domestic product of Saudi Arabia.
Even so, it's clear that organized crime is moving seriously onto the Internet, and Santorelli is, as Menn says, "at the center of one of the most important and least understood fights of our era."
"A cybercrime investigation is very much like a traditional police investigation," Santorelli says. "You have to turn over 10,000 tiny rocks looking for fleeting clues, all the while working against the clock."
He gives an example: During a recent investigation, he and his team at Cymru were able to link a piece of malware to a Southeast Asian team by hunting down a lead extracted from a single obscure detail. "After infecting one of our 'lab rat' computers to observe what the virus would do, we found that it was connecting to a specific website set up for the sole purpose of giving the virus directions. …" Santorelli says. "When we looked up the website's domain registration, we found that all of the identifying particulars were bogus, including the name, address and even the e-mail, which we quickly realized when the e-mails we sent out bounced back as undeliverable."
Recognizing that there was something uniquely odd about the string of characters that made up the cybercriminal's fictitious e-mail address, Santorelli and his team kept probing. Eventually, they found that

exact string of characters on the social networking page of a middle-aged female in Southeast Asia. Reading the postings on her page, they discovered they had just found the cybercriminal's mother. The unique string of characters was the son's family nickname. "Despite the fact that he had been meticulously careful not to leave any digital fingerprints anywhere, it was the mundane chitchat of his mom and her friends that ratted him out," Santorelli says. "We also got his first name, family name, country of residence and date of birth from our analysis of the mom's social networking page." The case has been handed over to law enforcement.

If there is to be any chance of curtailing the growth industry known as cybercrime, Santorelli says, there will need to be global collaboration between the information technology world, often stereotyped as über-geeks with poor interpersonal skills, and the policing community, often accused of being an insular brotherhood. "What's the use of well-intentioned IT people doing the drudge work of identifying the miscreants, who may be on the other side of the planet, if there isn't somebody with the authority and willingness to break down their front door, pull them off the keyboard and arrest them?" Santorelli asks. "And what's the use of arresting them if the policing community isn't supported by local prosecutors, who, in turn, need legislation that enhances the probability of convictions and demands sentencing that reflects the seriousness of these crimes?"

Otupal, the former Interpol official, says Santorelli may be one of the few people who can influence organizations and governments around the world to take heed of the seriousness of the global cybercrime explosion. "Steve has a global network of trusted experts on his side," he says.

Edward Gibson, a former FBI special agent and now a director of the Forensics Technology Group at PricewaterhouseCoopers in Washington, describes Santorelli's work at Cymru in a slightly different way. "Steve was part of one of the most prestigious law enforcement agencies in the world and employed by one of the most successful corporations globally," Gibson says. "He left all this to join an organization where he would be made virtually obscure, which to me speaks volumes about his integrity and why he's doing this."

http://www.miller-mccune.com/legal-affairs/cybercop-fights-organized-internet-crime-27897/

A Chimp Couldn't Have Created That Painting

New research finds even nonexperts can differentiate between masterful abstract art and similar works painted by a child or an animal. See for yourself with our enclosed art quiz.

By Tom Jacobs

"People untrained in visual art see more than they realize when looking at abstract expressionist paintings," say two Boston psychologists. In direct-comparison tests, humans could identify the products of human creativity. (Michael Courtney / istockphoto.com)

Angry dismissals of abstract art are commonly framed by the assertion. "A (blank) could have done that." The key word in the clichéd complaint is often "child," "monkey" or "elephant."

But Jumbo, you're no Rothko. Newly published research finds that, in spite of our protestations, nonexperts can tell the difference among acclaimed abstract paintings, colorful canvasses created by a nursery school students or residents of the zoo.

"People untrained in visual art see more than they realize when looking at abstract expressionist paintings," Boston College psychologists Angelina Hawley-Dolan and Ellen Winner report in the journal *Psychological Science.* Non-aficionados might not like a particular artwork, but in a direct-comparison test, they can usually identify it as the product of human creativity.

The researchers conducted an experiment in which 72 undergraduates — 40 psychology majors and 32 studio art majors — looked at a series of paintings placed side by side. Each pair featured one image taken from an art history textbook (the artists included Mark Rothko and Cy Twombly), and one created by either a young child or one of four types of animal (a monkey, gorilla, chimpanzee or elephant).

"We matched professional and nonprofessional paintings according to various attributes (color, line quality, brushstroke and medium)," Hawley-Dolan and Winner write. "Paired images were presented side by side in PowerPoint on a laptop; as much as possible, the images were equated in size and resolution."

The first 10 pairs of paintings were presented without labels. For the remaining 20 pairs, the paintings were labeled ("artist," "child," "monkey" or "elephant"), but half of those labels were deliberately incorrect.

After viewing each pair of images, the participants were asked "Which do you like more? Why?" and "Which image do you think is the better work of art? Why?" The questions were phrased to obtain separate results for

personal preference (which is based in one's immediate emotional response) and judgment (which is based on cognitive evaluation). Some of the participants then explained how they justified their decisions.
"Both groups chose the professional work significantly more often than would be predicted by chance," the researchers write. "As predicted, art students preferred professional works more often than did non-art students. However, the two groups' judgments did not differ."
When there was no label attached, nonexperts preferred the professional artwork 56 percent of the time; art students did so 62 percent of the time. But when it came to judging which was the better piece of art, the two groups were very much of one mind: The art students chose the professional piece 67.5 percent of the time, the nonart students 65.5 percent of the time.
"In the aesthetic domain," the researchers note, "people can recognize that a work is good, but still not like it."
The strength of that recognition was evident from the almost-nonexistent impact of the labels. When the works were correctly labeled, nonexperts preferred the professional work 79 percent of the time. But when the labels were incorrect, the nonart students (like their art student counterparts) tended to discard them, judging the professional (but wrongly labeled) work as their preferred piece 62.5 percent of the time.
"Analysis of the justifications revealed that when participants preferred the professional works, and judged them as better, they did so because they saw more intention, planning and skill in those works than those done by nonprofessionals," Hawley-Dolan and Winner write.
This suggests a blue squiggle created by an artist as a means of expression is fundamentally different than a blue squiggle created randomly by a monkey holding a paint brush — and more often than not, viewers can make the distinction. (One wonders whether this will also hold true for the computer-generated music created by David Cope's software.)
"People may say that a child could have made a work by a recognized abstract expressionist," the researchers note, "but when forced to choose between a work by a child and one by a master such as Rothko, they are drawn to the Rothko." This suggests that, for all the sneering done by cynics such as Morley Safer, nonrepresentational art truly does communicate — even if not everyone likes the message.
"People untrained in visual art see more then they realize when looking at abstract expressionist paintings," the researchers conclude. "People see the mind behind the art."

http://www.miller-mccune.com/culture-society/a-chimp-couldn%E2%80%99t-have-created-that-painting-28947/

Collective Bargaining and the Student Achievement Gap

A new analysis finds the best students are better off, while disadvantaged students are worse off, when teachers collectively bargain for a contract.

By Tom Jacobs

Collective bargaining hasn't always been this sticky. This 10-cent U.S. stamp, designed by Robert Hallock, was issued in 1975 to honor the 1935 Wagner Act.

As numerous states — most prominently Wisconsin and Ohio — consider curtailing the collective bargaining rights of their workers, the debate has largely focused on money and power. If public employee unions are de-authorized or restricted, what impact will that have on state budgets? Tax rates? Political contests?

When it comes to teachers, however, this discussion bypasses a crucial question: What is the impact of collective bargaining on students? A study just published in the *Yale Law Journal*, which looks at recent, real-life experience in the state of New Mexico, provides a troubling answer.

It finds mandatory collective bargaining laws for public-school teachers lead to a welcome rise in SAT scores – and a disappointing decrease in graduation rates. Author Benjamin Lindy, a member of the Yale Law School class of 2010 and former middle-school teacher, reports that any improvements in student performance appear to come "at the expense of those who are already worse off."

Teachers unions, which can legally require school districts to engage in collective bargaining in 34 states and the District of Columbia, have been derided by many conservatives (and some liberals) as impediments to needed reform. But these arguments, as Lindy notes, largely take place without empirical evidence.

He found some actual data from the American Southwest.

"Between 1993 and 1999, New Mexico — like most states — required school districts to enter into a formal collective bargaining process with a teachers' union once that union was properly recognized," he notes. "In 1999, however, the enabling piece of state legislation expired, and until 2003 — when the legislature reinstated the law — school districts in New Mexico could refuse to bargain with teachers' unions."

This provided Lindy with "a previously untapped natural experiment." He looked at state average scores on the SAT test from 1993 to 2005; graduation rates (that is, the percentage of freshmen who went on to get a diploma) from 1996 to 2005; and average per-pupil expenses from 1993 to 2007.

He found the ability to collectively bargain "appeared to have no effect on per-pupil expenditures." (Undercutting claims that negotiations lead to budget-busting contracts.) But it did impact the other two measures, leading to "an increase in students' SAT scores and a decrease in high school graduation rates." Why would those two measures move in opposite directions? Lindy has a compelling thesis.

"Absent collective bargaining agreements, teachers lost certain transfer rights," he notes. In many districts, pre-1999 collective bargaining agreements allowed "senior teachers — those with the most experience, who are often higher-performing teachers — to concentrate themselves in a district's higher-income, higher-performing schools.

"It is hardly surprising that established teachers at the peak of their careers would want to teach in a less-taxing environment, one with engaged students, engaged parents and newer facilities," he writes. "High-poverty schools with lower-performing students, by contrast, wind up with the least-experienced (and least successful) teachers.

"This change in transfer rights is especially significant, because it helps explain not only why low-performing students began to improve (when the teachers lost collective bargaining rights), but also why the achievement of high-performing students began to fall," Lindy writes. "If districts were able to shift high-quality teachers away from concentrated areas of high performance to areas of high-need, one would expect to see the performance of high-achieving students fall."

So when contracts are negotiated that give teachers with seniority a major say in where they'll teach, the result is already-advantaged students get yet another advantage: more experienced instructors. This helps them raise their test scores even higher. Meanwhile, the poorer kids get less-experienced teachers, leaving them still further behind and more likely to drop out.

Lindy concedes this analysis only provides "a starting point" in the attempt to gauge the impact of collective bargaining by teachers. He notes it does not take into account the "welfare gain that teachers experience under mandatory bargaining."

Nevertheless, he concludes: "If one's normative criterion is the maximization of social welfare, then mandatory collective bargaining is a poor choice for a state policy," since the harm done to low-performing students arguably offsets the benefits to high-performing students.

Of course, negotiated contracts don't have to give high-seniority teachers the right to choose their school. If nothing else, this study suggests school boards may want to think twice before bargaining away that control. While such a right has clear advantages for teachers, it appears to be at odds with a major plank of the progressive agenda: Ensuring equal opportunity for all

http://www.miller-mccune.com/blogs/news-blog/collective-bargaining-and-the-student-achievement-gap-28902/

How Did Students Become Academically Adrift?

"Academically Adrift," a new book on the failures of higher education, finds that undergrads don't study, and professors don't make them.

By Melinda Burns

The book "Academically Adrift" claims undergrads are too busy to study, and their professors are too busy to demand much of them. (gocrawford/istockphoto)

Here's the situation. You're an assistant to the president at DynaTech, a firm that makes navigational equipment. Your boss is about to purchase a small SwiftAir 235 plane for company use when he hears there's been an accident involving one of them. You have the pertinent newspaper clippings, magazine articles, federal accident reports, performance graphs, company e-mails and specs and photos of the plane.
Now, write a memo for your boss with your recommendation on the SwiftAir 235 purchase. Include your reasons for finding that the wing design on the plane is safe or not and your conclusions about what else might have contributed to the accident.
You have 90 minutes.
Whew. That's a sample "performance task" from the three-hour Collegiate Learning Assessment, a national test used by more than 200 colleges and universities to measure whether their undergraduates are learning to think critically in real-world scenarios and communicate effectively in writing.
Given the average cost of an undergraduate college education today — $16,000 per year for tuition, room and board at public schools and $37,000 at private institutions — one could be excused for believing that college students must be learning how to think.
But according to a new book, *Academically Adrift: Limited Learning On College Campuses*, they're frittering away their time at an astonishing rate. And the result, it shows, is that 45 percent of undergraduates in a survey of 29 colleges and universities nationwide showed no improvement in critical-thinking scores at the end of their sophomore year in 2007, compared to their scores as entering freshmen. At the end of their senior year, after four years of college instruction, 36 percent still had made no gains in critical thinking.
"Slacker" students are nothing new. But the picture from Academically Adrift is one of pervasive distraction in the halls of higher learning, of disengaged students and a faculty too busy with research to demand much of them.

"We found a set of conditions suggesting that something indeed is seriously amiss in U.S. higher education," says Richard Arum, a co-author and a sociologist at New York University. "We found that gains in student performance are disturbingly low. Students and faculty and administrators share equally in the blame. "It's a serious social problem that threatens the foundation of our society, our economic competitiveness and our ability to govern ourselves democratically."

Arum and co-author Josipa Roksa, a sociologist at the University of Virginia, found that undergrads study only 13 hours per week, on average, or less than two hours per day in a typical semester. That's half as much as their peers studied in the early 1960s. Today's college students spend more than 80 percent of their time, on average, on work, clubs, fraternities, sororities, sports, volunteering, watching TV, exercising, socializing, playing on their computers and sleeping.

Of more than 3,000 full-time undergraduates in the study, 50 percent took five or fewer classes over their entire four years of college in which they were required to write more than 20 pages per semester. Twenty percent took five or fewer classes requiring more than 40 pages of reading per week. They met with a professor outside of class only once a month, on average.

Of course, not all students or professors are neglecting academics: Arum and Roksa found a wide variation in scores among colleges and even wider variation among students at the same colleges. But in an era when elementary and secondary schools are being held strictly accountable for student learning, Arum says, the absence of accountability at the college level is glaring. It's not that faculty doesn't care, he says. It's that the system rewards research, not teaching. "College presidents have to assume the responsibility to provide leadership for improving instruction and measuring learning," Arum said. "They have trustees and regents that report to, and they should be held accountable. Let's start there."

Source: Academically Adrift: Limited Learning on College Campuses, 2011

Arum and Roksa's findings, as reported in their book and an accompanying update, largely confirm the work of other scholars. In 2009, for example, Philip Babcock and Mindy Marks, two University of California economists, reported that full-time students in 1961 invested 40 hours per week attending classes and studying, compared to 27 hours per week for students in 2004.

"Study time fell for students from all demographic subgroups, within race, gender, ability, and family background, overall and within major, for students who worked in college and for those who did not, and the declines occurred at four-year colleges of every type, size, degree structure and level of diversity," Babcock and Marks found.

But Arum and Roksa break new ground, too, delving into the past of individual students and following the same individuals through four years of college. To find out how and why they learn, the sociologists tracked their family backgrounds, high school characteristics, advanced placement courses, SAT and ACT scores, choice of college, choice of college major, college coursework, study habits and professors' expectations.

High school preparation counts, their book shows, but the college experience counts just as much. Students who take multiple advanced placement classes in high school and have high SAT and ACT scores perform notably better on the test for critical thinking and complex reasoning, but so do students who enroll in highly selective colleges, pursue demanding majors, take rigorous courses and spend 15 or 20 hours per week studying alone. (The average college student spends eight hours per week studying alone, and more than a third of undergrads spend five or fewer hours per week studying alone, the authors found.)

Students' majors matter, too. Those in traditional liberal arts fields such as social science, humanities, natural science and mathematics show much higher gains on the critical-thinking test than students in the less demanding "practical arts" – business, education, social work and communications.

Academically Adrift shows that the achievement gap between white and minority students persists at the end of four years of college, and, for African Americans, it widens. "This pattern suggests that higher education in general reproduces social inequality," the authors say.

Finally, Academically Adrift debunks the view, promoted by some colleges, that group studying, working on campus and joining a fraternity or a sorority helps keep potential dropouts in college and therefore enhances learning. Unfortunately, the more time students spend in these activities, the worse they do on the tests for critical thinking. Overall, undergraduates are working at jobs 14 hours per week, on average — more time than they spend preparing for class.

"The simple act of staying enrolled does not ensure that students are learning much," the authors conclude.

What are college students thinking? For a glimpse, Arum and Roksa cite from *College Life Through the Eyes of Students*, a 2009 book about the lives of 60 students during four years at an unnamed public university in the Midwest. Of the 60 undergraduates who were interviewed by Mary Grigsby, a sociologist at the University of Missouri, only four, or 7 percent, regarded academics as their top priority. Seventy percent viewed "social learning" as more important.
"Honestly, I feel like nothing I've learned in the classroom will help me do what I want to do in the end," one coed says. "I think it's the people I meet, the friends I make, that really matter. …"

http://www.miller-mccune.com/culture-society/what-happened-to-academic-rigor-27874/

An Etiquette Book for Patients and Caregivers

One small step for patient-centered care, and one big step for patient engagement, would be to set out clearly how patients and the village of professionals serving them will communicate.

By Jessie Gruman

When you're in the midst of a health crisis with a team of medical specialists involved in your care, etiquette guidelines would help with efficiency and prevent confusion. (claudiobaba / istockphoto.com)

As far as my chemo nurse Olga* is concerned, I can do nothing right.
She scolded me for sending an e-mail when she thought I should have called, and vice versa. She scolded me for going home before my next appointment was scheduled. She scolded me for asking to speak to her personally instead of whichever nurse was available. She scolded me for calling my oncologist directly. She scolded me for asking whether my clinical information and questions are shared between my oncologist and the staff of the chemo suite. I could go on …
"Funny," I think to myself. "If she had told me the basic ground rules of interacting with her and her colleagues, I would have been happy to follow them. Otherwise, how am I supposed to know — guess?"
While my recent diagnosis of stomach cancer last fall introduced me to many new doctors and their practices, most were one-shot consultations. Other than making sure the test results they ordered and their recommendations found their way to the right physicians (my responsibility in the absence of an interoperable health record), it didn't really matter how I communicated with them over time.
But when you start chemotherapy or have a heart attack, brain injury, stroke or a serious chronic condition, you sign on to a long-term relationship with a whole crew of people — receptionists, various types of nurses, aides, physical therapists, educators, coaches, phlebotomists, pharmacists and doctors — that is likely to require a lot of back-and-forth. Chances are that these professionals have figured out ways to work together pretty efficiently. The problem is that most of them don't let us in on the action; they rarely provide us with (ahem) "rules of engagement" that would tell us how to work most effectively with them.
And so we are left to guess, and when we guess wrong, sometimes we are scolded. This, of course, leaves us frustrated … sometimes even mildly rebellious.
In interviews that the Center for Advancing Health conducted about receiving care after a serious diagnosis, again and again patients and families raised their bewilderment (and annoyance) about the difficulty of learning how to communicate with their specialists. And the same was heard from people discussing their

regular providers. People can't figure out how to get their test results. They are puzzled about whom to call after hours or on weekends. They are baffled about whom they should talk to regarding billing and insurance problems. They are flummoxed by the new and unfamiliar demands placed on them by different sources of continuing care: rehabilitation hospitals, cardiac rehab, oncology suites, neurologists and other specialists and for some, unfamiliar primary care medical homes.

The confusion of patients and families will not in itself drive any widespread change in the way care is delivered. But our endless stream of identical questions to busy professionals surely interferes with their efficiency. And with increasing calls for the competent engagement of patients and families, making explicit the ways we can most effectively work with a team of professionals seems like a modest, feasible step for primary and specialty care providers to take. Doing so is one aspect of making our care truly patient- and family-centered that doesn't require a high-tech solution or federal policy nudge.

So consider, then: A couple of years ago, in response to interview findings, CFAH developed, with Susan Edgman-Levitan and her colleagues at Massachusetts General Hospital, a model guide for patients and caregivers that identified the basic information people need to interact over time with a given medical practice or setting. The model includes items such as the names of the care team members; a description of who is responsible for responding to which concerns, for instance, questions about symptoms, appointments, insurance and phone numbers; how to get prescription refills; procedures for after-hours and emergency care; access to health records; the process for reporting on tests; and even information about parking and public transportation.

Recently, a group of primary care practices decided they would pilot test this model. Weeks later they abandoned the effort. Why? Because the clinicians within the practices couldn't agree on their office hours. Sigh.

(*Not her real name)

http://www.miller-mccune.com/health/an-etiquette-book-for-patients-and-caregivers-28925/

Staunching Aggression From the Womb

Government investment in prenatal and postnatal health care could help prevent violent behavior later in life, researcher says.

By Melinda Burn

Research suggests that programs designed to promote pre- and postnatal health care can prevent aggressive behaviorial problems later in life. (arekmalang / istockphoto.com)

Crime and delinquency have roots in the womb, and so the risks can and should be addressed early on, even before a child is born, a University of Pennsylvania researcher says.

According to a large body of research, the early risk factors that may predispose a child to violence include teen pregnancy, birth complications, lead exposure, head injury, child abuse, and maternal stress and depression. Jianghong Liu, an assistant professor at Penn's School of Nursing and School of Medicine, argues that these factors, whether biological, psychological or environmental, can interact with each other early on, increasing the odds of a lifetime of violent behavior.

"We can do something about it," Liu said. "It's not that expensive, compared to the money government puts into prisons. Why not spend the money on prenatal care or on developing a parenting skill? I'm confident parents would like it."

Current theories on violence and aggression focus on the risks for adolescents. Liu makes the case for implementing prevention programs during the prenatal period and first three years of a child's life — and even before conception — to head off the possibility of early brain dysfunction and later aggression.

"It is never too early to intervene," she said. "The brain undergoes the most critical development in children in the first 36 months. Since all behavior is regulated by the brain, therefore early intervention is important."

Liu cites a number of studies showing that the fetus and the infant child are highly vulnerable to maternal smoking, maternal mental health problems, maternal drug and alcohol use, lead exposure, malnutrition and

domestic violence in the home — and that these influences can lead to brain dysfunction, low IQ and a lifetime of antisocial and criminal behavior.

In earlier research, Liu has shown that birth complications are linked with behavioral problems in 11-year-olds. Other studies by Liu suggest that malnutrition and deficiencies in protein, zinc, iron and omega-3 fatty acids can disturb brain functioning and predispose children to misbehave. Other researchers have shown that maternal depression and poor child-rearing behavior can predispose children to act out aggressively.

To prevent patterns of violence from developing, Liu said, a national public health program could include a free and mandatory course for future parents about pre- and postnatal nutrition, and the risks of smoking and drug and alcohol abuse. Prospective and expecting mothers could be screened for substance use and referred to treatment programs, she said.

