

<http://bit.ly/2B8PnCF>

## Indiana University biologists create beetle with functional extra eye

*'Three-eyed' insect could help reveal self-organizing mechanism behind the evolution of new complex traits*

On "Game of Thrones," a three-eyed raven holds the secrets of the past, present and future in a vast fantasy kingdom. But for real-world biologists, a "three-eyed beetle" may offer a true glimpse into the future of studying evolutionary development.



*The creation of three-eyed beetles through a new technique developed at IU provides scientists a new way to investigate the genetic mechanisms responsible for the evolutionary emergence of new physical traits.* Eduardo Zattara

Using a simple genetic tool, IU scientists have intentionally grown a fully functional extra eye in the center of the forehead of the common beetle. Unraveling the biological mechanisms behind this occurrence could help researchers understand how evolution draws upon pre-existing developmental and genetic "building blocks" to create novel complex traits, or "old" traits in novel places.

The study's results [appear in the journal of the Proceedings of the National Academy of Sciences](#). The work also provides deeper insights into an earlier experiment that accidentally produced an extra eye as part of a study to understand how the insect head develops.

"Developmental biology is beautifully complex in part because there's no single gene for an eye, a brain, a butterfly's wing or a turtle's shell," said Armin P. Moczek, a professor in the IU Bloomington College of Arts and Sciences' Department of Biology. "Instead, thousands of individual genes and dozens of developmental processes come together to enable the formation of each of these traits.

"We've also learned that evolving a novel physical trait is much like building a novel structure out of Legos, by re-using and recombining 'old' genes and developmental processes within new contexts."

As a consequence, the evolution of novel features often requires many fewer genetic changes than biologists originally thought.

But unlike rearranging and combining toy plastic bricks to form a new structure, Moczek said it's unclear what biological mechanisms guide the construction of new physical traits under some circumstances but not others.

"You can make new things over and over or in new places using the same old set of 'bricks,'" he said. "But in Legos, we know the rules of assembly: which pieces go together and which things don't. In biology, we still struggle to understand the respective counterparts."

One of the ways that scientists have sought to get a clearer view of this process is by coaxing the growth of "ectopic" organs - or organs that form on the wrong part of the body. Early work in the field has focused on the formation of fruit fly eyes in the wrong place, such as on the wing or leg. However, these experiments required activating major regulatory genes in the new location, a technique that is limited to only a few study organisms. The resulting "eyes" were also never fully functional.

By contrast, the new IU-led study reports on the formation of an extra functional eye -- technically, a "fusion" of two sets of extra eyes -- following the knockdown of a single gene, a technique widely available to scientists in most organisms. The unexpected formation of a complex, functional eye in a novel location in the process is "a remarkable example of the ability of developmental systems to channel massive perturbations toward orderly and functional outcomes," Moczek said.

To create a fully functional eye in the center of a beetle's head, Moczek's team deactivated a single gene called orthodenticle, or odt, which their research has previously shown to play a role in instructing the formation of the head during development.

"This study experimentally disrupts the function of a single, major gene," Moczek said. "And, in response to this disruption, the remainder of head development reorganizes itself to produce a highly

complex trait in a new place: a compound eye in the middle of the head. "Moreover, the darn thing actually works!"

To confirm the eye was a true extra eye, the IU team conducted multiple tests to prove the structure had the same cell types, expressed the same genes, grew proper nerve connections and elicited the same behavioral response as a normal eye. What makes the results so exciting -- beyond the eye's Frankenstein novelty -- is the relatively simple genetic technique used to achieve the gene knockdown, said IU postdoctoral researcher Eduardo E. Zattara, who is lead author on the study.

Moczek said the findings also go beyond this application to help address fundamental questions in development, evolution and medicine. For example, understanding how complex organs organize their growth and integration into the body are central challenges medical sciences must overcome to develop artificial organs for research and transplantation.

"The use of ectopic eyes is a highly accessible paradigm to study all of this, across many types of organisms," Zattara said. "We regard this study as really opening the door to new avenues of investigation in multiple disciplines."

*Additional authors on the study are Anna L. M. Macagno, a research associate, and Hannah A. Busey, an undergraduate student, in the IU Bloomington Department of Biology. This study was supported in part by the National Science Foundation.*

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## **Parkinson's disease: A looming pandemic**

***New research shows that the number of people with Parkinson's disease will soon grow to pandemic proportions.***

In a commentary appearing today in the journal JAMA Neurology, University of Rochester Medical Center neurologist Ray Dorsey, M.D. and Bastiaan Bloem, M.D., Ph.D., with Radboud University Medical Center in the Netherlands, argue that the medical community must be mobilized to respond to this impending public health threat.

"Pandemics are usually equated with infectious diseases like Zika, influenza, and HIV," said Dorsey. "But neurological disorders are now

the leading cause of disability in the world and the fastest growing is Parkinson's disease."

The piece builds upon the Global Burden of Disease study, also co-authored by Dorsey, which appeared in The Lancet Neurology in September and showed that neurological disorders are now the leading source of disability globally. That study tracked the prevalence of neurological diseases like Parkinson's, Alzheimer's, stroke, epilepsy, meningitis, encephalitis, multiple sclerosis, and migraine, both globally and by country.

In their commentary, the authors point out that between 1990 and 2015, the prevalence of Parkinson's more than doubled and it is estimated that 6.9 million people across the globe have the disease. By 2040, researchers believe that number of people with Parkinson's will grow to 14.2 million as the population ages and the rate of growth will outpace Alzheimer's. These estimates are likely conservative due to underreporting, misdiagnosis, and increasing life expectancy.

To combat this growing pandemic, the authors argue that the medical community should pursue the same strategies that, in 15 years, transformed HIV from an unknown and fatal illness into a highly treatable chronic condition.

"People with HIV infection simply demanded better treatments and successfully rallied for both awareness and new treatments, literally chaining themselves to the doors of pharmaceutical companies," said Bloem. "Today, HIV has become a treatable, chronic disease. This upcoming increase in the number of Parkinson patients is striking and frankly worrisome. We feel it is urgent that people with Parkinson's go to the pharmaceutical industry and policymakers alike, demanding immediate action to fight this enormous threat."

The authors contend that the Parkinson's community must come together and focus its activism in support of: developing a better understanding of the environmental, genetic, and behavioral causes and risk factors for Parkinson's to help prevent its onset; increasing access to care - an estimated 40 percent of people with the disease in both the

U.S. and Europe do not see a neurologist and the number is far greater in developing nations; advocating for increases in research funding for the disease; and lowering the cost of treatments - many patients in low-income countries do not have access to drugs that are both lifesaving and improve quality of life.

"For too long the Parkinson's community has been too quiet on these issues," said Dorsey. "Building on the AIDS community's motto of 'silence=death,' the Parkinson's community should make their voices heard. The current and future burden of this debilitating disease depends upon their action."

"Too many people have Parkinson's today and more will face diagnoses tomorrow," said Todd Sherer, Ph.D., CEO of The Michael J. Fox Foundation for Parkinson's Research. "We all -- government, patient organizations, researchers, doctors and patients -- must work together for better care for those living with this disease and research toward a future without Parkinson's."

<http://bit.ly/2mQblre>

## New Blood Pressure Numbers: 130 Is Now High, Doctors Say

*Means millions more Americans will now be classified as having high blood pressure*

By Rachael Rettner, Senior Writer | November 13, 2017 05:14pm ET

ANAHEIM, Calif. - The bar for what's considered "high blood pressure" just got lowered, meaning millions more Americans will now be classified as having the condition, according to [new guidelines](#) from several leading groups of heart doctors.

The guidelines, from the American Heart Association (AHA) and the American College of Cardiology (ACC), now define high [blood pressure](#) as 130 mm Hg or higher for the systolic blood pressure measurement, or 80 mm Hg or higher for the diastolic blood pressure measurement. (Systolic is the top number, and diastolic is the bottom number, in a blood pressure reading.) Previously, high blood pressure

was defined as 140 mm Hg or higher for the systolic measurement and 90 or higher for the diastolic measurement.

The findings mean that an additional 14 percent of U.S. adults, or about 30 million people, will now be diagnosed as having high blood pressure, compared with the number diagnosed before the new guidelines. This will bring the total percentage of U.S. adults with high blood pressure to 46 percent, up from 32 percent previously.

However, the guidelines stress that, for most of the newly classified patients, the recommended treatment will be lifestyle modifications, such as weight loss and changes in diet and exercise levels, as opposed to medications. Only a small increase in the percentage of U.S. adults receiving blood pressure medications — about 2 percent — is expected, the authors said.

## Blood Pressure Categories



BLOOD PRESSURE CATEGORY	SYSTOLIC mm Hg (upper number)		DIASTOLIC mm Hg (lower number)
NORMAL	LESS THAN 120	and	LESS THAN 80
ELEVATED	120 – 129	and	LESS THAN 80
HIGH BLOOD PRESSURE (HYPERTENSION) STAGE 1	130 – 139	or	80 – 89
HIGH BLOOD PRESSURE (HYPERTENSION) STAGE 2	140 OR HIGHER	or	90 OR HIGHER
HYPERTENSIVE CRISIS (consult your doctor immediately)	HIGHER THAN 180	and/or	HIGHER THAN 120

*A chart summarizing new guidelines on the definition of high blood pressure.*  
American Heart Association

### Lower is better

"There is a growing body of evidence that lower blood pressure is better for your health," Dr. Steven Houser, the immediate past president of the American Heart Association, said here today (Nov. 13) at a news conference announcing the new guidelines.

The guidelines "[reflect] this new information and should help people prevent, diagnose and treat high blood pressure sooner," Houser said. "We saw the needs to update these guidelines to reflect the real threats of [high blood pressure](#)."

The new guidelines are based on a rigorous review of nearly 1,000 studies on the subject, which took the authors three years to complete. The new guidelines now classify people's blood pressure measurements into the following categories:

- **Normal:** *Less than 120 mm Hg for systolic and 80 mm Hg for diastolic.*
- **Elevated:** *Between 120-129 for systolic, and less than 80 for diastolic.*
- **Stage 1 hypertension:** *Between 130-139 for systolic or between 80-89 for diastolic.*
- **Stage 2 hypertension:** *At least 140 for systolic or at least 90 mm Hg for diastolic.*

(The new guidelines eliminate an older category of "prehypertension," which was used for people with systolic blood pressure between 120-139 mm Hg or diastolic blood pressure between 80-89 mm Hg.)

The findings touch on an issue that has been under debate in the medical community: Exactly how [low should patients aim to go](#) when reducing blood pressure levels. Several recent studies suggest that lower blood pressure targets — even lower than previously recognized — had substantial health benefits for patients.

For example, a 2015 study known as the SPRINT trial found that patients who lowered their systolic blood pressure to around 120 mm Hg were 27 percent less likely to die during the study period, compared with those whose treatment target was to lower their blood pressure to less than 140 mm Hg. (The SPRINT study [made headlines in 2015](#) when the trial was abruptly cut short because the findings were so significant.)

Researchers also now know that people with a blood pressure between 130-139/80-89 mm Hg have double the risk of cardiovascular complications, compared with those with normal blood pressure, said Dr. Paul Whelton, a professor of global public health at Tulane University and lead author of the guidelines.

"We want to be straight with people — if you already have a doubling of risk, you need to know about it," Whelton [said in a statement](#). "It doesn't mean you need medication, but it's a yellow light that you need to be lowering your blood pressure."

