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Earth's surprise inside: Geologists unlock mysteries of the planet's inner core

Seismic waves are helping scientists to plumb the world's deepest mystery: the planet's inner core.

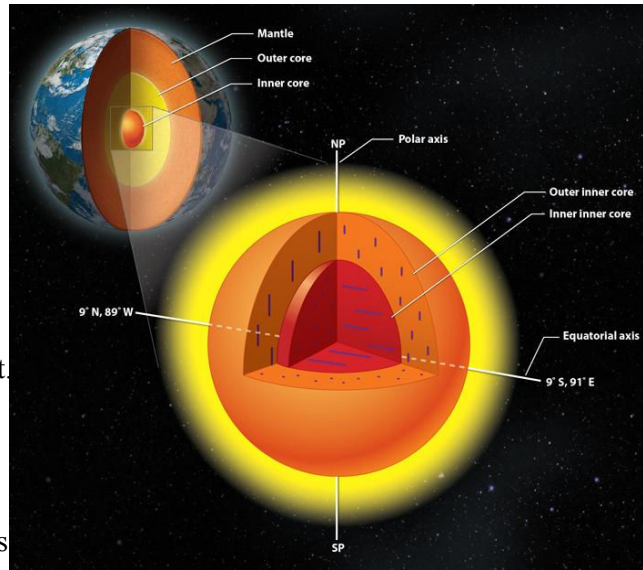
CHAMPAIGN, Ill. - Thanks to a novel application of earthquake-reading technology, a research team at the University of Illinois and colleagues at Nanjing University in China have found that the Earth's inner core has an inner core of its own, which has surprising properties that could reveal information about our planet. Led by Xiaodong Song, a professor of geology at the U. of I., and visiting postdoctoral researcher Tao Wang, the team published its work in the journal *Nature Geoscience* on Feb. 9.

A research team from the University of Illinois and colleagues in China found earth's inner core has an inner core of its own, with crystals aligned in a different direction.

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"Even though the inner core is small - smaller than the moon - it has some really interesting features," said Song. "It may tell us about how our planet formed, its history, and other dynamic processes of the Earth. It shapes our understanding of what's going on deep inside the Earth."

Researchers use seismic waves from earthquakes to scan below the planet's surface, much like doctors use ultrasound to see inside patients. The team used a technology that gathers data not from the initial shock of an earthquake, but from the waves that resonate in the earthquake's aftermath. The earthquake is like a hammer striking a bell; much like a listener hears the clear tone that resonates after the bell strike, seismic sensors collect a coherent signal in the earthquake's coda.



"It turns out the coherent signal enhanced by the technology is clearer than the ring itself," said Song. "The basic idea of the method has been around for a while, and people have used it for other kinds of studies near the surface. But we are looking all the way through the center of the Earth."

Looking through the core revealed a surprise at the center of the planet - though not of the type envisioned by novelist Jules Verne.

The inner core, once thought to be a solid ball of iron, has some complex structural properties. The team found a distinct inner-inner core, about half the diameter of the whole inner core. The iron crystals in the outer layer of the inner core are aligned directionally, north-south. However, in the inner-inner core, the iron crystals point roughly east-west.

Not only are the iron crystals in the inner-inner core aligned differently, they behave differently from their counterparts in the outer-inner core. This means that the inner-inner core could be made of a different type of crystal, or a different phase.

"The fact that we have two regions that are distinctly different may tell us something about how the inner core has been evolving," Song said. "For example, over the history of the Earth, the inner core might have had a very dramatic change in its deformation regime. It might hold the key to how the planet has evolved. We are right in the center - literally, the center of the Earth."

The U.S. National Science Foundation and the National Science Foundation of China supported this work.

The paper, "Equatorial anisotropy in the inner part of Earth's inner core from autocorrelation of earthquake coda," will be available online at time of embargo.

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F-bombs notwithstanding, all languages skew toward happiness

Research shows universal human bias for using positive words

In 1969, two psychologists at the University of Illinois proposed what they called the Pollyanna Hypothesis - the idea that there is a universal human tendency to use positive words more frequently than negative ones. "Put even more simply," they wrote, "humans tend to look on (and talk about) the bright side of life." It was a speculation that has provoked debate ever since.

Now a team of scientists at the University of Vermont and The MITRE Corporation have applied a Big Data approach - using a massive data set of many billions of words, based on actual usage, rather than "expert" opinion - to confirm the 1960s guess.

Movie subtitles in Arabic, Twitter feeds in Korean, the famously dark literature of Russia, websites in Chinese, music lyrics in English, and even the war-torn pages

of the New York Times - the researchers found that these, and probably all human language-, skews toward the use of happy words.

"We looked at ten languages," says UVM mathematician Peter Dodds who co-led the study, "and in every source we looked at, people use more positive words than negative ones."

But doesn't our global torrent of cursing on Twitter, horror movies, and endless media stories on the disaster du jour mean this can't be true? No. This huge study of the "atoms of language - individual words," Dodds says, indicates that language itself - perhaps humanity's greatest technology - has a positive outlook. And, therefore, "it seems that positive social interaction," Dodds says, is built into its fundamental structure.

The new study, "Human Language Reveals a Universal Positivity Bias," appeared in the February 9 online edition of the Proceedings of the National Academy of Sciences.

To deeply explore this Pollyanna possibility, the team of scientists at UVM's Computational Story Lab - with support from the National Science Foundation and The Mitre Corporation - gathered billions of words from around the world using twenty-four types of sources including books, news outlets, social media, websites, television and movie subtitles, and music lyrics. For example, "we collected roughly one hundred billion words written in tweets," says UVM mathematician Chris Danforth who co-led the new research.

From these sources, the team then identified about ten thousand of the most frequently used words in each of ten languages including English, Spanish, French, German, Brazilian Portuguese, Korean, Chinese (simplified), Russian, Indonesian and Arabic. Next, they paid native speakers to rate all these frequently-used words on a nine-point scale from a deeply frowning face to a broadly smiling one. From these native speakers, they gathered five million individual human scores of the words. Averaging these, in English for example, "laughter" rated 8.50, "food" 7.44, "truck" 5.48, "the" 4.98, "greed" 3.06 and "terrorist" 1.30.

A Google web crawl of Spanish-language sites had the highest average word happiness, and a search of Chinese books had the lowest, but - and here's the point - all twenty-four sources of words that they analyzed skewed above the neutral score of five on their one-to-nine scale - regardless of the language. In every language, neutral words like "the" scored just where you would expect: in the middle, near five. And when the team translated words between languages and then back again they found that "the estimated emotional content of words is consistent between languages."

In all cases, the scientists found "a usage-invariant positivity bias," as they write in the study. In other words, by looking at the words people actually use most often they found that, on average, we - humanity - "use more happy words than sad words," Danforth says.

This new research study also describes a larger project that the team of fourteen scientists has developed to create "physical-like instruments" for both real-time and offline measurements of the happiness in large-scale texts - "basically, huge bags of words," Danforth explains.

They call this instrument a "hedonometer" - a happiness meter. It can now trace the global happiness signal from English-language Twitter posts on a near-real-time basis, and show differing happiness signals between days. For example, a big drop was noted on the day of the terrorist attack on Charlie Hebdo in Paris, but rebounded over the following three days.

The hedonometer can also discern different happiness signals in US states and cities: Vermont currently has the happiest signal, while Louisiana has the saddest. And the latest data puts Boulder, CO, in the number one spot for happiness, while Racine, WI, is at the bottom.

But, as the new paper describes, the team is working to apply the hedonometer to explore happiness signals in many other languages and from many sources beyond Twitter. For example, the team has applied their technique to over ten thousand books, inspired by Kurt Vonnegut's "shapes of stories" idea.

Visualizations of the emotional ups and downs of these books can be seen on the hedonometer website; they rise and a fall like a stock-market ticker. The new study shows that Moby Dick's 170,914 words has four or five major valleys that correspond to low points in the story and the hedonometer signal drops off dramatically at the end, revealing this classic novel's darkly enigmatic conclusion. In contrast, Dumas's Count of Monte Cristo - 100,081 words in French - ends on a jubilant note, shown by a strong upward spike on the meter.

The new research "in no way asserts that all natural texts will skew positive," the researchers write, as these various books reveal. But at a more elemental level, the study brings evidence from Big Data to a long-standing debate about human evolution: our social nature appears to be encoded in the building blocks of language.

The new study as well as the hedonometer is based on the research of Peter Dodds and Chris Danforth and their team in the University of Vermont's Computational Story Lab, including visualization by Andy Reagan, at UVM's Complex Systems Center, and the technology of Brian Tivnan, Matt McMahon and their team from The MITRE Corporation.

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Historic US and UK dietary advice on fats 'should not have been introduced'

Dietary advice on fat consumption issued in 1977 and 1983 lacked any solid trial evidence to back it up

National dietary advice on fat consumption issued to millions of US and UK citizens in 1977 and 1983, to cut coronary heart disease incidence, lacked any solid trial evidence to back it up, and "should not have been introduced," concludes research published in the online journal Open Heart.

Both sets of dietary guidelines recommended reducing overall dietary fat consumption to 30% of total energy intake, and specifically, saturated fat to 10% of total energy intake. Both acknowledged that the evidence was not conclusive. In the absence of any analysis of the evidence used to corroborate the dietary recommendations, the researchers carried out a systematic review and meta-analysis of the randomised control trial data that would have been available to the US and UK regulatory committees at the time.

After a comprehensive search of research databases, they found six relevant trials, covering seven different dietary interventions, spanning an average of five years, and involving 2467 men.

All the trials had been published before 1983 and had looked at the relationship between dietary fat, serum cholesterol, and the development of coronary heart disease. Five out of the six did not consider either the overall or saturated fat recommendations. And all but one focused on secondary rather than primary prevention. The pooled data revealed a total of 740 deaths from all causes, and 423 from coronary heart disease.

There was no difference in deaths from all causes between the 'treatment' and comparison groups, with 370 deaths in both. And there was no significant difference in deaths from coronary heart disease, with 207 in the 'treatment' groups and 216 in the comparison groups.

The falls in serum cholesterol were significantly greater in the 'treatment' groups, but this did not seem to have any impact on the death rates from all causes or from coronary heart disease, the analysis showed.

The researchers highlight several caveats in the evidence available at the time: no women were included; no trial tested the dietary recommendations; no trial concluded that dietary guidelines should be drawn up.

"It seems incomprehensible that dietary advice was introduced for 220 million Americans and 56 million UK citizens, given the contrary results from a small number of unhealthy men," write the researchers.

They go on to say: "The results of the present meta-analysis support the hypothesis that the available [randomised controlled trials] did not support the introduction of dietary fat recommendations in order to reduce [coronary heart disease] risk or related mortality." And they conclude: "Dietary advice not merely needs review; it should not have been introduced."

But in a linked editorial, Rahul Bahl, of the Royal Berkshire NHS Foundation Trust, sounds a note of caution. The most up to date review of the evidence also concluded that the evidence on which current dietary guidance is based was "very limited," but this doesn't mean that the risk factor identified is not a true risk factor, he says.

There is epidemiological and ecological evidence suggesting a link between dietary fat and heart disease, added to which public policies generally don't require randomised controlled trial evidence, he adds.

"There is certainly a strong argument that an overreliance in public health on saturated fat as the main dietary villain for cardiovascular disease has distracted from the risks posed by other nutrients, such as carbohydrates," he writes.

"Yet replacing one caricature with another does not feel like a solution," he insists.

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Simple blood test can predict risk of dementia

New biomarker that can predict the risk of developing dementia by way of a simple blood test

Scientists at Rigshospitalet, Herlev Hospital and the University of Copenhagen identify a new biomarker that can predict the risk of developing dementia by way of a simple blood test. In the long term, this could mean better prevention and thus at least postponement of the illness and at best evading the development all together. The study was recently published in an internationally acclaimed journal, the Annals of Neurology.

Globally, in excess of 35 million people suffer dementia - in Denmark alone, there are approx. 80,000 who suffer this illness. Prevalence increases in step with aging, and as people's life years are continually on the rise in most countries, there is also an increasing need to be able to identify the citizens who are at the greatest risk of suffering dementia.

As opposed to cardiovascular diseases, where the level of cholesterol in our blood indicates the risk of cardiac arrest, there are no such trustworthy markers in our blood in terms of diagnosing the risk of dementia setting in. However, Scientists at Rigshospitalet, Herlev Hospital and the University of Copenhagen have now identified a new biomarker, measurable in a simple blood test, which will help predict the onset of dementia.

More precise risk evaluation

"The blood test will help provide a more precise risk evaluation of a citizen's risk of developing dementia later in life. Thus the citizens at the greatest risk of developing the illness are more easily identified than at present," says Ruth Frikke-Schmidt, assistant clinical and research professor at the Faculty of Health and Medical Sciences at the University of Copenhagen and consultant physician at Rigshospitalet.

Researchers hope that with time, this new blood test will be applicable in clinical practice. "The blood test will enable an earlier and more focused prevention effort, thus prolonging the onset of the illness and raising the individual's quality of life," adds Ruth Frikke-Schmidt.

76,000 people partook in public studies

In the study, researchers show that a low level of the biomarker, the so-called apolipoprotein E, in our blood, increases the risk of developing dementia in the future.

This was revealed in comprehensive studies of the general public, the Herlev-Oesterbro Study and the Oesterbro Study, involving 76,000 people.

Point of departure for the development of new drugs

The healthy brain consists of millions of interconnected nerve cells. The brain in a person suffering dementia is very different.

The well-organised, structured coordination of nerve cells is intersected by, among other things, senile plaques that consist of the viscous compound, β -amyloid.

The low level of apolipoprotein E in the blood, as the researchers point out in the study, most likely reflects a low level of apolipoprotein E in the brain, and this indicates that the viscous compound, β -amyloid, is less effectively removed. Thus the study's results underpin a biological mechanism.

"Over time, this increased biological knowledge about dementia can constitute a point of departure for the development of new drugs," concludes Ruth Frikke-Schmidt.

Fact Box

The research project was conducted in collaboration with Katrine Laura Rasmussen, PhD fellow at the Faculty of Health and Medical Science at the University of Copenhagen and physician at Rigshospitalet; Anne Tybjaerg Hansen, clinical professor at the Faculty of Health and Medical Science at the University of Copenhagen and consultant physician at Rigshospitalet; as well as Boerge Nordestgaard, clinical professor at the Faculty of Health and Medical Science at the University of Copenhagen and consultant physician at Herlev Hospital.