Monthly home visits by nurses during pregnancy and early childhood also could help reduce problems later on, Liu said. Such home visits through age 2 have been linked to fewer behavioral problems — including running away, using drugs and alcohol, and getting suspended or arrested — in 15-year-olds.

Finally, Liu said, Early Head Start programs could be expanded to help stimulate learning during the most critical window for brain development, before the age of 3.

"I truly believe that if we invest early, we can deal with the big problems in society," she said.

http://www.miller-mccune.com/health/staunching-aggression-from-the-womb-28885/

Dip in Arts Attendance tied to Decline of the Omnivore

A new NEA study finds the group of people who regularly attend arts events is both shrinking and getting less active.

By Tom Jacobs

A new study by the NEA suggests omnivores, or those who regularly attend varying art events from museum exhibits to operas, are on the decline. (TommL)

The omnivore may not technically qualify as an endangered species. But the coveted creature — known for its sensitivity, inquisitiveness and tendency to congregate around galleries and concert halls — is in decline. And that poses a major challenge to America's arts organizations.

Omnivores — defined by sociologists as people who regularly participate in a broad range of cultural activities — represent a small minority of the population, but a large portion of the arts audience. In a new analysis recently released by the National Endowment for the Arts, author Mark J. Stern concludes that this engaged, energetic group is both shrinking in size and becoming less active.

Stern, a professor of social policy and practice at the University of Pennsylvania, describes this trend as "a double blow" to the nation's arts organizations. In *Age and Arts Participation: A Case Against Demographic Destiny*, he argues the largely unexplained diminution of this group is a key reason attendance at arts events continues to dwindle.

Stern notes that, in recent decades, there has been "a precipitous decline in attendance" at art museums, plays, operas, dance performances, and concerts of both jazz and classical music. According to NEA statistics, classical music attendance has declined at a 29 percent rate since 1982, with the steepest drop occurring form 2002 to 2008. The only art form that did not record a statistically significant drop between 2002 and 2008 — and the one that has had the smallest decline overall since 1982 — is musical theater.

This drop-off has often been ascribed to demographic factors, with some worrying the baby boom generation (raised on television) and its kids (raised on computers) are too caught up in the world of mass media and pop culture to cultivate a taste for the arts, which demand a level of focused attention that seems anathema to contemporary life.

Others have argued the graying audience many arts organizations have noted is a natural phenomenon. According to this school of thought, it isn't until people's kids have grown that they have the money and time to enjoy the finer things in life, including going to concerts and museums.

Stern argues that, when you look at the population as a whole, neither of those arguments hold much water. Using data from the NEA's 2008 Survey of Public Participation in the Arts, he breaks down the audience by both age and generation (pre-1937, World War II, Early Baby Boom, Late Baby Boom, Gen X and Post-1975).

"When we control for other influences — especially the role of educational attainment — the predictive value of age and (generational) cohort turns out to be quite minor," he writes. In contrast, the likelihood of attending arts events increases dramatically with education, from less than 10 percent for those whose education stopped at high school graduation to more than 40 percent for those with graduate degrees.

That said, age and generation become relevant when you focus on the aforementioned slice of the population known as omnivores (as well as their close cousins, highbrows). First identified by sociologist Richard Peterson in the 1990s, omnivores are people who attend both a wide range and a large number of arts events. Highbrows also attend arts events frequently but limit their participation to such art forms as ballet and classical music.

According to Stern, the percentage of population classified as omnivores has dropped dramatically, from 15 percent in 1982 to 10 percent in 2008. The highbrow population also declined, from just over 7 percent in 1982 to 5 percent in 2008. These numbers matter enormously, since together, the two groups make up "more than half of all respondents that reported any type of arts attendance," he writes.

Moreover, "The average number of events attended by omnivores and highbrows dropped sharply between 2002 and 2008," Stern notes. "Omnivores' average number of events attended fell from 12.1 to 11.0 events per year, a decline of 9 percent. Highbrow attendance fell by 11 percent — from 6.1 to 5.5 events per year — while other participants' attendance held steady."

"Taken together," he adds, "the decline of the omnivores' share of the population, and their drop in average number of events attended, represented 82 percent of the entire decline in individual attendance at benchmark arts events between 2002 and 2008."

To put it simply: When your regulars decline in number, and the remaining ones stop coming quite so regularly, you're in trouble.

Stern links this phenomenon to both age and generation. "First, the proportion of cultural omnivores tends to decline with age," he writes. "Younger adults are more likely to be omnivores than older adults. Second, omnivores are more likely to have been born before 1955 than after. The omnivore pattern is more associated with the World War II and early baby boom cohorts than with later groups."

Stern points to larger societal trends to explain this shift. He notes that, since 1970s, the trajectories of Americans' lives have become far more varied and flexible. Perhaps, he argues, "the omnivore represented a transitional stage in our cultural development."

After all, Stern writes, the omnivore arose in the 1970s, at a time when people "were no longer willing to let their social status define what cultural tastes were acceptable for them." This newfound freedom prompted them to sample cultural activities from throughout the spectrum.

Although it's taking a different form, "this quest for a more personal, flexible and protean approach to cultural engagement appears very much alive," he concludes. He points to a 2009 study of Philadelphia residents that found that while many consider themselves "culturally engaged," their connection to music and the arts tends to be via radio, television and books.

That notion is compatible with a separate NEA report that finds while 34.6 percent of adults attended "benchmark" arts events such as ballets or art museum exhibits in 2008, nearly 75 percent "attended arts activities, created arts, or engaged with art via electronic media."

While this suggests fears of the U.S. becoming a cultural wasteland are overblown, it also implies getting people to leave their homes to see a show or visit a gallery is becoming increasingly difficult, leaving arts organizations in a precarious position.

It also makes hybrid experiments, such as the live-in-HD simulcasts recently inaugurated by the Metropolitan Opera, Los Angeles Philharmonic and National Theatre of Great Britain, all the more important. Will they stimulate cinema-goers to attend live performances, or drain the in-person audience further by serving as acceptable substitutes? It appears a lot is riding on the answer.

http://www.miller-mccune.com/culture-society/dip-in-arts-attendance-tied-to-decline-of-the-omnivore-29046/

Bullying: A Junior Hate Crime?

Serious research into juvenile bullying increasingly focuses on ways to curb what appears to many as an inevitable feature of the schoolyard.

By Ryan Blitstein

A study projects 160,000 American children stay home from school one day per month for fear of being bullied.

In American schools, bullying is often as common as pop quizzes and uncomfortable plastic chairs. Yet seemingly harmless, juvenile taunts may lead to anxiety and depression, drug use or even violence.

A growing body of research seeks to help school administrators understand and curb bullying on school grounds — the hub of social interaction for most American children and, consequently, the center of bullying behavior. In the October issue of *American Behavioral Scientist,* Bridgewater State College professor Elizabeth Englander suggests a novel approach: Prevention programs could treat bullying behavior not merely as a conflict between children, but as a hate crime.

Though some research points to an increase in the amount of bullying nationwide, many experts say this is likely due to better data collection and more reporting by students, and that the incidence has actually held steady for decades.

Most agree that bullying affects millions of kids: One pair of researchers estimated that as many as 15 percent of U.S. children are frequently or severely harassed by their peers. Another study projected that 160,000 American children stay home from school one day per month for fear of being bullied.

Until recently, though, few psychologists studied the issue in depth. The change occurred shortly after the 1999 Columbine High School massacre. Then a 2002 report by the U.S. Secret Service said bullying played a

significant role in many school shootings, adding urgency to bullying research and the development of new policies to eliminate it. The attention only increased as the explosion of Internet use gave rise to what's now called "cyberbullying," which includes harassing, threatening, tormenting or humiliating another person via e-mail, instant messaging, text messaging, blogs, mobile phones, pagers or Web sites.

Many local school boards and parent-teacher associations have pushed for new anti-bullying programs, though their implementation nationwide has been uneven. While children are quick to recognize the problem, their parents and teachers often remain in denial.

"The adults say: 'There's no real problem here,' or 'They should just suck it up,' and that we're exaggerating," Englander said. "It's, 'I think my school doesn't have any issues,' or 'I don't believe my child would ever do anything like that.'"

The paucity of research can leave even well-meaning principals at a loss for the right bullying prevention plan.

"Schools want to take this more seriously, but they don't know how," said Brenda High, co-director of Bully Police, an advocacy group for bullying victims.

The programs they choose often lack research to back up their effectiveness. University of Toledo professor Lisa Kovach, for example, described an "expert" who travels to Ohio schools, charging close to $1,000 per hour for a program unsupported by scientific evidence.

Many schools rely on proven courses, such as the Olweus Bullying Prevention Program. Developed during the 1980s by Dan Olweus, a Swede who conducted much of his research in Norway, it's been successfully tested in several countries worldwide, including the U.S.

The straightforward program begins with the creation of a committee to oversee the anti-bullying campaign and an anonymous student questionnaire assessing the level of bullying in the school. Teachers and administrators are then trained to deal with bullying, and students and parents are taught about the problem. The school establishes anti-bullying rules, and school staff conducts "interventions" with bullies and their victims.

Yet Olweus has its limits. It's expensive — $3,000 just for the two-day training of a school's "Bullying Prevention Coordinating Committee" — and its reliance on teachers to act as watchdogs means schools may still find it difficult to overcome underreporting.

"If kids fail to report bullying because the teacher is overbearing, the school will look like a utopia," Kovach said.

Englander is one of several academics, including Kovach, incorporating recent research results into programs that seek to improve on Olweus' methods.

An insight underpinning Englander's current work is the idea that bullies choose victims specifically because they're "different." To adults, bullying a child because she's nerdy may seem dissimilar from harassing her because she's a member of a minority ethnic group. Yet Englander has observed that children often view the actions as equivalent.

"When children are looking for someone to abuse, they're looking for a noticeable difference," Englander said. "That person may be an unusually high achiever or could be someone belonging to a sensitive group. They don't see the difference the way that we do."

In almost every school Englander studied, teens discussing bullying described their peers' failure to tolerate and respect differences. Though the students didn't use the phrase "hate crime," they employed language that meant virtually the same thing — indicating that the crimes were primarily motivated by the victim's membership in a group.

Englander designed a program that incorporated hate-crime prevention strategies, emphasizing tolerance between groups. She also sent college students into middle and high schools to make students feel more comfortable discussing bullying. The initial results are promising: In more than half the schools they worked with, there was a significant increase in reporting of and talking about bullying. About nine in 10 teachers said it was extremely useful and practical.

"Ultimately, our hope is that the incidence will decrease," she said. "But the first step is to find out what the incidence really is."

Like Englander's studies, much of the anti-bullying research is relatively new. The data are still inconclusive on the effectiveness of some common practices, such as putting bully and victim in a room together to resolve their conflict.

Whatever the right approach, political winds are shifting in favor of anti-bullying laws. Since 2001, more than half of U.S. states have enacted legislation to deal with bullying, with 11 new laws during the 2005-06 session alone, according to the National Conference of State Legislatures. They range from general statements prohibiting bullying to requirements for specific prevention programs and training within schools. There might be many more regulations, if not for some proposals having become culture war battlegrounds, with prolonged arguments over whether groups, such as gays, should be protected by the legislation.

As public officials and activists battle over the language, the research community continues on the path toward discovering what might work — and why.

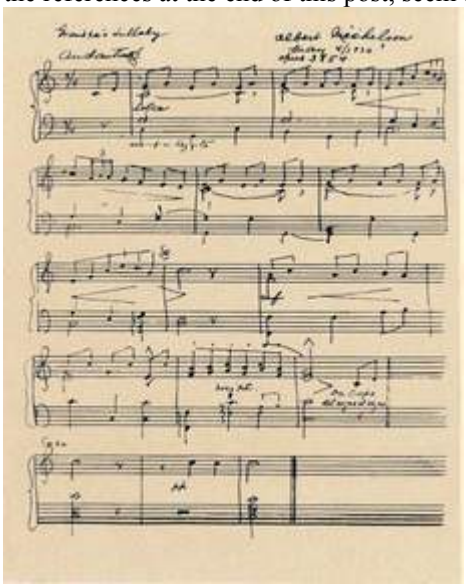
http://www.miller-mccune.com/culture-society/bullying-a-junior-hate-crime-4775/

Artsmarts: Why Cutting Arts Funding Is Not a Good Idea

Funding the arts funds scientific innovation and economic development.
Published on February 14, 2011
Congress is once again making plans to gut the National Endowment for the Arts, so it is time for us to post more data supporting the arts. In previous posts, we've argued that the arts are essential for the development of scientific imagination. (See *A Missing Piece in the Economic Stimulus*; *Arts and Crafts: Keys to Scientific Creativity*; *Arts at the Center of Creative Education*). Here we argue that the arts stimulate economic development by fostering scientific and technological innovation.

Let's start with a few inspiring quotes about the value of arts from CEOs of major technological companies:
"At Boeing, innovation is our lifeblood. The arts inspire innovation by leading us to open our minds and think in new ways about our lives - including the work we do, the way we work, and the customers we serve," writes W. James McNerney, Jr., Chairman, President and Chief Executive Officer, The Boeing Company. (1)
"We are a company founded on innovation and believe the arts, like science and engineering, both inspire us and challenge our notions of impossibility," says George David, Chairman and Chief Executive Officer, United Technologies Corporation (1)
"The arts foster creativity, and creativity is central to our business strategy," comments Randall L. Tobias, Chairman of the Board and CEO, Eli Lilly and Company. "Indeed, we believe there is a strong link between the creativity nurtured by the arts and scientific creativity. If our scientists are stimulated through their involvement with the arts, then it's ultimately good for our business -- and our community." (2)
Helge W. Wehmeier, President and Chief Executive Officer, Bayer Corporation agrees: "A good well-rounded education must include the study of both the arts and the sciences. As a company we explore the synergies between arts and science. Of all subjects, the arts and sciences are the closest and most interrelated. They offer complementary ways of understanding the same object or event... They also teach critical thinking, creativity and curiosity - skills that make for an educated and innovative work force." (3)

Unfortunately, these observations by our industrial leaders, and many similar statements that can be found in the references at the end of this post, seem to be insufficient to convince Congress to support the arts. So a



group of us at Michigan State University (*) have undertaken a study of the relationship of arts and crafts experience to scientific and technological innovation.

In our initial research, we contacted scientists and engineers who graduated from MSU's Honors College between 1990 and 1995. We asked them to take a survey about their childhood, young adult, and mature adult participation in various arts and crafts and we enquired about various measures of their innovativeness, including the number of patents they had obtained and the number of companies they had helped to found. Our findings amply validate the observations of the CEOs quoted above.

The data our scientists and engineers provided to us demonstrate that the more arts and crafts a person masters, the greater their probability of becoming an inventor or innovator. In the first place, Honors College graduates in the sciences, technology, engineering and math were three to eight times as likely to have had

lessons in any particular art or craft as the average American. Those Honors College graduates who have founded companies or produced licensed patents have even higher exposures to arts and crafts than the average Honors College scientist or engineer.

Take home message? The more arts and crafts experience our scientists and inventors have, the more likely they will be to generate creative capital of clear economic value. Invest in arts and crafts and it comes back to

you many-fold.
Which arts should we invest in? All of them! While almost all arts correlated with increased success as a scientist or inventor in our study, lifelong involvement in dance, composing music, photography, woodwork, metal work, mechanics, electronics and recreational computer programming were particularly associated with development of creative capital.
And invest early! A particularly striking finding was that early hands-on experience with arts and crafts was critical to continuing participation in these arts and crafts. And continuing participation in arts and crafts across a lifetime was one of the strongest correlates to generating patents and new companies.
The policy implications of our results point to government support of the arts as an economic stimulus. Yet President Obama has just recommended cutting the Department of Education arts education to ZERO in 2012. ZERO!!!! Adult innovators are able to invent because they have extensive experience making things starting as young children. Arts and crafts skills are the source of that inventiveness. The arts may not be rocket science; but they make rocket science possible.
In fact, our Honors College scientists and engineers reached this conclusion themselves. Eighty-one percent of the respondents to our survey recommend arts and crafts education as a useful or even essential background for a scientific or engineering innovator. Many provided commentaries just like those of the CEOs quoted above:
One wrote: *Arts and crafts encourage experimentation - there's no one right way to do art. It encourages one to break out of a "follow the steps to get some result" mold. I feel like I am adept at getting my bearings in unfamiliar situations and determining a direction to follow. This is very helpful when troubleshooting, where the unexpected happens all the time.*
Another agreed: *After these many years in the classroom, I see those that have music and arts background seem to do very well in physics and often times head to engineering careers.*
A third argued that *experience with arts and crafts, allows you to explore materials in a different way, figure out how to put things together, try to do things differently.*
While causality cannot be determined by these preliminary findings, the combination of data and personal testimony strongly indicate that arts and crafts education and ongoing participation are correlated with economic development of creative capital. Eliminating arts and crafts programs will certainly harm education in these areas, and will almost certainly have serious negative economic consequences as well.

Hobble the arts and crafts and you hobble innovation. Hobble innovation and our economy will suffer. Conversely, invest in arts and crafts and every dollar will stimulate the economy not only today, but through innovation a host of tomorrows.

(Nobel prize winning chemist Linus Pauling playing his guitar, left. And check out the UTUBE video of Michelson (above) painting: http://www.encyclopedia.com/video/sEa-qUOGLNQ-albert-abraham-michelson.aspx)
REFERENCES
(1) http://www.americansforthearts.org/information_services/arts_and_...
(2) David Finn and Judith A. Jedlicka, *The Art of Leadership: Building Business-Arts Alliances.* New York: Abbeville Press, 1998, p. 88.

http://www.psychologytoday.com/blog/imagine/201102/artsmarts-why-cutting-arts-funding-is-not-good-idea

Toxic Empowerment

A toxic leader imposes empowerment where it doesn't fit.
Published on March 14, 2011
As a leadership coach I come across a few troubled bosses. One recent case jumps out at me more than others. Mario Erasmus, a leader in the construction industry was dumbfounded by workers who in his words were "sabotaging his high end sites and perfecting the art of insubordination."
Mario was painfully aware that under his direction productivity had taken a plunge at Evening Glory. Motivation was non-existent. And the big guys could care less that Mario was taking the heat for missed deadlines and regularly facing irate clients. In a word, Mario was being "disrespected." But there was more to it than just insubordination. As the senior construction manager stated it:
"...My burly men had the audacity to say that I was the one who was poisoning operations and that I am a *toxic boss*. What part of a chain of command don't they understand? And why are they so dysfunctional when it comes to exercising some decision making, leadership and empowerment? Are they babies?"
Assigned to a new project at Evening Glory Circle, Mario's unfamiliar crew defied his orders at this much anticipated commercial building site. As Mario confessed,
"It's ironic. Maybe they're right and I *am* a toxic boss. Why? I was stupid enough to play the trust and empowerment game with them. I poisoned my hard hats by showing them some compassion. They only understand a dictator...you know...your typical rude and crude authoritarian boss!"
Mario went on to explain that several weeks after he entered his new leadership role at Morning Glory he had a revelation. It suddenly became crystal clear to him that his crew didn't want to be empowered. *It turned out to be a toxic empowerment*. (*To find out more about toxic leaders see my recent books, "**Transforming Toxic Leaders,**" Palo Alto, CA: Stanford University Press, 2009; and "**Destructive Leaders and Dysfunctional Organizations**," Cambridge, England, U.K.: Cambridge University Press, 2010.)* The men thought that Mario was a weakling when he didn't lay down the law with them. What the construction crew actually wanted was clear and pointed directions and they didn't appreciate the fact that Erasmus was quite vague about objectives and deadlines and advocated what they referred to as "soft leadership." Mario expected individual crew members to all participate in leadership decision making in order to determine who would perform what tasks and at what pace. Initially, Erasmus fell into the trap of a toxic empowerment scenario by delegating himself to the background while his subordinates failed to take control. When Marion announced that he was there for his employees on an "as needed" basis - the buzz that circulated was that Mr. Erasmus was incompetent. One hard hat shouted out, "we want a boss who works for a living and gives us freaking directions, not some double talking liberal idiot! We need a quarterback not a benchwarmer!"

What Erasmus assumed during his first weeks on the job was what management guru, Douglas McGregor termed a "theory Y" approach to leadership. Mario was a poster boy for a new generation of theory Y leaders who preach decentralization. Workers rule. You could almost hear the ancient chant of "power to the people." To the "Y leadership" faction - the old world, "hard leadership" born of monarchs and big bosses was a relic and dinosaur of a "theory X" past of sweat shops and antiquated, abominable factories. The theory Y gospel was the secular religion that Mario subscribed to when he first walked through the front door of the parent company, Oasis Development Inc. Mario deeply believed that high motivation and productivity results from treating employees with utmost dignity and delegating as much responsibility to them as possible. If a leader shows that s/he cares and trusts, employees will repay her many times over. One of Mario's many mantras was "get under their skin and watch the dividends."
How did Mario get caught up in what surprisingly turned out to be a toxic approach to leading? Why did Mario's employees reject being empowered and participating in strategic decision making? Why? What was being asked of them was in sharp contrast to their experience to date as construction workers. The concept of empowerment was not remotely a fit for the organizational culture in question. The theory Y edict seemed to emerge out of another world. It was perceived as an alien management missile and the equivalent of a leadership scud beamed in from another corporate universe.
Unfortunately, it's fairly cliché and predictable how Mr. Erasmus formulated his warm, fuzzy, well intentioned, politically correct and empowering approach to leadership. Getting into Mario's leadership head grants entrance into the nexus of what I have termed the *Mario Factor.* It is important to take note of the cultural context for Mario's misalignment, his unwittingly dysfunctional agenda, and an unanticipated

entanglement in toxic empowerment. In other words, where do we find the incubators for this paradoxical cultural phenomenon of empowering those who want to be bossed around?

Mario got more than his fair dose of theory Y in his Undergraduate and MBA business and psychology training. What else is new? He learned in his study of theory Y leadership that *empowerment is golden.* It is the psychological legal tender. Accordingly, Mario wanted to motivate his Evening Glory underlings and colleagues by trusting and empowering them. This student and leader of the new order of empowerment taught that there was more to being a corporate leader than just getting a job done and figuring out the best way to complete a task. In our top business schools and MBA programs we find that there is much theory substantiating that any semblance of issuing edicts, giving orders and being an authoritarian has largely fallen out of Fortune 500 and upscale U.S. favor - whether we are talking workplace or family. Like Mario, we who are allegedly educated have overwhelmingly learned that children, spouses and colleagues expect that their leaders and significant others trust, empathize and illustrate how much we are ready to empower. Superb listening skills, emotionally sensitized team work and 360 degree feedback are prime time. Mario was committed to the fact that getting his Evening Glory employees motivated, productive and collaborative requires that we somehow get into their Freudian subconscious mind via an ever evolving degree of emotional intelligence. Feelings rule. Leader sensitivity reigns supreme. Compassion is a commodity. Suffice to say that Mario was attempting at Evening Glory Circle to lead from the inside out, tapping into the subjective, inner world of employees in order to stimulate objective, external productivity and market share. Almost laughingly, the hard hats wanted nothing to do with this horizontal agenda. They were terribly uncomfortable, unfamiliar and suspicious - and with good reason. Was their leader, the new kid on the block, was he: ....Joking? Playing with them? Mental? Just plain clueless and dysfunctional?