### **Treating hypertension**

The new guidelines recommend that doctors only prescribe blood pressure medication for patients with stage I hypertension if they have already had a [cardiovascular "event"](#) such as a heart attack or stroke; or if they are at high risk for a [heart attack](#) or stroke based on other factors, such as the presence of diabetes, the authors said.

People with stage 1 hypertension who don't meet these criteria should be treated with lifestyle modifications. These include: starting the "DASH" diet, which is high in fruit, vegetables and fiber and low in saturated fat and [sodium](#) (less than 1,500 mg per day); exercising for at least 30 minutes a day, three times a week; and restricting alcohol intake to less than two drinks a day for men and one drink a day for women, said vice chairman of the new guidelines, Dr. Robert Carey, a professor of medicine and dean emeritus at the University of Virginia Health System School of Medicine.

Carey hopes the new guidelines will "cause our society and our physician community to pay attention much more to lifestyle recommendations." Stage 2 hypertension should be treated with a combination of [lifestyle modifications](#) and blood pressure medications. Some people may ask why doctors are lowering the threshold for high blood pressure, when it was already difficult for many patients to achieve the previous blood pressure targets of below 140 mm Hg/90 mm Hg, said Dr. Pamela B. Morris, a preventive cardiologist and chairwoman of the ACC's Prevention of Cardiovascular Disease Leadership Council. However, Morris said that the guidelines were changed because "we now have more precise estimates of the risk of [high] blood pressures," and these new guidelines really communicate that risk to patients. So, just because it's going to be difficult for people to achieve, "I don't think it's a reason not to communicate the

risk to patients, and to empower them to make appropriate lifestyle modifications," Morris told Live Science.

Dr. Rachel Bond, associate director of the Women's Heart Health Program at Lenox Hill Hospital in New York City, who was not involved with the guidelines, said she agreed with the new updates. "I believe this will allow for [earlier detection \[of high blood pressure\]](#), and allow for more lifestyle modification to prevent the long-term detrimental effects of untreated high blood pressure," Bond said.

The guidelines also say that a patient's blood pressure levels should be based on an average of two to three readings on at least two different occasions. It's also reasonable for doctors to screen for "white-coat hypertension," which occurs when blood pressure is elevated in a medical setting but not in everyday life, the authors said. This can be done by having patients [measure their blood pressure at home](#).

Bond said she also agreed with these guidelines, and noted that she has worked to educate her medical staff on the proper methods for obtaining blood pressure "rather than hastily checking a number which has a huge impact on our patients' medical care."

Dr. Ragavendra Baliga, a professor of internal medicine at The Ohio State University Wexner Medical Center, called the new guidelines a "tour-de-force."

"Given there is more up-to-date data on the impact and significance of hypertension...this ACC/AHA guideline is timely and comprehensive," said Baliga, who was not involved with the guidelines. Baliga added that he thought the new targets should be achievable with a combination of lifestyle modifications and medications.

<http://bit.ly/2jIXy4H>

### **Exercise increases brain size, new research finds**

***Aerobic exercise can improve memory function and maintain brain health as we age, a new Australian-led study has found.***

AUSTRALIA, Sydney - In a first of its kind international collaboration, researchers from Australia's National Institute of Complementary

Medicine at Western Sydney University and the Division of Psychology and Mental Health at the University of Manchester in the UK examined the effects of aerobic exercise on a region of the brain called the hippocampus, which is critical for memory and other brain functions.

Brain health decreases with age, with the average brain shrinking by approximately five per cent per decade after the age of 40.

Studies in mice and rats have consistently shown that physical exercise increases the size of the hippocampus but until now evidence in humans has been inconsistent.

The researchers systematically reviewed 14 clinical trials which examined the brain scans of 737 people before and after aerobic exercise programs or in control conditions.

The participants included a mix of healthy adults, people with mild cognitive impairment such as Alzheimer's and people with a clinical diagnosis of mental illness including depression and schizophrenia. Ages ranged from 24 to 76 years with an average age of 66.

The researchers examined effects of aerobic exercise, including stationary cycling, walking, and treadmill running. The length of the interventions ranged from three to 24 months with a range of 2-5 sessions per week.

Overall, the results - published in the journal *NeuroImage* - showed that, while exercise had no effect on total hippocampal volume, it did significantly increase the size of the left region of the hippocampus in humans.

Lead author, NICM postdoctoral research fellow, Joseph Firth said the study provides some of the most definitive evidence to date on the benefits of exercise for brain health.

"When you exercise you produce a chemical called brain-derived neurotrophic factor (BDNF), which may help to prevent age-related decline by reducing the deterioration of the brain," Mr Firth said.

"Our data showed that, rather than actually increasing the size of the hippocampus per se, the main 'brain benefits' are due to aerobic

exercise slowing down the deterioration in brain size. In other words, exercise can be seen as a maintenance program for the brain."

Mr Firth said along with improving regular 'healthy' ageing, the results have implications for the prevention of ageing-related neurodegenerative disorders such as Alzheimer's and dementia - however further research is needed to establish this.

Interestingly, physical exercise is one of the very few 'proven' methods for maintaining brain size and functioning into older age.

The paper, "Effects of aerobic exercise on hippocampal volume in humans: a systematic review and meta-analysis" is available online at

<http://www.sciencedirect.com/science/article/pii/S1053811917309138>.

<http://bit.ly/2AZJdEi>

## **Just 1 Cup of Coffee a Week May Lower Risk of Stroke & Heart Failure**

***Drinking as little as one cup of coffee a week may lower your risk of stroke and heart failure, a new study suggests.***

**By Rachael Rettner, Senior Writer | November 13, 2017 01:37pm ET**

The researchers analyzed information from 2,750 people who participated in the long-running Framingham Heart Study, who were followed for up to 34 years. The study tracked what participants ate as well as their cardiovascular health.

The researchers found that, over the course of the ongoing study, every cup of coffee a person drank per week was linked with a 7 percent decrease in the risk of stroke, and an 8 percent decrease in the risk of heart failure, compared with people who didn't drink coffee. (Heart failure means the heart muscle can't pump enough blood to meet the body's normal demands.)

The study was presented today (Nov. 13) at the American Heart Association's Scientific Sessions meeting in Anaheim, California.

Several previous studies have suggested that drinking coffee, up to a certain amount, may lower the risk of heart disease, including heart failure.

But in contrast to previous work, the researchers in the new study didn't specifically start out with the hypothesis that coffee lowers the

risk of heart failure and stroke. Instead, they used machine-learning techniques to identify patterns within a large data set. In this case, they looked for factors that predicted stroke and heart failure risk. Their analysis identified a number of well-known risk factors for heart failure and stroke, including age, blood pressure and cholesterol levels. But coffee consumption also showed up as a significant predictor of stroke and heart failure.

The researchers say the methods used in this study could help identify other, yet-unknown risk factors for heart failure and stroke.

"Machine learning may be a useful addition to the way we look at data, and help us find new ways to lower the risk of heart failure and strokes," Dr. David Kao, senior author of the study and an assistant professor at the University of Colorado School of Medicine in Aurora, Colorado, said in a statement.

The researchers also built a computer model to predict a person's risk of heart failure and stroke based on traditional risk factors, including blood pressure and age. When they included coffee consumption in the model, the prediction accuracy increased by 4 percent, the researchers said.

Still, the researchers noted that their study only found an association, and cannot prove a "cause and effect" relationship between coffee consumption and a lower risk of stroke and heart failure. The study also did not determine whether there is a limit to the amount of coffee consumed that's linked with a beneficial effect.

<http://bit.ly/2ztOyHJ>

## **Vegan diet as lifestyle choice and the need for risk communication**

***Findings of a BfR research project published on attitudes of vegans***

"Deficiencies in nutrients like vitamin B12 or iron are possible in those who completely refrain from eating foods of animal origin, particularly in the case of pregnant women and children", says BfR President Professor Dr. Dr. Andreas Hensel. "If we want information

on potential risks to reach the target group, then it's essential that we know about their attitudes."

The BfR is now publishing the findings of a research project on the individual and social influencing factors that motivate people to take up and maintain a vegan diet (in German). One of the things that became clear in the project was that effective risk communication needs to pick up on the existing convictions of vegans. The aim is to provide concrete tips for everyday life which can be combined with a vegan diet.

A growing percentage of the population is deciding to take up a vegan diet, but it is not yet absolutely clear from a scientific point of view what advantages and disadvantages are associated with such a decision. Some studies show that a vegan diet can positively impact health - by lowering cholesterol levels, for example, or reducing the risk of type 2 diabetes. At the same time, a purely vegan diet can result in potential health risks, because a plant-based diet makes it more difficult to ensure an adequate supply of some specific nutrients. Alongside vitamin B12, there are, for example, several minerals, certain amino acids and long-chain omega-3 fatty acids that are seen as potentially critical nutrients. This applies in particular to especially vulnerable groups of the population such as pregnant women and children. In 2016, the German Nutrition Society (DGE) adopted a stance on a vegan diet based on the latest scientific literature, and came to the conclusion that "the DGE does not recommend a vegan diet for pregnant or nursing women, infants, children and adolescents". The BfR decided to focus on this topic in order to develop suitable risk communication strategies. A research project was conducted in which a total of 42 vegans were asked about their attitudes in focus group interviews. In view of the sometimes very pronounced differences compared to the average population, the findings allow generalised statements.

According to the survey, vegans have above-average educational backgrounds and a sound knowledge of nutrition. 40 of the 42

respondents are aware, for example, that a vegan diet can result in a deficiency of vitamin B12. Most respondents therefore said that they regularly supplement this vitamin. There is, however, also a need for information. Knowledge regarding sources of iron in foods is fragmentary, for example. Nevertheless, the majority of respondents have an awareness of the risks of this special form of diet. The Internet is cited as the most important source of information for people interested in a vegan diet.

The survey highlighted the uniformity of attitudes. The decision in favour of a vegan diet is generally driven by ethical concerns, for example, and mostly also implies doing without animal products in other areas, such as clothing. The overwhelming majority of respondents could not imagine returning to an omnivorous diet permitting animal products, and neither is a pregnancy cited to any great extent as a potential reason for doing so.

It became apparent during the course of the study that portraying a vegan diet as dangerous or abnormal does hardly reach the target group. An effective risk communication strategy should rather attempt to pick up on existing convictions. This could include concrete guidelines which vegans can integrate with their nutritional preferences.

<http://bit.ly/2jTMEJu>

### **Quick! What's that smell? Mammal brains identify type of scent faster than once thought**

*It takes less than one-tenth of a second -- a fraction of the time previously thought -- for the sense of smell to distinguish between one odor and another, new experiments in mice show.*

In a study to be published in the journal Nature Communications online Nov. 14, researchers at NYU School of Medicine found that odorants -- chemical particles that trigger the sense of smell -- need only reach a few signaling proteins on the inside lining of the nose for the mice to identify a familiar aroma. Just as significantly, researchers say they also found that the animals' ability to tell odors apart was the

same no matter how strong the scent (regardless of odorant concentration).

"Our study lays the groundwork for a new theory about how mammals, including humans, smell: one that is more streamlined than previously thought," says senior study investigator and neurobiologist Dmitry Rinberg, PhD. His team is planning further animal experiments to look for patterns of brain cell activation linked to smell detection and interpretation that could also apply to people.