Read the scientific article in the internationally renowned journal, Annals of Neurology.

http://www.eurekalert.org/pub_releases/2015-02/tum-dma020915.php

Dark matter at the heart of our galaxy

New study confirms the presence of dark matter in the inner part of the Milky Way

The ubiquitous presence of dark matter in the universe is today a central tenet in modern cosmology and astrophysics. Its existence in galaxies was robustly established in the 1970s with a variety of techniques, including the measurement of the rotation speed of gas and stars, which provides a way to effectively 'weigh' the host galaxy and determine its total mass. These measurements showed that the visible matter only accounts for a fraction of the total weight, the predominant part is delivered by dark matter.

Applying this technique to our own Galaxy is possible, and the existence of dark matter in the outer parts of the Milky Way is well ascertained. But up to now it has proven very difficult to establish the presence of dark matter in the innermost regions.

The diameter of our Galaxy is about 100,000 lightyears. Our Solar System is located at a distance of about 26,000 light years from the center. Coming closer to the center of our galaxy it becomes increasingly difficult to measure the rotation of gas and stars with the needed precision.

Dark matter in our cosmic neighborhood

Now scientists from the Technische Universität München (TUM), Stockholm University, Universidad Autónoma de Madrid, ICTP South American Institute for Fundamental Research, São Paulo and University of Amsterdam have obtained for the first time a direct observational proof of the presence of dark matter in the innermost part the Milky Way, including at the Earth's location and in our own 'cosmic neighborhood'.

In a first step they created the most complete compilation of published measurements of the motion of gas and stars in the Milky Way. Then they compared the measured rotation speed with that expected under the assumption that only luminous matter exists in the Galaxy. The comparison clearly showed that the observed rotation cannot be explained unless large amounts of dark matter exist around us, and between us and the galactic center.

"We know that dark matter is needed in our Galaxy to keep the stars and gas rotating at their observed speeds," says Dr. Miguel Pato, who conducted the analysis at TU München. "However, we still do not know what dark matter is composed of. This is one of the most important science questions of our times."

Predictions with higher reliability

Possessing a very strong statistical evidence, even at small galactocentric distances, the results open a new avenue for the determination of dark matter

distribution inside the Galaxy. With future astronomical observations, the method will allow to measure the distribution of dark matter in our Galaxy with unprecedented precision.

"This will permit to refine the understanding of the structure and evolution of our Galaxy. And it will trigger more robust predictions for the many experiments worldwide that search for dark matter particles," says Miguel Pato, who meanwhile moved to The Oskar Klein Centre for Cosmoparticle Physics at the Stockholm University.

Evidence for dark matter in the inner Milky Way Fabio Iocco, Miguel Pato, Gianfranco Bertone *Nature Physics*, advanced online publication, 9 February 2015 DOI: 10.1038/nphys3237

http://www.eurekalert.org/pub_releases/2015-02/nsu-nrd020915.php

NSU researchers discover DNA repair is high in heart, nonexistent in brain

Results could help explain causes of dementia and memory loss

FORT LAUDERDALE-DAVIE, Fla. - Nova Southeastern University (NSU) researchers recently discovered that, contrary to prior belief, tissues of different mammalian organs have very different abilities to repair damage to their DNA.

These new findings indicate that the heart has the greatest capacity to repair its DNA, followed by the intestines, kidneys, spleen, testes, and lungs. The brain, however, exhibited no ability to repair damage to its DNA.

These studies were performed in murine cell tissue culture, but, based on previous human studies performed by the same investigators, such "tissue specificity" is true of humans, as well.

Using skin as the control, the researchers exposed growing cells derived from each of these tissues to a defined dose of ultraviolet (UVC) light, a part of normal sunlight, causing extensive DNA damage. Although there are five types of DNA repair performed by mammalian cells, the investigators then specifically measured the amount of repair performed by one type called nucleotide excision repair. This type of DNA repair is a complicated process that requires a high level of metabolic investment by the cell. Brain cells may focus their energies on other more essential activities, and are not commonly exposed to UVC light, perhaps explaining their undetectable level of repair.

"The human body was not designed to live past 30 or 40 years, so our brains haven't prioritized DNA repair over other necessary functions," said lead investigator Jean Latimer, Ph.D., associate professor of pharmaceutical sciences, NSU's College of Pharmacy. "Our brains are frequently not physically prepared to last as long as medical science is now allowing our bodies to live. These findings could help explain a root cause behind memory loss and dementia."

The research team consisted of Latimer; Stephen Grant, Ph.D., associate professor of public health, NSU's College of Osteopathic Medicine; NSU College of Pharmacy students Vongai Majekwana, Pharm.D. candidate; and Yashira Pabón-Padín, Pharm.D. candidate; and Manasi Pimpley, Ph.D. candidate.

Their findings are published in the peer-reviewed journal, *Photochemistry and Photobiology* in an article titled "Regulation and dysregulation of mammalian nucleotide excision repair: a pathway to non-germline breast carcinogenesis."

Read the full article at: <http://onlinelibrary.wiley.com/doi/10.1111/php.12387/full>.

Research reported in this press release was supported by the National Cancer Institute of the National Institutes of Health under award number R29CA71894.

The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

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<http://bit.ly/1zAjskQ>

Gene Changes Make Humans' Sense of Taste Unique *Our ability to eat bitter plants help distinguish us from our ancestors and chimpanzees today*

By Marissa Fessenden smithsonian.com

Our relationship with food is part of being human. Meals are [time for ritual](#) and a chance to strengthen social bonds over the work of cooking and eating. But what and how we eat also helped *make* us human, to begin with: Changes in our eating habits also shaped our genes.

Long ago, our ancestors lost the massive jaws and strong chewing muscles as invented tools to strip meat from bones and gained [the ability to cook](#). But the alterations continued with the genes that govern our sense of taste. Many wild vegetables are bitter, a taste shunned by chimpanzees and our other living ape cousins. But something in ancient humans changed that allowed them to munch happily on roots and leafy greens that older lineages might have shunned. That something included the loss of two bitter taste genes, researchers have discovered. The research group compared genes from modern humans, chimpanzees, a Neandertal and another ancient human called a Denisovan. They found that all three human groups lacked the genes called *TAS2R62* and *TAS2R64* while the chimpanzees hung on to them, [reports Ann Gibbons for Science](#). The losses - along with that of a third gene called *MYH16*, which builds up muscles in a chimpanzee's strong jaws - happened around the time hominin and chimpanzee lineages were splitting apart, the researchers write in the [Journal of Human Evolution](#).

A fourth gene alteration crops up about 200,000 years ago, when our human ancestors diverged from the Neandertals and Denisovans. Gibbons explains:

Our lineage, for example, carries an average of six copies, and as many as 20 copies, of the salivary amylase gene, AMY1. The gene produces the enzyme amylase in our saliva, which has been thought to help digest sugars in starchy foods, although its role in human digestion is still unproven. By contrast, chimps, Neandertals, and Denisovans carry only one to two copies of the salivary amylase gene, which suggests they got fewer calories from starchy veggies than modern humans.

Together, the findings indicate that ancient humans would have noshed the wild equivalents of squash, gourds and yams even though they were bitter. Eventually they would have cooked the veggies and eventually bred the sweeter, less starchy versions we enjoy today. The genetic and culinary advances together meant that ancient humans had more calories available for less work. The extra energy went toward [developing our brains](#).

After these changes, modern humans still exhibit diversity in the genes that code for taste. Such differences can be fodder for the forces of evolution in the future, but for now they explain [why some people prefer bland foods](#) or why others have a sweet tooth.

http://www.eurekalert.org/pub_releases/2015-02/tes-nrh020615.php

Napping reverses health effects of poor sleep

Study finds naps restore hormones and proteins involved in stress, immune health to normal levels

Washington, DC - A short nap can help relieve stress and bolster the immune systems of men who slept only two hours the previous night, according to a new study published in the Endocrine Society's Journal of Clinical Endocrinology & Metabolism (JCEM).

Lack of sleep is recognized as a public health problem. Insufficient sleep can contribute to reduced productivity as well as vehicle and industrial accidents, according to the U.S. Centers for Disease Control and Prevention. In addition, people who sleep too little are more likely to develop chronic diseases such as obesity, diabetes, high blood pressure and depression.

Nearly three in 10 adults reported they slept an average of six hours or less a night, according to the National Health Interview Survey. "Our data suggests a 30-minute nap can reverse the hormonal impact of a night of poor sleep," said one of the JCEM study's authors, Brice Faraut, PhD, of the Université Paris Descartes-Sorbonne Paris Cité in Paris, France. "This is the first study that found napping could restore biomarkers of neuroendocrine and immune health to normal levels." The researchers used a cross-over, randomized study design to examine the relationship between hormones and sleep in a group of 11 healthy men between the ages of 25 and 32. The men underwent two sessions of sleep testing in a laboratory, where meals and lighting were strictly controlled.

During one session, the men were limited to two hours of sleep for one night. For the other session, subjects were able to take two, 30-minute naps the day after their sleep was restricted to two hours. Each of the three-day sessions began with a night where subjects spent eight hours in bed and concluded with a recovery night of unlimited sleep.

Researchers analyzed the participants' urine and saliva to determine how restricted sleep and napping altered hormone levels. After a night of limited sleep, the men had a 2.5-fold increase in levels of norepinephrine, a hormone and neurotransmitter involved in the body's fight-or-flight response to stress. Norepinephrine increases the body's heart rate, blood pressure and blood sugar. Researchers found no change in norepinephrine levels when the men had napped following a night of limited sleep.

Lack of sleep also affected the levels of interleukin-6, a protein with antiviral properties, found in the subjects' saliva. The levels dropped after a night of restricted sleep, but remained normal when the subjects were allowed to nap. The changes suggest naps can be beneficial for the immune system.

"Napping may offer a way to counter the damaging effects of sleep restriction by helping the immune and neuroendocrine systems to recover," Faraut said. "The findings support the development of practical strategies for addressing chronically sleep-deprived populations, such as night and shift workers."

Other authors of the study include: Samir Nakib, Catherine Drogou, Maxime Elbaz, Fabien Sauvet, Jean-Pascal De Bandt and Damien Léger of the Université Paris Descartes-Sorbonne Paris Cité.

The study, "Napping Reverses the Salivary Interleukin-6 and Urinary Norepinephrine Changes Induced by Sleep Restriction," was published online, ahead of print.

http://www.eurekalert.org/pub_releases/2015-02/nsij-sfp021015.php

Surgery for pulmonary embolism may prevent deaths

Surgical procedure abandoned in the 1950s because of its high mortality rates may prevent more deaths in severely ill patients than current drug therapies

MANHASSET, NY - A surgical procedure that was virtually abandoned in the 1950s because of its high mortality rates in trying to save patients with acute pulmonary embolism may actually prevent more deaths in severely ill patients than current drug therapies alone, according to a new analysis of cases conducted in the North Shore-LIJ Health System over the past decade.

Findings from the study were published this month in the Texas Heart Institute Journal.

The high death rates associated with the surgery - 32 percent based on more than two dozen studies conducted between 1961 and 1984 - has made pulmonary

embolectomy a hard sell. But safer techniques have led to better outcomes, and surgeons continue to take their most seriously ill patients into the operating room. But just how successful is it? And who are the best candidates for surgery? A team of North Shore-LIJ Health System scientists have gone back into the surgical archives and identified 96 patients over a nine-year period from 2003 to 2011 to see exactly how many survived in the month following the surgery. Those results were compared to historical mortality data from patients who did not undergo surgery.

Every year, 600,000 to 800,000 people will suffer from a pulmonary embolism, a sudden blockage of a lung artery. About 200,000 Americans die each year from consequences of a pulmonary embolism. Anticoagulant therapy is successful in most patients. Today, only patients who arrive at the hospital with moderate-to-severe right ventricular dysfunction and/or are in shock are considered candidates for surgery, according to the American College of Chest Physicians guidelines. The guidelines also recommend that it only be used in those who are hemodynamically unstable with low blood pressure.

Alan R. Hartman, MD, chair of cardiovascular and thoracic surgery at North Shore-LIJ, and his colleagues conducted a retrospective review of data from cases conducted in the health system that had been submitted to the New York State Cardiac Surgery Reporting System and the Society of Thoracic Surgeons.

Thirteen surgeons in three of the health system's largest hospitals brought 96 patients into their operating rooms over a consecutive nine-year period. Eight of those surgeons had more than 15 years experience in cardiothoracic medicine. In addition to 30-day mortality, the study team collected data on post-operative length of stay, discharge location, readmission status and post-operative complications. All of the patients who had undergone surgery had acute, centrally located pulmonary embolus and severe global hyperkinetic right ventricular (RV) dysfunction.

All patients had either a large clot burden in the main pulmonary arteries or a saddle embolism, which is a clot that blocks the bifurcation of the main pulmonary artery. None of the patients had a history of chronic pulmonary thrombotic disease or evidence of chronic disease on a computed-tomographic-angiography scan. They all made it to surgery within one hour of the embolism. The surgery was performed through cardiopulmonary bypass, normal body temperature and without aortic cross-clamping, thus avoiding myocardial ischemia. A pulmonary arteriotomy and clot extraction were performed under direct vision, according to Dr. Hartman, which he believes is critical to the success of the procedure.

Data collection and analysis were conducted by a team of scientists led by Renee Pekmezaris, PhD, vice president of Community Health and Health Services Research at North Shore-LIJ, and associate professor of population health at the Hofstra North Shore-LIJ School of Medicine.

An analysis of the data revealed a mortality rate of 4.2 percent, lower than any other published reports. In addition, 68 patients (73.9 percent) were discharged home or to rehabilitation facilities. Those patients with low blood pressure had a higher 30-day mortality rate, 12.5 percent, compared to those with normal blood pressure (1.4 percent.) They also spent a longer time in the hospital, 13.4 days compared to 9.1 days in patients with normal pressure.

There are some people who arrive to the emergency room in intermediate stages who can't take thrombolytic therapy. According to Dr. Hartman and his colleagues, they would benefit from acute pulmonary embolectomy. The health system surgeons identified patients who would have gone into shock had they not been taken into surgery. Those who benefited most were patients with significant RV dysfunction but with normal blood pressure.

Dr. Hartman cautions that rates of success are also dependent upon experience, surgical ability and careful patient selection.