At the Evening Glory Circle construction site Mario begrudgingly learned alongside his co-leader (Trevor Evans) that none of the "theory Y leadership stuff" seemed to work. In fact the empowerment approach undermined and de-motivated construction employees. Mario became a joke, a laughing stock. Mario's sensitivity was equated with stupidity despite the fact that Mr. Erasmus had an IQ of almost 160!. The senior supervisor's empowerment strategy was equated with weakness and an inability to rise to the responsibilities of true leadership. Mario was in a quandary. Mario was about to discover and formulate what I herein name in his honor - the ***Mario Factor.***

Mario hesitated and dragged his feet but he finally figured out in midstream that he had to change his leadership style to better fit Morning Glory. Somehow the theory Y, empowerment models toted in his MBA program were seriously mistaken and off target for this venue. Mario was no longer a member of a removed, espresso laden, philosophical classroom. Mario was thrust into the real world of construction. The revelation that his humane, liberal approach to leading could in fact be viewed in certain companies, contexts and industries as a form of toxic empowerment was a tough pill to swallow. Putting two and two together Mario realized that a more authoritarian approach to leadership might in fact be more appropriate and successful for his construction site (and the construction industry) whereas a softer, theory Y approach to empowerment was better suited for aerospace engineers and university professors. Bravo! In other words, one size doesn't fit all. Immersed in this case as the external leadership coach, I diagnosed and discovered what I was soon to term the "Mario Factor" to refer to compassionate attempts at leadership and empowerment that turn dysfunctional. The "Mario Factor" can help identify the need for diversity in leadership as successful leaders develop a broad repertoire of styles specifically suited to individuals, teams, organizations and professions. Leadership must be customized. It must fit.

In addition, the Mario Factor forces clear minded leaders to view leadership along a continuum ranging from the extremely dictatorial, hierarchical and authoritarian all the way to leaderless teams and employees granted carte blanche empowerment to decide and perform all facets of their jobs. And there of course are many points in between the "X" and "Y" extremes as hybrid leadership styles can be customized to particular departments, leaders, and divisions under the same corporate umbrella.

More pointedly, however, the Mario Factor tells us that our most humane innovations in leading employees may not *fit* a given workplace. The psychology of the workplace is not about merely theorizing or advocating what we consider to be the most ethical, moral and humane approaches to leadership - while looking down from our theories and aircraft at an altitude of 40,000 feet. Once our boots step foot in the local soil and we walk a mile in the shoes of our employees and their industry we begin to tackle the far more difficult leadership question of "fit." Like it or not we are anthropologists who must get familiarized with our clients,

workers, colleagues and constituents and only then can we begin to make judgments as to the appropriates of more authoritarian, theory X leadership versus a more empowering theory Y trajectory.
When a leader such as Mario Erasmus imposes an inappropriate leadership style upon employees who are thoroughly unfamiliar with its premises - this is a recipe for conflict and toxicity. Poisons emanate from leaders who force a fit. As a celebrity lawyer once phrased it in the defense of an infamous primetime football and celebrity client, "If it doesn't fit you must acquit." The breathtaking beauty and skin tight fit of an empowerment approach to leadership at a university or as part and parcel of TQM at a Tokyo auto manufacturing plant - may turn out to be an ill advised and toxic fit at a construction company in Southern Arizona or along the Jersey Shore. Such is the ***Mario Factor.***

http://www.psychologytoday.com/blog/transforming-toxic-leaders/201103/toxic-empowerment

Don't Delay

Understanding procrastination and how to achieve our goals.
by Timothy A. Pychyl
Procrastination & The Science of Sin
Why we consider sloth a deadly sin.
Published on March 14, 2011

I did an interview recently for an upcoming documentary entitled "The Science of Sin." Not surprisingly, I talked about sloth. Why it's considered sinful is worth some reflection.
The categories of sin in the Catholic Church have a long and interesting history. It's beyond the scope of this post and my scholarship to do justice to this story. Suffice it to say that the notion of sin has changed in its meaning over the centuries.
One of the classic Christian discussions of the topic of the seven deadly sins is in the *Summa Theologica* by the 13th-century theologian St. Thomas Aquinas. These sins were also a popular theme in the morality plays and art of the European Middle Ages.
In short, from the cultural heritage of the Christian tradition, we are well acquainted with the usual list of the seven deadly sins: (1) vainglory, or pride, (2) covetousness, (3) lust, (4) envy, (5) gluttony (usually including drunkenness), (6) anger, and (7) sloth. Each of these has also been associated with an archdemon. In the case of sloth, this is Belphegor, pictured in this post (although these associated demons also had a long and changing history). There's nothing quite like putting a face to a name, is there?

Among the questions raised for me in terms of sloth and sin specifically were:
1) Is sloth simply a concern of the Christian tradition? and
2) Why is sloth considered a sin?
The answer to the first question is fairly straightforward. No. Each of the major religions seems to have something akin to sloth, with similarly negative connotations.

The answer to the second question is very interesting involving complex discussions of different types of sin. I won't dive into these deep waters. Instead, I will take an admittedly light-fingered approach to a complex history to make a fairly simple point.

Whether it be Buddhist, Christian, Hindu, Judaic or Muslim traditions, sloth is, at the very least, a hindrance or obstacle in life. In addition, blame is cast on the slothful individual. I'll come back to this important issue of blame.

Why a sin?

Borrowing from ancient Greek thought, sloth is a sin because it contributes to the individual's failure to achieve his or her true self-expression. In particular, sloth is a sin in this regard because time is of the essence. We are temporally-limited creatures. We live. We die. In the time in between, we are called to be our "true selves." This may be considered to be in the likeness of "God," whatever that may mean to you. However, we need not go this far theologically to see why sloth is a sin. Even an athesist might see how the temporal limit on human life leads to the notion that "time is holy."

To sum it up, time is holy because we have so little of it. Life is short. Time is precious. To waste it, to squander it through sloth - laziness, procrastination, task avoidance, amotivation, desultory or dilatory behavior - is a sin against life itself. This is a general commonality of the "sin" of sloth.

Sin. It's a heavy word for the 21st century. We prefer scientific explanations, and that's where this documentary is meant to take the viewer. Although I haven't seen the compiled interviews and footage yet, I'm sure we'll venture into the brain via modern studies with fMRI. We'll discuss the prefrontal cortex and executive function. In short, we'll look to understand why we humans are prone to these moral shortcomings we label as sin.

With procrastination, the scientific answer consistently points to self-regulation failure. We fail to regulate ourselves to engage in our intended actions even though this failure to act has the potential of being self-defeating. Acting now is in our best interest, we know this, nothing is stopping us from acting, but we still somewhat irrationally voluntarily delay our actions. My blog posts have addressed this in so many different ways, including the notion of our limited willpower.

It's not a new story, even with the "new" neuroscientific perspective. William James addressed this in his early psychological writings on the "obstructed will" as he denounced the "schemers and deadbeats" of the world. There was no mistaking the moral failing of the obstructed will. Modern psychology continues to investigate the failure of will. We continue to acknowledge that sloth is not the best route to take. Indeed, we call it self-regulation "failure."

However, the scientific view is not my perspective today. It's this notion of sin, of not fulfilling our potential, of wasting that which is truly "holy" in our lives, our lives themselves.

As long-time readers of this *Don't Delay* blog know, I have an existential perspective of our self-regulation failure that does speak to the moral failing of procrastination. I begin with the assumption of human agency, not a simplistic determinism that would deny this. For those so engaged philosophically, you might call mine a "compatibilist" position on human freedom and free will. Although I agree that we need to understand what we may call the "neural signature" of procrastination, this explanation provides no excuse for failing to act. These lower-level, neural explanations provide us with an understanding of the correlates of our action, not necessarily an ultimate cause in and of itself.

I think what we hope with this new science of sin, is that we can side-step the sin part altogether by explaining the neural causes of our behaviors. We hope we can understand the mechanism so that we can fix it, no effort required. These are vain hopes, I believe. We can't side-step human agency.

Praise and Blame

Sin necessarily begins with the assumption of agency, of free will. We are free to choose, and it is on the basis of this choice that we are open to praise or blame. This is the key common feature of the nature of sloth across belief systems as well. Sloth begets blame, the ultimate blame in fact, as sin.

And, we're back to human nature. We work for praise and to avoid blame. We do our best to foster self-regulatory skills in our children and ourselves to make the right choice, most of the time. We struggle with weakness of will. We seek forgiveness in our own way, and we try again.

What do we know about the science of sin? In terms of procrastination, we continue to refine our understanding of self-regulatory processes, neural and behavioral, that we might bolster to more effectively be the people we strive to be. A good and common example are the positive effects of mindfulness meditation on

self-regulatory strength. Of course, we have to choose to develop this attentional skill, and that takes us back to our active agency in the world. If our route to self-regulatory salvation is mindfulness meditation, then our slothful delay of this practice is its own perverse form of second-order procrastination (a whole new category of sloth perhaps?).

I hope you can see the difference here between some tongue-in-cheek comments and the more important issues of agency, self-regulatory failure and sin. Sloth is a sin in the sense that we feel the weight of the moral blame for not living up to our commitment to ourselves to act as we intend. It falls into the category of sin, as opposed to some less important moral failing, because it contributes to a failure to live life fully. Ouch. I thought it was only a problem of spending too much time on the couch on Saturday afternoons or too many "all-nighters" when reports are due.

Procrastination and the science of sin . . . the sin intrigues us, the science fascinates, but we have to be careful not to simply amuse ourselves to death with information posing as wisdom. Just as knowing how the gut digests food will not necessarily help us curb our over-eating, insight about how self-regulatory processes in the brain control behaviors may not bring us any closer to acting in a timely manner in our goal pursuit. This is not the level of analysis required. Instead, we need to heed another ancient adage, one as old as sin itself; know thyself.

http://www.psychologytoday.com/blog/dont-delay/201103/procrastination-the-science-sin

A Glass Half Full or Half Empty: How Much Water Do We Really Need?

Water pollution and debunking the rule of eight.
Published on March 14, 2011
Devastation from the recent earthquake and tsumani in Japan has brought subsequent threat of contamination from a potential nuclear meltdown, but more immediately, there have been reports of severe food and water shortages. Depending on our nutritional and body fat status, for example, we can survive without food for weeks or even months as long as we have water. According to researchers, though, we can live only 6 to 14 days, depending on the rate of water loss, without any water. Our bodies are, after all, about 50 to 70% water; even the brain, according to physiologist Heinz Valtin, is 75% water. We have water within and outside our cells, including in our blood, which is 85% water. When body fluids fall below an optimal level, we enter a toxic dehydrated state: there develops an imbalance of the vital electrolytes sodium and potassium and a disturbance in brain function. Dizziness, mood changes, lethargy, brain swelling, delirium, coma, and even death can result. As a result, our body has an exquisitely precise homeostatic system for water regulation that involves the kidneys and specific hormones of the endocrine system primarily, though the small intestine is the primary site of water absorption in our body.

So how much water do we need to drink daily for optimal health? Conventional wisdom is we require eight 8-ounce glasses of water daily, particularly since we lose water when we breathe, sweat, or excrete. Valtin takes issue with this common admonition. Writing some years ago in the *American Journal of Physiology*, he attempted to trace its origin by conducting a comprehensive search of the literature. In fact, he could not find any scientific validation or convincing evidence for this well-known recommendation given to healthy adults! And he even went so far as to suggest that too much daily liquid may be dangerous for some people and may lead to hyponatremia (low sodium levels) or even unnecessary exposure to pollutants. And he noted that all liquid consumption should count in our daily tally, whether water, juice, coffee, soda, and even beer in moderation, though we know that many liquids such as sweetened sodas can add many additional calories daily. The point is water is essential for life but our water requirements vary with climate (including temperature and humidity), gender, diet, exercise, age, health, etc. In general an average healthy adult requires about one and one-half quarts daily to replace normal losses. According to researchers Jequier and Constant, in a recent article in the *European Journal of Clinical Nutrition*, our level of thirst can usually determine our intake of water and it may vary substantially from person to person. This mechanism, though, may not be

accurate in the elderly or in infants, who are particularly sensitive to the effects of dehyration. Furthermore, infants have immature kidneys that cannot concentrate urine well, a high metabolic rate, and a limited ability to indicate thirst. Certain disease states, such as those causing fever or diarrhea, may increase our usual daily needs.

Other researchers have suggested that many things may influence the effect of water on us: even the speed with which we drink may determine how much we retain. For example, drinking a large amount in a few minutes is excreted rapidly whereas the same amount over several hours is largely retained. And some have suggested that water in food makes us feel more satiated, though it is not clear how long that effect lasts or how much liquid is required.

What about the use of bottled water? There have developed fairly common sightings, at least in New York City, of people who cling to huge bottles of water, not unlike the security blankets of infants, as if they were crossing the Sahara alone and far from mother rather than the city streets. Bottled water, incidentally, is not necessarily safer than most city tap water. It may also carry its share of industrial waste, sewage, bacteria, and chemical contaminants. In fact it was reported that at least one company carried the label, PWS, for "public water source!" And writer Ian Williams, in an article, aptly titled, Message in a Bottle, questioned whether water from melted glaciers is really so healthy, particularly when this water may have been "lying around from the last Ice Age" with such pollutants as lead, dioxin, and even "polar bear poop and...the occasional dead Inuit or Viking." The other problem with bottled water is the havoc all these plastic bottles are causing on our environment. For those ecologically-minded, I would strongly recommend the recent extraordinary book, *Moby Duck*, by Donovan Holm, which vividly describes the "toxic goulash" created by plastic debris, among other pollutants, floating in our oceans. Holm's own search for the almost 30,000 bath toys that fell overboard in a 1992 transit from Asia led to his "archeology of the ordinary" and a voyage of profound awakening to the problems of environmental pollution for both himself and for the reader. Hohn found that one beachcombing couple scavenging for debris had retrieved seventy-five different brands (many from other countries) of polyethylene water bottles!

Instead of those plastic bottles that may pollute the environment for hundreds of years, people may want to consider getting a water filter for their own tap water. And remember, though water is essential to our existence, there is no science to the rule of eight!

http://www.psychologytoday.com/blog/the-gravity-weight/201103/glass-half-full-or-half-empty-how-much-water-do-we-really-need

Friendly bacteria fight the flu

Microbes trigger immune response that suppresses infections.

Amy Maxmen

Beyond yogurt: friendly bacteria can help fight viral infections in the lungs.ALFRED PASIEKA/SCIENCE PHOTO LIBRARY

Helpful bacteria don't just aid digestion; they also fend off the flu, according to a report published today in the Proceedings of the National Academy of Sciences[1].

A research team led by Akiko Iwasaki, an immunologist at Yale University in New Haven, Connecticut, found that mice treated with neomycin antibiotics were more susceptible than control mice to influenza viruses. It turned out that neomycin-sensitive bacteria naturally present in the mice's bodies provided a trigger that led to the production of T cells and antibodies that could fight an influenza infection in the lungs.

The bacteria kick-started the flu-fighting pathway by activating 'inflammasome' protein complexes in the immune system. The inflammasomes then pushed precursors of an immune protein — the cytokine interleukin 1-β — into a chemically mature state. Mature interleukin 1-β triggered dendritic immune cells to migrate to lymph nodes in the lungs, where they initiate a potent attack on influenza viruses. When antibiotics eliminated the bacteria, inflammasomes failed to launch and the virus multiplied.

"This is a landmark paper that opens up new avenues of research and suggests new possibilities for ways to treat and prevent viral infections," says Sarkis Mazmanian, a microbiologist at the California Institute of Technology in Pasadena.

Gut feeling

Microbiologists have known that microbes inhabiting mammals interact with the immune system since the 1950s, when they found that eliminating bacteria in newborn mice prevented them from developing a normal immune system[2].

In the past decade, research has focused on how bacteria regulate immune pathways relevant to the health of the host's gut, where the bulk of the body's roughly 100 trillion 'commensal' — harmless or beneficial — bacteria reside. For example, an imbalance in the proportions of certain harmful and beneficial gut bacteria seems to over-activate inflammation-inducing cells, possibly fuelling inflammatory bowel disease[3].

A handful of detailed reports in the past five years have hinted that helpful microbial interactions don't stop at the gut[4], but Iwasaki's study is the first to pinpoint how bacteria combat infections in the lungs.

"This study contributes to a growing body of literature showing that signals from commensal bacteria can have an impact on immune cells in multiple tissues," says David Artis, an immunologist at the University of Pennsylvania in Philadelphia. "If certain antibiotics have an effect on our ability to mount a response against a viral infection, it means that people should be careful to only take antibiotics when they are absolutely needed — particularly in the flu season."

In addition, says Artis, the findings "suggest that our diet might affect our ability to fight viruses by influencing the composition of our commensal bacteria".

But Iwasaki cautions that "we don't yet know enough about which bacteria trigger what pathways to make health recommendations". Her team has not identified the bacteria responsible for the immune response, but Iwasaki suspects that effect is caused by Lactobacillus species residing in the gut. After antibiotics, the populations of these bacteria were significantly diminished in the mice's guts but not in their nasal cavities.

Mazmanian says, "the question is, do bacteria intentionally induce this process in order to protect their hosts from flu infections? Or is the inflammasome non-specifically activated by the bacteria, and one consequence of inflammasome activation just happens to be flu control?"

Either way, "it's become clear that our immune system has evolved to act like an interface for microorganisms to send signals to our body".

- ***References***

1. Ichinohe, T. *et al*. Proc. Natl Acad. Sci. USA doi:10.1073/pnas.1019378108 (2011).
2. Smith, K. , McCoy, K. D. & Macpherson, A. J. Sem. Immunol. 19, 59-69 (2007).
3. Round, J. L. & Mazmanian, S. K. Nature Rev. Immunol. 9, 313-323 (2009).
4. Clarke, T. B. *et al*. Nature Med. 16, 228-231 (2010).

http://www.nature.com/news/2011/110314/full/news.2011.159.html

Early Europeans unwarmed by fire

The first hominins to migrate into Europe may have done so without fire.

Matt Kaplan

The earliest inhabitants of Europe had to brave harsh winters without the benefit of fire.SHEILA TERRY / SCIENCE PHOTO LIBRARY

The logical argument that ancient human ancestors had to have mastered fire before departing balmy Africa for the often freezing climes of Europe is being challenged by a review revealing that there is no evidence to support the idea.

Exactly when fire became a tool in the hominin toolbox is a thorny issue. Unlike stone tools, which hold together reasonably well over the course of time and can be dated as having been in hominin hands for at least 2.6 million years, the ash and charcoal that are often the only remains from ancient fires are rare in the fossil record as they are easily destroyed by the elements.

Yet because fire makes food so much more energy efficient to consume and has such a key role in providing warmth, most anthropologists have agreed that hominins had to have mastered fire before they headed into Europe.

"We assumed fire had to be an element of the human toolkit to survive northern-latitude winters," says archaeologist, Francesco d'Errico at the University of Bordeaux in France.

As logical as the argument seems, the review, published today in Proceedings of the National Academy of Sciences[1], suggests that it is wrong.

Cold comfort

Wil Roebroeks at Leiden University in the Netherlands and Paola Villa at the University of Colorado Museum in Boulder, searched the European archaeological record for fires and found that the earliest possible evidence comes from two 400,000-year-old sites, one in England that seems to have the remains of an ancient hearth and one in Germany that has a charred wooden tool and heated flint present. Older sites in England, Italy and Spain showed no evidence of fire mastery. These observations are problematic because ancient human ancestors migrated into the cold European climate more than a million years ago, implying that they survived for 600,000 or so without fire.

Further analysis allowed Roebroeks and Villa to construct a dataset of sites showing good evidence of fire use over the past 400,000 years. Indeed, they identify 400,000 years ago as the point at which evidence of fire in the European fossil record starts to increase significantly.

Their work is not just challenging when fire was used, it is also altering views of who was using it. The pair found that fire was actually rather common at sites where Neanderthals lived. "We were surprised to find so many Neanderthal sites with clear and repeated evidence of fire, since archaeologists believe that they did not habitually use it," says Roebroeks.

Fanning the flames

The findings conflict with data from other parts of the world. In Israel, at the Acheulian site of Gesher Benot Ya'aqov, researchers have used heated microartefacts and plant remains to propose that controlled fires were being burned at the site as many as 780,000 years ago. And there are some controversial suggestions that controlled fires were in use in Africa 1.6 million years ago.

Although the Israeli site is an enigma, Roebroeks and Villa argue that the early fires detected in Africa may have formed through lightning strikes. In some cases these may have been collected by hominins who knew how useful fire could be but had no idea how to create it on their own.

"Distinguishing 'captured' fire versus fire made at will by hominins is problematic in old archaeological contexts," says palaeoanthropologist Lawrence Straus at the University of New Mexico in Albuquerque. "The review raises the question of how early European hominins managed to survive winters," adds Straus.

On a grander scale, fire is often evoked as a key factor in helping humans to evolve – by allowing them to spend less energy digesting and more thinking. "As things stand, their evidence, or lack thereof, really questions this ambitious theory, that fire made humans," says Straus.

- ***References***

1. Roebroeks, W. & Villa, P. *Proc. Natl Acad. Sci. USA* advance online publication doi:10.1073/pnas.1018116108 (2011).

http://www.nature.com/news/2011/110314/full/news.2011.158.html

Virology: Fighting for a cause

When Judy Mikovits found links between chronic fatigue syndrome and a virus, the world took notice. Now, she's caught between the patients who believe her work and the researchers who don't.

Ewen Callaway


FIGHTING FOR A
CAUSE

On a sunny January afternoon in Santa Rosa, California, a small crowd waits patiently for Judy Mikovits to arrive. She is scheduled to deliver a talk on a mysterious virus called XMRV, which she believes underlies chronic fatigue syndrome. Although she's two hours late — held up by fog at San Francisco International Airport — not a single person has left. And when she arrives, they burst into applause.