"Much like human brains only need a few musical notes to name a particular song once a memory of it is formed, our findings demonstrate that a mouse's sense of smell needs only a few nerve signals to determine the kind of scent," says Rinberg, an associate professor at NYU Langone Health and its Neuroscience Institute.

When an odorant initially docks into its olfactory receptor protein on a nerve cell in the nose, the cell sends a signal to the part of the brain that assigns the odor, identifying the smell, says Rinberg.

Key among his team's latest findings was that mice recognize a scent right after activation of the first few olfactory brain receptors, and typically within the first 100 milliseconds of inhaling any odorant.

Previous research in animals had shown that it takes as long as 600 milliseconds for almost all olfactory brain receptors involved in their sense of smell to become fully activated, says Rinberg. However, earlier experiments in mice, which inhale through the nose faster than humans and have a faster sense of smell, showed that the number of activated receptors in their brains peaks after approximately 300 milliseconds.

Earlier scientific investigations had also shown that highly concentrated scents activated more receptors. But Rinberg says that until his team's latest experiments, researchers had not yet outlined the role of concentration in the odor identification process.

For the new study, mice were trained to lick a straw to get a water reward based on whether they smelled orange- or pine-like scents.

Using light-activated fibers inserted into the mouse nose, researchers could turn on individual brain receptors or groups of receptors involved in olfaction to control and track how many receptors were available to smell at any time. The optical technique was developed at NYU Langone.

The team then tested how well the mice performed on water rewards when challenged by different concentrations of each smell, and with more or fewer receptors available for activation. Early activation of too many receptors, the researchers found, impaired odor identification, increasing the number of errors made by trained mice in getting their reward.

Researchers found that early interruptions in sensing smell, less than 50 milliseconds from inhalation, reduced odor identification scores nearly to chance. By contrast, reward scores greatly improved when the mouse sense of smell was interrupted at any point after 50 milliseconds, but these gains fell off after 100 milliseconds.

*Funding support for the study was provided by National Institutes of Health grants R01 DC013797 and R01 DC014366, and a grant from the Whitehall Foundation.*

*Besides Rinberg, other NYU researchers involved in this study are lead study investigator Christopher Wilson, PhD; and Gabriela Serrano, BS. Additional research support was provided by Alexei Koulakov, PhD, at Cold Spring Harbor Laboratory in Cold Spring, NY.*

<http://bit.ly/2zuCBS9>

## **Sex unlikely to stop your heart—but if it does, your partner may let you die**

***Only a third of amorous cardiac arrest patients got potentially life-saving help.***

**[Beth Mole](#) - 11/14/2017, 3:24 AM**

Your next romp with a paramour may blow your mind, but it's [unlikely to stop your heart](#), according to research presented this weekend at the American Heart Association's Scientific Sessions 2017 in Anaheim, California.

That's the good news. The bad news is that if you do suffer cardiac arrest from an amorous encounter, there's a decent chance your partner will just let you croak.



In an analysis of 4,557 adult cases of cardiac arrest in a Northwestern US community between 2002 and 2015, only 34 of them occurred during or within an hour of sexual intercourse. Of those, 32 were in men. That means that sex is linked to only about one in a hundred cases of cardiac arrest in men. For women, the rate is around one in a thousand.

Only a third of those suffering from cardiac arrest from sex received potentially life-saving CPR—despite the likelihood that a partner was around to witness the arrest. That's lower than the overall rate of CPR for those who suffer cardiac arrest out of a hospital, which is 46 percent. And that overall stat includes many cases where no bystanders are around during an arrest to give CPR.

The study, led by Dr. Aapo Aro, of Cedars-Sinai Heart Institute in Los Angeles, may put some minds at ease about the risks of sex. But it again highlights the need to educate the public about the importance of CPR for sudden cardiac arrest—which is when an electrical glitch in the heart causes it to stop beating. (This is opposed to a heart attack, which is when the heart keeps beating but a blockage prevents blood flow and the heart tissue is deprived of oxygen. That said, heart attacks can lead to cardiac arrest.)

### Heart breakers

CPR, or cardiopulmonary resuscitation, is vital during a cardiac arrest. It provides ventilation and chest compressions (~100-120 per minute) that can partially restore the flow of oxygenated blood to the body and brain while the heart has stopped. Though nearly 90 percent of those suffering cardiac arrest out of a hospital die, CPR can double or triple a person's chance of surviving, [according the American Heart Association](#).

In August, researchers in France [also reported that cardiac arrests from sexual intercourse appeared to be rare](#)—but when it did happen, people were unlikely to get CPR. In that study, researchers looked at 3,028 cases of sudden cardiac arrest where the patient arrived at a hospital alive. Of those, only 17 cases were linked to sexual

intercourse and 229 linked to non-sexual activity, including playing sports or doing moderate exercise.

Of the cardiac patients playing sports or exercising at the time of their arrest, nearly all (95 percent) were in the presence of bystanders at the time and 80 percent received CPR from bystanders before getting to the hospital. For those doing more horizontal activities, 100 percent were in the presence of a bystander at the time of their arrest, but only 47 percent received bystander CPR. As such, 50 percent of the physically active patients survived, while only about 12 percent of the sexually active patients made it.

Together, researchers suggest that CPR training is clearly warranted, but the worry that friskiness can halt a heart is not.

The new study also falls in line with previous research on sex and heart attacks. In [a 2011 meta-analysis in JAMA, Tufts University researchers](#) found that an hour of love-making a week raised absolute risk of a heart attack only a teeny amount—between two to three per 100,000 person years. And being physically fit could cut those risks even lower.

<http://bit.ly/2A4ZIQd>

### From southeast Asia to the sewers: Study determines new geographical origins of brown rats

*When it comes to rats, even scientists can get caught up in the blame game. For you see, in the case of the most common, the brown rat, its species name (*Rattus norvegicus*) is really a misnomer.*

No one knows why this became the accepted nomenclature, though perhaps, English naturalists first wanted to pin it on the Norwegians---even though there was no evidence they ever came from Norway.

It may have been for a good reason to avoid blame for the spread of rats, since the brown rat has long been a reservoir for zoonotic diseases like Hantavirus (though it was their genetic cousins, black rats (*Rattus rattus*), that caused the plague). Now, an international research team of more than 20 institutions has performed the largest,

whole genome DNA sequencing of 110 wild brown rats from across the world.

The new study, [published in the advanced online edition of the journal \*Molecular Biology and Evolution\*](#), has revealed that brown rats originally migrated "Out of Asia" from southern East Asia about 3,600 years ago, rapidly spreading, first into the Middle East, and then to Europe and Africa.

***A new study, published in the advanced online edition of the journal *Molecular Biology and Evolution*, has revealed that brown rats originally migrated 'Out of Asia' from southern East Asia about 3,600 years ago, rapidly spreading, first into the Middle East, and then to Europe and Africa. Kunming Institute of Zoology***

"We provided evidence for an out of southern East Asia origin for the brown rat and its subsequent dispersals to the Middle East, Europe and Africa thousands of years ago," said the team leader Ya-Ping Zhang, of the Kunming Institute of Zoology in China. "Along with the migration, we have also identified many genes involved in the immune response that have adaptively evolved under natural selection in the wild rats."

Using a suite of genetic analysis methods, the research team constructed a rat evolutionary tree using almost 25 million individual DNA variants, or autosomal single nucleotide polymorphisms (SNPs), that were identified in their genome dataset.

From the data, they found that brown rats from outside Asia clearly exhibited closer genetic relationships with rats from southern East



Asia (including Southeast Asia and southern China), than to those from Northern Asia (including northern China and Russia).

"This was further confirmed by a haplotype sharing analysis, where the "Out-of-Asia" rats showed more proximity to southern China rats than those from northern China," said co-author Hai-peng Li.

They could also more precisely pin down the statistical estimates of the timing of brown rat migrations. Their detailed analysis indicated that brown rats migrated from southern East Asia to northern Asia about 200,000 years ago.

From there, they made one wave of migration north, then another wave to the west. Brown rats spread from South East Asia to the Middle East about 3600 years ago to Africa ~2600 years ago and to Europe ~1800 years ago.

The estimated introduction times of brown rats to Europe are much older than historical reports that propose migrations in the 18th century, and the origins of the Norway rat name. The authors speculate that ancient maritime trade routes and human migrations may have been responsible for the spread of rats across the globe.

"Maritime trade has been in existence in the Indian Ocean and southern East Asia region for over 4,000 years. These early human activities could have facilitated the migration and dispersal of brown rat from southern Asia to other regions. Such kind of human-assisted migration was often proposed for rodents," said another co-author Dong-Dong Wu.

Next, from their comparison between different geographical populations, the team revealed many genes involved in the immune system also experienced positive selection in the wild brown rat.

"During dispersal, wild rats have transmitted and spread devastating diseases to human populations," said Dong-Dong Wu. "This property of rats, allowing them to host many pathogens, has long remained a puzzle. An "arms-race" that drives the rapid evolution of the immune system in a host might have endowed rats with this potential."

The top two clusters with the highest level of differences between Chinese and European rats were across immune genes *Mgat5* and *Lyst*. The gene *Mgat5* is thought to be involved in T-cell proliferation, while mutations in the *Lyst* gene causes the Chediak-Higashi Syndrome in humans, a genetic immunodeficiency disease where T-cell and natural killer cell cytotoxicity become defective.

Next, they hope to follow up their computer data and validate the immune system genomic hot spots with additional experiments.

These immune system adaptations may also help explain why, next to humans, rats have become the most successful mammals on Earth, inhabiting every nook and cranny - and every continent - except Antarctica. For wherever people go, rats will surely follow.

And now with the new study, perhaps, a species name change will finally be in order too.

<http://bit.ly/2zYs7tw>

## **Study of Amish suggests mutation linked to longer life span**

### ***A null mutation in SERPINE1 protects against biological aging in humans***

A particular mutation identified among Old Order Amish in Indiana is associated with a longer life span, improved metabolism and a lower occurrence of diabetes, according to a new study. The findings demonstrate the utility of studying mutations in populations with geographic and genetic isolation, and shed light on a novel therapeutic target for aging. Aging remains one of the most challenging biologic processes for scientists to unravel, due in part to the many interrelated molecular and cellular changes it brings.

One indicator of aging is the shortening of telomeres, caps at the end of strands of DNA that protect a person's chromosomes. Progressive shortening of telomeres leads to senescence, or biological aging.

Senescent cells and tissues exhibit a distinctive pattern of protein expression, including increased production of plasminogen activator inhibitor-1 (PAI-1).

To further examine the role of PAI-1 in human longevity, Sadiya Khan and colleagues studied 177 members of the Berne Amish community. Forty-three of these men and women carried a nonfunctional copy of the gene *SERPINE1*, which encodes PAI-1.

Carriers of this *SERPINE1* mutation lived an average of 10 years longer than other individuals in the community. What's more, they had a 10% longer average white blood cell telomere length, after adjusting for age, sex, and familial relatedness compared with noncarriers.

The authors say future studies will be needed to investigate the contribution of PAI-1 to individual telomere shortening over time, the development of incident diabetes, and other age-related diseases, and perhaps ultimately differences in health and lifespan in humans.

<http://bit.ly/2jQMxOA>

## **How long should you let a pregnancy run before being induced?**

*If your pregnancy runs past its due date, how long should you wait before being induced?*

By Clare Wilson

Evidence is building that, at least for older women, it's safer to get the baby out on time, at 40 weeks.