To access the Texas Heart Institute Journal study, go to: <http://thij.org/toc/thij/42/1>

http://www.eurekalert.org/pub_releases/2015-02/tl-tlp020915.php

The Lancet Psychiatry: Unemployment linked with around 45,000 deaths by suicide every year

Long-term analysis of suicide risk across 63 countries shows unemployment may account for nine times as many suicide deaths annually as the recent economic crisis

Unemployment might account for nine times as many deaths by suicide every year (about 45 000) as the recent economic crisis (around 5000 excess suicides), a long-term analysis of suicide risk across 63 countries* between 2000 and 2011, published in The Lancet Psychiatry journal has found. These striking findings suggest that suicide prevention strategies need to target the negative health effects of unemployment in times of economic stability as well as during recession. Researchers from the University of Zurich in Switzerland used longitudinal modelling to assess the impact of unemployment on suicide between 2000 and 2011-a period that includes economic stability as well as the 2008 global economic recession and its aftermath. Analysing data on suicide and the economy from the WHO mortality database and the International Monetary Fund's world economic outlook database, they calculated the effect of unemployment rates on suicide rates across 63 countries in four world regions, and in different age and sex groups.

Findings showed that unemployment had a similar effect on suicide in all four world regions. Between 2000 and 2011, the relative risk of suicide associated with unemployment was elevated by 20% to 30% in all regions (see figure 1 page 3). The researchers estimate that about 233 000 suicides took place each year between 2000 and 2011, of which unemployment accounted for around a fifth (about 45 000). Unemployment was linked with 41 148 suicides in 2007 and 46 131 in 2009, indicating that 4983 excess suicides were associated with the economic crisis in 2008 (see table 3 page 5). In contrast to earlier studies, they found that both men and women of all ages were equally vulnerable to the effects of rising unemployment.

According to lead author Dr Carlos Nordt of Zurich University's Psychiatric Hospital, "Our findings reveal that the suicide rate increases 6 months before a rise in unemployment. What is more, our data suggest that not all job losses necessarily have an equal impact, as the effect on suicide risk appears to be stronger in countries where being out of work is uncommon. It is possible that an unexpected increase in the unemployment rate may trigger greater fears and insecurity than in countries with higher pre-crisis unemployment levels."** Nordt adds, "Besides specific therapeutic interventions, sufficient investment by governments in active labour market policies that enhance the efficiency of labour markets could help generate additional jobs and reduce the unemployment rate, helping to offset the impact on suicide."**

Writing in a linked Comment, Roger Webb and Navneet Kapur from the University of Manchester in the UK caution that suicide cases attributable to the global recession are likely to be only "the tip of the iceberg" of a wider range of social and psychological problems, adding that, "many affected individuals who remain in work during these hard times encounter serious psychological stressors due to pernicious economic strains other than unemployment, including falling income, 'zero-hour' contracting, job insecurity, bankruptcy, debt, and home repossession. Caution should therefore be exercised...[As well as death by suicide], we also require a better understanding of other psychosocial manifestations of economic adversity, including non-fatal self-harm, stress and anxiety, low mood, hopelessness, alcohol problems, anger, familial conflict and relationship breakdown. We also need to know how and why highly resilient individuals who experience the greatest levels of economic adversity manage to sustain favourable mental health and wellbeing."

Notes to Editors:

When covering a suicide-related issue, please consider following Samaritans' media guidelines on the reporting of suicide, due to the potentially damaging consequences of irresponsible reporting:

<http://www.samaritans.org/sites/default/files/kcfinder/files/press/Samaritans%20Media%20Guidelines%202013%20UK.pdf> In particular the guidelines advise including links to sources of support, such as Samaritans, for anyone affected by the themes in the article, and emphasising that suicide is preventable.

This study was funded by the University of Zurich.

**Americas (Costa Rica, El Salvador, Mexico, Nicaragua, Panama, Argentina, Brazil, Chile, Colombia, Ecuador, Paraguay, Suriname, Uruguay, Canada, the USA); Northern and Western Europe (Denmark, Estonia, Finland, Ireland, Latvia, Lithuania, Norway, Sweden, the UK, Austria, Belgium, France, Germany, Luxembourg, The Netherlands, Switzerland); Southern and Eastern Europe (Belarus, Bulgaria, Czech Republic, Hungary, Moldova, Poland, Romania, Russia, Slovakia, Ukraine, Croatia, Greece, Italy, Portugal, Serbia, Slovenia, Spain, Macedonia); Non- Americas and non-Europe (Mauritius, Egypt, South Africa, Kazakhstan, Kyrgyzstan, Hong-Kong, Japan, South Korea, Singapore, Georgia, Israel, Kuwait, Australia, New Zealand).*

***Quotes direct from author and cannot be found in text of Article.*

http://www.eurekalert.org/pub_releases/2015-02/acop-cfs020915.php

Chronic fatigue syndrome - What's in a name?

News from Annals of Internal Medicine Feb. 10, 2015

A new report from the Institute of Medicine (IOM) presents new diagnostic criteria for chronic fatigue syndrome and examines whether a new name for the condition is warranted. The author of a related commentary being published in Annals of Internal Medicine suggests that a new name alone will not improve the lives of people suffering with chronic fatigue syndrome, but expresses optimism that improved clinician knowledge and acceptance, and an enhanced research agenda, is a step in the right direction.

The IOM's 15-member expert committee found sufficient evidence that chronic fatigue syndrome is a disease with a physiologic basis, and not a psychological problem that should not be taken seriously. An important clinical characteristic of the disease is post-exertional malaise, or PEM, where exertion from even mild activities can trigger a "collapse" or "relapse" of malaise that lasts days or longer. Commentary author, Theodore G. Ganiats, MD, Professor of the Department of Family Medicine and Community Health at the University of Miami, agrees that new diagnostic criteria and a new name should include the concept of PEM. The proposed diagnosis - **Systemic Exertion Intolerance Disease** - better describes the debilitating physiological nature of the disease.

The full commentary is available at <http://www.annals.org/article.aspx?doi=10.7326/M15-0357>. The commentary author can be reached directly at tganiats@mac.com. A link to information about the IOM report and teleconference can be accessed at <http://www8.nationalacademies.org/onpinews/newsitem.aspx?RecordID=02042015>.

http://www.eurekalert.org/pub_releases/2015-02/uota-uot021015.php

Crocodiles just wanna have fun, too

According to research by a psychology professor at the University of Tennessee, Knoxville, crocodiles think surfing waves, playing ball and going on piggyback rides are fun, too

Turns out we may have more in common with crocodiles than we'd ever dream. According to research by a psychology professor at the University of Tennessee, Knoxville, crocodiles think surfing waves, playing ball and going on piggyback rides are fun, too.

Vladimir Dinets, a research assistant professor in psychology, has studied crocodiles for a decade. While doing so, he has observed the animals engaging in play-like behavior. To get more data, he conducted an informal survey of crocodylian-themed groups on social media and various conferences.

His results show a softer side of the intimidating creatures - one that includes romping around with river otters and people. The findings could shed light on how intelligence has evolved.

The research shows that crocodylians engage in all three main types of play distinguished by behavior specialists: locomotor play, play with objects and social play. Play with objects is reported most often. Crocodylians have been spotted playing with wooden balls, noisy ceramic bits, streams of water, their prey and debris floating in the water. Cases of locomotor play include young alligators repeatedly sliding down slopes, crocodiles surfing ocean waves and caimans riding currents of water in their pools. Observed cases of social play include baby alligators riding on their older friends' backs, baby caimans playfully "courting" each other and a male crocodile giving his lifetime mate rides on his back. Crocodiles have also been seen playing with other animals. Dinets observed a juvenile alligator playing with a river otter. In rare cases, individual crocodylians have been known to bond so strongly with people that they become playmates for years. For example, a man who rescued a crocodile that had been shot in the head became close friends with the animal. They happily played every day until the crocodile's death 20 years later.

"The croc would swim with his human friend, try to startle him by suddenly pretending to attack him or by sneaking up on him from behind, and accept being caressed, hugged, rotated in the water and kissed on the snout," said Dinets. Dinets' research builds on the work of colleague Gordon Burghardt, a professor in the Department of Psychology and the Department of Ecology and Evolutionary Biology, whose work defined "play" in a way that allows us to identify it in species not previously thought capable of play, such as wasps, fish and invertebrates. Dinets' work provides further evidence that play is a universal

feature of "intelligent" animals - those with complex, flexible behavior. This knowledge might help determine how intelligence evolves and what is needed for its development.

"Hundreds of thousands of crocodylians are now kept in captivity in zoos, commercial farms and breeding centers set up for endangered species. Providing them with toys and other opportunities for play makes them happier and healthier," Dinets said. The work is the first to scientifically study play in crocodiles. It is published in the journal *Animal Behavior and Cognition* and can be viewed at <http://bit.ly/1uwowLq>.

Previous research by Dinets discovered that crocodiles are able to climb trees, work as a team and use lures such as sticks to hunt prey. More of his crocodile research can be found in his book "Dragon Songs."

<http://www.bbc.com/news/health-31364407>

Breath test for Parkinson's disease

Experts believe that a simple breath test could help doctors detect and diagnose Parkinson's disease.

By Michelle Roberts Health editor, BBC News online

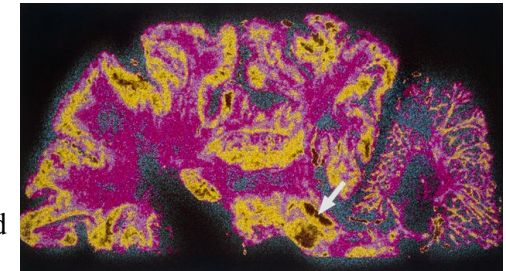
The test looks for a unique signature of chemicals in exhaled breath. Small studies in volunteers have begun and early findings suggest the test can identify those with the debilitating brain condition. Larger trials are now planned to see if it could truly be a useful test, particularly for picking up Parkinson's in its earliest stages.

Currently, no test can conclusively show that a person has Parkinson's. Instead, doctors reach a diagnosis based on a person's symptoms and test results - such as brain scans to rule out other diseases. At this stage, Parkinson's may already be fairly advanced. Identifying it earlier would be beneficial because it would mean treatment could be given sooner.

Sniff it out

Parkinson's disease is a progressive condition where there is gradual loss of nerve cells from the brain. And it is thought that this degradation leaves a chemical footprint in the body that could potentially be used in diagnostic tests.

A scan showing tell-tale brain degeneration in a patient with Parkinson's
Scientists have been exploring different ways of finding such biomarkers, including looking in blood, spinal fluid, and exhaled breath. The breath test looks for traces of volatile organic compounds or VOCs in the air we exhale.



[In a small trial](#) in Israel with 57 people, some with Parkinson's and some without, the test could identify the individuals with Parkinson's by looking for distinctive patterns of VOCs. It also appeared to distinguish between different sub-types of the disease based on the presence and quantity of different VOCs.

The charity Parkinson's UK and experts at the University of Cambridge were intrigued by these early findings and are now setting out to do a bigger study involving 200 volunteers from England.

Dr Simon Stott, who is part of this UK team and will be working alongside the scientists from the Israel Institute of Technology, in Haifa, said: "We would like to find biomarkers that can identify patients early. "A breath test would be really appealing because it's non-invasive, non-painful and can be done in seconds. "While it wouldn't replace what doctors already do, it could be a useful diagnostic tool to help them."

The biggest hope is that there may be molecules in the breath of people with Parkinson's which throw up new options for drug targets. The researchers say they have many years of work ahead of them before they will know if the test can be used in clinics.

http://www.eurekalert.org/pub_releases/2015-02/aha-onm020415.php

Optic nerve may help predict stroke patient death risk

Optic ultrasound can measure the optic nerve to help identify acute stroke patients most at risk of dying

Using optic ultrasound to measure the sheath of a nerve that connects the eye and brain can help identify acute stroke patients most at risk of dying within days or months, according to research presented at the American Stroke Association's International Stroke Conference 2015.

The new study aimed to quickly and noninvasively identify stroke patients who are at risk from increased pressure inside the skull - which is thought to reflect stroke severity and is the major cause of death. Measuring the thickness of the optic nerve sheath may be a simple test for increased intracranial pressure, said Vishnumurthy S. Hedna, M.D., lead researcher and assistant professor of neurology at the University of Florida College of Medicine in Gainesville, Fla. "Ultrasound on the optic nerve can be used to test your brain for swelling, which sometimes occurs after a major stroke," Hedna said. "This can be done by looking at the nerve diameter behind your eye with ultrasound images, since it is thought that when your brain swells, pressure gets transmitted towards your eyes," Hedna said. "This would help doctors treat your stroke with medications that would reduce brain pressures."

The study involved 86 patients at the University of Florida's Shands Hospital in Gainesville, Fla., who were suspected of having a buildup of pressure in the skull

after their stroke. Researchers used ocular ultrasound (ultrasound assessment of the eyes) to measure the sheath that encases the optic nerve.

For patients who later died of a stroke due to a blood vessel blockage, average diameter of the nerve sheath was 5.82 millimeters, versus 5.33 millimeters in those who survived. In patients with a bleeding stroke, average diameter was 6.23 millimeters for those who died, versus 5.72 for survivors.

For every millimeter bigger the nerve sheath diameter was, the risk of death within six months was four times as high in patients whose stroke was due to a blood vessel blockage, and six times as high in patients who had a bleeding stroke. Most of the deaths occurred within a month of patients' hospitalization. The study also suggested that the larger the nerve sheath measurement, the more disabled a patient was likely to be six months later.

Optic ultrasound is a safe, routine bedside test that is performed using gel and a device placed on closed eyelids, Hedna said. "Optic ultrasound is easy to do, and has been described in many studies as easily teachable. Other methods are invasive, involve radiation, and are not cost-effective."

Currently, intracranial pressure is monitored directly from within the skull or with a spinal tap. In the future, the findings could help doctors assign risk levels to patients during their initial exam without performing invasive testing, and when needed, act earlier to monitor intracranial pressure, give medicine to diminish it, place a drain in the head to reduce fluid buildup, or otherwise change management of the patient, Hedna said.

The researchers measured two dimensions of the nerve sheath in each eye on both the first and second day a patient was hospitalized after a stroke, totaling eight measurements for most patients. The study based its estimates of death risk mainly on measurements taken on day two, but for patients who soon died or were quickly discharged from intensive care, only one day's measurements were available. The researchers are still studying whether differences in optic nerve sheath diameter from day one to day two were related to patients' risk of death or disability.

The team plans to study whether treating patients for fluid buildup on the brain based on an abnormal neurological exam plus a bigger nerve sheath affects how they fare, compared with patients who have usual care. The most severely impaired patients "are probably the ones who would get medications to decrease brain edema later in the course of their illness anyway," Hedna said. "We feel the optic nerve sheath diameter would just help the clinician make the decision sooner."

The ultrasound test is likely to be useful in stroke care only when given soon after stroke injury, he said. "Brain swelling after stroke usually peaks between three to four days, hence its use in the acute stroke setting."