To a rapt audience, she gives a chaotic and wide-ranging talk that explores viral sequences, cell-culture techniques and some of the criticisms that have been thrown at her since she published evidence[1] of a link between XMRV and chronic fatigue in 2009. Afterwards, Mikovits is swarmed by attendees. A middle-aged woman who spent most of the talk in a motorized scooter stands up to snap pictures of her with a digital camera. Ann Cavanagh, who has chronic fatigue and has tested positive for XMRV, says that she came in part for information and in part to show her support for Mikovits. "I just wish there were a hundred of her," Cavanagh says.

The event was "surreal", says Mikovits, a viral immunologist at the Whittemore Peterson Institute for Neuro-Immune Disease (WPI) in Reno, Nevada. She is discomfited by the attention from patients, which at times borders on adulation. But her reception among scientists has been markedly cooler. Numerous follow-up studies have found no link between the virus and the disease; no group has published a replication of her findings; and some scientists argue that XMRV is an artefact of laboratory contamination. Now, even some of Mikovits's former collaborators are having second thoughts.

Mikovits has dug in, however, attacking her critics' methods and motives. She says that their distrust of her science stems from doubts about the legitimacy of chronic fatigue syndrome itself. Chronic fatigue, also known as myalgic encephalomyelitis, affects an estimated 17 million people worldwide, but it is extremely difficult to diagnose. Many with the disorder are told that their symptoms — which include exhaustion, joint and muscle pain, cognitive issues, and heart and respiratory problems — are psychosomatic. "I had no idea there was that much bias against this disease," Mikovits says.

The stakes are high and many are taking the risks seriously. Several countries have barred people with chronic fatigue from donating blood in case the virus spreads (see 'Something in the blood'). And the US government

has launched a US$1.3-million study to investigate the link. Patients are already being tested for XMRV, and some are taking antiviral drugs on the assumption that the virus causes chronic fatigue by attacking their immune defences. Many say that such action is premature, but Mikovits is steadfast. "We're not changing our course," she says.

First findings

In October 2007, Mikovits attended a prostate-cancer meeting near Lake Tahoe, Nevada, where she met Robert Silverman, a virologist at the Cleveland Clinic in Ohio. Silverman co-discovered XMRV, which stands for xenotropic murine leukaemia virus-related virus[2]. While examining human prostate tumours, he and his collaborators found genetic sequences that resemble retroviruses found in the mouse genome. Like all retroviruses, XMRV rewrites its RNA genome into DNA on infection, then slips the DNA into the genomes of host cells. Ancient remnants of such viruses litter animal genomes. But the only active retroviruses conclusively linked to human disease are HTLV-1, which causes leukaemia, and HIV.

At the meeting, Silverman was presenting research linking XMRV to deficiencies in a virus-defence pathway. Mikovits recalled that the same pathway was weakened in some patients with chronic fatigue. She wondered whether the prostate-tumour virus could also be behind chronic fatigue. After the meeting, Silverman sent Mikovits reagents to test for XMRV.

The idea excited Mikovits, but she had other priorities. After stints in industry and at the US National Cancer Institute (NCI) in Maryland, she had recently joined the WPI to lead its research programme. The WPI was founded in 2006 by physician Daniel Peterson, an expert on chronic fatigue, and by Annette Whittemore, the wife of a well-connected Nevada businessman, whose daughter Andrea has had chronic fatigue for more than 20 years. The Whittemores spent $5 million establishing the WPI, and several million more to support Mikovits's research, which has attracted few other grants.

At the WPI, Mikovits established a sample collection from Peterson's patients and began screening it for signs of an infection. A litany of pathogens has been linked to chronic fatigue over the years, including Epstein-Barr virus, Borna disease virus, human herpes virus 6 and HTLV-2. None panned out. Still, the disorder bears some hallmarks of an infection. Many patients report acute illness before chronic symptoms appear, and their bodies often show signs of an immune system at war. The disease can also crop up in apparent outbreaks, including one characterized by Peterson near Lake Tahoe in the 1980s.

Just before Christmas 2008, Mikovits turned her attention to Silverman's reagents. She and her postdoc, Vincent Lombardi, known as Vinny, asked a graduate student to test for XMRV DNA in white blood cells from some of the most seriously ill people being studied at the WPI.

The first try turned up just two positives out of 20. But by tweaking the conditions of the test, Mikovits says her team found XMRV in all 20. "Vinny and I looked at each other and said, 'Well, that's interesting'," she says. They spent the next few weeks convincing themselves that they were onto something, and soon conscripted Silverman and Mikovits's former mentor at the NCI, Frank Ruscetti, to help prove that XMRV infection was behind chronic fatigue.

"We really retooled our entire programme and did nothing but focus on that," she says. They kept the effort under wraps, dubbing it 'Project X'. Even Peterson and the Whittemores weren't clued in. Mikovits says that the secrecy was necessary because her team also found XMRV in the blood of some healthy people, raising concerns about blood products. She hoped to build an airtight case because she worried that sceptical public-health officials would undermine her work.

In May 2009, the team submitted a paper to Science reporting the identification of XMRV genetic material in two-thirds of the 101 patients with chronic fatigue they had tested and in 3.7% of 218 healthy people. They also included data suggesting that infected white blood cells could pass the virus on to uninfected cells.

“They call me every single day. I spend so much time trying to understand the patients, to understand this disease.”

Reviewers wanted more evidence: a clear electron micrograph of virus-infected cells, proof that patients mounted an immune response to the virus, an evolutionary tree showing XMRV's relationship to other viruses and the locations where viral DNA was integrating into patient genomes. Mikovits's team went to work. "None of us took any time off, not even a weekend," she says. They resubmitted the paper in early July with everything the reviewers had asked for, except the DNA integration sites, which many scientists consider a gold standard in proving a retroviral infection.

Later that month, NCI officials who had learned about the work invited Mikovits to give a talk at a closed-door meeting with other XMRV researchers and government scientists. "When I finished speaking you could've heard a pin drop," she says. Mikovits says she thinks at least one of her manuscript's reviewers was at the meeting, because soon after, she got a call from a Science editor. Their paper had been accepted.

Jonathan Stoye, a retrovirologist at the MRC National Institute for Medical Research in London, wrote a commentary about the paper for Science[3]. He had never heard of Mikovits, but Frank Ruscetti's name on the paper gave him confidence, he says, and "if it were true, it was clearly very important". Stoye's co-author John Coffin, a retrovirologist at Tufts University in Boston, Massachusetts, says he was satisfied with the data and thought it was time to "let the field and public chew on them".

The BBC, US National Public Radio, The New York Times, The Wall Street Journal and dozens of other news outlets covered the research. "Prostate cancer pathogen may be behind the disease once dubbed 'yuppie flu'," Nature announced on its news website the day the paper came out. Phoenix Rising, a forum for patients with chronic fatigue that has become a hub for all things XMRV, called the work a "game changer", and patients flocked to learn more about a virus that they hoped would explain their condition. But others, including Britain's leading chronic fatigue patient group, urged caution until more research buttressed the link.

The first negative findings started to arrive in January 2010 — failing to find XMRV in 186 people with chronic fatigue from the United Kingdom[4]. A month later, a team including Stoye published a paper[5] showing no evidence of XMRV in more than 500 blood samples from patients with chronic fatigue and healthy people. One day later, the British Medical Journal accepted a paper reporting more negative results in Dutch patients[6]. Studies began piling up so fast that Coffin made a scorecard to show at talks. "I've lost count now," he says.

Mikovits says that the discrepancies can be explained by differences in the geographical distribution of XMRV or in the methods used.

Judy Mikovits says that she will not abandon the hypothesis that XMRV and related viruses cause chronic fatigue syndrome, despite a growing chorus of critics.D. Calvert/AP

The most common way to detect XMRV is PCR, or polymerase chain reaction, which amplifies viral DNA sequences to a level at which they can be identified. Mikovits and her team used this method to detect XMRV in some of their patients, but she contends that the most sensitive way to detect the virus is to culture patients' blood cells with a cell line in which the virus replicates more quickly. This should create more copies of the virus, making it easier to detect with PCR and other techniques. She says that none of the negative studies applied this method exactly, a fact that annoys her. "Nobody's tried to rep-li-cate it," she says, sounding out each syllable for emphasis.

In summer 2010, some evidence emerged in Mikovits's corner. Harvey Alter, a hepatitis expert at the NIH's Clinical Center, and his team identified viruses similar to XMRV in 32 of 37 people with chronic fatigue and in 3 of 44 healthy people. They were preparing to publish their results in the Proceedings of the National Academy of Sciences. But scientists at the Centers for Disease Control and Prevention (CDC) in Atlanta, Georgia, were about to publish a negative report. The authors delayed publication of both papers[7,8] for several weeks to assess discrepancies. The move agitated Mikovits as well as the chronic-fatigue community, who suspected that important data were being suppressed.

When Alter's work came out in late August[7], Mikovits was ecstatic, and the WPI released a YouTube video of her touting it. For other researchers, however, the new paper had shortcomings. The viral sequences from Alter's paper differed from XMRV, says Greg Towers, a retrovirologist at University College London. "He doesn't get variation, he gets a totally different virus." Towers says that mouse DNA, which is chock-full of virus sequences like those Alter's team found, probably contaminated their samples, which were collected in the 1990s. But Alter says that his team found no contamination from mouse DNA and recovered the same viral sequences from the same patients sampled a decade later.

Contamination became a dirty word for Mikovits. Just before Christmas 2010, Retrovirology published four papers[9,10,11,12] that highlighted laboratory contamination as a possible explanation for her findings. One showed, for example, that mouse DNA contaminates an enzyme from a commercial kit commonly used for

PCR. Coffin, an author on two of the Retrovirology papers, urges caution against over-extrapolating. These papers do not say that contamination explains Mikovits's results, he says, just that extreme care is required to avoid it.

Towers and his colleague Paul Kellam, a virologist at the Wellcome Trust Sanger Institute near Cambridge, UK, are less charitable, however. Their study[12] showed that the XMRV sequences that Mikovits and Silverman had extracted from patients lacked the diversity expected of a retrovirus that accumulates mutations as it passes between patients. "This doesn't look like an onwardly transmittable infectious virus," says Kellam. A press release for the paper issued by the Sanger Institute put it more bluntly: "Chronic fatigue syndrome is not caused by XMRV."

Mikovits is riled when the topic turns to Towers's paper over dinner one night in Reno — "Christmas garbage", she calls it. Contamination cannot explain why her team can reproduce its results both in her lab in Reno and at Ruscetti's at the NCI, she says. Her team checks for contamination in reagents and in the cells it grows the patients' samples with. She says that her team has also collected viral sequences that will address Towers's and Kellam's criticism but that it hasn't yet been able to publish them. Meanwhile, an unpublished study of patients in Britain with chronic fatigue bears out the link to XMRV, she says. "I haven't for one second seen a piece of data that convinced me they're not infected."

Jay Levy, a virologist at the University of California, San Francisco, has a window in his closet-sized office that looks out into the laboratory where, in the 1980s, he became one of the first scientists to isolate HIV. After his discovery was scooped by other researchers, Levy turned his attention to chronic fatigue and started a long but fruitless search for an infectious cause.

Now, Levy is putting the finishing touches on what could be the most thorough response yet to Mikovits's Science paper, adopting the same cell-culture techniques to detect the virus and using samples from the same patients. He's done this with the help of Daniel Peterson, who left the WPI in 2010 for what Peterson says are "personal reasons". Peterson has questioned the institute's singular pursuit of XMRV, a research direction that was pursued without his consultation.

Mikovits says that she kept the XMRV work secret from Peterson over fears he would tell his patients, and left his name off the original Science manuscript until a reviewer questioned the omission. When asked whether that episode contributed to his departure, he says, "I was surprised at the secrecy and lack of collaboration." As for his motivation to team up with Levy: "I'm just trying to get to the truth. It's my only motive, because this is such a deserving group of patients who need to know what's going on."

Others, too, are rallying for a definitive answer. Ian Lipkin, a microbial epidemiologist at Columbia University in New York, has a reputation for getting to the bottom of mysterious disease–pathogen links. His team debunked the association between Borna disease virus and chronic fatigue, for example. Now he is spearheading the $1.3-million effort funded by the US government. He is leaving the testing to three labs: Mikovits's at the WPI, Alter's at the NIH and the CDC. Each will receive coded samples of white blood cells and plasma from 150 patients with chronic fatigue and from 150 healthy controls. The labs will test for XMRV using their method of choice. Lipkin will crunch the data and unblind the samples.

But even if a study confirms the link to chronic fatigue, it won't be able to determine whether the virus is the cause. XMRV could, for example, be an opportunistic infection affecting those whose immune systems are already dampened by chronic fatigue. Even Mikovits can only hypothesize as to how it might cause disease.

The virus might not even exist as a natural infection. At a retrovirus conference this month in Boston, Massachusetts, Coffin and his colleague Vinay Pathak at the NCI in Frederick, Maryland, presented data showing that XMRV emerged in the 1990s, during the development of a prostate-tumour cell line called 22Rv1. Developing the line involved implanting a prostate-tumour sample into mice, retrieving cells that

might divide indefinitely and repeating the process. But looking back at DNA samples taken throughout the cell-line's development showed that human cells became infected only after passing through several different mice. Importantly, XMRV's sequence seems to have come from two different mouse strains. "They just sort of snapped together like two puzzle pieces," says Coffin, an event extremely unlikely to have happened twice.

Bumper stickers are just one of the supportive gifts given to the WPI.D. Calvert/AP

XMRV sequences retrieved from patients with prostate cancer and chronic fatigue — including some who have had chronic fatigue since the mid-1980s — are nearly identical to the virus from 22Rv1 cells. The implication, says Coffin, is that this virus, born in a laboratory, has probably been infecting samples for more than a decade, but not people. "Although people on the blogs aren't going to believe me, I'm afraid this is by far the most reasonable explanation for how XMRV came to be," says Coffin, who hoped that the association with chronic fatigue would pan out and still thinks some pathogen other than XMRV could explain the disease.

Silverman, who no longer works with Mikovits, says that he wasn't using 22Rv1 cells when XMRV was discovered. Nonetheless, the work has rattled his confidence in XMRV's link to both prostate cancer and chronic fatigue.

Mikovits, however, is undeterred. The WPI owns a company that charges patients up to $549 to be tested for XMRV, and Mikovits believes that patients who test positive should consult their doctors about getting antiretroviral drugs normally prescribed to those with HIV. Levy and others worry that she is overreaching. "That's scary for me. These antiretroviral drugs are not just like taking an aspirin," he says. Mikovits argues that they might be some patients' only hope. "The people who we know they're infected should have a right to get therapy," she says, "They have nothing. They have no other choice."

Context and debate

Back in her Reno laboratory two days after the talk in Santa Rosa, Mikovits examines a stack of small plastic flasks under a microscope. Some contain patient cells that she hopes will turn into cell lines and churn out XMRV. "On Wednesdays I get to take care of my cells, and that's where I'm the happiest," she says.

She has just come off the phone from a sobbing patient infected with XMRV whose symptoms had worsened. "They call me every single day," Mikovits says. "I don't do science any more. I spend so much time trying to understand the patients, to understand this disease. People have moved to Reno to be here," she says. They've

left gifts: stuffed animals, and stacks of bumper stickers that say "Today's Discoveries, Tomorrow's Cures" and, more boldly, "It's the virus XMRV".

Mikovits clearly shares in the frustration of those with chronic fatigue who have been marginalized over the years and told that their disease is not real. She says that this disbelief in the disorder drives the criticism of her work. Kellam and the others say that this isn't true. They don't deny the existence of the syndrome or even the possibility of an infectious origin. "What we're trying to understand is the aetiology," Kellam says. "It's a scientific debate."

Mikovits says that she's analysed all the papers critical of her work and found flaws in each of them. Nevertheless, she's quick to endorse findings that support her work. She claims that Coffin and Pathak's study, for example, "says nothing about human infection". Yet new work presented at a different meeting that found XMRV using next-generation DNA sequencing offers "no doubt it's not contamination — that the whole story's real", she says.

Despite the growing choir of sceptics, Mikovits says that she has simply seen too many data implicating XMRV and other related viruses in chronic fatigue to change her mind. For her supporters, that steadfastness offers legitimacy and hope. "The scientists are moving forward," she announced at her talk in Santa Rosa, "and I think the politics will go away shortly." The crowd responded with vigorous applause.

Ewen Callaway writes for Nature from London.

- ***References***

1. Lombardi, V. C. *et al.* Science 326, 585-589 (2009). | Article | PubMed | ISI | ChemPort |
2. Urisman, A. *et al.* PLoS Pathog. 2, e25 (2006). | Article | PubMed | ChemPort |
3. Coffin, J. M. & Stoye, J. P. Science 326, 530-531 (2009). | Article | PubMed | ChemPort |
4. Erlwein, O. *et al.* PLoS ONE 5, e8519 (2010). | Article | PubMed | ChemPort |
5. Groom, H. C. *et al.* Retrovirology 7, 10 (2010). | Article | PubMed | ChemPort |
6. Van Kuppeveld, F. J. *et al.* Br. Med. J. 340, c1018 (2010).
7. Lo, S. C. *et al.* Proc. Natl Acad. Sci. USA 107, 15874-15879 (2010).
8. Switzer, W. M. *et al.* Retrovirology 7, 57 (2010).
9. Robinson, M. J. *et al.* Retrovirology 7, 108 (2010).
10. Oakes, B. *et al.* Retrovirology 7, 109 (2010).
11. Sato, E. , Furuta, R. A. & Miyazawa, T. Retrovirology 7, 110 (2010).
12. Hué, S. *et al.* Retrovirology 7, 111 (2010).

http://www.nature.com/news/2011/110314/full/471282a.html

Do gut bacteria worsen malnourishment?

Human microbiota could be behind why deficient diets leave only some children seriously ill.

Nicola Jones

Bacteria in the gut could be linked to the swollen bellies caused by condition known as kwashiorkor in malnourished children.MAURO FERMARIELLO / SCIENCE PHOTO LIBRARY

A study transplanting gut bacteria from human twins into mice could help to explain why some malnourished children develop kwashiorkor — a condition that triggers swelling in the belly, fatigue and vulnerability to disease. Researchers hope the work will point the way to better emergency rations for sick children.

The study, presented yesterday by Michelle Smith, a postdoc at Washington University in Saint Louis, Missouri, at the International Human Microbiome congress in Vancouver, Canada, looked at kwashiorkor in children in Malawi. The condition affects tens of thousands of children in Malawi alone and is fatal in up to 15% of cases. Although poor diet is clearly a factor, no one knows why some children are afflicted and others, living under the same conditions, are not. In tracking 317 pairs of twins in Malawi for the first three years of their lives, the group found that kwashiorkor affected both twins in a pair in only 7% of cases, and in 50% of of cases, only one of the twins.

"It's so odd, because they're living together," says Smith.

One possible explanation for why only some malnourished children fall prey to kwashiorkor is that differences in gut bacteria might affect how susceptible people are. Gut bacteria can change how people

absorb iron, zinc and vitamins from their food, and have been linked to obesity (see 'Fat people harbour 'fat' microbes').

To investigate, Smith's team, working in Jeff Gordon's microbe genomics lab at Washington University, took faecal samples from some of the Malawian twins and used them to create a set of gut bacteria for mice raised in a completely clean, germ-free environment. Through this they made a near-perfect mimic of the children's gut bacteria, allowing the researchers to see how those bacteria react to changes in diet, and to do other experiments, such as faecal transplants, that would be difficult or impossible with the children themselves. "People think their faeces is just waste — but it's really useful stuff," says Smith.

In preliminary results presented at the conference, Smith showed how mice with gut bacteria from one set of twins reacted to a series of timed diet regimes. First the mice had three weeks on a typical Malawian diet, consisting of 90% maize (corn) flour and water, and 10% vegetables; then two weeks on a diet of 'ready-to-use therapeutic food', a high-calorie peanut-butter-based food often given to malnourished children in developing countries; and finally two weeks back on the Malawian diet.

The mice with gut bacteria from the sibling with kwashiorkor were found to lose more weight on the maize-and-vegetable diet typical for Malawi, and gain more on the peanut-butter diet, than the mice with gut bacteria from the 'healthy' sibling.

Riding dietary wobbles

One possible conclusion is that the gut bacteria of the sick twin make it hard for the child to absorb the already limited nutrients and calories available in a meagre diet. The 'sick' bacteria were also much more susceptible to change — some species flourished, while others died down, altering the overall composition of the population. The 'healthy' gut bacteria, on the other hand, were relatively stable throughout the dietary wobble.

This doesn't prove that gut bacteria composition is the key to why some children get sick and others don't. "I don't think it's not involved. But I can't say it is, yet," says Smith. James Kinross, a clinical researcher at Imperial College London, who was also at the meeting, wonders whether parasitic infections might also be a contributing cause.

But the results point the way to further studies that could help pin down the role of gut bacteria in kwashiorkor, and how they might be harnessed to help sick children. One idea is to transplant 'healthy' gut bacteria into the mice with 'sick' bacteria, and see if this makes a difference. "Their work is very important for developing countries," says Martin Blaser, a microbiologist at New York University, who was also present at Smith's talk. Their method, he adds, could be used to determine the microbiota that help people extract the maximum possible value from food.

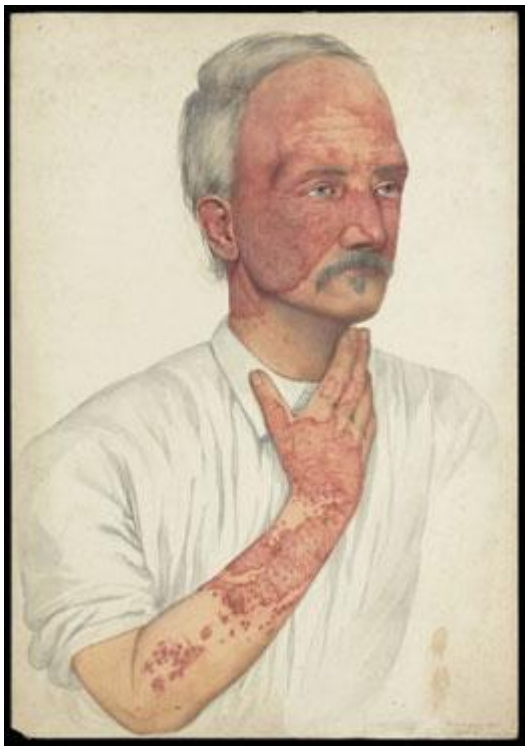
Ultimately, Smith would like to identify a bacterium or set of bacteria that protects children from kwashiorkor, and add it to the emergency rations handed out to starving children, or give it to them beforehand. "Maybe we can do earlier interventions — before they suffer," she says.

http://www.nature.com/news/2011/110310/full/news.2011.151.html

First lupus drug in half a century approved

A therapeutic antibody is the first success in a wave of experimental therapies aimed at tackling the autoimmune disease.