This seems to be the case for first-time mums, according to a review of 80,000 women in England. [Gordon Smith](#) of the University of Cambridge and his colleagues found that when women aged 35 or older are induced at 40 weeks, only 0.08 per cent of their babies died. But in women who waited until they gave birth naturally, or who were induced at 41 to 42 weeks, this rose to 0.26 per cent.

This means that, for every 562 women who were induced at 40 weeks, one stillbirth was avoided.

### **Failing placenta**

After a certain point, the longer a pregnancy continues, the more likely it is that a baby will die unexpectedly in the womb – probably because it gets too big to be supported by a deteriorating placenta. By 40 weeks, the placenta is beginning to fail, says Smith.

Birth can be triggered with medicines that open the cervix and bring on contractions, but this tends to make labour longer and more painful. Induction is currently recommended in the UK if a woman has gone overdue by one to two weeks, regardless of her age.

The team found that earlier inductions tended to have a slightly higher rate of emergency Caesarean sections and the use of instruments like forceps. But this could have been because women with complications were more likely to be induced early, says Smith.

Last year a randomised trial found inducing over-35s even earlier, at 39 to 40 weeks, made [no difference to the rate of C-sections or instrumental deliveries](#).

### **Making a choice**

Smith says women should be told about the pros and cons of induction and offered a choice. "The absolute risk [of waiting] is small. For some women it's acceptable in the context of prioritising a natural approach. For others it's unacceptable."

Women are tending to have children later in life in the UK, says [Hannah Knight](#) of the London School of Hygiene and Tropical Medicine, who also worked on the study. About one in seven first-time mothers were 35 or older in England and Wales in 2015.

Smith says younger women might also consider an earlier induction based on these findings. "It's self-evident that if you deliver the baby at 40 weeks, it cannot be stillborn at 41 weeks."

*Journal reference: Plos Medicine, DOI: 10.1371/journal.pmed.1002425*

<http://bit.ly/2zuf1hw>

## **Chimp study reveals how brain's structure shaped our evolution**

***Chimpanzee brains may be more different from those of humans than was previously thought, according to new research that sheds light on our evolution.***

The pattern of asymmetry in human brains could be a unique feature of our species and may hold the key to explaining how we first developed language ability, experts say.

Findings are based on brain scans of humans and previously collected data from chimpanzees.

They could help scientists understand how our brains evolved and why asymmetry is vital to human development.

The study explores the phenomenon of brain torque, in which the human brain shows slight twisting. Until now, this was also thought to be true of other primates.

Researchers led by the University of Edinburgh studied images from an existing bank of chimpanzee brain scans held in the US.

Comparisons were made with the brains of humans who were scanned using similar equipment - known as magnetic resonance imaging (MRI) - and identical experimental procedures.

Chimpanzee brains were shown to be made up of equal halves, or hemispheres, whereas in human brains a subtle twist was present.

Asymmetry was seen in humans - but not chimpanzees - with the left hemisphere longer than the right.

Language ability has been linked to areas within the left hemisphere of the brain and has also been associated with asymmetry.

The research sheds light on how humans developed skills for language, researchers suggest. A new study of particular brain areas related to language using the same image bank could aid understanding of this.

Neil Roberts, Professor of Medical Physics and Imaging Science at the University of Edinburgh, said: "Our findings highlight a special, subtle feature of the human brain that distinguishes us from our closest primate cousins and may have evolved rapidly. Better understanding of how this came about in our evolution could help explain how humans developed language."

The study was published in the journal *NeuroImage*. It was carried out in collaboration with researchers at the University of Oxford, as well as in China and the US.

<http://bit.ly/2zsI4bN>

## **Astronomers find an Earth-size world just 11 light years away**

***Fewer stellar flares coming from the planet's star is a good thing for habitability.***

**Eric Berger - 11/15/2017, 11:15 PM**

Astronomers have discovered a planet 35 percent more massive than Earth in orbit around a red dwarf star just 11 light years from the Sun. The planet, Ross 128 b, likely exists at the edge of the small, relatively faint star's habitable zone even though it is 20 times closer to its star than the Earth is to the Sun. The study in the journal *Astronomy & Astrophysics* finds the best estimate for its surface temperature is between -60 degrees Celsius and 20 degrees Celsius.

This is not the closest Earth-size world that could potentially harbor liquid water on its surface—that title is held by Proxima Centauri b, which is less than 4.3 light years away from Earth and located in the star system closest to the Sun. Even so, due to a variety of factors, Ross 128 b is tied for fourth on a list of potentially most habitable exoplanets, with an Earth Similarity Index value of 0.86.

In the new research, astronomers discuss another reason to believe that life might be more likely to exist on Ross 128 b. That's because its parent star, Ross 128, is a relatively quiet red dwarf star, producing fewer stellar flares than most other, similar-sized stars such as Proxima Centauri. Such flares may well sterilize any life that might develop on such a world.

### Further Reading

Nearby system has 7 Earth-sized planets, several in the habitable zone. Ultimately, the question of habitability on these worlds will have to wait for more powerful telescopes to come online. For worlds that transit in front of their star, such as the promising exoplanet TRAPPIST-1 d, the James Webb Space Telescope should have the capability to characterize the composition of their atmospheres with just a few hours of observation.

For other worlds that don't make such a transit, such as Ross 128 b, other methods will have to be employed. The next generation of large ground-based telescopes, including the European Extremely Large Telescope, should be able to resolve features such as oxygen in the atmosphere of these nearby exoplanets. And if one of them has oxygen, our confidence that life is probably there will increase dramatically.

<http://bit.ly/2A0ITrJ>

## **Tapeworm drug fights prostate cancer**

***A Norwegian study shows that medicine against parasites like tapeworms and giardia, contains a substance that kills prostate- and colon cancer.***

Cancer researchers at the University of Bergen (UiB) in Norway have in the recent years experienced with hundreds of known drugs, to see how they influence cancer cells.

Recently they found that a substance in medicine against parasites like Giardia and Tapeworms, acts like tailored medicine against prostate- and colon cancer.

"We discovered that this specific substance is blocking the signalling pathway in the cancer cells, and make them stop growing. It is not often that researchers discover a substance that targets specific molecules as precisely as this one, " says Professor Karl-Henning Kalland at the Department of Clinical Science, at UiB. He is the leader of the research group.

### **Hyperactive cells**

The researchers at Kalland team saw that the cells in prostate- and colon cancer contain high amounts of activated Beta-catenin. Activation of this protein makes the cells go amok and divides at high tempo. In addition, Beta-catenin makes the cancer cells more resistant and more able for survival.

In the study, the researchers discovered that it was the substance NTZ (nitazoxanide), a well known and approved anti-parasite drug, that decompose the activated Beta-catenin.

"We are the first researchers who have mapped the complex molecular mechanisms involved in this process," Kalland says.

### **Recycling old medicines**

Experiments with well-known drugs show that a medicine may have different and unknown targets in the cells.

"The advantage of testing already approved drugs, is that we know they work in the human body and have no serious side effects, which means that a future treatment may happen quicker," Kalland explains.

### **Strengthen the immune system**

NTZ attacks cancer cells by hindering the activated Beta-catenin. It appears that this hindering also stimulates central parts of the immune system, that attacks cancer cells.

"At the moment, we are working on how to strengthen our on going immune therapy against prostate cancer by using the mechanisms we discovered of the NTZ," Kalland says.

Kalland and his research-team is in the first phase in a clinical trial using immune therapy against prostate cancer (cryoIT).

<http://bit.ly/2BeNTXC>

## **Kevlar-based artificial cartilage mimics the magic of the real thing**

### ***Synthetic materials couldn't match cartilage -- until "Kevlartilage"***

ANN ARBOR--The unparalleled liquid strength of cartilage, which is about 80 percent water, withstands some of the toughest forces on our bodies.

Synthetic materials couldn't match it -- until "Kevlartilage" was developed by researchers at the University of Michigan and Jiangnan University.

"We know that we consist mostly of water -- all life does -- and yet our bodies have a lot of structural stability," said Nicholas Kotov, the Joseph B. and Florence V. Cejka Professor of Engineering at U-M, who led the study. "Understanding cartilage is understanding how life forms can combine properties that are sometimes unthinkable together."

Many people with joint injuries would benefit from a good replacement for cartilage, such as the 850,000 patients in the U.S. who undergo surgeries removing or replacing cartilage in the knee.

While other varieties of synthetic cartilage are already undergoing clinical trials, these materials fall into two camps that choose between cartilage attributes, unable to achieve that unlikely combination of strength and water content.

The other synthetic materials that mimic the physical properties of cartilage don't contain enough water to transport the nutrients that cells need to thrive, Kotov said.

Meanwhile, hydrogels -- which incorporate water into a network of long, flexible molecules -- can be designed with enough water to support the growth of the chondrocytes cells that build up natural cartilage. Yet those hydrogels aren't especially strong. They tear under strains a fraction of what cartilage can handle.

The new Kevlar-based hydrogel recreates the magic of cartilage by combining a network of tough nanofibers from Kevlar--the "aramid" fibers best known for making bulletproof vests--with a material commonly used in hydrogel cartilage replacements, called polyvinyl alcohol, or PVA.

In natural cartilage, the network of proteins and other biomolecules gets its strength by resisting the flow of water among its chambers. The pressure from the water reconfigures the network, enabling it to deform without breaking. Water is released in the process, and the network recovers by absorbing water later.

This mechanism enables high impact joints, such as knees, to stand up to punishing forces. Running repeatedly pounds the cartilage between the bones, forcing water out and making the cartilage more pliable as a result. Then, when the runner rests, the cartilage absorbs water so that it provides strong resistance to compression again.

The synthetic cartilage boasts the same mechanism, releasing water under stress and later recovering by absorbing water like a sponge. The aramid nanofibers build the framework of the material, while the

PVA traps water inside the network when the material is exposed to stretching or compression. Even versions of the material that were 92 percent water were comparable in strength to cartilage, with the 70-percent version achieving the resilience of rubber.

As the aramid nanofibers and PVA don't harm adjacent cells, Kotov anticipates that this synthetic cartilage may be a suitable implant for some situations, such as the deeper parts of the knee. He also wonders whether chondrocytes might be able to take up residence inside the synthetic network to produce a hybrid cartilage.

But his potential applications are not limited to cartilage. He suspects that similar networks, with different proportions of aramid nanofibers, PVA and water, may be able to stand in for other soft tissues.

"We have a lot of membranes in the body that require the same properties. I would like to evaluate the space," Kotov said. "I will talk to doctors about where the acute need is and where this intersection of the properties will allow us to make best headway and biggest impact."

Kotov is a member of the Biointerfaces Institute, which provides shared space for researchers from U-M's engineering and medical schools. He is also a professor of chemical engineering, materials science and engineering, and macromolecular science and engineering. The study, recently published in *Advanced Materials*, is titled "Water-rich biomimetic composites with abiotic self-organizing nanofiber network." It was supported by the National Science Foundation, with additional funding from the Department of Defense. The university is seeking patent protection and partners to bring the technology to market.

<http://bit.ly/2hXIMHY>

### **Study raises possibility of naturally acquired immunity against Zika virus**

***Virus-fighting antibodies in mothers pass protection to unborn fetus***

CINCINNATI - Birth defects in babies born infected with Zika virus remain a major health concern. Now, scientists suggest the possibility

that some women in high-risk Zika regions may already be protected and not know it.