Co-authors are Vaibhav Rastogi, M.D.; Emily Weeks, M.P.H.; and Rohit Pravin Patel, M.D. Author disclosures are on the abstract. No outside funding reported.

http://www.eurekalert.org/pub_releases/2015-02/acs-tpi021115.php

Turning plants into meat-like foods to save the planet

Producing the savory, juicy steaks and pork chops that many people crave requires a lot of animals raised on huge, unsustainable amounts of plant protein.

But what would happen if, instead of giving so much of it to animals as feed, we ate the plant protein ourselves? Food scientists are working to make this Earth-friendlier option a palatable reality, according to an article in Chemical & Engineering News (C&EN), the weekly newsmagazine of the American Chemical Society.

Melody M. Bomgardner, a senior editor at C&EN, notes that we need protein, which our bodies break down into essential amino acids, to maintain good health. Low-carb diets and research showing the benefits of protein have boosted the trendiness of this macronutrient. As a result, on average Americans consume more protein than they need. And raising livestock, the major source of dietary protein in the U.S., puts a tremendous strain on water resources and arable land. It also contributes to greenhouse gas emissions.

The good news is that Americans are increasingly turning to plants for protein out of concern that red meat can lead to heart disease and obesity. Food manufacturers are paying attention. They have quickly responded with a growing range of protein-packed soy, pea and algae products. But to win over more steak lovers, scientists are still working toward the ultimate goal: plant protein that looks, feels and tastes like meat.

http://www.eurekalert.org/pub_releases/2015-02/mu-wu-021115.php

Wikipedia use - nothing to be ashamed about

While Wikipedia is a popular background resource with students, it has not supplanted traditional sources of intellectual scholarship

Academics and students alike should be making better use of Wikipedia, a major study of digital technology use in Higher Education has recommended.

The Australia-UK collaboration led by Professor Neil Selwyn from Monash University's Faculty of Education found that while Wikipedia was is a popular background resource with students, it had not supplanted traditional sources of intellectual scholarship and authority.

The study of more than 1600 students found that while Wikipedia was used by seven in eight students, the world's sixth most visited website wasn't seen as the most useful education resource. Google and other internet search engines, library websites, learning management systems and Facebook all ranked higher. Most students used Wikipedia for background research.

The researchers suggest that given the important but relatively background role Wikipedia plays in student life, universities should continue to consider ways of better integrating Wikipedia into their accepted modes of teaching and learning provision. "There are clearly many ways in which universities need to engage more directly in supporting and enhancing the role that Wikipedia is now playing in students' scholarship," Professor Selwyn said.

"The early alarmist fears that Wikipedia would lead to a dumbing down of university study was not apparent. But neither is Wikipedia ushering in a new dawn of enlightenment and students and teachers creating their own knowledge.

"Lecturers should be encouraging their classes to edit and improve Wikipedia pages. At the very least, more academics should become Wikipedia editors - writing on their areas of expertise."

"Wikipedia is here to stay, and universities should be getting more engaged with it rather than just trying to deny its existence."

The study was one of a series on Technology Enabled Learning funded by the Australian Office of Learning and Teaching.

http://www.eurekalert.org/pub_releases/2015-02/uow-sfn021115.php

Study finds new lethal combination of cancer drugs shrinks tumors

Controlling the time and sequence of cancer therapies may hold the key to unlocking better outcomes for patients with aggressive cancers, according to research published today.

In a collaborative effort between cancer biologists at Harvard Medical School and applied mathematicians at the University of Waterloo, researchers are now showing that improved cancer therapy can be achieved by targeting drug-resistant cancer cells in a new way. Dr. Shiladitya Sengupta and Dr. Aaron Goldman, cancer biologists at Harvard Medical School, led the research which is published in the journal Nature Communications. The team found that targeting cancer cells that survive a cancer therapy known as cytotoxic chemotherapy - with specific combinations of therapies - kills cancer cells in the lab, reduces tumors and extends the survival of mice with cancer.

Researchers say their findings can have a major and immediate impact on the clinical administration of cancer therapy by introducing new methods of delivering old drugs.

The Harvard researchers used a mathematical model developed by Mohammad Kohandel, a professor in Waterloo's Department of Applied Mathematics, and Andrew Dhawan, a former Waterloo math undergrad who is now a medical student. The model predicted the populations of cells within tumors developing resistance to therapy.

"It's an exciting time to be involved in cancer biology as relationships between biologists and mathematicians are now being recognized as critical to the development of . . . cancer management," said Goldman.

There is a small subset of cancer stem cells (CSCs), well known to be drug resistant, that have been of interest to researchers as they strive to overcome the challenges associated with cancer therapy failure. The research team found that, after exposure to cytotoxic chemotherapy, populations of non-CSCs were acquiring some attributes of CSCs, reorganizing the proteins within them to overcome the cancer therapy. The researchers observed that drugs targeting a specific protein known as Hck, killed a large fraction of these transitioning cells.

"It is an honor to be a part of this important study," said Professor Kohandel.

"Application of mathematical and computational models to cancer biology is an exciting and novel area of research which can determine the most effective timing, sequencing and dosage of chemotherapy."

The lead authors are now working together with Professor Kohandel to unravel even more complexities of cancer chemotherapy to not only achieve better sequences and combinations of existing drugs, but to develop brand new therapies with the use of nanotechnology.

<http://bbc.in/1Cs4h1H>

Google adds medical information to its search results

Google is rolling out a health feature that provides information about "common" medical conditions in response to related searches.

By Leo Kelion Technology desk editor

The facility provides medical illustrations, possible treatments and other data ahead of its traditional links to others' sites. The firm says it worked with doctors to develop the service, but adds that it is not intended to replace visits to a professional. It is initially limited to the US. But the firm adds that it plans to extend the service across the globe, adding rarer ailments in time.

British doctors have welcomed the initiative, but caution that the information needs to be edited to become suitable for local markets.

"One in 20 Google searches are for health-related information," said Prem Ramaswami, [announcing the launch of the feature](#). "We'll show you typical symptoms and treatments, as well as details on how common the condition is - whether it's critical, if it's contagious, what ages it affects, and more.

"For some conditions you'll also see high-quality illustrations from licensed medical illustrators. Once you get this basic info from Google, you should find it easier to do more research on other sites around the web, or know what questions to ask your doctor."

The effort is the latest in a series of moves into health by the search giant.

Last year it revealed it was funding development of a cancer and heart-attack detector, which would involve placing nanoparticles in users' bloodstreams. It has also bought the maker of a spoon for Parkinson's patients, is working on smart contact lenses for people with diabetes, and has invested in 23andMe, a start-up that sells genetics tests to the public.

'Unnecessary treatments'

The latest service is an extension [of Knowledge Graph](#) - a Google initiative to map the various connections that link together different objects, facts and concepts. The company introduced the information tool in 2012, and uses it to provide boxed summaries that appear to the top right-hand side of desktop searches, and above the results of its smartphone Search app.

Much of Knowledge Graph's information is sourced from Wikipedia, the online encyclopedia written by its readers. While Wikipedia is hugely popular, its crowdsourced nature means its entries can include inaccuracies. To minimise the risk of errors in the health-related tips, Google says it has had the information checked by doctors employed by itself and/or by Minnesota's Mayo Clinic. Dr Andrew Goddard, from the UK's Royal College of Physicians, cautiously welcomed the development. "The public have come to rely on Google and other search engines so it is important we understand how best to use these resources to allow people and patients to be engaged with their health and healthcare," he said. "The involvement of the Mayo Clinic is reassuring but if it were to be rolled out in the UK we would like to see a UK badge of quality assurance."

Dr Richard Vautrey, deputy chair of the British Medical Association's GP committee, added that the initiative had the potential to reduce pressure on family doctors if it encouraged the public to take care of minor conditions.

But he too had concerns about Google's willingness to adapt to the UK's health system. "This experiment from Google may well have benefits although we will need more detail to see how practically it will work," he told the BBC. "Most importantly it must be underpinned by clinical guidance from UK based health professionals as there are stark differences between the UK and the USA health systems and culture. "Some evidence suggests that many patients in America are often exposed to unnecessary investigations and treatments that are not recommended here, partially owing to the profit driven incentive that underpins the USA's private health care system."

http://www.eurekalert.org/pub_releases/2015-02/tl-tld021015.php

Experts question value of current obesity treatments

Experts argue that obesity is a chronic disease with largely biological causes that cannot be cured with just diet and exercise

The mantra in obesity treatment is 'eat less and move more'. But a leading group of obesity experts writing in The Lancet Diabetes & Endocrinology question the belief that this is sufficient to treat obesity. They argue that obesity is a chronic disease with largely biological causes that cannot be cured with just diet and exercise.

Many people with obesity can lose weight for a few months, but 80%-95% regain their lost weight eventually. One explanation for this limited long-term success is that reducing caloric intake triggers several biological systems that drive us to eat high-calorie foods and gain weight. These biological systems evolved when humans needed to survive times of food scarcity. But in modern humans who have had obesity for some time, these biological adaptations encourage calorie consumption and the storage of fat to protect an individual's highest sustained weight. Overriding this fat-loss defence does not appear possible for most individuals through just lifestyle changes, say the authors, particularly in a 21st century environment that promotes the consumption of calorically dense, high-fat foods along with low energy expenditure.

"Although lifestyle modifications may result in lasting weight loss in individuals who are overweight, in those with chronic obesity, bodyweight seems to become biologically 'stamped in' and defended"^[1], explains Dr Christopher Ochner, lead author and Assistant Professor of Pediatrics and Psychiatry at the Icahn School of Medicine at Mount Sinai in New York, USA. "Therefore, the current advice to eat less and exercise more may be no more effective for most individuals with obesity than a recommendation to avoid sharp objects for someone bleeding profusely."^[1] Moreover, he point outs, recent evidence suggests that these biological adaptations could persist indefinitely, even in formerly obese individuals who achieve a healthy bodyweight through dieting. "Few individuals ever truly recover from obesity; rather they suffer from 'obesity in remission'. They are biologically very different from individuals of the same age, sex, and bodyweight who never had obesity."^[1]

The authors argue that if weight loss is to be sustained in the long-term, at least some of these biological factors need to be addressed. However, current biologically based interventions are limited to antiobesity drugs, weight-loss surgery, and intra-abdominal vagal nerve blockage^[2], which do not permanently correct the biological factors that undermine weight-loss effort. To date, only Roux-en-Y gastric bypass, a common surgical procedure for extreme obesity, has

been shown to reverse obesity-induced changes in appetite hormones and the brain's response to food. This, say the authors, might explain why bariatric surgery is the only treatment showing long-term effectiveness in individuals with sustained obesity.

According to Dr Ochner, "Many clinicians are not aware of the reasons individuals with obesity struggle to achieve and maintain weight loss. Obesity should be recognised as a chronic and often treatment-resistant disease with both biological and behavioural causes that require a range of medical interventions including biologically based interventions such as pharmacotherapy or surgery as well as lifestyle modification."^[1] He adds, "Ignoring these biological factors and continuing to rely on behavioural modification will surely result in the continued inability to treat obesity effectively and the premature death of millions of individuals each year."^[1]

^[1] Quotes direct from authors and cannot be found in text of Comment.

^[2] Intra-abdominal vagal nerve blockage uses an implanted pacemaker-like device to alter the brain-gut signalling associated with appetite.

http://www.eurekalert.org/pub_releases/2015-02/uos-sa020915.php

Stopping at red lights exposes drivers to high levels of air pollution, new study finds

UK commuters spend an average of about 1.5 hours a day at the wheel.

Road vehicles in particular are known to emit polluting nanoparticles which contribute to respiratory and heart diseases. Now, researchers at the University of Surrey have found that where drivers spend just 2% of their journey time passing through traffic intersections managed by lights, this short duration contributes to about 25% of total exposure to these harmful particles.

The team monitored drivers' exposure to air pollutants at various points of a journey. Signalised traffic intersections were found to be high pollution hot-spots due to the frequent changes in driving conditions. With drivers decelerating and stopping at lights, then revving up to move quickly when lights go green, peak particle concentration was found to be 29 times higher than that during free flowing traffic conditions. As well as concentration, researchers found that as cars tend to be close together at lights, the likelihood of exposure to vehicle emissions is also significantly increased.

"Air pollution was recently placed in the top ten health risks faced by human beings globally, with the World Health Organization linking air pollution to seven million premature deaths every year," said lead author, Dr Prashant Kumar, from the University of Surrey.

"Our time spent travelling in cars has remain fairly constant during the past decade despite the efforts to reduce it and with more cars than ever joining the

roads, we are being exposed to increasing levels of air pollution as we undertake our daily commutes."

"It's not always possible to change your route to avoid these intersections, but drivers should be aware of the increased risks at busy lights. The best ways to limit your exposure is to keep vehicle windows shut, fans off and try to increase the distance between you and the car in front where possible. Pedestrians regularly crossing such routes should consider whether there might be other paths less dependent on traffic light crossings. Local transport agencies could also help by synchronising traffic signals to reduce waiting time and consider alternative traffic management systems such as flyovers."

<http://bit.ly/1CsdAP8>

Healers Once Prescribed Chocolate Like Aspirin

From ancient Mesoamerica to Renaissance Europe, the modern confectionary treat has medical roots

By [Helen Thompson](#)

Chocolate - it makes [miracle pills](#) go down easier. Miracle Max probably wasn't thinking of the Aztecs when he used a chocolate-coated pill to revive Westley in *The Princess Bride*. But chocolate has been [used in medicine](#) since at least the 1500s, and probably much earlier, as part of Olmec, Maya and Aztec treatments for a range of ailments.

"Throughout history, chocolate is considered to be extremely healthful," says

[Louis Grivetti](#), a nutrition historian at the University of California, Davis.

Most of what we know about how pre-colonial healers prescribed cacao comes from European sources. According to the [Florentine Codex](#), compiled by a priest named Bernardino de Sahagún in 1590, the Aztecs brewed a drink from cacao and silk cotton tree bark (*Castilla elastica*) to treat infections. Children suffering from diarrhea received a drink made from the grounds of five cacao beans mixed with unidentified plant roots. Another recipe incorporated cacao into a cough treatment. Written in 1552, the [Badianus Manuscript](#) lists a host of ailments cacao-based remedies could treat, including [angina](#), fatigue, dysentery, gout, hemorrhoids and even dental problems. There's also Montezuma's fabled use of chocolate concoctions before visiting his wives.

Long before Mary Poppins and her spoonful of sugar, the Aztecs used cacao to mask the unsavory flavors of other medicinal ingredients, including roots used to treat fever and "giants bones" - possibly mistaken vertebrate fossils - used to treat blood in the urine. A [manuscript](#) of Maya curative chants mentions that after chanting, patients consumed a cacao-based concoction to treat skin rashes, fever and seizures.