Heidi Ledford



A 1902 watercolour of a man with Lupus erythematosus by Mabel Green.Wellcome Library, London

For more than 50 years, the autoimmune disease lupus has confounded drug developers. But a new therapy finally broke through that barrier yesterday when the US Food and Drug Administration (FDA) announced the approval of Benlysta (belimumab) for the treatment of systemic lupus erythematosus.

The greatly anticipated move heralded a step forward not only for belimumab's developers, but also for the many other experimental lupus therapies hot on the trail. "It's a very exciting time in lupus," says Richard Furie, a rheumatologist at the North Shore-Long Island Jewish Health System in New York, who has conducted clinical trials of belimumab. "There's an awful lot of activity right now."

Lupus is a mysterious disease in which the immune system attacks healthy tissues. Nearly all lupus patients experience some degree of joint pain, and some will face life-threatening complications including kidney failure, heart problems and difficulty in breathing.

Belimumab is an antibody that interferes with the immune system's assault by binding to and inhibiting a protein called the 'B-lymphocyte stimulator' (BLyS). Blocking BLyS is thought to cause the immune system's antibody-producing B cells to self-destruct, thereby reducing the body's ability to attack its own tissues.

Belimumab was developed by Human Genome Sciences, a biotechnology company based in Rockville, Maryland, together with London-based pharmaceutical giant GlaxoSmithKline.

Several companies have similar drugs in the pipeline, and are likely to be spurred on by belimumab's success, notes Furie. Before 2009, when data from two large, successful clinical trials of belimumab were released, no drug developed for lupus had ever made it through a phase III clinical trial. "It was a little hard for these programmes to raise money when all the studies were failing," says Furie. "People said, 'you're never going to have a positive study'."

Belimumab's success has lessened that stigma, Human Genome Science's vice-president David Stump told investors yesterday: "We have shown with Benlysta that the barriers that have existed for all of these years for drug development in lupus can be overcome."

Targeted therapy

BLyS was discovered in the middle of the genomics revolution of the late 1990s, as scientists at Human Genome Sciences trawled through the sequences of genes expressed in certain white blood cells. It was an exciting time, says David Hilbert, former head of research and discovery at Human Genome Sciences and now research head at Zyngenia, a biotechnology company in Gaithersburg, Maryland. "You'd sit there and watch new genes coming off the line every day and you didn't know what they were and what they did," he says.

Some researchers, including chemist Jonathan Hall of the Swiss Federal Institute of Technology in Zurich, see the success of belimumab as evidence that the often-criticized investments that many pharmaceutical companies made in genomics are beginning to pay off. "There's a lot more value in genomics to pharma than one gets the impression from reading articles in the press," says Hall, who spent a decade working in the genomics team at the Swiss drug-maker Novartis.

But when researchers at Human Genome Sciences realized that BLyS increased during inflammation, and was particularly high in lupus patients, they knew that they faced a difficult road ahead, Hilbert says. Drug developers had long struggled to conduct clinical trials in lupus patients. The disease is notoriously variable, with some patients experiencing only mild discomfort and others life-threatening complications. And lupus patients often take two or more drugs to control their disease. These other medications can mask the effects of an experimental drug in a clinical trial.

In 2008, a trial of a drug called atacicept, which binds both BLyS and a related protein, in patients with a severe form of lupus called lupus nephritis was halted as a result of an abnormally large number of infections in those taking the drug. And a clinical trial in lupus patients of the antibody ocrelizumab in patients with lupus nephritis, which targets B cells through a different mechanism, was similarly halted because of a large number of fatal infections in those under treatment. Some say these effects may have been brought about by the combination of the experimental drugs with those already used by the patients that also suppressed the immune system.

More in the pipeline

Those failures have not stopped progress on other BLyS-targeting drugs in early clinical development, including inhibitors made by Anthera, a biotechnology company based in Hayward, California, and Eli Lilly, a pharmaceutical company based in Indianapolis, Indiana. And some companies are pushing forward with therapies that target other proteins in the immune system. Amgen, based in Thousand Oaks, California, has

two antibodies in phase I clinical trials in lupus patients. One targets T-cells, another type of white blood cell, by inhibiting a protein called B7-related protein; the other inhibits an important mediator of inflammation called interferon-γ.

There is likely to be room for these drugs in the lupus market, even in the wake of the belimumab approval. Keith Elkon, a rheumatologist at the University of Washington in Seattle, notes that belimumab had a relatively small impact on patients' symptoms. Also, it took two months after first taking the drug for patients to get relief from their symptoms, he says, which will do little to help those who come to their doctor in the middle of a serious flare-up of the disease.

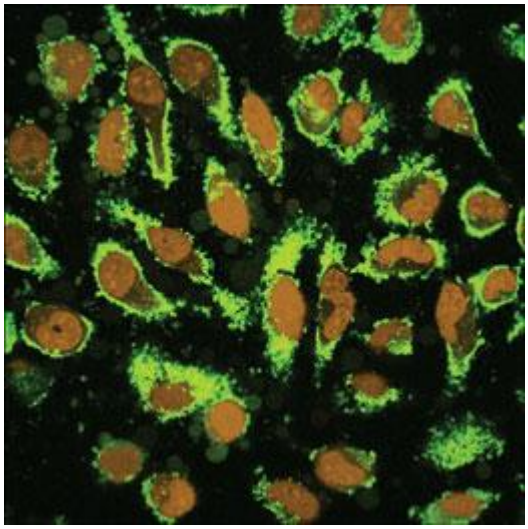
Nevertheless, belimumab is an important step forward for lupus patients, Elkon says. "I'm excited," he says. "It's been such a struggle, and this is a major victory."

http://www.nature.com/news/2011/110310/full/news.2011.150.html

Diamonds deliver on cancer treatment

Carbon nanoparticles promise multifaceted benefits in transporting drugs.

Marian Turner



Nanodiamonds (shown here in green) can make anti-cancer drugs more effective.Science/AAAS

Attaching chemotherapy drugs to small particles called nanodiamonds can make the drugs more effective, according to a study published this week in Science Translational Medicine[1].

Anticancer drugs tend to become ineffective because cancer cells quickly pump them out before they have had time to do their work. This kind of drug resistance accounts for 90% of treatment failure in malignant cancer.

Nanodiamonds — carbon-based particles 2–8 nanometres in diameter with a truncated octahedral structure that gives it multiple facets not unlike a diamond's — overcome this problem because the cellular transport proteins that usually pump the drug out of the cell can't carry them. The drug therefore stays inside the cell.

Dean Ho, a biomedical engineer from Northwestern University in Evanston, Illinois, who led the study, says that the surface chemistry of nanodiamonds is what makes them special. The diamonds' facet surfaces possess differing properties, such as electrical charge. So a drug could be attached to one neutral surface, for example, while another facet retains an electrostatic charge, allowing the nanodiamond to disperse in fluids. Theoretically, nanodiamonds could be loaded with both a drug and an agent to target cancer cells, although the team have not yet done this.

Other nanoparticles, such as synthetic polymers made from PLGA (poly(lactic-co-glycolic acid)), are already in clinical use for drug delivery, but they do not have this inbuilt surface versatility.

Cheap and non-toxic

Nanodiamonds are non-toxic and don't cause inflammation. They are also cheap to produce in large quantities, says Ho. "The first idea for nanodiamonds was to use them as friction agents in the car industry."

Scientists from Ho's group attached the anticancer drug doxorubicin to nanodiamonds. They treated mice with liver tumours with either this compound or with doxorubicin alone, and checked levels of the drug in the tumours two days later. They found that doxorubicin levels were ten times higher in mice treated with the nanodiamond compound compared with mice given doxorubicin alone, and remained high for seven days. The tumours of mice receiving nanodiamond-doxirubicin also shrank more and the mice survived longer.

Ho's group then put the nanodiamonds to a tougher test — using a model of breast cancer which is highly resistant to doxorubicin. The nanodiamond-doxirubicin compound worked better there too. Strikingly, the nanodiamonds also reduced the toxicity of the drug by releasing it more slowly. Doses that would have killed mice if given as free drug did not even cause them to lose weight when the drug was carried on nanodiamonds.

But the concept of using nanodiamonds for drug delivery is still in its infancy. "No one has used them in humans yet," cautions Robert Langer, a drug-delivery biochemist at Massachusetts Institute of Technology in Cambridge. "I'd like to see a really significant advantage over materials already in use that are approved by the Food and Drug Administration."

Bioengineer Tim Deming from the California NanoSystems Institute at the University of California, Santa Barbara, thinks that the concept might need refining. "Synthetic polymers have reproducible properties and composition, and we can fine-tune the structures," he points out.

The process of generating nanodiamonds is more crude. "It's like detonating TNT and then doing a lot of purification," says Deming. Further polishing of the nanodiamond production process might be necessary if they are to be used for human therapeutics, he says.

- ***References***

1. Chow, E. *et al.* Sci. Trans. Med. 3, 73ra21 (2011).

http://www.nature.com/news/2011/110309/full/news.2011.149.html

The Trouble With Bright Girls

For women, ability doesn't always lead to confidence. Here's why.
Published on January 27, 2011

Successful women know only too well that in any male-dominated profession, we often find ourselves at a distinct disadvantage. We are routinely underestimated, underutilized, and even underpaid. Studies show that women need to perform at extraordinarily high levels, just to appear moderately competent compared to our male coworkers.

But in my experience, smart and talented women rarely realize that one of the toughest hurdles they'll have to overcome to be successful lies *within*. We judge our own abilities not only more harshly, but fundamentally *differently*, than men do. Understanding *why* we do it is the first step to righting a terrible wrong. And to do that, we need to take a step back in time.

Chances are good that if you are a successful professional today, you were a pretty bright fifth grade girl. My graduate advisor, psychologist Carol Dweck (author of *Mindset*) conducted a series of studies in the 1980s, looking at how bright girls and boys in the fifth grade handled new, difficult and confusing material.

She found that bright girls, when given something to learn that was particularly foreign or complex, were quick to give up - and the higher the girls' IQ, the *more* likely they were to throw in the towel. In fact, the straight-A girls showed the most helpless responses. Bright boys, on the other hand, saw the difficult material as a challenge, and found it energizing. They were more likely to redouble their efforts, rather than giving up.

Why does this happen? What makes smart girls more vulnerable, and less confident, when they should be the most confident kids in the room? At the 5th grade level, girls routinely outperform boys in every subject, including math and science. So there were no differences between these boys and girls in ability, nor in past history of success. The only difference was how bright boys and girls *interpreted* difficulty - what it meant to them when material seemed hard to learn. Bright girls were much quicker to *doubt* their ability, to lose confidence, and to become less effective learners as a result.

Researchers have uncovered the reason for this difference in how difficulty is interpreted, and it is simply this: more often than not, **bright girls believe that their abilities are innate and unchangeable, while bright boys believe that they can develop ability through effort and practice.**

How do girls and boys develop these different views? Most likely, it has to do with the kinds of feedback we get from parents and teachers as young children. Girls, who develop self-control earlier and are better able to follow instructions, are often praised for their "goodness." When we do well in school, we are told that we are "so smart," "so clever, " or " such a good student." This kind of praise implies that traits like smartness, cleverness, and goodness are qualities you either have or you don't.

Boys, on the other hand, are a handful. Just trying to get boys to sit still and pay attention is a real challenge for any parent or teacher. As a result, boys are given a lot more feedback that emphasizes effort (e.g., "If you would just pay attention you could learn this," "If you would just try a little harder you could get it right.")

The net result: when learning something new is truly difficult, girls take it as sign that they aren't "good" and "smart", and boys take it as a sign to pay attention and try harder.

We continue to carry these beliefs, often unconsciously, around with us throughout our lives. And because bright girls are particularly likely to see their abilities as innate and unchangeable, they grow up to be women who are far too hard on themselves - women who will prematurely conclude that they don't have what it takes to succeed in a particular arena, and give up way too soon.

Even if every external disadvantage to a woman's rising to the top of an organization is removed - every inequality of opportunity, every chauvinistic stereotype, all the challenges we face balancing work and family - we would still have to deal with the fact that through our mistaken beliefs about our abilities, we may be our own worst enemy.

How often have you found yourself avoiding challenges and playing it safe, sticking to goals you knew would be easy for you to reach? Are there things you decided long ago that you could never be good at? Skills you believed you would never possess? If the list is a long one, you were probably one of the Bright Girls - and your belief that you are "stuck" being exactly as you are has done more to determine the course of your life than you probably ever imagined. Which would be fine, if your abilities *were* innate and unchangeable. Only they're not.

No matter the ability - whether it's intelligence, creativity, self-control, charm, or athleticism - studies show them to be profoundly malleable. When it comes to mastering any skill, your experience, effort, and persistence matter *a lot*. So if you were a Bright Girl, it's time to toss out your (mistaken) belief about how ability works, embrace the fact that you can *always* improve, and reclaim the confidence to tackle *any* challenge that you lost so long ago.

http://www.psychologytoday.com/blog/the-science-success/201101/the-trouble-bright-girls

Is Cannibalism in Our DNA?

We may all be capable of committing the final taboo.
Published on March 16, 2011

Cannibalism in Myth, Religion, Literature, Fairy Tales and Nursery Rhymes, Works of Art, and the Cinema

This subtopic could be a post (or *many* posts) all by itself. So I'll try to keep it as brief as possible. Still, the mystical subject of Holy Communion in certain Christian sects begs for some elaboration here.
Cannibalism occurs in various mythologies (e.g., Greek, Roman, Slavic, Egyptian, Scandinavian, Germanic, Hindu, and Algonquian). However, it's perhaps most frequently recognized in Greek mythology. To take but one example, the supreme god, Kronos (or Chronos, or Cronus), who reigned over the cosmos during the so-called Golden Age, is said to have swallowed each of his four children to circumvent the prophecy that sometime in the future he'd be overthrown by one of them (which in the end he was anyway--remember Zeus?). And, quite possibly, this exemplifies the Greek belief either in poetic justice, or divine retribution.

In religion, there's nothing that quite compares to the Christian ritual of Holy Communion, which is far more closely linked to pagan practices than generally realized. According to this belief, the procedure--technically, at least--would make all such-practicing adherents both cannibals and vampires. (And for a comically satirical introduction to this ceremony--which has "informed" my own approach--I should cite one Jim Walker, who confesses that he himself is an "ex-cannibal".)
Whether Christian or not, almost everyone knows that in eating the wafer and drinking the wine during this religious service (also known as the "Eucharist" or "Sacrament of the Last Supper"), communicants are presumably eating the flesh and blood of Jesus Christ. Although many Protestant Christians don't believe in the *literal* eating of Jesus, in Walker's estimation at least, virtually all Catholics and Episcopalians do. And, indeed, in the Bible we have this quotation from Jesus himself: "Verily, verily, I say unto you, Except ye eat the flesh of the Son of man, and drink his blood, ye have no life in you. Whoso eateth my flesh, and drinketh my blood, hath eternal life. . . . For my flesh is meat indeed, and my blood is drink indeed" (John 6:53-55).

The idea that bread and wine can actually be turned into human flesh comes from the concept of *transubstantiation*, which refers to the literal conversion of one substance into another. Most tellingly, Walker adds that "this theophagy (god eating) . . . did not come first from the Catholics but had occurred throughout the pagan religions long before Christianity [and that] eating another living human being [implies] the belief [that doing so enables one to absorb] his nature into [one's] own, thus becoming, in some sense, more godlike, similar to the even more primitive belief that eating one's enemies makes one more powerful."

Finally, Walker looks at the folklore surrounding vampire stories, also comparing it to fundamentalist Christian dogma. Vampire myths and Christianity are both seen as encompassing the idea that through imbibing human blood, the individual will live forever--a reason for participating in the ritual that, I'd think for many death-fearing individuals, would be well-nigh irresistible.

Moving from faith to fiction, cannibalism has been a subject in so many short stories and novels that it's hardly viable to list them here--except to note that many movies have been adapted from such provocative works of make-believe. Additionally, unless you're a Shakespeare aficionado, you're probably not aware that one of his lesser tragedies,*Titus Andronicus*, actually portrays horrific scenes of cannibalism. (It's by far the bard's goriest drama--although even in the great *King Lear* there's a horrendously graphic scene of someone's literally having his eyes gouged out.)

Children's fairy tales, the best know of which is probably *Hansel and Gretel*, particularly dramatize a child's primeval terror of being eaten and utterly devoured. (And yes, witches, too, have a taste for human flesh--hideously embodying the worst nightmares of the young.) There's also this gruesome rhyme from "Jack and the Beanstalk," with which almost every child is familiar:

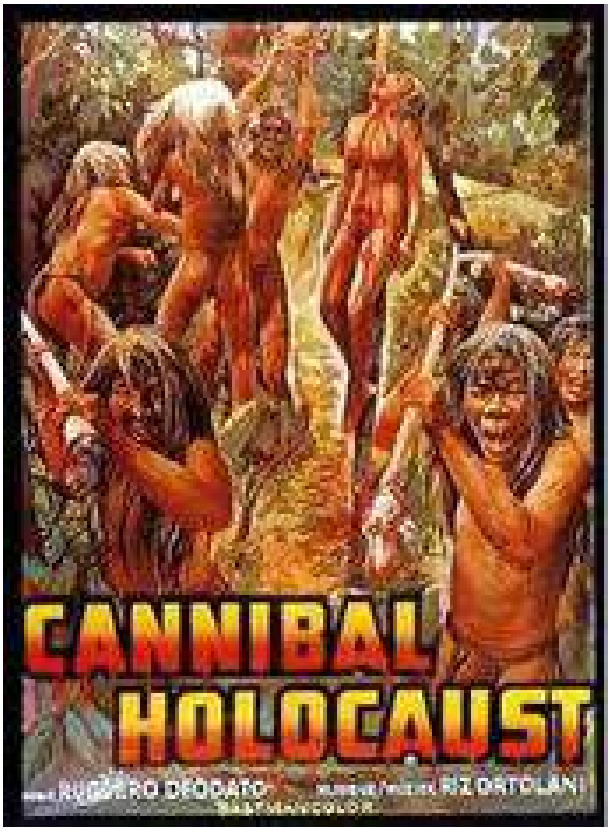
Fe, Fi, Fo, Fum.
I smell the blood of an Englishman.
Be he alive or be he dead,
I'll grind his bones to make my bread.

Many works of art--including some remarkable paintings--have employed cannibalism as their theme. Possibly the most notable among these compositions are "Saturn [the Roman equivalent of Kronos] Devouring One of His Children" (Goya), "The Raft of Medusa" (Géricault), and the shockingly surreal "Autumn Cannibalism" (Dali).

Of course, the most sensational use of cannibalism comes from the cinema, where examples of it abound. Wikipedia has an excellent overview on the subject, especially in its coverage of such controversial films as they constitute a sub-genre of the exploitation films made mostly in Italy in the '70s and '80s. And the notorious, dripping-with-blood *Cannibal Holocaust* is almost certainly the single best example from this era. For those wishing to go more deeply into the subject (you know who you are), the web-based *Encyclopedia of Cannibal Movies* provides yet additional information.

A few of the best know mainstream movies addressing the subject--either from a serious or humorous/satirical perspective--include *Soylent Green*; *Survive!*; *Eating Raoul*; *The Cook, the Thief, His Wife, and Her Lover; Sweeney Todd; The Road;* and, of course, *Silence of the Lambs*. (And doubtless, some readers will come up with other movies they think should have made the, er-, cut.)

The fact that the very theme of cannibalism is so *verboten*, so taboo, may largely account for its enduring popularity with the movie-going public, especially younger audiences. Chomping on popcorn (and perhaps sipping a blood-colored drink), in the dark sanctuary of a movie theater they can let their imaginations run wild. And producers, governed by the profit motive, are more than happy to indulge their viewers' shadow side.



Our Enduring Fascination with Cannibalism

So what, finally, does our fascination with such violence and slaughter tell us about ourselves? Is there something about watching such appalling beings in action that, at the same time it excites us with morbid curiosity and fear, also gratifies some terribly illicit urge from deep within? Why *do* so many of us seem magnetically drawn to horror flicks--and to the macabre generally? And why is it that the grade B movies full of flesh-eating zombies and blood-sucking vampires always seem to rise from their own ashes, somehow immune to ever going out of style?

For that matter, why is it that Halloween is almost as alluring to adults as it is to kids? And why do so many people dress up (or *down*?!) for such festivities by searching for the scariest, most outlandish and terrifying outfits they can find? Sure, it's all in fun--but still, how can this not say something essential about the human psyche and the hidden/forbidden longings for a barbarism we're all-to-ready to condemn in others?
If we're "captivated" by cannibalism, might it be because in our earlier history this was what we did to those we held captive? If, essentially, we humans are a tribal species, and the practice of cannibalism was (and still is) predominantly tribal, is there something "everlasting" about the phenomenon, despite it's today being performed only in remote regions? Given the exigencies of hunger, famine, or a war-induced regression to our native proclivities, will it always be part of our "backwards" potential--or *devolution*?

No one wants to entertain the idea that he--or she--might harbor an appetite for same-species flesh. That under just the right conditions they might even relish a meal of human liver "with some fava beans and a nice

chianti". We'd, of course, *prefer* to think that such grotesque behavior, such moral turpitude, was simply not part of us--or the human equation. Yet, as I've shown, evidence of such human primitivism has been documented as far back in history--and pre-history--as scientists have been able to explore. What to most of us might seem almost too hideous to imagine, has been both thinkable and do-able.

In *The Future of an Illusion*, Freud refers to cannibalism as one of the "instinctual wishes." And in an interview with Anthony Hopkins, the loathsome (but spellbinding) antagonist of the Hannibal Lecter franchise, the actor opines that "we are fascinated by the darkness in ourselves . . . fascinated by the shadow . . . fascinated by the bogeyman."

Could this be so because, at bottom, we're all more or less repressed cannibals? Did we perhaps need to become civilized in order to transcend what may have been primally ingrained in us--in our very DNA? And is this, at last, how we've managed over time to keep from devouring each other--and to live in, well, *relative* peace? . . .

http://www.psychologytoday.com/blog/evolution-the-self/201103/is-cannibalism-in-our-dna-part-3-3?page=2

Are You an Irrational Optimist?