New research in *PLOS Pathogens* on Nov. 16, performed in mice, shows women who develop symptom-free Zika infections may be able to acquire immunity that would protect them from future infections and their offspring in a future pregnancy. The study was led by investigators at the Cincinnati Children's Perinatal Institute.

During their study of Zika infection in pregnant mice, the authors found built-up immunity in previously infected mothers that continued into pregnancy and protected fetal tissues. Because the mothers had already cleared their non-symptomatic Zika infections, they developed high levels of protective immunoglobulin antibodies against the virus that researchers found in the animals.

Detection of these protective antibodies points to the possibility of developing diagnostic tests to identify naturally immune women and distinguish them from women at high risk of infection, according to researchers.

"We need more research to investigate the levels of antibodies generated when humans get infected, and how they work in women during pregnancy. But this opens up the possibility that some individuals likely have acquired natural resistance to infection," said Sing Sing Way, MD, PhD, lead author and a pediatrician in the Division of Infectious Diseases. "There are promising efforts underway to develop a vaccine against Zika, but currently there isn't one. These results suggest in lieu of a vaccine, Zika-fighting antibodies could be used therapeutically to help protect high-risk women."

The ability to identify high-risk women would help develop focused therapeutic strategies for prevention, researchers say. They also suggest their findings point to the possibility of combining protective antibodies with an eventual vaccine, which could synergistically provide more a robust level of protection against Zika.

Way and his colleagues, including co-first authors Lucien Turner and Jeremy Kinder, PhD, stress that because study was in animal infection models, it's premature to say how the findings will apply clinically. Future studies will include closer biological investigation to understand exactly how built-up immunoglobulin antibodies protect against Zika infection in mothers and their developing fetal offspring.

### Zika Explosion

The study comes in the wake of an ongoing Zika epidemic and an explosion of cases involving fetal death, microcephaly (born with severely decreased head size), and other congenital birth defects. Researchers said expectant mothers are especially susceptible to Zika infection compared to non-pregnant women. If the virus is active during pregnancy, it usually spreads to vital tissues of a developing fetus.

Because Zika virus infection in healthy non-pregnant women is mostly asymptomatic, many women of reproductive age in high-risk regions have a cleared infection before pregnancy, according to researchers. High-risk regions of the world include areas of Africa and Central and South America, according to the US Centers for Disease Control and Prevention.

To investigate the impact of a prior infection on the susceptibility to reinfection, researchers infected two groups of mice with Zika.

One group had a previous asymptomatic infection that had resolved before scientists performed a second round of infection. They found that susceptibility to Zika virus infection was markedly reduced in mice that had previously cleared a prior infection compared to those undergoing a first infection during pregnancy.

Mice that didn't have prior Zika infections developed clinical symptoms and sharply increased levels of Zika virus in their blood, which spread to fetal tissues.

Zika virus could not be found in most of the baby mice from mothers with resolved infection prior to pregnancy. Protection found in Zika-resistant mice could be transferred to susceptible mice with Zika virus

neutralizing antibodies found in the blood of mice with prior asymptomatic infection.

*The research was supported in part by the National Institute of Allergy and Infectious Disease (R01-AI100934, R01-AI120202), the March of Dimes Foundation, Howard Hughes Medical Institute Faculty Scholars program, and a Burroughs Wellcome Fund Pathogenesis of Infectious Disease award.*

<http://bit.ly/2B4qqYc>

## Intervention becomes first to successfully reduce risk of dementia

***Computerized brain-training is now the first intervention of any kind to reduce the risk of dementia among older adults.***

TAMPA, Fla - The breakthrough results from a randomized controlled trial were just published in the journal *Alzheimer's & Dementia*:

Translational Research & Clinical Interventions. The article, "Speed of Processing Training Results in Lower Risk of Dementia", reports on the latest findings from the Advanced Cognitive Training for Independent and Vital Elderly (ACTIVE) study funded by the National Institutes of Health.



***The brain training exercise pushes a user to progressively improve visual speed of processing with attentional demands both at the center of gaze and periphery.***

Posit Science

"Speed of processing training resulted in decreased risk of dementia across the 10-year period of, on average, 29 percent as compared to the control," said lead author Jerri Edwards, PhD, University of South Florida. "When we examined the dose-response, we found that those who trained more received more protective benefit."

The ACTIVE Study enrolled 2,802 healthy older adults at six sites around the United States and followed them for 10 years (as they aged from an average of 74 to 84). Participants were randomized into a



control group or one of three intervention arms using different types of cognitive training: 1) a group receiving instruction on memory strategies; 2) a group receiving instruction on reasoning strategies; and 3) a group receiving individualized computerized speed of processing training. Participants in the cognitive training groups were offered 10 initial sessions of training (60-75 minutes per session) which was conducted over the first six weeks of the study.

All participants were assessed on a number of cognitive and functional measures at the beginning of the study, after the first six weeks, and at 1, 2, 3, 5 and 10 years. Subsets of each intervention group also received four additional "booster" training sessions in months 11 and 35 of the study. Researchers found no significant difference in risk of dementia for the strategy-based memory or reasoning training groups, as compared to the control group. However, as compared to the control group, the computerized speed training group showed significantly less risk of dementia - averaging a 29 percent risk reduction.

When reviewing the impact of each computerized speed training session completed, researchers found those who completed more sessions had lower risk. Among those who completed 15 or more sessions across all three intervention groups, the risk of dementia for the computerized speed training group was lowest at 5.9%, as compared to 9.7% and 10.1% for the memory and reasoning groups, respectively. The control group, which did not engage in any training, had a dementia incidence rate of 10.8%.

Participants in the computerized speed training group were trained on a highly specific task designed to improve the speed and accuracy of visual attention, including both divided and selective attention exercises. To perform the divided attention training task, a user identified an object (i.e., car or truck) at the center of gaze while at the same time locating a target in the periphery (i.e., car). As the user got the answers correct, the speed of presentation becomes progressively briefer, while the targets become more similar. In the more difficult

training tasks, the target in the periphery is obscured by distracting objects, engaging selective attention.

There is substantial prior scientific literature on this training exercise, which is referred to as "speed of processing training", "useful field of view training", or "UFOV training." The exercise was developed by Dr. Karlene Ball of the University of Alabama Birmingham and Dr. Dan Roenker of Western Kentucky University. It is now exclusively licensed to Posit Science Corporation, and is available as the "Double Decision" exercise of the BrainHQ.com brain training program.

The paper notes that this particular type of computerized brain training, as updated by its inventors and Posit Science over the years, has previously been shown effective across more than 18 clinical trials in older adults on standard measures of cognitive abilities (e.g., speed of processing and attention) and functional abilities (e.g., maintaining the ability to live independently, depressive symptoms, feelings of control, and health-related quality of life), as well as in real world activities (e.g., driving safety, balance and gait).

"We need to further delineate what makes some computerized cognitive training effective, while other types are not," said Dr. Edwards. "We also need to investigate what is the appropriate amount of training to get the best results. The timing of intervention is also important. Existing data indicate speed training is effective among older adults with and without mild cognitive impairment, but it is important to understand this is preventative to lower risk of dementia and is not a treatment for dementia. Our ongoing research is examining this intervention among persons with Parkinson's disease as well as other types of cognitive interventions."

The preliminary results reported at the Alzheimer's Association International Conference were confirmed in this report. However, to be more conservative, the publication used a narrower definition of dementia. The article "Speed of Processing Training Results in Lower Risk of Dementia" reflects the ACTIVE study's conclusion based on 3 criteria for dementia: cognitive and functional impairment, outcome of

the Mini-Mental State Examination (MMSE) and/or diagnosis of dementia or Alzheimer disease as reported by the participant or a relative of the participant. The risk reduction from randomization to speed training ranged from 29-33%, depending on how dementia was defined.

<http://bit.ly/2mVhaUj>

## **Computer program finds new uses for old drugs**

*Researchers repurpose pain meds to kill cancer cells*

*Researchers at the Case Comprehensive Cancer Center at Case Western Reserve University School of Medicine have developed a computer program to find new indications for old drugs.*

The computer program, called DrugPredict, matches existing data about FDA-approved drugs to diseases, and predicts potential drug efficacy. In a recent study published in [Oncogene](#), the researchers successfully translated [DrugPredict](#) results into the laboratory, and showed common pain medications--like aspirin--can kill patient-derived epithelial ovarian cancer cells.

In the new study, DrugPredict suggested non-steroidal anti-inflammatory drugs, also known as NSAIDs, could have applications for epithelial ovarian cancer. The researchers exposed patient-derived epithelial ovarian cancer cells growing in their laboratory to a specific NSAID, indomethacin, and confirmed the DrugPredict finding. Indomethacin killed both drug-resistant and drug-sensitive epithelial ovarian cancer cells. Interestingly, cisplatin-resistant epithelial ovarian cancer cells were most sensitive to indomethacin. When the researchers added chemotherapy drugs to the experiments, the cancer cells died even faster. The findings could represent the first step toward a new therapy regimen for epithelial ovarian cancer.

Epithelial ovarian cancer is the fifth leading cause of cancer deaths in women, killing approximately 14,000 women annually in the United States. Available therapies are only moderately successful, with more than 70 percent of women dying within five years of diagnosis. According to the authors, part of the challenge in developing new

ovarian cancer drugs lies in escalating clinical trial costs and lengthy drug development timelines. Programs like DrugPredict could "reposition" FDA-approved medications for new indications--a more efficient strategy.

"Traditional drug discovery process takes an average of 14 years and billions of dollars of investment for a lead anti-cancer drug to make the transition from lab to clinic," said study first author Anil Belur Nagaraj, PhD, research associate at Case Western Reserve University School of Medicine. "Drug re-positioning significantly shortens the long lag-phase in drug discovery and also reduces the associated cost." DrugPredict was developed by co-first author QuanQiu Wang of ThinTek, LLC, and co-senior author Rong Xu, PhD, associate professor of biomedical informatics in the department of population and quantitative health sciences at Case Western Reserve University School of Medicine. The program works by connecting computer-generated drug profiles--including mechanisms of action, clinical efficacy, and side effects-- with information about how a molecule may interact with human proteins in specific diseases, such as ovarian cancer.

DrugPredict searches databases of FDA-approved drugs, chemicals, and other naturally occurring compounds. It finds compounds with characteristics related to a disease-fighting mechanism. These include observable characteristics--phenotypes--and genetic factors that may influence drug efficacy. Researchers can collaborate with Xu to input a disease into DrugPredict and receive an output list of drugs--or potential drugs--with molecular features that correlate with strategies to fight the disease.

"For any given disease, DrugPredict simultaneously performs both a target-based, and phenotypic screening of over half a million chemicals, all in just a few minutes," Xu said.

In the *Oncogene* study, DrugPredict produced a prioritized list of 6,996 chemicals with potential to treat epithelial ovarian cancer. At the top of the list were 15 drugs already FDA-approved to treat the

cancer, helping to validate the DrugPredict approach. Of other FDA-approved medications on the list, NSAIDs ranked significantly higher than other drug classes. The researchers combined the DrugPredict results with anecdotal evidence about NSAIDs and cancer before confirming DrugPredict results in their laboratory experiments.

The program could help identify safe alternatives for diseases--like epithelial ovarian cancer--that desperately require new treatment options. "The primary advantage of drug re-positioning over traditional drug development is that it starts from compounds with well-characterized pharmacology and safety profiles. This significantly reduces the risk of adverse effects and attrition in clinical trials," Xu said.