Maya dignitaries introduced chocolate to Spain in 1552, and from there it spread across the continent. Europeans embraced the exotic delicacy and started mixing in some flavor enhancers, such as cinnamon and vanilla. Not long after chocolate was imported as a food, it gained a reputation as a drug. At this point, European medicine still drew heavily from classical scholars Hippocrates and [Galen](#). Four "humors" comprised the human body, and whenever these humors fell out of balance, disease ensued. Diseases could be "hot" or "cold", "wet" or "dry", and physicians treated them with oppositely classified pharmaceuticals. Though cold by nature, cacao could supposedly be prepared in hot or cold forms, depending on necessity.

While some may have viewed chocolate as a miracle drug or cure-all, others saw it as a treatment for specific illnesses. In the late 1500s and 1600s, Western doctors experimented with chocolate as a treatment for many of the same conditions it had been used for in the Americas, including chest pain, fevers, stomach problems, kidney issues and fatigue.

In a [1631 treatise](#), Spanish physician Antonio Colmenero de Ledesma gave a glowing description of the medicinal food: "It quite takes away the Morpheus, cleaneth the teeth, and sweeteneth the breath, provokes urine, cures the stone, and expels poison, and preserves from all infectious diseases."

Several scholars noted the potential for chocolate eaters to gain weight, citing potential for emaciated or convalescing patients. In the 1700s, some doctors incorporated chocolate into smallpox treatments as a way to prevent the weight loss associated with the disease. Richard Saunders (a pen name for Benjamin Franklin) references the benefits of chocolate against smallpox in the 1761 edition of *Poor Richard's Almanac*. During the U.S. Civil War, injured soldiers were given chocolate when available, presumably to help keep their energy up and again help them gain weight.

Like the Aztecs, European doctors used chocolate to help deliver drugs - some less savory than others. Eighteenth century Frenchman D. de Quélus [posited](#) that chocolate could be used as a vehicle for "powders of millipedes, earthworms, vipers and the livers and galls of eels."

As they experimented, European doctors clearly got a little creative in their chocolate prescriptions. In 1796, one scholar argued that chocolate could delay the growth of white hair. In 1864, Auguste Debay described a chocolate concoction used to treat syphilis. Chocolate was also cited as a part of a treatment regimen for a measles outbreak in 19th-century Mexico. "These are hunches. They're schemes to get people to buy the product," says Grivetti.

With such a wide range of ailments and recipes, would any of these chocolate medicines actually have worked? Maybe. Grivetti thinks that the perceived

general health benefit of chocolate may have stemmed from its preparation. In many cases, chocolate concoctions were heated, sometimes boiled, before drinking. By simply heating the liquid, both Mesoamerican and early European drinkers may have unknowingly killed microbial pathogens.

"It's probably more serendipitous than anything," says Grivetti. Without a time machine and a water testing kit, there's no way to know for sure. As for the nutritional content of cacao itself, several studies have suggested that the flavanoid compounds common in unprocessed dark chocolate may reduce risks from [clogged arteries and increase circulation](#) to the hands and feet. Unfortunately, since the mid-1800s, [dutching](#) has removed dark chocolate's acidity - and its flavanoids. Around the same time, people were starting to add cocoa butter back into processed chocolate to make bars, along with the dairy and sugar that are now common in modern chocolate candy. These manufacturing methods probably make chocolate more of a medical hindrance than help.

Chocolate prepared by the Aztecs and earlier Europeans would not have undergone dutching, so it might have benefitted heart health, possibly eased chest pain. The high calorie count of even early forms of chocolate also means it could have benefitted patients fighting draining diseases like smallpox, but without knowledge of doses and a full understanding of how chocolate compounds work in the body, it's hard to pin down the degree of benefit.

Though the overall health benefits of modern chocolate [remain up for debate](#), a 2006 study [found](#) that eating a little chocolate could have a similar effect to taking an aspirin, and the chocolate compound theobromine has been [marketed](#) as an alternative to the erectile dysfunction drug Viagra. So whether you're mostly dead or merely aching, there's a chance that a little chocolate could give your health a boost. Using it to cure syphilis, however - that would take a miracle.

http://www.eurekalert.org/pub_releases/2015-02/afot-mla021215.php

Make like a squid and transform

Tel Aviv University researcher discovers that squid recode their genetic make-up on-the-fly to adjust to their surroundings

The principle of adaptation -- the gradual modification of a species' structures and features -- is one of the pillars of evolution. While there exists ample evidence to support the slow, ongoing process that alters the genetic makeup of a species, scientists could only suspect that there were also organisms capable of transforming themselves ad hoc to adjust to changing conditions.

Now a new study published in eLife by Dr. Eli Eisenberg of Tel Aviv University's Department of Physics and Sagol School of Neuroscience, in collaboration with Dr. Joshua J. Rosenthal of the University of Puerto Rico, showcases the first example of an animal editing its own genetic makeup on-the-fly to modify most

of its proteins, enabling adjustments to its immediate surroundings. The research, conducted in part by TAU graduate student Shahar Alon, explored RNA editing in the *Doryteuthis pealiei* squid.

"We have demonstrated that RNA editing is a major player in genetic information processing rather than an exception to the rule," said Dr. Eisenberg. "By showing that the squid's RNA-editing dramatically reshaped its entire proteome -- the entire set of proteins expressed by a genome, cell, tissue, or organism at a certain time -- we proved that an organism's self-editing of mRNA is a critical evolutionary and adaptive force." This demonstration, he said, may have implications for human diseases as well.

Using the genetic red pencil

RNA is a copy of the genetic code that is translated into protein. But the RNA "transcript" can be edited before being translated into protein, paving the way for different versions of proteins. Abnormal RNA editing in humans has been observed in patients with neurological diseases. The changing physiological appearance of squid and octopuses over their lifetime and across different habitats has suggested extensive recoding might occur in these species. However, this could never be confirmed, as their genomes (and those of most species) have never been sequenced.

For the purpose of the new study, the researchers extracted both DNA and RNA from squid. Harnessing DNA sequencing and computational analyses at TAU, the team compared the RNA and DNA sequences to observe differences. The sequences in which the RNA and DNA did not match up were identified as "edited."

"It was astonishing to find that 60 percent of the squid RNA transcripts were edited. The fruit fly, for the sake of comparison, is thought to edit only 3% of its makeup," said Dr. Eisenberg. "Why do squid edit to such an extent? One theory is that they have an extremely complex nervous system, exhibiting behavioral sophistication unusual for invertebrates. They may also utilize this mechanism to respond to changing temperatures and other environmental parameters."

"Misfolding" the proteins

The researchers hope to use this approach to identify recoding sites in other organisms whose genomes have not been sequenced.

"We would like to understand better how prevalent this phenomenon is in the animal world. How is it regulated? How is it exploited to confer adaptability?" said Dr. Eisenberg. "There may be implications for us as well. Human diseases are often the result of 'misfolded' proteins, which often become toxic. Therefore the question of treating the misfolded proteins, likely to be generated by such an extensive recoding as exhibited in the squid cells, is very important for future

therapeutic approaches. Does the squid have some mechanism we can learn from?"

The researchers recently received an Israel-U.S. Binational Science Foundation grant to explore the subject of genetic editing in octopuses.

American Friends of Tel Aviv University supports Israel's most influential, most comprehensive and most sought-after center of higher learning, Tel Aviv University (TAU). US News & World Report's Best Global Universities Rankings rate TAU as #148 in the world, and the Times Higher Education World University Rankings rank TAU Israel's top university. It is one of a handful of elite international universities rated as the best producers of successful startups, and TAU alumni rank #9 in the world for the amount of American venture capital they attract.

A leader in the pan-disciplinary approach to education, TAU is internationally recognized for the scope and groundbreaking nature of its research and scholarship -- attracting world-class faculty and consistently producing cutting-edge work with profound implications for the future.

http://www.eurekalert.org/pub_releases/2015-02/esfr-nrs021015.php

New research shows possibility of cure for HPV positive throat cancer patients

Patients with cancer of the throat caused by the Human Papilloma virus (HPV+) have a better prognosis than those who are negative for the virus (HPV-).

Nice, France - Now, for the first time, researchers have shown with convincing evidence that a group of patients with HPV+ cancer of the oropharynx (the part of the throat located behind the mouth, that makes up the region of the tonsils and the back part of the tongue where it connects to the swallowing part of the throat), can be cured in some cases even after disease has spread to distant organs in the body, like the lungs.

Dr Sophie Huang, Assistant Professor in the Department of Radiation Oncology, Princess Margaret Cancer Centre, University of Toronto, Canada, will tell the 5th International Conference on Innovative Approaches in Head and Neck Oncology (ICHNO) today (Friday) that her research has shown that, following intensive treatment, certain patients with HPV+ oropharyngeal cancer (OPC) and distant metastases (tumours appearing in an organ not directly related to the primary cancer site) can survive for more than two years without further evidence of disease. Such cancers are usually considered to be incurable, and the goal of treatment is usually limited to symptom control. "Our research, the largest study to date to explore survival predictors for metastatic HPV+ and HPV-

oropharyngeal cancer patients, has shown that cure is a realistic goal in those patients with oligometastasis - metastases involving five or fewer lesions in one distant organ", she will say.

Dr Huang and colleagues identified 934 patients with HPV+ OPC out of the 1238 OPC patients who had been treated at the Princess Margaret Cancer Centre between 2000 and 2011. Distant metastases were detected in 15% of these patients; 88 in the HPV+ group and 54 in those with HPV- disease.

Oligometastasis was present in 24 HPV+ patients with distant metastases in a single organ.

The researchers found two types of distinct distant metastases in HPV(+) patients: "explosive" and "indolent" metastases. The explosive type metastasis, where more than ten lesions in one organ appear quickly in a short period (within three months of appearance of the first lesion), was present in 55% of the HPV+ group, as opposed to none in those who were HPV-. In both HPV+ and HPV- groups, lung was the most common metastatic site. The indolent type of metastases grow and spread at a much slower pace, most often manifesting as oligometastasis. This occurred in 24% of the HPV+ cases with metastases in a single organ as opposed to 26% of those who had HPV- cancer.

"In the HPV+ group of patients with oligometastases, when they were given definitive local treatment aimed at disease control - for example, a high radiation dose or surgical removal of the metastatic lesion, as opposed to a less aggressive treatment used to control symptoms -there was a long term disease-free period, suggesting that some may be cured," Dr Huang will say. "In the HPV+ group with oligometases 25% were still alive after three years, whereas the percentage in the HPV- group was 15%."

The survival advantage in HPV+ OPC patients is due to a number of factors, the researchers say. The cancer is more sensitive to radiotherapy and chemotherapy; the patients tend to be younger (an average age of 55 at diagnosis as opposed to 65) with fewer other health problems, including those caused by smoking-related illness, and this enables them to receive the more aggressive treatment necessary to eradicate metastatic disease.

The percentage of HPV positive to negative OPC cancers varies globally, depending on a number of factors, including the prevalence of smoking and the practice of oral sex. Overall the incidence of HPV+ throat cancers has increased over the past 20 years in developed countries, such as US, Canada, Japan, Australia, and some European countries. [1]

"This research has shown that metastatic HPV+ OPC patients who receive active treatment can survive considerably longer than those who did not receive treatment. One of the reasons patients with metastatic disease do not receive

aggressive treatment is due to the physician and patient's perception that this is an incurable state. We hope that these results will motivate researchers to optimise management strategies for these patients. This will not only help to produce a better quality of life and a return to work for them, but also reduce the cost to healthcare systems," Dr Huang will say.

"We also hope that our study may trigger research to explore cost-effective methods for the early detection of metastases. Optimising and tailoring surveillance strategies for HPV+ patients are also important. For example, our research has shown that the surveillance period should be longer than the traditional two-year window, due to the possibility of later onset of metastases. Selecting the appropriate imaging method in order to detect asymptomatic oligometastasis (e.g. ultrasound for the early detection of liver metastasis) may allow salvage treatment of some patients before the cancer progresses. Finally, we hope that it will help clinicians identify patients who are best able to benefit from aggressive treatment, such as metastasectomy (surgical removal of the metastases) or stereotactic radiotherapy (highly focused high dose radiotherapy to small regions)," Dr Huang will say.

Whether it is possible to identify which patients at initial presentation are at high risk of developing distant metastasis, and which type of distant metastasis will subsequently develop are other important questions for future studies, say the researchers. "We know there is a degree of correlation between the initial stage and the risk of distant metastasis, but we did not find a strong relationship between this stage and the type of metastasis. The intensity of cigarette smoking in the years prior to the time of diagnosis is a possible factor. Being able to identify such relationships could be a huge help in deciding appropriate treatment at an early stage," Dr Huang will say.

Although head and neck cancer is the sixth most common type of cancer worldwide, awareness of it is low, and hence the majority of diagnoses are not made until the disease is in an advanced stage, resulting in limited treatment choices and hence a reduction in the chance of survival.

Professor Jean Bourhis, co-chair of the conference scientific committee, said: This important piece of research adds substantially to what we know about the role and the importance of the Human Papilloma Virus (HPV) in oropharyngeal cancers and gives real hope of improvement in both diagnosis and treatment to those who are affected by the condition."

¹Chaturvedi AK, Anderson WF, Lortet-Tieulent J, et al. Worldwide trends in incidence rates for oral cavity and oropharyngeal cancers. *Journal of Clinical Oncology* : official journal of the American Society of Clinical Oncology 2013;31(36):4550-9.

http://www.eurekalert.org/pub_releases/2015-02/kl-aaf021215.php

An aggressive form of HIV uncovered in Cuba

Engaging in unprotected sex with multiple partners increases the risk of contracting multiple strains of HIV, the virus that causes AIDS.

Once inside a host, these strains can recombine into a new variant of the virus. One such recombinant variant observed in patients in Cuba appears to be much more aggressive than other known forms of HIV. Patients progress to AIDS within three years of infection - so rapidly that they may not even realise they were infected.

Before it can enter human cells, HIV must first anchor itself to them. The virus does this via anchor points, or co-receptors, which are proteins on the cell membrane. In a normal infection, the virus first uses the anchor point CCR5. In many patients, after a number of healthy years, the virus then switches to the anchor point CXCR4. This co-receptor switch coincides with a faster progression to AIDS.

Writing in the journal *EBioMedicine*, researchers at KU Leuven's Laboratory for Clinical and Epidemiological Virology now report a recombinant form of HIV observed in patients in Cuba that makes this transition much faster. The virus targets the anchor point CXCR4 early after infection, shortening drastically the healthy phase and triggering rapid progression to AIDS.

Professor Anne-Mieke Vandamme and an international team of researchers studied the blood of 73 recently-infected patients - 52 at AIDS diagnosis and 21 without AIDS - and compared results with blood from 22 patients who had progressed to AIDS after a normal healthy period with HIV.