Why Positivity Gets a Bad Name

Published on March 17, 2011

After giving a lecture at a large tech company, I got into a cab bound for the airport along with one of the attendees. As I searched for my seatbelt in the bottomless crevice of the back seat, I noticed that my fellow passenger was not wearing his seatbelt. I said something clever like "Afraid of seatbelts?" and he replied, "Nope, I'm an optimist."

That's not optimism. That's insanity. Optimism is good for many things, but it will definitely not keep other cars from hitting you, nor keep you from flying through the windshield. That is irrational optimism.

In *The Happiness Advantage*, I define rational optimism as "a realistic assessment of the present, while maintaining a belief that our behavior will eventually create a better reality." This is the type of leadership we want to develop at our companies and reward in the political sphere.

Unfortunately, most people do not distinguish between rational and irrational optimism. As a result, we have three fundamental misunderstandings about the role optimism plays at work.

First, **"you're being an optimist" should not be an insult**. What we should be saying is "you're an irrational optimist!" We are trying to say that person has a warped vision of reality, which is based on desire, not how things actually are. And that definitely should be an insult. Irrational optimism is why financial bubbles form, why we buy homes we can't afford, and why we prematurely put up banners that say "mission accomplished." Irrational optimists attempt to put on rose-colored glasses first, and therefore even their initial steps are Pollyannaish and flawed. You can't sugarcoat the present and still make good decisions for the future.

You probably know people who are irritatingly optimistic. That guy who talks about how great the weather is while people are being fired, or the pilot who seems chipper as she reports another hour delay on the tarmac, or the person who says "don't worry, be happy" when he shows up an hour late to pick you up at the airport. Don't be that guy. We find ourselves wanting to pop their bubbles because they affront our conception of reality.

None of this is the type of rational optimism we are referring to in positive psychology research. If people find you to be annoyingly cheerful, don't lose the optimism. Try today to first communicate that you recognize the existence and scope of a problem, then proceed to communicate your gratitude or hope that things will change. This approach will help other people to accept your mindset as both palatable and authentic.

Second, **"I'm not a pessimist nor an optimist, I'm a realist" is a nonsensical statement**. Both optimists and pessimists can make realistic assessments of the present. The difference between an optimist and a pessimist is how they then deal with the reality they perceive. According to researchers like Martin Seligman, pessimists see problems as "permanent and pervasive." Optimists see the problems, but they perceive them as "local and temporary." In other words, the problem is only one part of reality, and there are lots of other good

things going on in other domains of our life. And if we continue to believe our behavior matters, we believe this too shall pass.

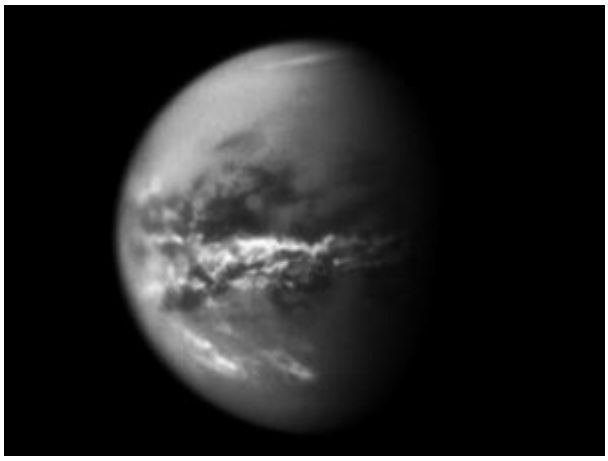
Third, **the idea "it's good to have pessimists so we know what the problems are" is false**. I've heard business leaders try to make a case that their pessimism was evolutionarily selected. But remember, both optimists and pessimists see the approaching saber-tooth tiger; there is just a difference in opinion about whether it can be dealt with. Some well-intentioned writers have railed against positive psychology because they mistakenly assume that optimism means turning a blind eye to injustice or ignoring loss. Only irrational optimists overlook problems and think that reality has no bearing upon the future. Rational optimists see problems, but unlike pessimists, they think they can do something about them.

On a related note, I have encountered a couple people who have read books like "The Secret" and erroneously become irrational optimists. They start to believe that mindset is *all* that matters. Rational optimists believe that mindset matters, but they also recognize that reality is part of the formula. You must change reality, not just wish it away.

Pessimism causes paralysis. Irrational optimism causes delusion. Only rational optimism allows us to actively confront the injustices and ills in society. Rational optimists see the tragedy in Japan, or understand the difficulty in treating breast cancer, or recognize the racial injustices in our educational system...but they are also the ones who search for ways to help the survivors, or believe a cure can be found, or continue to work to invent a better system.

http://www.psychologytoday.com/blog/the-happiness-advantage/201103/are-you-irrational-optimist

Cassini Sees Seasonal Rains Transform Surface of Saturn's Moon Titan



NASA's Cassini spacecraft chronicles the change of seasons as it captures clouds concentrated near the equator of Saturn's largest moon, Titan. (Credit: NASA/JPL/SSI)

ScienceDaily (Mar. 17, 2011) — As spring continues to unfold at Saturn, April showers on the planet's largest moon, Titan, have brought methane rain to its equatorial deserts, as revealed in images captured by NASA's Cassini spacecraft. This is the first time scientists have obtained current evidence of rain soaking Titan's surface at low latitudes.

Extensive rain from large cloud systems, spotted by Cassini's cameras in late 2010, has apparently darkened the surface of the moon. The best explanation is these areas remained wet after methane rainstorms. The observations released in the journal *Science*, combined with earlier results in Geophysical Research Letters last month, show the weather systems of Titan's thick atmosphere and the changes wrought on its surface are affected by the changing seasons.

"It's amazing to be watching such familiar activity as rainstorms and seasonal changes in weather patterns on a distant, icy satellite," said Elizabeth Turtle, a Cassini imaging team associate at the Johns Hopkins University Applied Physics Lab in Laurel, Md., and lead author of the study. "These observations are helping us to understand how Titan works as a system, as well as similar processes on our own planet."

The Saturn system experienced equinox, when the sun lies directly over a planet's equator and seasons change, in August 2009. (A full Saturn "year" is almost 30 Earth years.) Years of Cassini observations suggest Titan's global atmospheric circulation pattern responds to the changes in solar illumination, influenced by the atmosphere and the surface, as detailed in the Geophysical Research Letters paper. Cassini found the surface temperature responds more rapidly to sunlight changes than does the thick atmosphere. The changing circulation pattern produced clouds in Titan's equatorial region.

Clouds on Titan are formed of methane as part of an Earth-like cycle that uses methane instead of water. On Titan, methane fills lakes on the surface, saturates clouds in the atmosphere, and falls as rain. Though there is evidence that liquids have flowed on the surface at Titan's equator in the past, liquid hydrocarbons, such as methane and ethane, had only been observed on the surface in lakes at polar latitudes. The vast expanses of dunes that dominate Titan's equatorial regions require a predominantly arid climate. Scientists suspected that clouds might appear at Titan's equatorial latitudes as spring in the northern hemisphere progressed. But they were not sure if dry channels previously observed were cut by seasonal rains or remained from an earlier, wetter climate.

An arrow-shaped storm appeared in the equatorial regions on Sept. 27, 2010 -- the equivalent of early April in Titan's "year" -- and a broad band of clouds appeared the next month. As described in the Science paper, over the next few months, Cassini's imaging science subsystem captured short-lived surface changes visible in images of Titan's surface. A 193,000-square-mile (500,000-square-kilometer) region along the southern boundary of Titan's Belet dune field, as well as smaller areas nearby, had become darker. Scientists compared the imaging data to data obtained by other instruments and ruled out other possible causes for surface changes. They concluded this change in brightness is most likely the result of surface wetting by methane rain.

These observations suggest that recent weather on Titan is similar to that over Earth's tropics. In tropical regions, Earth receives its most direct sunlight, creating a band of rising motion and rain clouds that encircle the planet.

"These outbreaks may be the Titan equivalent of what creates Earth's tropical rainforest climates, even though the delayed reaction to the change of seasons and the apparently sudden shift is more reminiscent of Earth's behavior over the tropical oceans than over tropical land areas," said Tony Del Genio of NASA's Goddard Institute for Space Studies, New York, a co-author and a member of the Cassini imaging team.

On Earth, the tropical bands of rain clouds shift slightly with the seasons but are present within the tropics year-round. On Titan, such extensive bands of clouds may only be prevalent in the tropics near the equinoxes and move to much higher latitudes as the planet approaches the solstices. The imaging team intends to watch whether Titan evolves in this fashion as the seasons progress from spring toward northern summer.

"It is patently clear that there is so much more to learn from Cassini about seasonal forcing of a complex surface-atmosphere system like Titan's and, in turn, how it is similar to, or differs from, the Earth's," said Carolyn Porco, Cassini imaging team lead at the Space Science Institute, Boulder, Colo. "We are eager to see what the rest of Cassini's Solstice Mission will bring."

The Cassini-Huygens mission is a cooperative project of NASA, the European Space Agency and the Italian Space Agency. The Jet Propulsion Laboratory (JPL), a division of the California Institute of Technology in Pasadena, manages the Cassini-Huygens mission for NASA's Science Mission Directorate, Washington. The Cassini orbiter and its two onboard cameras were designed, developed and assembled at JPL. The imaging team is based at the Space Science Institute in Boulder, Colo. For more information about the Cassini-Huygens mission, visit http://www.nasa.gov/cassini and http://saturn.jpl.nasa.gov.

Story Source:

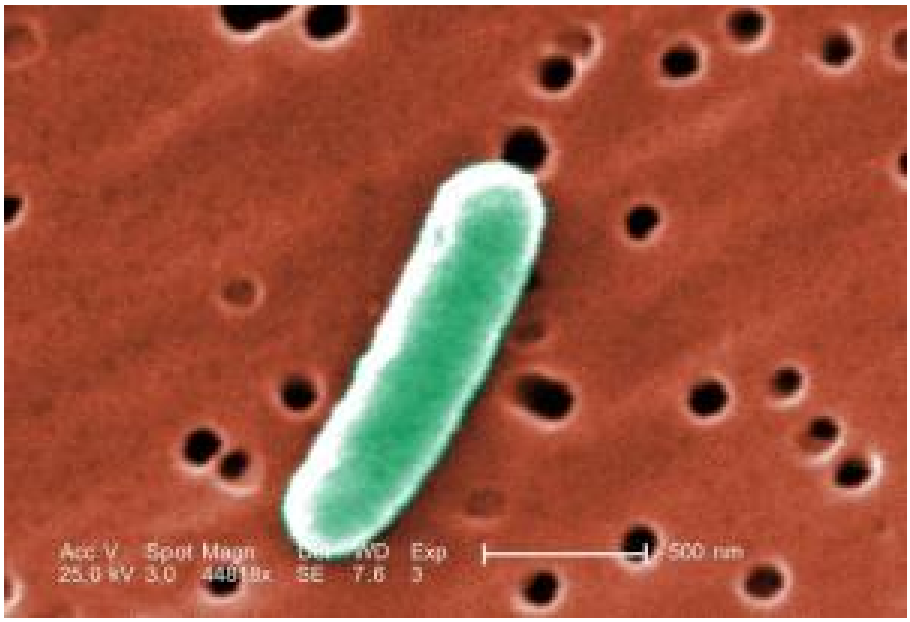
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **NASA/Jet Propulsion Laboratory**.

Journal Reference:

1. E. P. Turtle, J. E. Perry, A. G. Hayes, R. D. Lorenz, J. W. Barnes, A. S. Mcewen, R. A. West, A. D. Del Genio, J. M. Barbara, J. I. Lunine, E. L. Schaller, T. L. Ray, R. M. C. Lopes, E. R. Stofan. **Rapid and Extensive Surface Changes Near Titan's Equator: Evidence of April Showers**. *Science*, 2011; 331 (6023): 1414-1417 DOI: 10.1126/science.1201063

http://www.sciencedaily.com/releases/2011/03/110317152720.htm

E. Coli Engineered to Produce Record-Setting Amounts of Alternative Fuel



E. coli at an extremely high magnification of 44, 818X. (Credit: Janice Haney Carr)

ScienceDaily (Mar. 16, 2011) — Researchers at UCLA's Henry Samueli School of Engineering and Applied Science have developed a way to produce normal butanol -- often proposed as a "greener" fuel alternative to diesel and gasoline -- from bacteria at rates significantly higher than those achieved using current production methods.

The findings, reported online in the journal *Applied and Environmental Microbiology*, mark an important advance in the production of normal butanol, or n-butanol, a four-carbon chain alcohol that has been shown to work well with existing energy infrastructure, including in vehicles designed for gasoline, without modifications that would be required with other biofuels.

The UCLA team, led by James C. Liao, UCLA's Chancellor's Professor of Chemical and Biomolecular Engineering, demonstrated success in producing 15 to 30 grams of n-butanol per liter of culture medium using genetically engineered Escherichia coli -- a record-setting increase over the typical one to four grams produced per liter in the past.

For the study, Liao and his team initially constructed an n-butanol biochemical pathway in *E. coli*, a microbe that doesn't naturally produce n-butanol, but found that production levels were limited. However, after adding metabolic driving forces to the pathway, the researchers witnessed a tenfold increase in the production of n-butanol. The metabolic driving forces pushed the carbon flux to n-butanol.

"Like human beings, microbes need an incentive to work," said Liao, the study's senior author.

"We created driving forces by genetically engineering the metabolism," said Claire R. Shen, a UCLA Engineering graduate student and lead author of the study.

While certain microbes, including species of the bacteria Clostridium, naturally produce n-butanol, Liao's team used *E. coli* because it is easier to manipulate and has been used industrially in producing various chemicals.

"By using *E. coli*, we can make it produce only the compound with no other byproducts," Liao said. "With native producing organisms like *Clostridium*, which naturally produces n-butanol, there are other byproducts that would add cost to the separation process."

The next step in the research, the researchers say, will be to transfer the study to industry for the development of a more robust industrial process.

The study was funded by the KAITEKI Institute Inc. of Japan, a strategic arm of Mitsubishi Chemical Holdings Corp., Japan's largest chemical company.

Story Source:
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University of California - Los Angeles**. The original article was written by Wileen Wong Kromhout.

Journal Reference:

1. C. R. Shen, E. I. Lan, Y. Dekishima, A. Baez, K. M. Cho, J. C. Liao. **High titer anaerobic 1-butanol synthesis in Escherichia coli enabled by driving forces**. *Applied and Environmental Microbiology*, 2011; DOI: 10.1128/AEM.03034-10

http://www.sciencedaily.com/releases/2011/03/110317102603.htm

Fossils Record Reveals Ancient Migrations, Trilobite Mass Matings

This cluster of Devonian trilobites suggests a mass gathering for molting and mating. (Credit: Carlton E. Brett)

ScienceDaily (Mar. 17, 2011) — Few specimens inspire greater thrills among fossil collectors than a complete trilobite. These ancient arthropods -- relatives of lobsters, spiders and insects -- went extinct more than 250 million years ago, but are sometimes found in beautifully preserved condition. In rare instances, an entire population of trilobites is found fossilized together. Carlton E. Brett finds evidence for ancient environment and behavior in these mass graves.

Brett, University of Cincinnati professor of geology, will present his findings March 20 at the Geological Society of America regional meeting in Pittsburgh, in a paper co-authored with Adrian Kin of Poland's Institute of Geological Sciences at Jagiellonian University, and Brenda Hunda of the Cincinnati Museum Center.

In a quest that has taken him from Oklahoma to Morocco and Poland, Brett has analyzed multiple examples of mass trilobite burial. A smothering death by tons of hurricane-generated storm sediment was so rapid that the trilobites are preserved in life position. These geologic "snapshots" record behavior in much the way that ancient Roman life was recorded at Pompeii by volcanic ash.

Burial was rapid, Brett said, but also somewhat delicate. Trilobites, like other arthropods, shed their hard exoskeletons from time to time.

"We find molted pieces lying immediately adjacent to each other," he said. "This is proof that the sediments were not significantly disturbed after burial."

Like modern crabs and lobsters, trilobites appear to have gathered in large groups for protection when they shed their protective exoskeletons. During molting, there was safety in numbers. And, like their modern cousins, trilobites seem to have used these molting gatherings as opportunities for mating.

The mass burials preserve large groups of similar-sized -- and therefore similarly aged -- specimens, segregated by species and, after molting, "naked."

"It's an orgy," Brett said.
Brett and colleagues found evidence of another behavioral connection to modern arthropods -- long chains of trilobites apparently fossilized in mid-migration.
"The recent discovery of rows of more than a dozen specimens provides the oldest evidence of migratory queues similar to those seen in modern crustaceans," Brett said.
Taken together, the mass burials record an array of communal behaviors in ancient trilobites, comparable to those seen in some living crustaceans.
"Such evidence points to complex synchronized escape and reproductive behavior," Brett said. "This provides extraordinary insights into the paleobiology of these ancient organisms."

Story Source:
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University of Cincinnati**. The original article was written by Greg Hand.

http://www.sciencedaily.com/releases/2011/03/110316152939.htm

New Laser Technique Opens Doors for Drug Discovery

Patterns created by the red laser in the backscattering interferometer. (Credit: Daniel Dubois/Vanderbilt)

ScienceDaily (Mar. 17, 2011) — Researchers have demonstrated that a new laser technique can be used to measure the interactions between proteins tangled in a cell's membrane and a variety of other biological molecules. These extremely difficult measurements can aid the process of drug discovery.

Scientists estimate that about 30 percent of the 7,000 proteins in a human cell reside in the cell's membrane, and that these membrane proteins initiate 60 to 70 percent of the signals that control the operation of the cell's molecular machinery. As a result, about half of the drugs currently on the market target membrane proteins. Despite their importance, they are difficult to study. Individual membrane proteins are extremely hard to purify, so scientists have very little structural information about them. In addition, existing methods to measure their activity have serious limitations. Most existing assays remove the membranes from their natural environment or modify them in a variety of different ways, such as attaching fluorescent labels, in order to analyze membrane protein activity.

"In addition to being expensive and time-consuming, these modifications can affect the target membrane's function in unpredictable ways," said Vanderbilt Professor of Chemistry Darryl Bornhop, who developed the new technique.

By contrast, in an article published online in the journal *Nature Biotechnology*, Bornhop's research group and their collaborators at The Scripps Research Institute report that the laser-based technique, called backscattering interferometry (BSI), can precisely measure the binding force between membrane proteins and both large and small molecules in a natural environment.

This is a powerful tool and a major advance in measuring membrane protein interactions," said Lawrence Marnett, director of the Vanderbilt Institute of Chemical Biology. "This is a powerful tool and a major advance in measuring membrane protein interactions," said Lawrence Marnett, director of the Vanderbilt Institute of Chemical Biology. Marnett, who is also Mary Geddes Stahlman Professor of Cancer Research, was not involved in the study but is planning on collaborating with the Bornhop group.

Lasers aid measurement

BSI is deceptively simple. It measures the binding force between two molecules mixed in a microscopic liquid-filled chamber by shining a red laser like those used in barcode scanners through it. When the geometry of the chamber is correct, the laser produces an interference pattern that is very sensitive to what the molecules are doing. If the molecules begin sticking together, for example, the pattern begins to shift.

In the new study, the researchers created synthetic membranes that contained a small protein, called GM1, that is a primary target that cholera toxins bind with in order to get into a cell. When they mixed these

membranes with cholera toxin B, they measured a binding force consistent with that obtained by other methods.
The researchers performed similar validation tests with naturally derived membranes and three membrane proteins, one associated with breast cancer, another associated with pain and inflammation and the neurotransmitter GABA known to aid in relaxation and sleep and to regulate anxiety.
When they mixed the membranes containing each of these proteins with molecules known to bind with them, the BSI technique provided measurements that agreed with the values obtained by other methods, the scientists reported.
Vanderbilt has applied for and received three patents on the process and has several other patents pending. The university has issued an exclusive license to develop the technology to Molecular Sensing, Inc. Bornhop is one of the founders of the start-up and serves as its chief scientist.
Vanderbilt research associate Amanda Kussrow and Michael Baksh, Mauro Mileni and M.G. Finn from The Scripps Research Institute contributed to the study, which was funded by awards from the National Institutes of Health, Joint Center for Innovative Membrane Protein Technologies and the Skaggs Institute for Chemical Biology.
Story Source:
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Vanderbilt University**.

Journal Reference:

1. Michael M Baksh, Amanda K Kussrow, Mauro Mileni, M G Finn, Darryl J Bornhop. **Label-free quantification of membrane-ligand interactions using backscattering interferometry**. *Nature Biotechnology*, 2011; DOI: 10.1038/nbt.1790

http://www.sciencedaily.com/releases/2011/03/110315130140.htm

Newborn Stars Wreak Havoc in Their Nursery

This very detailed false-color image from ESO's Very Large Telescope shows the dramatic effects of very young stars on the dust and gas from which they were born in the star-forming region NGC 6729. The baby stars are invisible in this picture, being hidden behind dust clouds at the upper left of the picture, but material they are ejecting is crashing into the surroundings at speeds of that can be as high as one million kilometers per hour. This picture was taken by the FORS1 instrument and records the scene in the light of glowing hydrogen and sulfur. (Credit: ESO)

ScienceDaily (Mar. 17, 2011) — A new image from ESO's Very Large Telescope gives a close-up view of the dramatic effects new-born stars have on the gas and dust from which they formed. Although the stars themselves are not visible, material they have ejected is colliding with the surrounding gas and dust clouds and creating a surreal landscape of glowing arcs, blobs and streaks.

The star-forming region NGC 6729 is part of one of the closest stellar nurseries to Earth and hence one of the best studied. This new image from ESO's Very Large Telescope gives a close-up view of a section of this strange and fascinating region. The data were selected from the ESO archive by Sergey Stepanenko as part of the Hidden Treasures competition [1]. Sergey's picture of NGC 6729 was ranked third in the competition.

Stars form deep within molecular clouds and the earliest stages of their development cannot be seen in visible-light telescopes because of obscuration by dust. In this image there are very young stars at the upper left of the picture. Although they cannot be seen directly, the havoc that they have wreaked on their surroundings dominates the picture. High-speed jets of material that travel away from the baby stars at velocities as high as one million kilometres per hour are slamming into the surrounding gas and creating shock waves. These shocks cause the gas to shine and create the strangely coloured glowing arcs and blobs known as Herbig-Haro objects [2].

In this view the Herbig-Haro objects form two lines marking out the probable directions of ejected material. One stretches from the upper left to the lower centre, ending in the bright, circular group of glowing blobs and arcs at the lower centre. The other starts near the left upper edge of the picture and extends towards the centre right. The peculiar scimitar-shaped bright feature at the upper left is probably mostly due to starlight being reflected from dust and is not a Herbig-Haro object.