"By combining my laboratory's expertise in ovarian cancer biology and Dr. Xu's expertise in bioinformatics, we were able to uncover a potentially novel drug approach to treat ovarian cancer," said co-senior author Analisa DiFeo, PhD, the Norma C. and Albert I. Geller Designated Professor of Ovarian Cancer Research and assistant professor in the Case Comprehensive Cancer Center at Case Western Reserve University School of Medicine. Said Nagaraj, "Currently there are no drugs targeting cancer stem cells being evaluated in ovarian cancer clinical trials. Our results provide a rationale to test NSAIDs like Indomethacin as a novel drug in ovarian cancer clinical trials."

DiFeo is planning to test indomethacin's ability to specifically target ovarian cancer stem cells in patient tumors in a phase 1 clinical trial. She will conduct the trial in collaboration with Steven Waggoner, MD, division chief of gynecologic oncology at University Hospitals Seidman Cancer Center and professor of obstetrics and gynecology at Case Western Reserve University School of Medicine.

*This study was supported by Norma C. and Albert I. Geller via the Gynecological Cancer Translation Research Program at the Case Comprehensive Cancer Center, and grants from The Mary Kay Foundation (to A.D. and R.X.), the Eunice Kennedy Shriver National Institute Of Child Health & Human Development of the National Institutes of Health under the NIH Director's New Innovator award number DP2HD084068 (to R.X.), The National Cancer Institute award number R01CA197780-01A1 (to A.D.), and The Young Scientist Foundation*

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<http://bit.ly/2hYOU1v>

## **Neuroscience research provides evidence the brain is strobing not constant**

***First sight, now sound -- new discoveries show perception is cyclical***

It's not just our eyes that play tricks on us, but our ears. That's the finding of a landmark Australian-Italian collaboration that provides new evidence that oscillations, or 'strokes', are a general feature of human perception.

While our conscious experience appears to be continuous, the University of Sydney and Italian universities study suggests that perception and attention are intrinsically rhythmic in nature.

This has profound implications for our understanding of human behaviour, how we interact with environment and make decisions.

A paper published today in *Current Biology* provides the important new evidence for the cyclical nature of perception.

The key findings are:

- 1. auditory perception oscillates over time and peak perception alternates between the ears - which is important for locating events in the environment;***
- 2. auditory decision-making also oscillates; and***
- 3. oscillations are a general feature of perception, not specific to vision.***

The work is the result of an Italian-Australian collaboration, involving Professor David Alais, Johahn Leung and Tam Ho of the schools of Psychology and Medical Science, University of Sydney; Professor David Burr from the Department of Neuroscience, University of Florence; and Professor Maria Concetta Morrone of the Department of Translational Medicine, University of Pisa.

With a simple experiment, they showed that sensitivity for detecting weak sounds is not constant, but fluctuates rhythmically over time.

It has been known for some years that our sight perception is cyclical but this is the first time it has been demonstrated that hearing is as

well. "These findings that auditory perception also goes through peaks and troughs supports the theory that perception is not passive but in fact our understanding of the world goes through cycles," said Professor Alais from the University of Sydney.

"We have suspected for some time that the senses are not constant but are processed via cyclical, or rhythmic functions; these findings lend new weight to that theory."

These auditory cycles happen at the rate of about six per second. This may seem fast, but not in neuroscience, given that brain oscillations can occur at up to 100 times per second.

"These findings are important as humans make decisions at the rate of about one-sixth of a second, which is in line with these auditory oscillations," said Professor Alais.

The study found a variation of oscillation between the two ears, first one ear is at peak sensitivity, then the other. The oscillation is so fast that we are normally unaware of it, but can be revealed in experiments using very fine-grained timing.

Why should the brain sample information in this cyclic fashion? Theories abound, but one popular idea - favoured by the authors of this study - is that it reflects the action of attention which appears to sample neural activity in rapid bursts.

The scientists are next focusing their attention on perceptions of touch and how this might make use of neural oscillations as part of a goal of characterising perception in general over all the senses.

"The brain is such a complex 'machine' one could say - it is a testament to science that we are starting to make sense of it - but a takeaway could be that there is so much we don't know," Professor Alais concludes.

"A decade ago, no one would have thought that perception is constantly strobing - flickering like an old silent movie."

For the moment, this research shows one thing very clearly: our sensory perception of the world is fundamentally oscillatory, like a strobing light or a wave waxing and waning.

### **The strobing brain - how it works:**

When we peruse a scene, not all parts are equally important: some receive more attention than others and are prioritised in processing. This is an effective strategy, concentrating limited cognitive resources on specific items of interest, rather than diluting resources over the entire space. Similarly, oscillating attention would produce an analogous result over time, with resources concentrated into small temporal epochs instead of being sustained in a uniform but thin allocation. This strobing approach to attention would bind together relevant information at regular time points and allow new groupings of information to reassemble at other moments.

<http://bit.ly/2hNloYQ>

### **Human evolution was uneven and punctuated, suggests new research**

#### ***A new study in Heliyon suggests that Neanderthals survived at least 3,000 years longer in Spain than we thought***

London - Neanderthals survived at least 3,000 years longer than we thought in Southern Iberia - what is now Spain - long after they had died out everywhere else, according to new research published in Heliyon.

The authors of the study, an international team from Portuguese, Spanish, Catalanian, German, Austrian and Italian research institutions, say their findings suggest that the process of modern human populations absorbing Neanderthal populations through interbreeding was not a regular, gradual wave-of-advance but a "stop-and-go, punctuated, geographically uneven history."

Over more than ten years of fieldwork, the researchers excavated three new sites in southern Spain, where they discovered evidence of distinctly Neanderthal materials dating until 37,000 years ago.

"Technology from the Middle Paleolithic in Europe is exclusively associated with the Neanderthals," said Dr. João Zilhão, from the University of Barcelona and lead author of the study. "In three new excavation sites, we found Neanderthal artefacts dated to thousands of

years later than anywhere else in Western Europe. Even in the adjacent regions of northern Spain and southern France the latest Neanderthal sites are all significantly older."

The Middle Paleolithic was a part of the Stone Age, and it spanned from 300,000 to 30,000 years ago. It is widely acknowledged that during this time, anatomically modern humans started to move out of Africa and assimilate coeval Eurasian populations, including Neanderthals, through interbreeding.

According to the new research, this process was not a straightforward, smooth one - instead, it seems to have been punctuated, with different evolutionary patterns in different geographical regions.

In 2010, the team published evidence from the site of Cueva Antón in Spain that provided unambiguous evidence for symbolism among Neanderthals. Putting that evidence in context and using the latest radiometric techniques to date the site, the researchers show Cueva Antón is the most recent known Neanderthal site.

"We believe that the stop-and-go, punctuated, uneven mechanism we propose must have been the rule in human evolution, which helps explaining why Paleolithic material culture tends to form patterns of geographically extensive similarity while Paleolithic genomes tend to show complex ancestry patchworks," commented Dr. Zilhão.

The key to understanding this pattern, says Dr. Zilhão, lies in discovering and analyzing new sites, not in revisiting old ones. Although finding and excavating new sites with the latest techniques is time-consuming, he believes it is the approach that pays off.

"There is still a lot we do not know about human evolution and, especially, about the Neanderthals," said Dr. Zilhão. "Our textbook ideas about Neanderthals and modern humans have been mostly derived from finds in France, Germany and Central Europe, but during the Ice Ages these were peripheral areas: probably as much as half of the Paleolithic people who ever lived in Europe were Iberians. Ongoing research has begun to bear fruit, and I have no doubt that there is more to come."

*"Precise dating of the Middle-to-Upper Paleolithic transition in Murcia (Spain) supports late Neanderthal persistence in Iberia" by João Zilhão et al. (DOI: 10.1016/j.heliyon.2017.e00435). The article appears in Heliyon (November 2017), published by Elsevier.*

<http://bit.ly/2A85n8d>

## **Report suggests association between coffee and up to 70 percent reduced risk of liver disease**

### ***New report on coffee and liver health discusses potential impact of coffee consumption on chronic liver disease, liver cancer and cirrhosis***

A new roundtable report from the [Institute for Scientific Information on Coffee \(ISIC\)](#) on '[Looking after the liver: coffee, caffeine and lifestyle factors](#)' highlights the potential role of coffee consumption in reducing the risk of liver diseases such as liver cancer and cirrhosis.

Roundtable delegates including academics, media medics and representatives from national liver associations from across seven European countries, met to discuss the most recent research into coffee and liver health, and the potential mechanisms behind a suggested reduced risk of liver disease.

The roundtable, held at the Royal Society of Medicine in London, was chaired by Professor Graeme Alexander (University College London and senior advisor to the British Liver Trust) who also presented on the prevalence of liver disease in Europe and the role of lifestyle. Dr. Carlo La Vecchia (Professor of Medical Statistics and Epidemiology, Dept. of Clinical Sciences and Community Health, Università degli Studi di Milano) discussed the latest research on coffee and liver health and potential mechanisms. Group discussion focussed on how best to disseminate the latest findings and challenges for both liver associations and healthcare professionals.

Liver disease is a significant concern across Europe, where chronic liver disease is the fifth most common cause of death<sup>1</sup> and approximately 29 million people in the European Union suffer from a chronic liver condition<sup>2</sup>.

**Key research findings highlighted in the report include:**

- **Meta-analyses have suggested that coffee consumption versus no coffee consumption is associated with up to a 40% risk reduction of liver cancer, although this appears to be a dose-dependent relationship<sup>3-5</sup>.**
- **Research from the US<sup>6</sup> and Italy<sup>7,8</sup> suggests that coffee consumption is consistently associated with a reduced risk of cirrhosis, with a potential risk reduction of 25-70%.**
- **Research suggests an inverse association between coffee consumption and risk of chronic liver disease, with an average risk reduction of 25-30% in low coffee consumers, and up to 65% in high coffee consumers<sup>9</sup>.**\*

During the roundtable, Professor Alexander suggested that it is likely that liver cancer develops from an existing liver disease, and proposed that the association between coffee consumption and a reduced risk of liver cancer may in fact link back to an effect of coffee drinking on liver disease.

One of the main issues discussed at the roundtable was the diagnosis of liver disease, and the fact that a majority of sufferers are unaware of their condition. Even though the liver is a vital organ, the perception in some European countries is that liver health is not considered as high a priority as other conditions, such as heart disease.

Professor Graeme Alexander, senior advisor to the British Liver Trust, commented: "Liver disease is on the rise across Europe and it is important that we understand how coffee, one of the most popular drinks in the world, and diet affects the disease. Research suggests that coffee may reduce the risk of liver diseases and it is important patients have access to dietary information and advice from health care professionals in a manner that is easy for them to understand and act upon."

Judi Rhys, Chief Executive, British Liver Trust said: "Liver disease is a silent killer as often there are no symptoms until it's too late. Coffee is something that is easily accessible to everyone and regularly drinking it - filtered, instant or espresso - may make a difference in preventing and, in some cases, slowing down the progression of liver disease- it is an easy lifestyle choice to make."

To read the report, titled 'Looking after the Liver: Lifestyle, Coffee and Caffeine' [click here](#).