In the patients infected with the HIV recombinant, the researchers observed abnormally high doses of the virus and of the defensive molecule RANTES. This molecule is part of our natural immune response and acts through binding to CCR5, to which most forms of HIV have to bind before entering the cell.

The high concentration of RANTES suggests that most of the CCR5 proteins were no longer available as anchor points for HIV. This may have caused the HIV recombinant to bypass that anchor point and go straight to anchor point CXCR4. The observation that all study patients who were infected with the recombinant HIV variant went on to develop AIDS within three years of infection supports this theory.

The transition from anchor point CCR5 to CXCR4 is normally very difficult. The researchers suspect that the rapid transition observed in this HIV recombinant occurs as a result of combining fragments from different HIV subtypes. One of these fragments contains a protease (from subtype D), which acts very efficiently. Protease is an enzyme that cleaves the proteins that are used in new virus particles.

This protease is very 'fit' - it enables the virus to replicate in greater numbers hence facilitating the transition to CXCR4 anchoring.

The unexpectedly rapid progression of this HIV variant increases the risk that patients become very ill before ever realising that they are infected.

http://www.eurekalert.org/pub_releases/2015-02/sri-fpt021215.php

Finding points to possible mechanism underpinning Alzheimer's and Parkinson's diseases

\$1.4 million grant will enable team to follow up with search for drug candidates

JUPITER, FL - Scientists from the Florida campus of The Scripps Research Institute (TSRI) have for the first time discovered a killing mechanism that could underpin a range of the most intractable neurodegenerative diseases such as Alzheimer's, Parkinson's and ALS.

The new study, published recently in the journal *Brain*, revealed the mechanism of toxicity of a misfolded form of the protein that underlies prion diseases, such as bovine spongiform encephalopathy ("mad cow disease") and its human equivalent, Creutzfeldt-Jakob disease.

"Our study reveals a novel mechanism of neuronal death involved in a neurodegenerative protein-misfolding disease," said Corinne Lasmézas, a TSRI professor who led the study. "Importantly, the death of these cells is preventable. In our study, ailing neurons in culture and in an animal model were completely rescued by treatment, despite the continued presence of the toxic misfolded protein. This work suggests treatment strategies for prion diseases--and possibly other protein misfolding diseases such as Alzheimer's."

Failure and Rescue of Brain Cells

In the new study, the scientists used a misfolded form of the prion disease protein, called TPrP, a model they had previously developed, to study misfolded protein-induced neurodegeneration in the laboratory. Misfolded proteins are the common cause of the group of diseases comprising prion, Alzheimer's, Parkinson's diseases, ALS and other conditions.

Using biochemical techniques, the researchers demonstrated that TPrP induces neuronal death by profoundly depleting NAD⁺ (nicotinamide adenine dinucleotide)--a metabolite well known as a coenzyme that is common to all cells and necessary for energy production and cellular homeostasis.

Restoring NAD⁺ proved to be the critical factor for the rescue of neurons subjected to TPrP injury.

Even when added three days after TPrP exposure, an infusion of NAD⁺ reversed within only a few hours the fate of neurons that had been doomed to destruction.

"Our study shows for the first time that a failure of NAD⁺ metabolism is the cause of neuronal loss following exposure to a misfolded protein," Lasmézas said.

The loss of NAD⁺ also triggers autophagy--a way cells rid themselves of damaged material such as misfolded proteins--and apoptosis, or programmed cell death, the last resort of the cell when everything starts to go wrong.

However, the researchers demonstrated these mechanisms do not initiate the neuronal demise.

"We show that apoptosis or programmed cell death and autophagy are not primary players in the death cascade," said Staff Scientist Minghai Zhou, the first author of the study. "Modulation of neither of these processes significantly alters the death of TPrP-exposed neurons. This is all caused by NAD⁺ disappearing--the cell cannot survive without it."

Lasmézas noted the loss of NAD⁺ is suggestive of some other neurodegenerative diseases, such as Parkinson's where NAD⁺ depletion could play a role in mitochondrial failure.

New Grant to Support Further Research

A recent \$1.4-million grant from the National Institute of Neurological Disorders and Stroke (NINDS) will support further work to look for drug candidates based on the new findings.

Lasmézas and Louis Scampavia, a TSRI associate professor of molecular therapeutics, will be co-principal investigators for the new three-year study, whose team will also include Tom Bannister, a TSRI associate scientific director at Scripps Florida's Translational Research Institute.

The scientists have developed several primary tests for compounds that could restore NAD⁺ and plan to begin those tests at Scripps Florida's High Throughput Screening facility.

Since it was established in 2005, the Scripps Florida High Throughput Screening facility has screened more than 200 targets in more than 235 industrial and academic collaborations--several of these collaborations have produced successful clinical trial candidates.

The drug discovery facility is currently capable of routinely screens one quarter of a million compounds in a single day.

In addition to Zhou and Lasmézas, other authors of the study, "Neuronal Death Induced by Misfolded Prion Protein Is Due To NAD⁺ Depletion and Can Be Relieved In Vitro And In Vivo by NAD⁺ Replenishment," include Gregory Ottenberg, Gian Franco Sferrazza, Christopher Hubbs, Mohammad Fallahi, Gavin Rumbaugh and Alicia F. Brantley of TSRI. The work was supported by TSRI and by the National Institutes of Health (RNS081519). The number of the new NINDS grant is 1R01NS085223.

http://www.eurekalert.org/pub_releases/2015-02/gumc-abs021215.php

A brain system that appears to compensate for autism, OCD, and dyslexia

Declarative memory appears to compensate for dysfunction of neurodevelopmental disorders

WASHINGTON -- Individuals with five neurodevelopmental disorders -- autism spectrum disorder, obsessive-compulsive disorder, Tourette syndrome, dyslexia, and Specific Language Impairment -- appear to compensate for dysfunction by relying on a single powerful and nimble system in the brain known as declarative memory. This hypothesis being proposed by a Georgetown University Medical Center neuroscientist is based on decades of research. It is published online and will be in the April issue of *Neuroscience and Biobehavioral Reviews*. The proposed compensation allows individuals with autism to learn scripts for navigating social situations; helps people with obsessive-compulsive disorder or Tourette syndrome to control tics and compulsions; and provides strategies to overcome reading and language difficulties in those diagnosed with dyslexia, autism, or Specific Language Impairment, a developmental disorder of language. "There are multiple learning and memory systems in the brain, but declarative memory is the superstar," says Michael Ullman, PhD, professor of neuroscience at Georgetown and director of the Brain and Language Laboratory. He explains that declarative memory can learn explicitly (consciously) as well as implicitly (non-consciously).

"It is extremely flexible, in that it can learn just about anything. Therefore it can learn all kinds of compensatory strategies, and can even take over for impaired systems," says Ullman. "Nevertheless, in most circumstances, declarative memory won't do as good a job as these systems normally do, which is an important reason why individuals with the disorders generally still have noticeable problems despite the compensation," he adds.

Knowing that individuals with these disorders can rely on declarative memory leads to insights on how to improve diagnosis and treatment of these conditions. It could improve treatment in two ways, Ullman says. First, designing treatments that rely on declarative memory, or that improve learning in this system, could enhance compensation. Conversely, treatments that are designed to avoid compensation by declarative memory may strengthen the dysfunctional systems. Ullman says compensation by declarative memory may also help explain an observation that has long puzzled scientists -- the fact that boys are diagnosed with these disorders more frequently than girls. "Studies suggest that girls and women are better than boys and men, on average, in their use of declarative

memory. Therefore females are likely to compensate more successfully than males, even to the point of compensating themselves out of diagnosis more often than males," Ullman says. Declarative memory may also compensate for dysfunctions in other disorders, he adds, including attention deficit hyperactivity disorder (ADHD) and even adult-onset disorders such as aphasia or Parkinson's disease. The hypothesis may thus have powerful clinical and other implications for a wide variety of disorders. Ullman says.

Support for this research was provided by the National Institutes of Health (ROI HD049347), the Simons Foundation, and the Mabel H. Flory Trust.

Mariel Pullman, a former research assistant in Ullman's lab and current medical student, is co-author.

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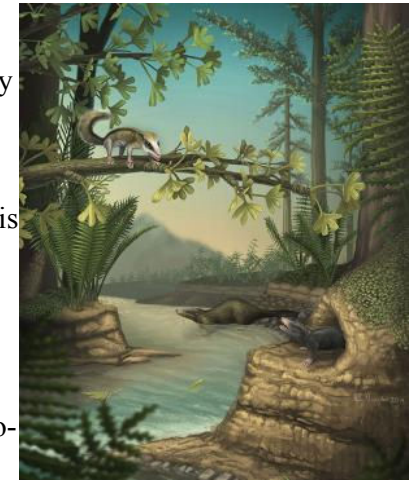
Jurassic fossils reveal varied life of early mammals

In the days of the Jurassic, dinosaurs ruled the Earth, while early mammals cowered in their shadows. That used to be the idea.

19:00 12 February 2015 by Jeff Hecht

Two remarkably preserved fossils from China now reveal that there was a surprising diversity among early mammals. The two specimens lived 165 to 160 million years ago and were part of a group that died out before the dinosaurs, leaving no living descendants. But the lifestyles they were adapted for shows that they evolved similarly to modern mammals, and were not severely constrained by the presence of the dinosaurs, says Zhe-Xi Luo of the University of Chicago. This finding puts the final nail in the coffin of the long-standing view that early mammals were primitive, shrew-like insectivores, overshadowed by the dinosaurs. This idea was based on many specimens of tiny teeth and a few jaw fragments.

Discoveries in more recent years of more complete skeletons in rare fossil beds that preserve exceptional details first challenged this idea about 10 years ago. The finding of a predator of baby dinosaurs, about the size of a honey badger, in 2005, and of an aquatic, beaver-like fish-eater called *Castorocauda* in 2006, revealed that early mammals did more than just live under the feet of their reptilian co-inhabitants.



Digger Docofossor chilling out by a stream, and Agilodocodon hiding in the branches
(Image: April I. Neander, the University of Chicago)

Tree houses

Now Luo and his colleagues have found two small but highly specialised relatives of *Castorocauda*. One is the earliest digging mammal ever to have been discovered; the other is both the earliest herbivorous mammal and the earliest tree-dwelling mammal. Together, they show how mammals might have evolved in a world they shared with dinosaurs. Luo thinks that dinosaurs only had a strong influence on limiting mammal diversity at larger sizes. Mammals did not evolve to be large or fast-running herbivores like elephants or deer until the dinosaurs were gone, he says.

As the first mammal able to eat plants, Luo says *Agilodocodon scansorius* broke "a very important barrier", because plants were more abundant than the insects eaten by other early mammals. Its spade-shaped front teeth would have enabled it to gnaw into bark to feed on tree gums or saps, much like a modern marmoset monkey, while the curved, horny claws on its hand and feet, a bit like those of some squirrels, suggests that it lived in trees or shrubs.

With shovel-like fingers for digging, a sprawling posture for crawling through tunnels, and short wide upper molars for foraging underground, *Docofossor* resembles the modern African golden mole. Just like this mole, it had lost one bone segment in its fingers, which would have strengthened its fingers for digging, Luo says.

Extreme lifestyle

"We wouldn't be able to interpret those fossils if nothing like them lived today," says Anne Weil of Oklahoma State University in Stillwater. Burrowers have such an extreme lifestyle that they develop very distinctive skeletons, which have characteristics like longer arm bones and probing fingers, she says.

But although these animals occupied similar niches to modern-day mammals, these species were members of the Docodontia group, which is outside what we consider to be true mammals. "If we could go back to the Jurassic, we probably would think of these animals as furry mammals, but we might notice that they had funny heads or moved awkwardly," says Weil.

These Docodonts shared a common ancestor with extant mammals, but have no descendants living today. "If you went back and looked at the mid-Jurassic, our ancestors didn't look special. They were just one of many groups. Maybe we just got lucky," says Weil.

"It continually surprises me how new discoveries expose more and more structural and palaeoecologic diversity," says Rich Cifelli of the University of Oklahoma in Norman. He speculates that docodonts may have had a head start in diversifying compared with other early mammal relatives because they had complex molar teeth that are easily adapted for special roles.

Journal references: *Science*, DOI: 10.1126/science.1260879 and DOI: 10.1126/science.1260880

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The Western U.S. Could Soon Face the Worst Megadrought in a Millennium

Climate models predict that the region will be drier than the droughts that likely caused ancient Native Americans to abandon their pueblo cities

By [Sarah Zielinski](#)

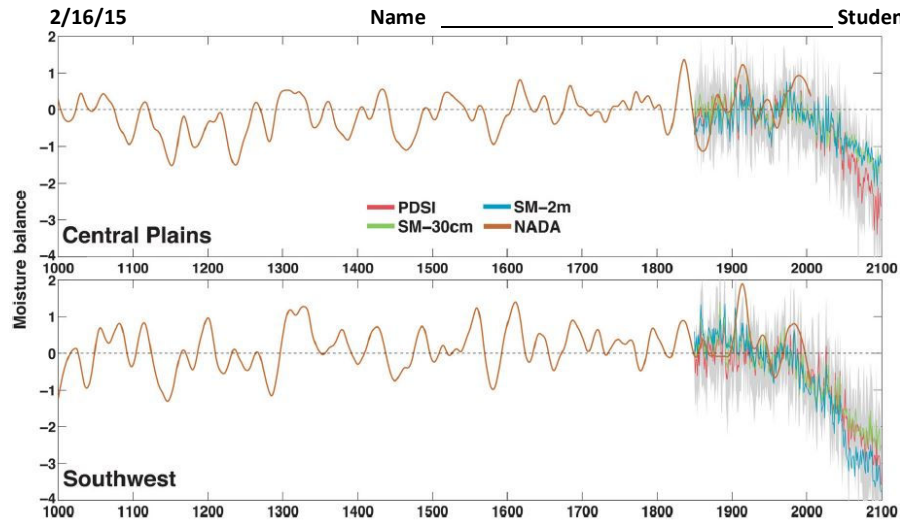
Without dramatic cuts to greenhouse gas emissions, the southwestern U.S. and Central Plains will suffer persistent drought in the latter half of the 21st century that would exceed even the worst droughts seen a millennium ago, says a new study. Those hot, dry conditions likely caused ancient Native Americans known as the [Anasazi](#) to abandon the pueblo cities at [Mesa Verde](#) and [Chaco Canyon](#). The results, appearing today in the new journal *Science Advances*, suggest that the impacts of future megadroughts on modern society—including the agriculture and energy sectors—could be severe.