This enhanced-colour picture [3] was created from images taken using the FORS1 instrument on ESO's Very Large Telescope. Images were taken through two different filters that isolate the light coming from glowing hydrogen (shown as orange) and glowing ionised sulphur (shown as blue). The different colours in different parts of this violent star formation region reflect different conditions -- for example where ionised sulphur is glowing brightly (blue features) the velocities of the colliding material are relatively low -- and help astronomers to unravel what is going on in this dramatic scene.

Notes
[1] ESO's Hidden Treasures 2010 competition gave amateur astronomers the opportunity to search through ESO's vast archives of astronomical data, hoping to find a well-hidden gem that needed polishing by the entrants. Participants submitted nearly 100 entries and ten skilled people were awarded some extremely attractive prizes, including an all expenses paid trip for the overall winner to ESO's Very Large Telescope (VLT) on Cerro Paranal, in Chile, the world's most advanced optical telescope. The ten winners submitted a total of 20 images that were ranked as the highest entries in the competition out of the near 100 images.
[2] The astronomers George Herbig and Guillermo Haro were not the first to see one of the objects that now bear their names, but they were the first to study the spectra of these strange objects in detail. They realised that they were not just clumps of gas and dust that reflected light, or glowed under the influence of the ultraviolet light from young stars, but were a new class of objects associated with ejected material in star formation regions.
[3] Both the ionised sulphur and hydrogen atoms in this nebula emit red light. To differentiate between them in this image the sulphur emission has been coloured blue.

Story Source:
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **European Southern Observatory - ESO**.

http://www.sciencedaily.com/releases/2011/03/110316084411.htm

Rare Andean Cat No Longer Exclusive to the Andes

Once thought to live exclusively in the Andes, the Andean cat also occurs on the Patagonian steppe, according to the Wildlife Conservation Society and its partners. (Credit: Copyright Jim Sanderson, PhD/Small Wild Cat Conservation Foundation)

ScienceDaily (Mar. 16, 2011) — Once thought to exclusively inhabit its namesake mountain range, the threatened Andean cat -- a house cat-sized feline that resembles a small snow leopard in both appearance and habitat -- also frequents the Patagonian steppe at much lower elevations, according to a new study published by the Wildlife Conservation Society and partners.

The finding represents a range extension for the Andean cat, which normally occurs at altitudes above 3,000 meters (approximately 9,800 feet). The new survey presents evidence of the cats occurring at elevations as low as 650 meters (approximately 2,100 feet) on the Patagonian steppe. The species is listed as "Endangered" on the World Conservation Union's Red List and may number only 2,500 individuals throughout its entire range.

The study appears in the recent edition of CATNews. The authors include: Andres Novaro and Lorena Rivas of the Wildlife Conservation Society and CONICET, Argentina; Susan Walker of the Wildlife Conservation Society; Rocio Palacios of Alianza Gato Andino; Sebastian di Martino of Department of Protected Areas of the Province of Neuquén; Martin Monteverde of Centro de Ecología Aplicada del Neuquén; Sebastian Canadell of Universidad Nacional de Cordoba; and Daniel Cossios of Université de Montréal.

"These confirmed records show the lowest elevations ever reported for the Andean cat," said WCS conservationist Andres Novaro, lead author of the study. "According to genetic studies underway led by Daniel Cossios, this new population appears to represent an evolutionary lineage distinct from the highland population."

Prompted by a lone photograph of two Andean cats in the foothills of central Argentina, the research team surveyed approximately 31,000 square kilometers (approximately 12,000 square miles) of Argentina's Mendoza and Neuquén provinces in 2007-2009. The team collected samples from several locations that included scat, skulls, and skin, all of which were confirmed with DNA analysis. In addition, the researchers conducted surveys with inhabitants of the region. The conservationists also found evidence of three other small cat species: Geoffroy's cat, pampas cat, and jaguarundi.

The Andean cat's range extension coincides with the known distribution of the mountain vizcacha, a rabbit-like rodent that inhabits both the Andes Mountains and Patagonian steppe and is the Andean cat's primary prey.

"Discovering a new population of Andean cats is an important finding for this elusive and rare species," said Mariana Varese, Acting Director of WCS's Latin America and Caribbean Program. "Determining the range of the Andean cat in the Patagonian steppe will provide conservationists with a foundation for later conservation plans."

Threats to the newly discovered population of Andean cat include goat herders who assume the felines are preying on their livestock, oil exploration activities that destroy habitat, and new roads that open up formerly inaccessible areas to poachers.

Critical support for this study was provided by Panthera, the Rufford Small Grants Foundation, Wildlife Conservation Network, and the Whitley Fund for Nature.

Story Source:
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Wildlife Conservation Society**, via EurekAlert!, a service of AAAS.

Journal Reference:

1. Andres Novaro, Susan Walker, Rocio Palacios, Sebastian Di Martino, Martin Monteverde, Sebastian Canadell, Lorena Rivas, and Daniel Cossios. **Endangered Andean cat distribution beyond the Andes in Patagonia**. *CATnews*, 53 Autumn 2010

http://www.sciencedaily.com/releases/2011/03/110316142626.htm

Some Blind People 'See' With Their Ears, Neuropsychologists Show

Some blind people 'see' with their ears. The part of the brain that normally works with our eyes to process vision and space perception can actually rewire itself to process sound information instead. (Credit: iStockphoto/Eva Serrabassa)

ScienceDaily (Mar. 17, 2011) — Dr. Olivier Collignon of the University of Montreal's Saint-Justine Hospital Research Centre compared the brain activity of people who can see and people who were born blind, and discovered that the part of the brain that normally works with our eyes to process vision and space perception can actually rewire itself to process sound information instead.

The research was undertaken in collaboration with Dr Franco Lepore of the Centre for Research in Neuropsychology and Cognition and was published March 15 in the *Proceedings of the National Academy of Sciences*.

The research builds on other studies which show that the blind have a heightened ability to process sounds as part of their space perception. "Although several studies have shown occipital regions of people who were born blind to be involved in nonvisual processing, whether the functional organization of the visual cortex observed in sighted individuals is maintained in the rewired occipital regions of the blind has only been recently investigated," Collignon said. The visual cortex, as its name would suggest, is responsible for processing sight. The right and left hemisphere of the brain have one each. They are located at the back of the brain, which is called the occipital lobe. "Our study reveals that some regions of the right dorsal occipital stream do not require visual experience to develop a specialization for the processing of spatial information and are functionally integrated in the preexisting brain network dedicated to this ability."

The researchers worked with 11 individuals who were born blind and 11 who were not. Their brain activity was analyzed via MRI scanning while they were subjected to a series of tones. "The results demonstrate the brain's amazing plasticity," Collignon said. Plasticity is a scientific term that refers to the brain's ability to change as a result of an experience. "The brain designates a specific set of areas for spatial processing, even if it is deprived of its natural inputs since birth. The visually deprived brain is sufficiently flexible that it uses "neuronal niche" to develop and perform functions that are sufficiently close to the ones required by the remaining senses. Such a research demonstrates that the brain should be more considered as a function-oriented machine rather than a pure sensory machine."

The findings raise questions regarding how this rewiring occurs during the development of blind new born babies. "In early life, the brain is sculpting itself on the basis of experience, with some synaptic connections eliminated and others strengthened," Collignon noted. Synaptic connections enable our neurons, or brain cells, to communicate. "After a peak of development ending approximately at the age of 8 months, approximately 40% of the synapses of the visual cortex are gradually removed to reach a stable synaptic

density at approximately the age of 11 years. It is possible that that the rewiring occurs as part of the maintenance of our ever changing neural connections, but this theory will require further research," Collignon said.

Collignon's study received funding from the Fondation de l'Hôpital Sainte-Justine, the Fonds de la recherche en santé du Québec, the Canadian Institutes for Health Research, the Natural Sciences and Engineering Council of Canada, and the Fonds de la Recherche Scientifique of Belgium.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University of Montreal**, via EurekAlert!, a service of AAAS.

Journal Reference:

1. O. Collignon, G. Vandewalle, P. Voss, G. Albouy, G. Charbonneau, M. Lassonde, F. Lepore. **Functional specialization for auditory-spatial processing in the occipital cortex of congenitally blind humans**. *Proceedings of the National Academy of Sciences*, 2011; 108 (11): 4435 DOI: 10.1073/pnas.1013928108

http://www.sciencedaily.com/releases/2011/03/110316104123.htm

Ancient 'Hyperthermals' Serve as Guide to Anticipated Climate Changes; Sudden Global Warming Events More Frequent?

Richard Norris in his lab with ancient sediments obtained by the Ocean Drilling Program reveal the mark of "hyperthermals," warming events lasting thousands of years that changed the composition of the sediment and its color. The dark color in the large sediment core sample at left depicts the onset and aftermath of a 55-million-year-old warming event when changes in ocean temperatures altered the composition of marine life (Credit: Scripps Institution of Oceanography, UC San Diego)

ScienceDaily (Mar. 16, 2011) — Bursts of intense global warming that have lasted tens of thousands of years have taken place more frequently throughout Earth's history than previously believe, according to evidence gathered by a team led by Scripps Institution of Oceanography, UC San Diego researchers.

Richard Norris, a professor of geology at Scripps who co-authored the report, said that releases of carbon dioxide sequestered in the deep oceans were the most likely trigger of these ancient "hyperthermal" events. Most of the events raised average global temperatures between 2° and 3° Celsius (3.6 and 5.4° F), an amount comparable to current conservative estimates of how much temperatures are expected to rise in coming decades as a consequence of anthropogenic global warming. Most hyperthermals lasted about 40,000 years before temperatures returned to normal.

The study appears in the March 17 issue of the journal *Nature*.

"These hyperthermals seem not to have been rare events," Norris said, "hence there are lots of ancient examples of global warming on a scale broadly like the expected future warming. We can use these events to examine the impact of global change on marine ecosystems, climate and ocean circulation."

The hyperthermals took place roughly every 400,000 years during a warm period of Earth history that prevailed some 50 million years ago. The strongest of them coincided with an event known as the Paleocene-Eocene Thermal Maximum, the transition between two geologic epochs in which global temperatures rose

between 4° and 7° C (7.2° and 12.6° F) and needed 200,000 years to return to historical norms. The events stopped taking place around 40 million years ago, when the planet entered a cooling phase. No warming events of the magnitude of these hyperthermals have been detected in the geological record since then.
Phil Sexton, a former student of Norris' now at the Open University in the United Kingdom, led the analysis of sediment cores collected off the South American coast. In the cores, evidence of the warm periods presented itself in bands of gray sediment layered within otherwise pale greenish mud. The gray sediment contained increased amounts of clay left after the calcareous shells of microscopic organisms were dissolved on the sea floor. These clay-rich intervals are consistent with ocean acidification episodes that would have been triggered by large-scale releases of carbon dioxide. Large influxes of carbon dioxide change the chemistry of seawater by producing greater amounts of carbonic acid in the oceans.
The authors concluded that a release of carbon dioxide from the deep oceans was a more likely cause of the hyperthermals than other triggering events that have been hypothesized. The regularity of the hyperthermals and relatively warm ocean temperatures of the period makes them less likely to have been caused by events such as large melt-offs of methane hydrates, terrestrial burning of peat or even proposed cometary impacts. The hyperthermals could have been set in motion by a build-up of carbon dioxide in the deep oceans caused by slowing or stopping of circulation in ocean basins that prevented carbon dioxide release.
Norris noted that the hyperthermals provide historical perspective on what Earth will experience as it continues to warm from widespread use of fossil fuels, which has increased carbon dioxide concentrations in the atmosphere nearly 50 percent since the beginning of the Industrial Revolution. Hyperthermals can help scientists produce a range of estimates for how long it will take for temperatures to fully revert to historical norms depending on how much warming human activities cause.
"In 100 to 300 years, we could produce a signal on Earth that takes tens of thousands of years to equilibrate, judging from the geologic record," he said.
The scientists hope to better understand how fast the conditions that set off hyperthermals developed. Norris said that 50 million year old sediments in the North Sea are finely layered enough for scientists to distinguish decade-to-decade or even year-to-year changes.
Co-authors of the paper include researchers from the National Oceanography Centre Southampton at the University of Southampton in England and the Center for Marine Environmental Sciences, University of Bremen, Germany.

Story Source:
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Scripps Institution of Oceanography, UC San Diego**.

Journal Reference:

1. Philip F. Sexton, Richard D. Norris, Paul A. Wilson, Heiko Pälike, Thomas Westerhold, Ursula Röhl, Clara T. Bolton, Samantha Gibbs. **Eocene global warming events driven by ventilation of oceanic dissolved organic carbon**. *Nature*, 2011; 471 (7338): 349 DOI: 10.1038/nature09826

http://www.sciencedaily.com/releases/2011/03/110316152941.htm

Viscous Cycle: Quartz Is Key to Plate Tectonics

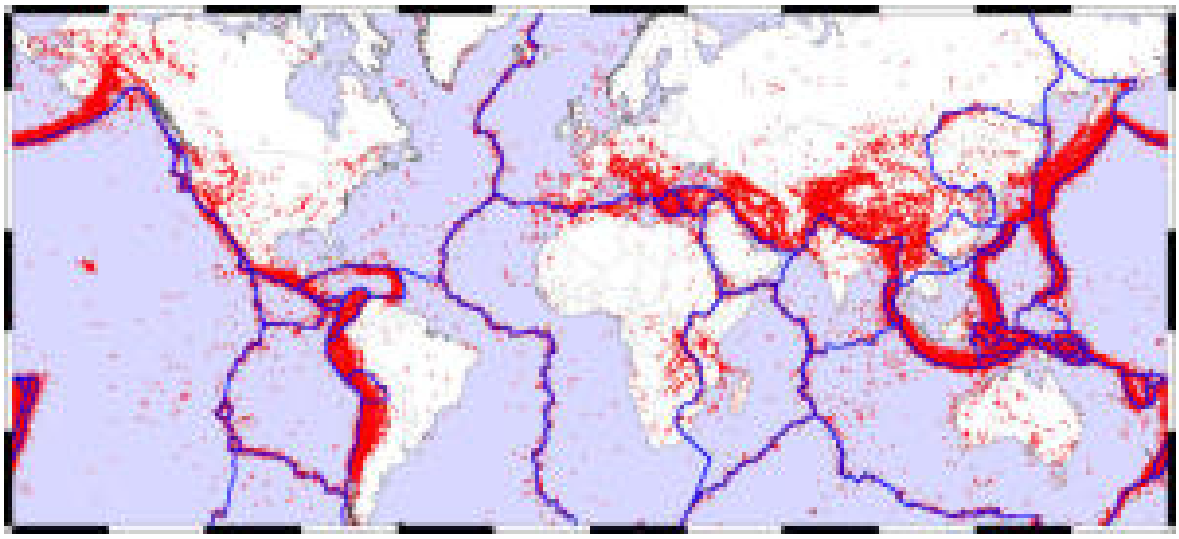


Plate tectonics revolutionized understanding of earthquake distributions (in red). (Credit: Tony Lowry, Utah State University)

ScienceDaily (Mar. 16, 2011) — More than 40 years ago, pioneering tectonic geophysicist J. Tuzo Wilson published a paper in the journal *Nature* describing how ocean basins opened and closed along North America's eastern seaboard.

His observations, dubbed "The Wilson Tectonic Cycle," suggested the process occurred many times during Earth's long history, most recently causing the giant supercontinent Pangaea to split into today's seven continents.

Wilson's ideas were central to the so-called Plate Tectonic Revolution, the foundation of contemporary theories for processes underlying mountain-building and earthquakes.

Since his 1967 paper, additional studies have confirmed that large-scale deformation of continents repeatedly occurs in some regions but not others, though the reasons why remain poorly understood.

Now, new findings by Utah State University geophysicist Tony Lowry and colleague Marta Pérez-Gussinyé of Royal Holloway, University of London, shed surprising light on these restless rock cycles.

"It all begins with quartz," says Lowry, who published results of the team's recent study in the March 17 issue of *Nature*.

The scientists describe a new approach to measuring properties of the deep crust.

It reveals quartz's key role in initiating the churning chain of events that cause Earth's surface to crack, wrinkle, fold and stretch into mountains, plains and valleys.

"If you've ever traveled westward from the Midwest's Great Plains toward the Rocky Mountains, you may have wondered why the flat plains suddenly rise into steep peaks at a particular spot," Lowry says.

"It turns out that the crust beneath the plains has almost no quartz in it, whereas the Rockies are very quartz-rich."

He thinks that those belts of quartz could be the catalyst that sets the mountain-building rock cycle in motion.

"Earthquakes, mountain-building and other expressions of continental tectonics depend on how rocks flow in response to stress," says Lowry.

"We know that tectonics is a response to the effects of gravity, but we know less about rock flow properties and how they change from one location to another."

Wilson's theories provide an important clue, Lowry says, as scientists have long observed that mountain belts and rift zones have formed again and again at the same locations over long periods of time.

But why?

"Over the last few decades, we've learned that high temperatures, water and abundant quartz are all critical factors in making rocks flow more easily," Lowry says. "Until now, we haven't had the tools to measure these factors and answer long-standing questions."

Since 2002, the National Science Foundation (NSF)-funded Earthscope Transportable Array of seismic stations across the western United States has provided remote sensing data about the continent's rock properties.

"We've combined Earthscope data with other geophysical measurements of gravity and surface heat flow in an entirely new way, one that allows us to separate the effects of temperature, water and quartz in the crust," Lowry says.

Earthscope measurements enabled the team to estimate the thickness, along with the seismic velocity ratio, of continental crust in the American West.

"This intriguing study provides new insights into the processes driving large-scale continental deformation and dynamics," says Greg Anderson, NSF program director for EarthScope. "These are key to understanding the assembly and evolution of continents."

Seismic velocity describes how quickly sound waves and shear waves travel through rock, offering clues to its temperature and composition.

"Seismic velocities are sensitive to both temperature and rock type," Lowry says.

"But if the velocities are combined as a ratio, the temperature dependence drops out. We found that the velocity ratio was especially sensitive to quartz abundance."

Even after separating out the effects of temperature, the scientists found that a low seismic velocity ratio, indicating weak, quartz-rich crust, systematically occurred in the same place as high lower-crustal temperatures modeled independently from surface heat flow.

"That was a surprise," he says. "We think this indicates a feedback cycle, where quartz starts the ball rolling."

If temperature and water are the same, Lowry says, rock flow will focus where the quartz is located because that's the only weak link.

Once the flow starts, the movement of rock carries heat with it and that efficient movement of heat raises temperature, resulting in weakening of crust.

"Rock, when it warms up, is forced to release water that's otherwise chemically bound in crystals," he says. Water further weakens the crust, which increasingly focuses the deformation in a specific area.

More information about the EarthScope Project is available at: http://www.earthscope.org/

story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **National Science Foundation**.

Journal Reference:

1. Anthony R. Lowry, Marta Pérez-Gussinyé. **The role of crustal quartz in controlling Cordilleran deformation**. *Nature*, 2011; 471 (7338): 353 DOI: 10.1038/nature09912

http://www.sciencedaily.com/releases/2011/03/110316152949.htm

Naval Sonar Exercises Linked to Whale Strandings, According to New Report

Dtag on a beaked whale. (Credit: Photo by Todd Pusser, taken under NMFS permit 14241)

ScienceDaily (Mar. 16, 2011) — Scientists have long been aware of a link between naval sonar exercises and unusual mass strandings of beaked whales. Evidence of such a link triggered a series of lawsuits in which environmental groups sued the U.S. Navy to limit sonar exercises to reduce risk to whales. In 2008, this conflict rose to the level of the US Supreme Court which had to balance potential threat to whales from sonar against the military risk posed by naval forces inadequately trained to use sonar to detect enemy submarines. The court ruled that the Navy could continue training, but that it was essential for the Navy to develop better methods to protect the whales.

The knowledge most critical to protecting these whales from risk of sonar involves measuring the threshold between safe and risky exposure levels, but until now it has not been known how beaked whales respond to sonar, much less the levels that pose a problem. "We know so little about beaked whales because they prefer deep waters far offshore, where they can dive on one breath of air to depths of over a mile for up to an hour and a half," said Peter Tyack, a senior scientist at Woods Hole Oceanographic Institution (WHOI).

Now, an international team of researchers reports in a paper led by Tyack the first data on how beaked whales respond to naval sonar exercises. Their results suggest that sonar indeed affects the behavior and movement of whales.

Tyack and his colleagues used two complementary methods to investigate behavioral responses of beaked whales to sonar: "an opportunistic approach that monitored whale responses to multi-day naval exercises involving tactical mid-frequency sonars, and an experimental approach using playbacks of simulated sonar and control sounds to whales tagged with a device that records sound, movement, and orientation," the researchers report in the current issue of the online journal *PLoS ONE*, published by the Public Library of Science.

That research team developed experiments to slowly increase the level of sonar at a tagged whale, to stop exposure as soon as the whale started responding, to measure that exposure, and to define the response. The experimental approach used tags to measure acoustic exposure and behavioral reactions of beaked whales to one controlled exposure each of simulated military sonar, killer whale calls, and band-limited noise.

"These experiments were very difficult to develop, and it was a major breakthrough simply to be able to develop a study that could safely study these responses," Tyack said. "All three times that tagged beaked whales were exposed experimentally to playback of sounds when they were foraging at depth, they stopped foraging prematurely and made unusually long and slow ascents to the surface, moving away from the sound.

Beaked whales use their own biosonar to find prey when they are foraging; this means that one can monitor cessation of foraging by listening for when they stop clicking. Once the researchers found that beaked whales responded to sonar by ceasing clicking, they were able to monitor reactions of beaked whales during actual sonar exercises on the range. The research was conducted on a naval testing range where an array of underwater microphones, or hydrophones, covered the seafloor, allowing whale sounds to be monitored over 600 square miles. "During actual sonar exercises, beaked whales were primarily detected near the periphery of the range, on average 16 km away from the sonar transmissions. Once the exercise stopped, beaked whales gradually filled in the center of the range over 2-3 days," they report.