Readers interested in finding out more about coffee and health can visit: <http://www.coffeeandhealth.org>

#### Notes to editors

- \* Definitions of low and high coffee consumption from the studies within the meta-analysis vary and tend to be study specific dependent on levels of coffee consumed by participants.
- \* Moderate coffee consumption can be defined as 3-5 cups per day, based on the European Food Safety Authority's review of caffeine safety<sup>6</sup>.
- \* To read a full overview of coffee and liver function, [click here](#).

#### Roundtable delegates

- Professor Graeme Alexander University College London and senior advisor to the British Liver Trust, United Kingdom.
- Dr. Carlo La Vecchia, Professor of Medical Statistics and Epidemiology, Dept. of Clinical Sciences and Community Health, Università degli Studi di Milano, Italy.
- HIlje Logtenberg-van der Grient, Physician Educator, Scientific Committee ELPA/Dutch Liver Patient Association, The Netherlands.
- Andreas Röhrenbacher, Steering Committee Member, Die Hepatitis Hilfe Österreich, Plattform Gesunde Leber (HHO), Austria.
- Raquel Peck, CEO, World Hepatitis Alliance, United Kingdom.
- Dr David Semela, Council Member, Swiss Association for the Study of the Liver, Switzerland.
- Dr Trisha Macnair, Speciality Doctor/Medical Journalist, NHS, United Kingdom.
- Dr Ellie Cannon, NHS GP, Abbey Medical Centre, London, United Kingdom.
- Dr JW Langer, medical doctor, author, lecturer and medical journalist, Denmark.
- Dr Luca Miele, MD, PhD, Consultant Internist and Hepatologist, University Hospital Policlinico A. Gemelli Foundation, Italy.
- Dr Beatrice Alfonso PhD, Fondazione Italiana Fegato, ONLUS- Italian Liver Foundation, Italy.
- Gerardo Reyna, Federación Nacional de Enfermos y Trasplantados Hepáticos, Spain.

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#### About ISIC

The Institute for Scientific Information on Coffee (ISIC) is a not-for-profit organization, established in 1990 and devoted to the study and disclosure of science related to "coffee and health." Since 2003 ISIC also supports a pan-European education programme, working in partnership with national coffee associations in nine countries to convey current scientific knowledge on "coffee and health" to health care professionals.

ISIC's activities are focused on:

- the study of scientific matters related to "coffee and health"
- the collection and evaluation of studies and scientific information about "coffee and health"
- the support of independent scientific research on "coffee and health"

• active dissemination of balanced "coffee and health" scientific research to a broad range of stakeholders. ISIC respects scientific research ethics in all its activities. ISIC's communications are based on sound science and rely on scientific studies derived from peer-reviewed scientific journals and other publications. ISIC members are six of the major European coffee companies: illycaffè, Jacobs Douwe Egberts, Lavazza, Nestlé, Paulig, and Tchibo.

<http://bit.ly/2hMBIc4>

## **Why a female fly will ruin your drink, but a male is fine A single fly falling into your glass of wine may be enough to ruin it.**

**By Jasmin Fox-Skelly**

We're able to sense tiny quantities of a pheromone released by female fruit flies, and just one nanogram is enough to give a drink an unpleasant smell and taste.

*Drosophila melanogaster* females produce a pheromone to attract males, releasing about 2.4 nanograms of the chemical an hour. When Peter Witzgall and Paul Becher at the Swedish University of Agricultural Sciences, in Uppsala, first identified and isolated this pheromone, they wondered if it explained an anecdote they'd heard about a fly flying into a glass of wine and changing how it tastes.

To find out, the team enlisted the help of a panel of eight experienced wine tasters from the Baden wine region in Germany.

### **Funky taste**

They asked the tasters to examine various glasses of wine. Some of these glasses had previously contained a female fly for five minutes, while others had contained a male fly, and some had had no contact with flies at all. The experts all rated the glasses that had had female flies in them as having a stronger and more intense smell than the others.

The panel were then given glasses of water and of pinot blanc wine, some of which had previously had a female fly in them. Some other glasses had trace amounts of a synthetic version of the female pheromone dissolved in them.

The wine experts said that 10 nanograms of the synthetic pheromone mimicked the funky taste of a female fly. But even as little as 1 nanogram of the pheromone was enough for the panel to describe the taste of the wine as "somewhat unpleasant".

This suggests that even if a fly is removed from a glass quickly, it may already have spoiled the wine. If you leave the fly to drown instead, it can still stink out the glass, because females have a pheromone precursor chemical on the waxy surface of their bodies.

### **Lingering smell**

"Putting a few nanograms of the synthesized pheromone into the glass resulted in the same off-flavour as when a fly walked over the glass," says Becher. "The compound is not only detectable in tiny amounts, it's also hard to wash off, which means that the smell might even stick to glass after dishwashing."

Strictly speaking, humans can only smell, not taste, the pheromone. But our perception of taste is heavily reliant on our sense of smell, meaning that the presence of the fly pheromone is enough to tarnish both the odour and flavour of a drink.

But it is unclear why we have evolved the ability to smell the fly pheromone. "We think it interesting that both flies and humans are highly sensitive to the same compound," says Becher.

Reference: [doi.org/10.1101/206375](https://doi.org/10.1101/206375)

<http://bit.ly/2iJqkFt>

## **Dog ownership linked to lower mortality**

### ***Dog owners had a lower risk of death due to cardiovascular disease or to other causes***

A team of Swedish scientists have used national registries of more than 3.4 million Swedes aged 40 to 80 to study the association between dog ownership and cardiovascular health. Their study shows that dog owners had a lower risk of death due to cardiovascular disease or to other causes during the 12-year follow-up.

A total of more than 3.4 million individuals without any prior cardiovascular disease in 2001 were included in the researchers' study linking together seven different national data sources, including two dog ownership registers. The results are being published for the first time in Scientific Reports. The goal was to determine whether dog

owners had a different risk of cardiovascular disease and death than non-dog owners.

"A very interesting finding in our study was that dog ownership was especially prominent as a protective factor in persons living alone, which is a group reported previously to be at higher risk of cardiovascular disease and death than those living in a multi-person household. Perhaps a dog may stand in as an important family member in the single households. The results showed that single dog owners had a 33% reduction in risk of death and 11% reduction in risk of myocardial infarction during follow-up compared to single non-owners. Another interesting finding was that owners to dogs from breed groups originally bred for hunting were most protected," says Mwenya Mubanga, lead junior author of the study and PhD student at the Department of Medical Sciences and the Science for Life Laboratory, Uppsala University.

In Sweden, every person carries a unique personal identity number. Every visit to a hospital is recorded in national databases, accessible to researchers after de-identification of data. Even dog ownership registration has been mandatory in Sweden since 2001. These scientists studied whether being registered as a dog-owner was associated with later diagnosis of cardiovascular disease or death from any cause.

"These kind of epidemiological studies look for associations in large populations but do not provide answers on whether and how dogs could protect from cardiovascular disease. We know that dog owners in general have a higher level of physical activity, which could be one explanation to the observed results. Other explanations include an increased well-being and social contacts or effects of the dog on the bacterial microbiome in the owner," says Tove Fall, senior author of the study and Associate Professor in Epidemiology at the Department of Medical Sciences and the Science for Life Laboratory, Uppsala University.

"There might also be differences between owners and non-owners already before buying a dog, which could have influenced our results, such as those people choosing to get a dog tending to be more active and of better health. Thanks to the population-based design, our results are generalisable to the Swedish population, and probably also to other European populations with similar culture regarding dog ownership," says Tove Fall.

<http://wb.md/2zeKqad>

### **Acupuncture for Chronic Pain: The Latest Research Another Option for Chronic Pain**

**Arefa Cassoobhoy, MD, MPH**

Hello. I'm Dr Arefa Cassoobhoy, a practicing internist, Medscape advisor, and senior medical director for WebMD. Welcome to Morning Report, our 1-minute news story for primary care.

Chronic pain is a major medical issue faced by many of our patients. And with the opioid epidemic, we're in greater need of more nonpharmacologic interventions. [Acupuncture has emerged as a viable complementary treatment to conventional pain management.](#)

An analysis of 29 higher-quality trials with almost 18,000 patients was presented at the Academy of Integrative Pain Management meeting. Acupuncture was statistically superior to both sham acupuncture and non-acupuncture for neck and lower back pain, osteoarthritis of the knee, and chronic headache.

Sham acupuncture and non-acupuncture also improved pain somewhat, so the power of placebo is clearly a factor that needs to be understood better.

Finding alternative therapies for pain, like acupuncture, is important, especially given our aging population.

So consider it as a possible option, along with your standard treatment, the next time you're addressing chronic pain.



<http://bit.ly/2jiu5KL>

## Interstellar space probes: Where's the brakes?!

***"Breakthrough Starshot" project will send space probes to the stars  
Slowing them down again seems more challenging***

FRANKFURT. With a miniaturised space probe capable of being accelerated to a quarter of the speed of light, we could reach Alpha Centauri, our nearest star, in 20 to 50 years. However, without a mechanism to slow it down, the space probe could only collect data from the star and its planets as it zoomed past. A theoretical physicist at Goethe University Frankfurt has now examined whether interstellar spacecraft can be decelerated using "magnetic sails".

For a long time, the idea of sending unmanned space probes through the depths of interstellar space to distant stars was purely utopian. Recent research on new concepts - amongst others within the "Breakthrough Starshot" project - has shown that miniaturised space probes could be accelerated by means of powerful lasers. Slowing them down again seems more challenging, since they cannot be fitted with braking systems for weight reasons. However, according to Professor Claudius Gros from the Institute for Theoretical Physics at Goethe University Frankfurt, it would be possible to decelerate at least comparatively slow space probes with the help of magnetic sails.

"Slow would mean in this case a travel velocity of 1,000 kilometres per second, which is only 0.3 percent of the speed of light but nevertheless about 50 times faster than the Voyager spacecraft," explains Gros. According to Gros' calculations, what is needed is a magnetic sail in order to transfer the spacecraft's momentum to the interstellar gas. The sail consists of a large, superconducting loop with a diameter of about 50 kilometres. A lossless current induced in this loop then creates a strong magnetic field. The ionised hydrogen in the interstellar medium is then reflected off the probe's magnetic field, slowing it down gradually. This concept works, as Gros was able to show, despite the extremely low particle density of interstellar space (0.005 to 0.1 particles per cubic centimetre).

Gros' research shows that magnetic sails can decelerate 'slow' spacecraft weighing up to 1,500 kilograms. However, the journey would take historical periods of time, for example about 12,000 years to reach the seven known planets of the TRAPPIST-1 system. Surprisingly, slower cruising probes the size of a car could be launched by the same laser which would make it possible to send, according to current planning, high-speed space probes weighing just a few grams to Alpha Centauri.

Missions to distant stars that would take thousands of years are out of the question for exploratory missions. But the situation is quite different in cases where cruising time is irrelevant, such as missions that open up alternative possibilities for terrestrial life. Such missions, like Gros proposed in 2016 under the name of 'The Genesis Project', would carry single-celled organisms, either as deep-frozen spores or encoded in a miniaturised gene laboratory. For a Genesis probe, it is not the time of arrival which is important, but the possibility to decelerate and then orbit the target planet.