"The future looks fairly bleak, and it's a future that all of us ... need to pay attention to," Marcia McNutt, editor-in-chief of the *Science* family of journals, said today at a press conference.

For the last decade, studies have been predicting that as temperatures rise due to anthropogenic climate change, the U.S. West faces an increasingly dry future. For instance, researchers [reported last year](#) in the *Journal of Climate* that the Southwest faced a 20 to 50 percent chance in the next century of a megadrought—a drought lasting 35 years or more.

The new study predicts an even bleaker future, showing "more convincingly than ever before that unchecked climate change will drive unprecedented drying across much of the United States—even eclipsing the huge megadroughts of medieval times," says [Jonathan Overpeck](#), co-director of the Institute of the Environment at the University of Arizona, who was not involved in the study.

To come up with their new predictions, [Toby Ault](#) of Cornell University and [Benjamin Cook](#) and [Jason Smerdon](#) of Columbia University's Lamont-Doherty Earth Observatory began with a [record of climate](#) from the past thousand years derived from [tree rings](#). The width of a tree ring changes depending on how much moisture the tree receives in a given year. The team then used 17 different climate models to develop drought predictions for the next century for the Southwest and Central Plains under two scenarios: one in which greenhouse gas emissions [continue unabated](#) and a second in which they are [moderated](#).



The brown line reflects changes in summer moisture as recorded in tree ring data, with negative numbers reflecting drier times. Colored lines show what climate models predict for the latter half of the 21st century. (Cook et al., Science Advances, 2015)

The models consistently predicted that the U.S. West is headed for drier times. The risk of a decades-long drought was high even under the moderate emissions scenario. With high emissions continuing, though, the risk was even greater—80 percent or more in the Southwest and at least 70 percent in the Central Plains. “These future changes that we are seeing are likely to be more persistent than past megadroughts,” which occurred in a more stable past, Smerdon says. The bad droughts of the past in this region have historically been driven by persistent [La Niña](#) conditions, when there are unusually cold waters in the Pacific. But the megadroughts of the not-too-distant future will be triggered by increased greenhouse gas concentrations in the atmosphere, the report finds. The resulting changes to the climate will make these regions warmer, so that both the Southwest and the Central Plains will experience more evaporation, which will dry out the land. The Southwest will also experience reductions in winter precipitation. “What’s important to realize is that continued warming is pretty much a sure bet without cuts in our greenhouse gas emissions, and this warming alone will likely overwhelm any increases in precipitation to dry out and bake a large swath of our country stretching from California through Texas,” says Overpeck. “Decreases in precipitation will make the pain more acute where they occur.”

After the drought that sparked the [Dust Bowl](#) in the 1930s, the United States implemented conservation efforts and changed farming techniques in ways that have lessened the impacts of severe droughts. Irrigation, for instance, has let many

farmers keep fields green even through dry times. And reservoirs have kept communities supplied with water.

Those methods, however, may not see Americans through the upcoming megadroughts, the researchers warn. Giant reservoirs such as [Lake Mead](#) have been shrinking due to [drought and overuse](#), threatening water and [energy](#) supplies. [Groundwater supplies](#) are also being depleted faster than rains can recharge them. Now entering its fourth consecutive year of drought, California is already starting to encounter some of those limits. In that [state](#), no reservoir is above half full, and farmers may not be able to obtain as much water as they need come spring. Groundwater supplies are being [depleted](#). Wells have [run dry](#). “Humans act as a positive feedback on hydrological drought,” says [James Famiglietti](#), of the University of California, Irvine. “The drier it gets, the more groundwater we use, and as a result, we accelerate drying. The results presented in this paper could not be any more dismal.”

But there is still time to head off that future, he says. “The good news is that we have ample warning and know what to do to stop the unprecedented drying from becoming reality—we just need to make serious cuts in greenhouse gas emissions,” Famiglietti notes. “Otherwise the next generations of Americans are going to have a huge problem on their hands.”

The one bright note, Ault says, is that past megadroughts were recorded in tree rings, which meant that the trees survived even those ultra-dry conditions. “I am optimistic that we can cope with the threat of megadrought in the future because it doesn’t mean no water,” he says. “It means significantly less water than we are used to.”

Sarah Zielinski is an award-winning science writer and editor. She is a contributing writer in science for Smithsonian.com and blogs at Wild Things, which appears on Science News.

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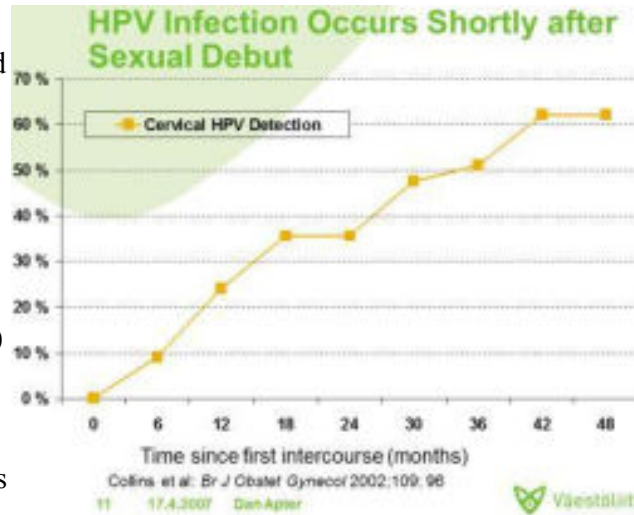
HPV vaccine highly effective against multiple cancer-causing strains

Cervarix not only has the potential to prevent cervical cancer, but was effective against other common cancer-causing human papillomaviruses

WASHINGTON, DC - According to a multinational clinical trial involving nearly 20,000 young women, the human papilloma virus vaccine, Cervarix, not only has the potential to prevent cervical cancer, but was effective against other common cancer-causing human papillomaviruses, aside from just the two HPV types, 16 and 18, which are responsible for about 70 percent of all cases. That effectiveness endured for the study's entire follow-up, of up to four years. The research was published February 4 in *Clinical and Vaccine Immunology*, a journal of the American Society for Microbiology.

"The study confirms that targeting young adolescent girls before sexual debut for prophylactic HPV vaccination has a substantial impact on the incidence of high grade cervical abnormalities," said corresponding author, Dan Apter, Director, The Sexual Health Clinic, Family Federation of Finland, Helsinki.

The vaccine was extremely effective in young women who had never been infected with HPV. It protected nearly all from HPV-16 and -18, and protected 50-100 percent against different grades of precancerous transformation of cervical cells caused by other strains of HPV, including up to 100 percent of those with the immediate precursor grade to cancer. The women were followed for up to four years post-vaccination.



This graph shows the time since first intercourse and the percentage with HPV infection. Collins et al

The vaccine was distinctly more effective among ages 15-17 than ages 18-25, underscoring the value of vaccinating young adolescents, said Apter. The lower efficacy in the oldest age group may result from a larger proportion of women in that age group having had persistent infections at the time of vaccination, he said. The study is the final report from the Papilloma Trial Against Cancer in Young Adults (PATRICIA), a multinational clinical trial encompassing 14 countries in Europe, the Asia-Pacific region, North America, and Latin America, and it confirms previous reports in this trial. The over-all trial constituted the basis for approval of the Cervarix vaccine in Europe and the United States.

While the trial did not investigate the vaccine's efficacy in males, sexually transmitted HPV causes anogenital and head and neck cancers in both males and females. HPV-related head and neck cancers now number around 8,400 in the US, annually. "The more adolescents are vaccinated, the closer we will be to eradicating high risk HPV viruses," said Apter. "So I think boys should also be vaccinated."

"Cervical cancer is the fourth most common cancer among women, with estimates from 2012 indicating that there are 528,000 new cases and 266,000 deaths each

year worldwide, with the majority of cases occurring in developing countries," said Apter. In the US, about 12,000 new cases, and 4,000 deaths occur annually, according to the SEER database of the National Cancer Institute. "It is now established that having a persistent infection with HPV is a necessary cause of cervical cancer," said Apter.

<http://bit.ly/1yGqKDB>

Jailing People Has Little Effect on Crime Levels

At some point, the data indicates, more people in prison doesn't translate to fewer crimes

By Marissa Fessenden

The U.S. incarceration rate is extreme—the [highest in the world since 2002, even after modest declines in 2014](#). Is that expense worth it? To explore this issue, the New York University School of Law's Brennan Center for Justice produced a report, [published this week](#), that delves into data on crime and incarceration rates across the country. What they found suggests that more people in prison doesn't necessarily translate to fewer crimes.

At FiveThirtyEight, one of the authors, Oliver Roeder, [hits the report's highlights](#). The data do not argue against incarceration. But they do suggest that there's a point beyond which imprisoning more people just isn't worth it. Roeder writes at FiveThirtyEight:

Once the worst offenders are in prison, each additional prisoner will yield less benefit in the form of reduced crime. Increased incarceration — and its incapacitation effect — loses its bite. And at its world-historic level, it's not surprising that it would've lost nearly all of it.

But the data truly backing that assertion are lacking, at least at the broad scale. So the report instead dives into some different between states in the U.S. that provide "anecdotal evidence of diminishing incarceration returns." Roeder again:

For example, California had to decrease their incarceration rates to address overcrowding in their prisons — a change mandated by the Supreme Court. However, from 2000 to 2013 the state actually saw a significant decrease in violent crime rate. Thirteen other states, including New York and Texas, also saw decrease in violent crime at the same time as their decrease in incarceration. Only two states that made an effort to put fewer people in prison faced increases in violent crime.

The best suggestion to actively reduce crime isn't to increase incarceration, the report suggests, but to get better at policing. To back this up, the authors offer evidence that use of a computerized system called CompStat to keep track of crime data in several major cities has coincided with drops in crime rates.

All the evidence lines up with other arguments against the high U.S. incarceration rate. For example, when people are given longer sentences for their crimes, their peers are more likely to end up in prison — [incarceration is contagious](#). At the

very least, the report adds to mounting evidence that if rehabilitation and a safer, more lawful society is the goal, then [strategies other than mass incarceration](#) are worth considering.

<http://bit.ly/1L0u453>

Common gum-disease bug may also give cancer a boost

What do your mouth and your behind have in common? They're linked by a bug that we thought was usually benign, but may in fact have a much darker side.

19:30 13 February 2015 by Linda Geddes

Fusobacterium nucleatum is a common bacterium that lives in our mouths, often without causing any ill effects, although it is also frequently the culprit in gum disease. Until recently, it was thought to be just one of many relatively harmless bacteria we carry around.

Previous work on gum disease had hinted that *F. nucleatum* interacts with natural killer cells, part of the immune system's first line of defence against infection and cancer. But when a recent study revealed high levels of the bacterium in human colorectal tumours, Gilad Bachrach at the Hebrew University of Jerusalem, Israel, and his colleagues decided to take a closer look.

First, they incubated *F. nucleatum* together with a variety of human tumour cells and natural killer cells, and found that the bacterium inhibited the killer cells' ability to attack cancer. Further work revealed that a bacterial protein called Fap2 binds to a receptor on the natural killer cells called TIGIT. "By activating this receptor, *F. nucleatum* prevents the killing of cancer cells by the natural killer cells," Bachrach says.

A handful of other bacteria are known to boost the risk of certain cancers by triggering an inflammatory response. But this is the first time a bacterium has been shown to be helping cancer develop by inhibiting the immune system.

Coincidence or ploy?

Whether this interaction is a coincidence or a deliberate strategy on the part of the bacterium remains unclear, but the relationship between it and cancer is probably a mutually beneficial one. *F. nucleatum* prefers anaerobic – low-oxygen – environments, and tumours are often precisely that. Once established, tumours also harness or suppress the immune system in some way themselves. But by suppressing the natural killer cells that detect and destroy cancer, *F. nucleatum* may help tumours gain a foothold.

"The purpose of this pathogen is not to kill the host; it is to survive. Maybe by preventing these tumours from being killed, the bacterium creates a sheltered niche in which to proliferate," says Yiping Han of Columbia University in New

York. She recently published data suggesting that *F. nucleatum* can also stimulate the growth of colon cancer cells via a different mechanism.

Now that it's clear that the bacterium is interacting with natural killer cells, the next question is whether that link could be disrupted – possibly by developing drugs that block Fap2.

Could the bacterium be lurking in other types of tumours and influencing their growth in similar ways? Han thinks it might; the bacterium can escape the mouth and has been found in many other tissues. There are even hints that it could be associated with other diseases, including Alzheimer's and atherosclerosis.

"I wouldn't be surprised if *F. nucleatum* was associated with other types of cancer, but I think it's premature to generalise that it is a root cause of all cancer," says Han. "For now, I think it's safe to say it's one of the causes of colon cancer, although it's probably not the exclusive cause."

Journal reference: Immunity, DOI: 10.1016/j.immuni.2015.01.010

<http://wapo.st/1DuANlp>

How a method used to wipe out smallpox is making a comeback in the fight against Ebola

Scientists [are launching tests of two experimental Ebola vaccines](#) in West Africa. In one of the countries, Guinea, they are turning to a method that helped wipe smallpox off the globe.

By [Amy Brittain](#) February 14

In the 1960s, as smallpox raged across parts of Africa, Asia and South America, the leading global strategy was to vaccinate masses of people against the disease. Smallpox, which is caused by the variola virus, [spreads by direct contact or through droplets of saliva transmitted in a person's breath](#).

In Nigeria at about that time, a medical missionary named Bill Foege was [faced with the challenge of containing a smallpox outbreak](#). He questioned the strategy of mass vaccinations and helped develop a different approach. It reflected his experience as a young man fighting forest fires in the Pacific Northwest. The thought was pretty simple: A fire can't live without fuel or oxygen.

"And so you develop a ring around the fire," he said in a recent interview. If you created a ring of immunity — in this case, of vaccinated people around each smallpox case — the disease could be wiped out much more efficiently, he believed. Foege and his team sent messengers into remote Nigerian villages and mapped out a plan to vaccinate people who had come into contact with infected patients.

The strategy also became known as the "ring vaccination theory" or "surveillance" or "targeted" vaccination. "The whole emphasis is not on

protecting people en masse. It's on being so intelligent that you can out-think the virus ... and look at who is at risk and where the virus is," Foege said. "You protect those people rather than other people."

The success was soon evident.

"What surprised us was how fast the smallpox stopped," Foege said. Within six months, the outbreak in Nigeria had been contained. Foege went on to lead the U.S. Centers for Disease Control and Prevention and [later earned the Presidential Medal of Freedom](#), largely for his work in developing the theory of ring vaccination. The World Health Organization officially declared smallpox eradicated in 1980. It had killed, by some estimates, more than 300 million people in the 20th century alone.