A satellite tagged whale moved outside the range during an exercise, returning over 2-3 days post-exercise. "The combined results indicate similar disruption of foraging behavior and avoidance by beaked whales in the two different contexts, at exposures well below those used by regulators to define disturbance," the scientists report.
"This suggests that beaked whales are particularly sensitive to sound. Their behavior tended to be disrupted at exposure levels around 140 decibels (dB), so they may require a lower threshold than many current regulations that anticipate disruption of behavior around 160 dB, " said Tyack. "But the observations on the naval range suggest that while sonar can disrupt the behavior of the whales, appropriate monitoring and management can reduce the risk of stranding."
The research was supported by the United States Office of Naval Research, the U.S. Strategic Environmental Research and Development, the Environmental Readiness Division of the U.S. Navy, the U.S. Chief of Naval Operations Submarine Warfare Division (Undersea Surveillance), NOAA and the Joint Industry Program on Sound and Marine Life of the International Association of Oil and Gas Producers. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

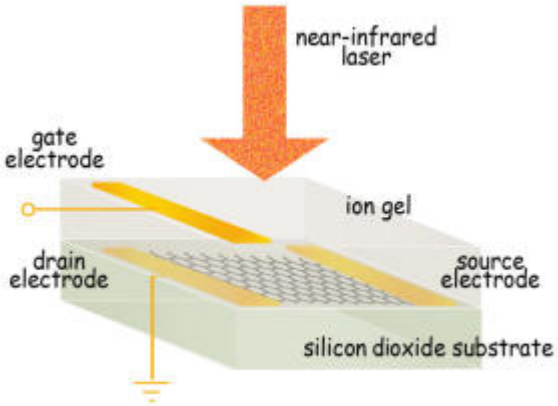
Story Source:
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Woods Hole Oceanographic Institution**.

Journal Reference:

1. Peter L. Tyack, Walter M. X. Zimmer, David Moretti, Brandon L. Southall, Diane E. Claridge, John W. Durban, Christopher W. Clark, Angela D'Amico, Nancy DiMarzio, Susan Jarvis, Elena McCarthy, Ronald Morrissey, Jessica Ward, Ian L. Boyd. **Beaked Whales Respond to Simulated and Actual Navy Sonar**. *PLoS ONE*, 2011; 6 (3): e17009 DOI: 10.1371/journal.pone.0017009

http://www.sciencedaily.com/releases/2011/03/110316153133.htm

Scientists Control Light Scattering in Graphene



A flake of graphene was grown on copper and transferred onto an insulating substrate of silicon dioxide. The Fermi energy in the graphene was adjusted by varying the gate voltage on the overlying ion gel, which confines a strongly conducting liquid in a polymer matrix. (Credit: Lawrence Berkeley National Laboratory)

ScienceDaily (Mar. 16, 2011) — Scientists at the U.S. Department of Energy's Lawrence Berkeley National Laboratory (Berkeley Lab) and the University of California at Berkeley have learned to control the quantum pathways determining how light scatters in graphene. Controlled scattering provides a new tool for the study of this unique material -- graphene is a single sheet of carbon just one atom thick -- and may point to practical applications for controlling light and electronic states in graphene nanodevices.

The research team, led by Feng Wang of Berkeley Lab's Materials Sciences Division, made the first direct observation, in graphene, of so-called quantum interference in Raman scattering. Raman scattering is a form of "inelastic" light scattering. Unlike elastic scattering, in which the scattered light has the same color (the same energy) as the incident light, inelastically scattered light either loses energy or gains it.

Raman scattering occurs in graphene and other crystals when an incoming photon, a particle of light, excites an electron, which in turn generates a phonon together with a lower-energy photon. Phonons are vibrations of the crystal lattice, which are also treated as particles by quantum mechanics.

Quantum particles are as much waves as particles, so they can interfere with one another and even with themselves. The researchers showed that light emission can be controlled by controlling these interference pathways. They present their results in a forthcoming issue of the journal *Nature*, now available in Advance Online Publication.

Manipulating quantum interference, in life and in the lab

"A familiar example of quantum interference in everyday life is antireflective coating on eyeglasses," says Wang, who is also an assistant professor of physics at UC Berkeley. "A photon can follow two pathways, scattering from the coating or from the glass. Because of its quantum nature it actually follows both, and the coating is designed so that the two pathways interfere with each other and cancel light that would otherwise cause reflection."

Wang adds, "The hallmark of quantum mechanics is that if different paths are nondistinguishable, they must always interfere with each other. We can manipulate the interference among the quantum pathways that are responsible for Raman scattering in graphene because of graphene's peculiar electronic structure."

In Raman scattering, the quantum pathways are electronic excitations, which are optically stimulated by the incoming photons. These excitations can only happen when the initial electronic state is filled (by a charged particle such as an electron), and the final electronic state is empty.

Quantum mechanics describes electrons filling a material's available electronic states much as water fills the space in a glass: the "water surface" is called the Fermi level. All the electronic states below it are filled and all the states above it are empty. The filled states can be reduced by "doping" the material in order to shift the Fermi energy lower. As the Fermi energy is lowered, the electronic states just above it are removed, and the excitation pathways originating from these states are also removed.

"We were able to control the excitation pathways in graphene by electrostatically doping it -- applying voltage to drive down the Fermi energy and eliminate selected states," Wang says. "An amazing thing about graphene is that its Fermi energy can be shifted by orders of magnitude larger than conventional materials. This is ultimately due to graphene's two-dimensionality and its unusual electronic bands."

The Fermi energy of undoped graphene is located at a single point, where its electronically filled bands, graphically represented as an upward-pointing cone, meet its electronically empty bands, represented as a downward-pointing cone. To move the Fermi energy appreciably requires a strong electric field.

Team member Rachel Segalman, an associate professor of chemical engineering at UC Berkeley and a faculty scientist in Berkeley Lab's Materials Sciences Division, provided the ion gel that was key to the experimental device. An ion gel confines a strongly conducting liquid in a polymer matrix. The gel was laid over a flake of graphene, grown on copper and transferred onto an insulating substrate. The charge in the graphene was adjusted by the gate voltage on the ion gel.

"So by cranking up the voltage we lowered the graphene's Fermi energy, sequentially getting rid of the higher energy electrons," says Wang. Eliminating electrons, from the highest energies on down, effectively eliminated the pathways that, when impinged upon by incoming photons, could absorb them and then emit Raman-scattered photons.

What comes of interference, constructive and destructive

"People have always known that quantum interference is important in Raman scattering, but it's been hard to see," says Wang. "Here it's really easy to see the contribution of each state."

Removing quantum pathways one by one alters the ways they can interfere. The changes are visible in the Raman-scattering intensity emitted by the experimental device when it was illuminated by a beam of near-infrared laser light. Although the glow from scattering is much fainter than the near-infrared excitation, changes in its brightness can be measured precisely.

"In classical physics, you'd expect to see the scattered light get dimmer as you remove excitation pathways," says Wang, but the results of the experimenter came as a surprise to everyone. "Instead the signal got stronger!"

The scattered light grew brighter as the excitation pathways were reduced -- what Wang calls "a canonical signature of destructive quantum interference."

Why "destructively?" Because phonons and scattered photons can be excited by many different, nondistinguishable pathways that interfere with one another, blocking one path can either decrease or increase the light from scattering, depending on whether that pathway was interfering constructively or destructively with the others. In graphene, the lower and higher-energy pathways interfered destructively. Removing one of them thus increased the brightness of the emission.

"What we've demonstrated is the quantum-interference nature of Raman scattering," Wang says. "It was always there, but it was so hard to see that it was often overlooked."

In a second observation, the researchers found yet another unexpected example of inelastic light scattering. This one, "hot electron luminescence," didn't result from blocked quantum pathways, however.

When a strong voltage is applied and the graphene's Fermi energy is lowered, higher-energy electron states are emptied from the filled band. Electrons that are highly excited by incoming photons, enough to jump to the unfilled band, thus find additional chances to fall back to the now-vacant states in what was the filled band. But these "hot" electrons can only fall back if they emit a photon of the right frequency. The hot electron luminescence observed by the researchers has an integrated intensity a hundred times stronger than the Raman scattering.

The road taken

The poet Robert Frost wrote of coming upon two roads that diverged in a wood, and was sorry he could not travel both. Not only can quantum processes take both roads at once, they can interfere with themselves in doing so.

The research team, working at UC Berkeley and at Berkeley Lab's Advanced Light Source, has shown that inelastic light scattering can be controlled by controlling interference between the intermediate states between photon absorption and emission. Manipulating that interference has enabled new kinds of quantum control of chemical reactions, as well as of "spintronic" states, in which not charge but the quantum spins of electrons are affected. Strongly enhanced Raman scattering can be a boon to nanoscale materials research. Hot

luminescence is potentially attractive for optoelectronics and biological research, in which near-infrared tags -- even weak ones -- could be very useful.
"Likewise the phenomenon of hot electron luminescence, because it immediately follows excitation by a probe laser, could become a valuable research tool," says Wang, "particularly for studying ultrafast electron dynamics, one of the chief unusual characteristics of graphene."

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **DOE/Lawrence Berkeley National Laboratory**.

Journal Reference:

1. Chi-Fan Chen, Cheol-Hwan Park, Bryan W. Boudouris, Jason Horng, Baisong Geng, Caglar Girit, Alex Zettl, Michael F. Crommie, Rachel A. Segalman, Steven G. Louie, Feng Wang. **Controlling inelastic light scattering quantum pathways in graphene**. *Nature*, 2011; DOI: 10.1038/nature09866

http://www.sciencedaily.com/releases/2011/03/110316142622.htm

NASA's Prolific Mars Reconnaissance Orbiter Reaches Five-Year Mark

Images like this from the High Resolution Imaging Science Experiment (HiRISE) camera on NASA's Mars Reconnaissance Orbiter show portions of the Martian surface in unprecedented detail. (Credit: NASA/JPL-Caltech/University of Arizona)

ScienceDaily (Mar. 17, 2011) — NASA's versatile Mars Reconnaissance Orbiter, which began orbiting Mars five years ago March 10, has radically expanded our knowledge of the Red Planet and is now working overtime.

The mission has provided copious information about ancient environments, ice-age-scale climate cycles and present-day changes on Mars.

The orbiter observes Mars' surface, subsurface and atmosphere in unprecedented detail. The spacecraft's large solar panels and dish antenna have enabled it to transmit more data to Earth -- 131 terabits and counting, including more than 70,000 images -- than all other interplanetary missions combined. Yet many things had to go well for the mission to achieve these milestones.

After a seven-month journey from Earth, the spacecraft fired its six main engines for nearly 27 minutes as it approached Mars on March 10, 2006. Mars could not capture it into orbit without this critically timed maneuver to slow the spacecraft. The orbiter's intended path took it behind Mars, out of communication, during most of the engine burn.

"That was tense, waiting until the spacecraft came back out from behind Mars and we had contact," recalled Dan Johnston, now the mission's deputy project manager at NASA's Jet Propulsion Laboratory, Pasadena, Calif.

The Mars Reconnaissance Orbiter mission met all its science goals in a two-year primary science phase. Two extensions, the latest beginning in 2010, have added to the bounty of science returns.

The mission has illuminated three very different periods of Mars history. Its observations of the heavily cratered terrains of Mars, the oldest on the planet, show that different types of ancient watery environments formed water-related minerals. Some of these would have been more favorable for life than others.

In more recent times, water appears to have cycled as a gas between polar ice deposits and lower-latitude deposits of ice and snow. Extensive layering in ice or rock probably took hundreds of thousands to millions of years to form and, like ice ages on Earth, is linked to cyclic changes in the tilt of the planet's rotation axis and the changing intensity of sunlight near the poles.

The present climate is also dynamic, with volatile carbon dioxide and, just possibly, summertime liquid water modifying gullies and forming new streaks. With observations of new craters, avalanches and dust storms, the orbiter has shown a partially frozen world, but not frozen in time, as change continues today.

In addition to its science observations, the mission provides support for other spacecraft as they land and operate on the surface. The orbiter's cameras captured the Phoenix Mars Lander as it parachuted to the surface in 2008 and monitored the atmosphere for dust storms that would affect Phoenix and the Mars Exploration Rovers Spirit and Opportunity. The Mars Reconnaissance Orbiter augmented NASA's Mars Odyssey in performing relay functions for these missions.

JPL's Phil Varghese, project manager for the Mars Reconnaissance Orbiter, said, "The spacecraft is still in excellent health. After five years at Mars, it continues with dual capabilities for conducting science observations, monitoring the Mars environment and serving as a relay."
The orbiter has examined potential landing sites for NASA's Mars Science Laboratory mission, which will land a rover named Curiosity at one of those sites in August 2012. "We are preparing to support the arrival of the Mars Science Laboratory and the rover's surface operations," Varghese said. "In the meantime, we will extend the science observations into a third Martian year." One Mars year lasts nearly two Earth years.
The orbiter's Mars Color Imager has produced more than four Earth years of daily global weather maps. More than 18,500 images from the High Resolution Imaging Science Experiment camera have resolved features as small as a desk in target areas scattered around the planet that, combined, cover about as much ground as Alaska. More than 36,900 images from the Context Camera cover nearly two-thirds of the surface of Mars at a resolution that allows detection of features the size of large buildings.
The Compact Reconnaissance Spectrometer for Mars has mapped minerals on more than three-fourths of the planet's surface. The Mars Climate Sounder has monitored atmospheric temperature and aerosols with more than 59 million soundings. The Shallow Radar has checked for underground layers in more than 8,600 swaths of ground-penetrating observations.
"Each Mars year is unique, and additional coverage gives us a better chance to understand the nature of changes in the atmosphere and on the surface," said JPL's Rich Zurek, project scientist for the Mars Reconnaissance Orbiter. "We have already learned that Mars is a more dynamic and diverse planet than what we knew five years ago. We continue to see new things."
JPL, a division of the California Institute of Technology in Pasadena, manages the Mars Reconnaissance Orbiter for NASA's Science Mission Directorate in Washington. Lockheed Martin Space Systems, Denver, built the orbiter and partners with JPL in spacecraft operations. For more about the Mars Reconnaissance Orbiter, visit http://www.nasa.gov/mro .

Story Source:
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **NASA's Jet Propulsion Laboratory**.

http://www.sciencedaily.com/releases/2011/03/110311140425.htm

New Tool Debuts for Measuring Indoor Air Pollutants

At NIST's small chamber test facility, researchers are assessing the performance of a prototype reference material for testing emissions of VOCs from building products. (Credit: NIST)

ScienceDaily (Mar. 17, 2011) — A promising new approach for checking the accuracy of measurements of hazardous indoor air pollutants may soon be ready for prime time, report researchers from the National Institute of Standards and Technology (NIST) and Virginia Tech. The measurement tool, a reference sample for volatile organic compounds (VOCs), would be a boon to testers of indoor air quality and to manufacturers of paints, rugs, cleaners and other building products.

The researchers put their innovation -- thin squares of plastic saturated with vapors of a common solvent -- through the paces at four testing laboratories. The prototype test material, made at Virginia Tech, yielded measurement results more accurate than those previously achieved in more costly and time-consuming interlaboratory studies using less standardized materials.

The researchers suggest that their method might be used to produce a range of reference materials to validate measurements of VOCs emitted from building materials and products. VOCs are used in paints, adhesives, furniture and many other indoor products. Indoor levels of some VOCs average two to five times higher than outdoors, according to the Environmental Protection Agency.

VOC emissions from building materials and products have been linked to occupant illness, reduced worker productivity, and increased requirements for ventilation/air cleaning, leading to increased energy consumption. As a result, low VOC emitting products are being used more widely in buildings to help achieve a healthy and sustainable indoor environment.

Several programs for testing VOC emissions from building products exist, and manufacturers often test their products to determine that emissions are below limits set in regulations or voluntary standards. However, results often vary significantly.

Past evaluations of test performance have been based on how much measurements reported by individual laboratories differ from the average value for the entire set of laboratories. "These kinds of inter-laboratory comparisons can take months to conduct," explains NIST environmental engineer Cynthia Howard-Reed, lead author of the new report, "and, unfortunately, the results are relative because there is no true reference value for determining just how accurate an emission measurement really is."

That's the gap the researchers are trying to fill. They aim to produce VOC reference materials -- standardized test samples that produce known results when analyzed. These benchmark references are commonly used in industry to check the accuracy of important measurement instruments.

In the initial trial, they prepared two batches of their sample material -- thin films of polymethyl pentane, a plastic used in gas-permeable packaging, saturated with toluene, a common VOC found in paint and other products. A mathematical model developed by the research team is used to accurately predict rates of emission from the sample over time. The preliminary multi-laboratory tests showed that the prototype

reference material is uniform in composition and sufficiently stable and that rates of VOC emissions within and between production batches are consistent.
The researchers conclude that their prototype could reduce inter-laboratory variability in results to less than 10 percent -- much better than current methods.
The pilot study also identified several opportunities for improvement, which will be incorporated before an international pilot is conducted later this year. With further progress, the project will be expanded by 2013 to include more types of VOC references that will be produced in larger batches for broader distribution.

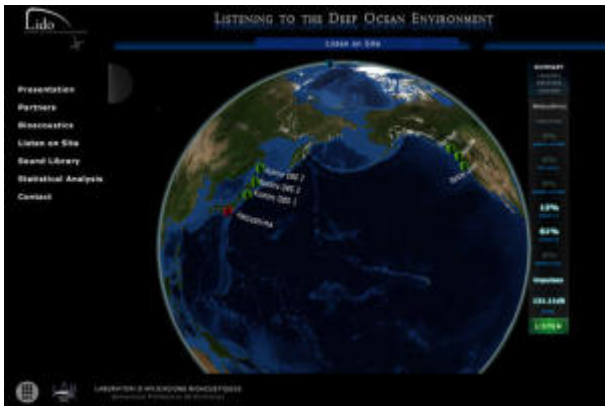
Story Source:
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **National Institute of Standards and Technology (NIST)**.

Journal Reference:

1. Cynthia Howard-Reed, Zhe Liu, Jennifer Benning, Steven Cox, Daniel Samarov, Dennis Leber, Alfred T. Hodgson, Stephany Mason, Doyun Won, John C. Little. **Diffusion-controlled reference material for volatile organic compound emissions testing: Pilot inter-laboratory study**. *Building and Environment*, 2011; 46 (7): 1504 DOI: 10.1016/j.buildenv.2011.01.024

http://www.sciencedaily.com/releases/2011/03/110316153123.htm

Sounds of Japan Earthquake and Aftershocks from Underwater Observatories



LIDO's web, world map. (Credit: Image courtesy of Universitat Politècnica de Catalunya)

ScienceDaily (Mar. 17, 2011) — The Laboratory of Applied Bioacoustics (LAB), a unit of the Universitat Politècnica de Catalunya (UPC), directed by Professor Michel André, has recorded the sound of the earthquake that shook Japan on Friday, March 11. The recording, now available online, was provided by a network of underwater observatories belonging to the Japan Agency for Marine-Earth Science and Technology (JAMSTEC) and located on either side of the earthquake epicenter, close to the Japanese island of Hatsushima.

The UPC laboratory is using this platform as part of Listening to the Deep Ocean Environment (LIDO), a LAB-led international project. "LIDO aims, for the first time ever, to record deep-sea sounds in real time and determine how artificial sounds impact the conservation states of the marine environment," says Michel André. Equipped with hydrophones for monitoring underwater sounds in real-time over the Internet, the LIDO system has been continuously recording the sound of the earthquake and its aftershocks. LIDO obtains automatic recordings of the acoustic events detected. Sources are then identified and classified as being of biological or anthropogenic origin.

The system can be used to listen simultaneously to what is happening at different observatories. On March 11, 2011, at 2:45 p.m. Japanese local time, the LIDO system acoustically detected and recorded the earthquake at JAMSTEC observatories located off the coast off Kushiro and Hatsushima. The recording is available on the LIDO website http://listentothedeep.com. The sound of the earthquake and two aftershocks registered by these two Japanese observatories is available in the "Sound Library" section of the website (under "Earthquakes"). The data published there have been accelerated 16 times so that they can be audible to human ears. In the "Listen on Site" section of the same website, visitors can also listen to, and view, a live stream of the acoustic data in which aftershocks are continuously perceptible.

The spectrograms shown on the website reflect, both acoustically and visually, the intensity and energy distribution of the earthquake sound. The images illustrate the frequency and intensity of the sound by means of a spectrum of colors (with red and yellow being the most intense). The earthquake's effect on Japan's underwater ecosystem pales in comparison to its dramatic impact on the country's population. Nevertheless, due to their sensitivity to noise, cetaceans are considered valuable bioindicators of the natural acoustic balance of oceans.

Their sensitivity and their crucial role in ecosystems have already made it possible to determine the tolerance of the food chain to exposure to artificial sound sources. The LIDO system has given access to these exceptional geophysical data -- from Japan and other seismically active geographical areas around the world -- that are already being used in other disciplines as bioindicators of the natural balance of the oceans. They can now assist in the development of models that would integrate the reaction of cetaceans to noise as a geohazard indicator in the event of major seismic activity. The website also offers the general public the opportunity to witness the earthquake and follow its evolution in real time.

Undersea noise impact assessment

Understanding the link between natural and anthropogenic processes is essential to being able to predict the magnitude of the impact of changes in the natural balance of oceans. Deep-sea observatories can play a key role in assessing and monitoring these changes.
The LIDO project applies and extends techniques developed for passive acoustic monitoring to cabled deep-sea platforms and moored stations. Through the use of the information provided by existing and future underwater observatories, LIDO is helping to assess the impact of natural and human-made noise on the underwater environment and to describe long-term trends in ambient noise levels, especially as relates to the effects of human activities. The LIDO system contains several independent modules that process real-time acoustic data streams for noise assessment, detection, classification and localization of acoustic events, e.g. the presence of cetaceans.
The software developed under this project is currently in use at the European Sea-Floor Observatory Network (ESONET), at the ANTARES neutrino detector in France, at the UPC's OBSEA shallow-water test site off the coast of Vilanova i la Geltrú in Catalonia, at the underwater platforms of the University of Victoria's NEPTUNE network in Canada, and at the NEMO sites to the east of Sicily, operated by Italy's National Institute of Nuclear Physics.
The software is also being used at the JAMSTEC observatories off the coast of Kushiro and Hatsushima in Japan. The Kushiro platform is located 140 km from the city of the same name and 2,500 m below sea level, while the Hatsushima platform is located 1,174 m beneath the sea in Sagami Bay. The epicenter of the March 11 earthquake is located between these two observatory networks. JAMSTEC's objective is to predict and understand global change phenomena triggered by large-scale natural disasters and environmental destruction caused by global warming, continental and submarine earthquakes, and volcanic eruptions.
Under an ongoing scientific collaboration agreement between the UPC, Japan's National Research Institute of Fisheries Engineering (Fishing Technology and Information Science Division) and JAMSTEC, LIDO is continuously analyzing a live acoustic stream from the sea off the east coast of Japan in order to understand the effect of noise sources on marine fauna and ecosystems, as well as on the movement patterns of great whales.

Story Source:
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Universitat Politècnica de Catalunya**.

http://www.sciencedaily.com/releases/2011/03/110316142746.htm