Defeating smallpox "stands as one of the greatest accomplishments of the 20th century, if not one of the greatest human accomplishments of all time," [two authors wrote in the Journal of Clinical Medicine Research](#).

Of course, the Ebola epidemic in West Africa is completely different from the smallpox epidemic. Roughly 9,000 people have died in the region since the outbreak began in Guinea in 2013, with a death rate of about 60 percent for those diagnosed with Ebola. Unlike smallpox, there is no proven vaccine.

The Ebola outbreak has significantly receded in recent months. That makes [testing treatments and vaccines for Ebola more difficult](#), as scientists need a good number of cases to scientifically prove that any of these interventions work.

Officials from the World Health Organization plan to set up 190 "rings" in Guinea to test two experimental Ebola vaccines. That means that they need 190 Ebola patients, who make up the center of the rings. They plan to start the trial later this month.

A spokeswoman for the WHO, Daniela Bagozzi, said that Donald Henderson, [who directed the organization's Global Smallpox Eradication Program](#), has given advice for the ring vaccination plans in Guinea.

Health workers plan to identify new Ebola cases and then find the recent contacts of those patients, including family members, neighbors and co-workers. Half of the rings will be vaccinated immediately, while the other half will be vaccinated several weeks later. If the vaccines work, the immediate group would likely develop fewer cases of Ebola.

One person eagerly watching the developments is Foege, who is now 78 and lives in Washington state. "This is exactly what I've spent my life doing," he said, referring to his work with infectious diseases. "I know it can be stopped."

http://www.eurekalert.org/pub_releases/2015-02/uobc-ttr021215.php

Twitter the right prescription for sharing health research

Using Twitter can help physicians be better prepared to answer questions from their patients, according to researchers from the University of British Columbia.

The study, presented today at the 2015 Annual Meeting of the American Association for the Advancement of Science (AAAS), finds more and more health care professionals are embracing social media.

This challenges common opinion that physicians are reluctant to jump on the social media bandwagon.

"Many people go online for health information, but little research has been done on who is participating in these discussions or what is being shared," says Julie Robillard, lead author and neurology professor at UBC's National Core for Neuroethics and Djavad Mowafaghian Centre for Brain Health.

Robillard and fourth-year psychology student Emanuel Cabral spent six months monitoring conversations surrounding stem cell research related to spinal cord injury and Parkinson's disease on Twitter.

They found roughly 25 per cent of the tweets about spinal cord injury and 15 per cent of the tweets about Parkinson's disease were from health care professionals. The study found the majority of tweets were about research findings, particularly the ones perceived as medical breakthroughs.

The most shared content were links to research reports.

The study also found the users tweeting about spinal cord injury and Parkinson's disease differed.

Users who tweeted about spinal cord injury talked about clinical trials, while users who tweet about Parkinson's disease mostly talked about new tools or methods being developed to conduct research.

Less than five per cent of the tweets spoke out against stem cell research, which surprised the researchers.

"We expected to see debate on stem cell controversy," says Robillard.

"But people are sharing ideas of hope and expectations much more than anything else."

Robillard believes social media can help physicians become more aware of what their patients are consuming about scientific research beyond traditional media.

This could help temper patients' expectations about potential treatments.

Julie Robillard (@ScientificChick) presented [Finally, We Can Grow Spines: Stem Cells on Twitter](#) at the 2015 AAAS annual meeting 8-9:30 a.m. PST, Feb. 14, 2015.

http://www.eurekalert.org/pub_releases/2015-02/uobc-ttr021215.php

<http://bit.ly/1Ad6Y6F>

Would You Like to Grow Color-Changing Flowers?

A Colorado company is working to genetically engineer petunias that change colors throughout the day

By [Megan Gambino](#) smithsonian.com

In 1887, a 21-year-old Rudyard Kipling wrote a poem called "Blue Roses." The four stanzas describe a woman, presumably a past love of the poet's, who demanded blue roses, as opposed to the conventional red or white. Kipling says:

*"Half the world I wandered through,
Seeking where such flowers grew.
Half the world unto my quest
Answered me with laugh and jest."*

But the plant biotechnology community today isn't laughing. While blue roses do not occur naturally, the Japanese company, Suntory, and its Australian subsidiary, Florigene, released a [genetically modified blue rose](#) six years ago. The researchers inserted a gene from a pansy that is responsible for producing a blue pigment called Delphinidin into a white Old Garden 'Cardinal de Richelieu' rose.

Nikolai Braun and Keira Havens, the two entrepreneurial scientists behind the Fort Collins, Colorado-based company [Revolution Bioengineering](#), are now in pursuit of a new flower—one that changes color, from pink to blue and back again. While it does not exist yet, they are calling the bloom "Petunia Circadia," because they intend to link the expression of pigment molecules called anthocyanins to the plant's circadian rhythm. This way, the flower will change color every 12 hours.

So far, the duo has successfully engineered a petunia that changes color on demand. Instead of transforming on its own, this early version is activated by ethanol. "The petunia typically produces white blooms, but if you water it with the ethanol solution, the existing flowers will go from white to red and new flowers will bloom a purplish red," says Braun, who received his doctorate in plant biophysics at University of California, Davis in 2007. (Watch the video, above.) The color change happens over the course of 24 hours. "The flowers are typically all white because the enzymatic pathway to produce anthocyanins is broken at an early step," explains Braun. By tinkering with the plant's genetic makeup, he has wired it to repair this pathway in the presence of ethanol. "When elements in the cell come in contact with ethanol, they will cause the missing enzyme in the anthocyanin pathway to be produced, and the flower will turn that purple color," he adds. Sprinkle the flowers with water, and they will become white again. The flowers are meant to be a cool, harmless addition to your garden, but environmental groups and others could have their concerns about releasing such synthetic organisms into the wild, as was seen when a San Francisco team

raised funds to grow [glow-in-the-dark plants](#) on Kickstarter in 2013. This previous foray into synthetic biology ignited a debate about how to regulate the spread of genetically engineered plants, when the researchers promised to distribute seeds to thousands of the project's backers. Ultimately, Kickstarter [amended](#) its [rules](#), allowing genetic projects, but not the gifting of genetically modified organisms that come from them to donors.

Braun and Havens have their own message in mind. "For almost everyone outside of the farming world, it will be the first time they will have interacted with a genetically modified organism, and by engineering traits for consumers—flower colors, shapes, smells—we hope to normalize that technology to eventually fully realize the promise of plant biotech to provide food, fuels, and fibers in a sustainable way," says Braun. The two imagine that in the future they might be able to create flowers of different colors on a single plant, flowers with polka dots and novel scents.

"It can be hard to connect to the reality of people struggling in far-away places," plant geneticist Pam Ronald told [UC Davis Today](#). "So when you tell people that genetic engineering can be used to fight hunger by increasing vitamin content and reducing crop loss to insects, sometimes it just doesn't register. Maybe seeing this technology at work in your own backyard can make the science more accessible." As a way to introduce their color-changing flowers to the world, Revolution Bioengineering is teaming up with [Helen Storey](#), a fashion professor at the University College of the Arts, London, to create "A Living Dress," incorporating their petunias, to be on display in London in the summer of 2016.

<http://nyti.ms/1JkPSEg>

Let It Snow. There's Work to Be Done.

Great news for employers: A blizzard is coming!

By MATT RICHTEL FEB. 14, 2015

When bad weather hits, workers get more productive. That's the finding of new research that marries real world and laboratory data to show that the mere prospect of frolicking in the sun — even when workers stay at their desks — interrupts focus, slows task time and leads to greater error rates.

"The greater the amount of rain, the better you are at completing a task," said Joa Julia Lee, a postdoctoral fellow at Harvard Law School who conducted the research with scholars from the business schools at Harvard and the University of North Carolina. The productivity pattern holds for snow, too.

The research, published last year in *The Journal of Applied Psychology*, drew partly from data generated over two and a half years at a midsize Japanese bank in Tokyo. The study looked at 111 workers performing various data-entry tasks,

generally menial, allowing researchers to capture the precise time it took the workers to finish a job and move to the next.

The researchers matched individuals' performance against Tokyo's weather conditions and discovered a clear connection. As precipitation rose, task time fell, such that an inch of rain correlated with a 1.3 percent increase in productivity. For each individual worker, this is not a huge effect, the researchers acknowledged, but they also said it would add up; over a year, bad weather would be a productivity boon of \$937,000 for the company and, extrapolated over the economy, hundreds of millions of dollars for Japan. (With bad weather, Dr. Lee inadvertently punned, the gains "snowball.")

To support the findings, the researchers conducted an online study involving 329 participants who were asked to spend 30 minutes finding and correcting spelling errors in a short essay. The researchers then matched performance — speed and accuracy — against each subject's local weather (as determined by ZIP code), and found that bad weather correlated with more efficiency and accuracy.

To better understand the counterintuitive findings — conventional wisdom holds that bad weather leads to depressed moods and hampers performance — the researchers conducted several additional lab experiments on a rainy day. Study subjects were shown pictures of outdoor activities, asked to imagine themselves having fun and then given data entry tasks.

Despite the bad weather outside, task performance fell for subjects who looked at pictures of fun-in-the-sun activities. This result told researchers that the mere idea of good weather led to distraction and falling productivity.

But Dr. Lee doesn't think the results mean that good weather is bad news for companies. Rather, she says, they might be able to capitalize on this research. For instance, they could offer flexible work schedules. Such a policy would allow workers to skip out in good weather rather than sit idly while distracted, but also recognize that they will most likely spend more time at the desk when skies darken.

This research seems to apply to more menial tasks rather than creative ones, Dr. Lee said. In fact, she conjectured that good weather — by creating better moods and freer-flowing thoughts — might prompt employees "to think more outside the box."

In short, the research suggests, when the weather's bad, employees should hunker down with those long-ignored expense reports. And the researchers offered a last bit of counsel:

"Holding all other factors constant," the research concludes, "locating operations in places with worse weather may be preferable."

<http://bit.ly/1EBzOxY>

Autism rates aren't actually increasing

If you were to believe newspaper reports and anecdotal evidence about autism, you probably think rates of the disorder are exploding around the world.

Updated by Julia Belluz on February 13, 2015, 4:40 p.m.

But a recent study - the most extensive review of the data on the global prevalence and incidence of autism, published in the journal *Psychological Medicine* - actually found rates have remained unchanged since 1990.

"This study drew together research findings on autism spectrum disorders conducted across the world over the past 20 years," says study lead Amanda Baxter.

Studies using different methods and sample sizes reported a range of prevalence estimates, though few actually reported an increase. When Baxter and her co-authors adjusted for differences in the study methods and synthesized the results, they found no evidence for a growth in the prevalence of autism spectrum disorders over time and little regional variation.

"In 2010 there were an estimated 52 million cases of (autism spectrum disorders) around the world, equating to a population prevalence of 7.6 per 1000 or one in 132 persons," the study authors wrote. "In 1990, age-standardized point prevalence for ASDs was 7.5 per 1000 compared with 7.6 per 1000 in 2010."

Autism spectrum disorders include autism, Asperger syndrome, and "pervasive developmental disorder, not otherwise specified" commonly known as PDD-NOS. All of these neurodevelopmental disorders impair people's ability to communicate and interact socially. Their cause is still not known. When asked about the reports on rising rates of autism disorders in the US and other countries, Baxter says those are mostly explained by an increase in awareness and diagnosis.

"Reports of higher rates of autism in recent years means that we are doing a better job of identifying people on the autism disorder spectrum, particularly those at the milder end of the spectrum, and also identifying them at an earlier age."

What's more, autism spectrum disorders - which causes social impairment and stifles people's ability to communicate - still represents significant suffering globally. "The burden of disease caused by the disorders is not only high in children but continues throughout the lifespan into adulthood," says Baxter. "In 2010, autism spectrum disorders caused 7.7 million person-years of healthy life lost, around the world."

The researchers also found a "huge gap" in the data about adults with autism.

"Only one study has been conducted on autism spectrum disorders in adults," she says. So even if rates aren't sky-rocketing, there's still a lot of room for understanding.

<http://www.bbc.com/news/health-31480234>

'Skunk-like cannabis' increases risk of psychosis, study suggests
Smoking potent cannabis was linked to 24% of new psychosis cases analysed in a study by King's College London.

The research suggests the risk of psychosis is three times higher for users of potent "skunk-like" cannabis than for non-users. The study of 780 people was carried out by KCL's Institute of Psychiatry, Psychology and Neuroscience. A Home Office spokesman said the report underlines the reasons why cannabis is illegal.

Scientists found the risk of psychosis was five times higher for those who use it every day compared with non-users. They also concluded the use of hash, a milder form of the drug, was not associated with increased risk of psychosis. Psychosis refers to delusions or hallucinations that can be present in certain psychiatric conditions such as schizophrenia and bipolar disorder.

Risk increased 'threefold'

"Compared with those who had never tried cannabis, users of high potency 'skunk-like' cannabis had a threefold increase in risk of psychosis," said Dr Marta Di Forti, lead author on the research. She added: "The results show that psychosis risk in cannabis users depends on both the frequency of use and cannabis potency."

A Home Office spokesman said the findings backed up the government's approach: "Drugs such as cannabis are illegal because scientific and medical evidence demonstrates they are harmful. "This report serves to emphasise how they can destroy lives and communities." The spokesman added "there are positive signs our drugs strategy is working", claiming "people going into treatment today are more likely to recover now than in 2010".

Skunk contains more THC than other types of cannabis, which is the main psychoactive ingredient. Unlike skunk, hashish - cannabis resin - contains substantial quantities of another chemical called cannabidiol or CBD and research suggests this can act as an antidote to the THC, counteracting psychotic side effects.

Doctors criticised

Sir Robin Murray, professor of psychiatric research at King's, commented: "This paper suggests that we could prevent almost one quarter of cases of psychosis if no-one smoked high potency cannabis.

"This could save young patients a lot of suffering and the NHS a lot of money."

The research was carried out over several years, comparing 410 patients aged 18-65 who reported a first episode of psychosis at a south London psychiatric

hospital with 370 healthy participants within the same age range from the same area of London. It will be published later this week in the Lancet Psychiatry.

The researchers argued that frequency of use and cannabis potency are "essential factors in the mental health effects on users" which are "not sufficiently considered by doctors" at present.

Dr Di Forti called for "a clear public message" to users, comparable to medical advice on alcohol and tobacco. She said that, as with alcohol, GPs should be encouraged to ask how often and what type of cannabis patients use.

Rosanna O'Connor, director of alcohol, drugs and tobacco at Public Health England, responded: "No drug use is without risk as this report demonstrates.

"Anyone having problems with drug use should seek help from their local specialist drug services. It is important to remember that treatment for all types of drug problems, including cannabis, are readily available and very effective".