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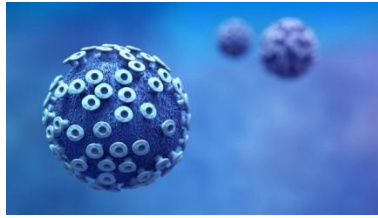
## Cheap, Safe Anti-Malaria Drug Reduces Zika Virus in Mice

***Infected animals given chloroquine while pregnant had fetuses with a far lighter viral load in their brains than untreated mice did.***

By Kerry Grens | November 17, 2017

Chloroquine has been used for decades to prevent and treat malaria. It also appears to partially ward off the Zika virus in unborn mice when their mothers are given the drug, researchers report today (November 17) in [Scientific Reports](#).

The scientists showed that when mice infected with Zika virus drank chloroquine-treated water mid-way through their pregnancies, their pups ended up with 20-fold less virus in their brains than pups whose mothers were not treated.



ISTOCK, [LUISMMOLINA](#)

Because chloroquine is already considered safe for use during pregnancy, the authors say it should be considered for treatment and prevention of Zika infection in women.

See [“Chloroquine Protects Against Zika In Vitro”](#)

“Chloroquine has a long history of successfully treating malaria, and there are no reports of it causing birth defects,” coauthor Alexey Terskikh of Sanford Burnham Prebys Medical Discovery Institute says in a [press release](#).

“Additional studies are certainly needed to determine the precise details of how it works. But given its low cost, availability and safety history further study in a clinical trial to test its effectiveness against Zika virus in humans is merited.”

Terskikh’s team used a new model of Zika virus in which mice have their interferon signaling systems intact, unlike other strains that have deficient interferon signaling.

“We believe our mouse model more accurately represents the way Zika virus infects men, women and babies while in the womb,” he says in the release. They found that pregnant mothers could pass Zika virus to their fetuses, but if the animals received chloroquine a day after they became infected, the virus load in the mothers’ blood and the fetuses’ brains was 20-fold less.

Additionally, the researchers found that in human fetal neural progenitor cells and in neural stem cell culture, chloroquine reduced Zika virus infection—and it did so at doses equivalent to or less than those that people normally receive as an antimalarial.

<http://bit.ly/2zvovNr>

## **New finding: nuke blast crippled Chernobyl** ***A new analysis of the Chernobyl disaster finds a nuclear explosion started the catastrophe.***

**Andrew Masterson reports.**

The Chernobyl 4 reactor was destroyed by a nuclear explosion, not a steam one, according to research [published in the journal \*Nuclear Technology\*](#).

The reactor, 130 kilometres of Kiev, Ukraine, exploded in on April 25, 1986, killing 30 people, and inducing acute radiation poisoning in 134. Today, encased in thick concrete, it stands at the centre of a 2600 square-kilometre exclusion zone.

Investigations into the causes of the reactor failure concluded that the cause was a steam explosion. [This remains the accepted explanation](#), and is sometimes deployed to bolster the case put by the power industry that no reactor has ever experienced a nuclear explosion.

Now, analysis by researchers from the Swedish Defence Research Agency, Swedish Meteorological and Hydrological Institute, and Stockholm University contradicts the standard explanation.

The team, led by Lars-Erik De Geer, concludes that the first of two explosions reported by eyewitnesses was in fact a nuclear one – or rather, a very rapid series of nuclear ones – followed three seconds later by a secondary steam explosion.

The nuclear explosions, the researchers conclude, sent a jet of debris very high into the sky. The steam explosion immediately afterwards ruptured the reactor and sent still more debris into the atmosphere, but at lower altitudes.

The findings are based on a new analysis of xenon isotopes made four days after the event.

The original study – carried out by scientists from the Leningrad-based VG Khoplin Radium Institute – detected xenon isotopes present in the city of Cherepovets, north of Moscow, and a long way distant from where Chernobyl detritus was predicted to spread.

Re-analysis of these isotopes reveals them to be the products of nuclear fission, implying they could have been created in a nuclear explosion. Xenon isotopes detected within the main Chernobyl detritus track over Scandinavia are slightly different and conform to material simply propelled from the reactor core by a non-nuclear blast. Looking back at weather patterns in the days after the explosion, De Geer's team concluded that the Chernobyl isotopes could only have reached the city if they had been sent significantly higher into the air than the bulk of the Chernobyl outpour.

Investigators looking at damage to the reactor as soon as it was practical to do so after the explosion noted that the first blast had generated temperatures hot enough to melt through a two-metre-thick plate beneath the core – an outcome, say the Swedish team, compatible with a nuclear blast. A steam explosion, they say, would not have contained sufficient energy to cause the plate to melt.

"We believe that thermal neutron mediated nuclear explosions at the bottom of a number of fuel channels in the reactor caused a jet of debris to shoot upwards through the refuelling tubes," says De Greer.

"The steam explosion which ruptured the reactor vessel occurred some 2.7 seconds later."

<http://bit.ly/2B3qXR9>

## How an unpaid UK researcher saved the Japanese seaweed industry

*After crops failed, botanist Kathleen Drew-Baker realized that nori wasn't what it seemed.*

Esther Inglis-Arkell - 11/19/2017, 10:41 PM

The tasty Japanese seaweed nori is ubiquitous today, but that wasn't always true. Nori was once called "lucky grass" because every year's harvest was entirely dependent on luck. Then, during World War II, luck ran out. No nori would grow off the coast of Japan, and farmers were distraught. But a major scientific discovery on the other side of the planet revealed something unexpected about the humble plant and turned an unpredictable crop into a steady and plentiful food source.

Nori is most familiar to us when it's wrapped around sushi. It looks less familiar when floating in the sea, but for centuries, farmers in Japan, China, and Korea knew it by sight. Every year, they would plant bamboo poles strung with nets in the coastal seabed and wait for nori to build up on them.



[Enlarge](#) / *A nori farm off the coast of Japan. H. Grobe*

At first it would look like thin filaments. Then, with luck, it grew into healthy, harvestable plants with long, green leaves. The farmers never saw seeds or seedlings, so no one could cultivate it. The filaments simply appeared every year. That is, they appeared until after World War II, when pollution, industrialization along the coast, and a series of violent typhoons led to a disastrous drop in harvests. By 1951, nori production in Japan had been all but wiped out.

### Nori's secret identity

Fortunately, on an island at the other end of Eurasia, Kathleen Drew-Baker had recently gotten fired. She had been a lecturer in botany at the University of Manchester where she studied algae that reproduced using spores rather than flowers. But the university did not employ married women. So when she got married to fellow academic Henry Wright-Baker she was kicked off the faculty and relegated to a job as an unpaid research fellow.



*Mary Drew-Baker discovered the unusual life cycle of nori and saved the Japanese seaweed farming industry. Smithsonian Institution*

Drew-Baker focused on a type of nori unfamiliar to nearly everyone: *Porphyra umbilicalis*. It's a leafy seaweed that grows off the coast of Wales. Locals harvest it, grind it up, and use it to make bread or soup. Known colloquially as laver, it's still eaten in Britain but has not attained the international standing of nori.

Drew-Baker and her husband made a seaside lab where she could study its lifecycle. During her research, she noticed that she kept running across what seemed to be an entirely different species, known as *Conchocelis*. *Conchocelis* is a group of single-celled organisms that look like pinkish sludge and grow on the inside of abandoned shells. Drew-Baker noticed the pink sludge was especially common during the summer months, while the seaweed showed up during the winter months.

Eventually, Drew-Baker realized she was dealing with the plant equivalent of a superhero who is never seen at the same time as his alter-ego. These seemingly different species were actually the same. They were both a type of algae. In the summer, the leafy green seaweed sent out spores that collected and grew as the pink sludge in shells. In the winter, the pink sludge sent out spores that collected on debris (and bamboo poles) and built up into the seaweed again. In 1949, Drew-Baker published a paper in *Nature* detailing her discovery, "[Conchocelis-Phase in the Life-History of \*Porphyra umbilicalis\*.](#)"

This might have been nothing more than a bit of trivia if it weren't for a second expert. Back in Japan, Segawa Sokichi at the Shimoda Marine Biological Station read Drew-Baker's paper and realized that what was true for Welsh seaweed was probably true for Japanese seaweed. The reason nobody had been able to find nori seeds was because they were looking for the wrong plant. And nori had stopped thriving of the coast because of disruptions to seabeds full of the shells where the pink sludge liked to grow.

Thanks to Drew-Baker's work, Segawa was able to invent the industrial process that lead to the stable, predictable production of nori, for which everyone with a taste for sushi should be grateful.

### Seaweed goes high tech

Today, nori farmers leave nothing to luck. They still harvest the leafy stage of the seaweed from the sea. After that, technology takes over. Any spores grown by the leafy form of nori are chopped down to an ideal seeding length of 0.4mm. To encourage the spores to grow into

their single-celled stage, farmers import shells from oyster fisheries, string them on fishing line, and hang them in huge vats of water that reproduce the ideal environment for the pink sludge to grow.

Inside the tanks, chlorine is added to the seawater to get rid of any harmful pathogens. It's filtered with sand to remove pollution.

Industrial workers regulate the oxygen levels in the tanks and add in precise amounts of magnesium,

sodium, iron, and potassium. Even the light levels are controlled.

Indeed, nori farms only use the bottom shell of oysters because they are smoother and allow for more control over the level of light the *Conchocelis* spores are exposed to.



[Enlarge](#) / A satellite photo shows seaweed farms off the coast of South Korea. NASA Goddard Space Flight Center

While the spores grow, a bit of biological engineering goes on as well. Each new batch of spores brought in from the ocean is sampled, cultured, and stored. Its production rate and the conditions under which it thrives are noted. As a result, researchers have identified spores that produce seaweed in waters of varying levels of saltiness, as well as various temperatures. With rising global temperatures, knowing which spores can survive best in warmer water will probably come in handy sooner rather than later.

Nori tanks also use temperature to induce the *Conchocelis* to move into the next stage of its life cycle. The waters are kept at summer-warm levels until it's time to harvest the spores that will produce seaweed. Then the facilities drop the temperature in the tanks to shock the *Conchocelis* into work.

An agitator encourages the release of the second set of spores and gets them swirling around the tanks. Most facilities have the agitation state timed to the minute. Then workers put nets into the tanks for

"seeding." The nets are rolled onto human-sized spools to be sent to farms or stored in freezers until they're needed. At every stage they're checked for the quality and concentration of the spores on them. People no longer need to put bamboo poles in the ocean and hope for luck.

Drew-Baker's discovery was the first step toward the industrialization of a form of farming that seemingly couldn't be industrialized. Segawa and countless later innovators in Japan turned an unpredictable crop into a sure harvest. The application of technology to farming, especially this kind of farming, has entirely changed the game. Even the people involved in nori production have changed. While most types of fishing and farming are losing workers, nori farming keeps attracting young, technologically minded people. Seventy years after the nori farming industry was seemingly destroyed, it is thriving more than it ever has before.

Thanks to her many discoveries, Drew-Baker's career thrived, too. Despite being fired for getting married, she became the first elected president of the British Phycological Society in 1952. Today, Drew-Baker is known in Japan as "[the mother of the sea](#)," and every year a festival is held in her honor in Uto City.

<http://bit.ly/2hMn44H>

## If you liked the Cambrian Explosion, you'll love the Ordovician Radiation

*Life went nuts 450 million years ago, when oxygen levels rose in the seas.*

[Annalee Newitz](#) - 11/21/2017, 9:05 AM

Over half a billion years ago, during the Cambrian geological period, life on Earth started to get a lot more interesting. Thanks to the rise in free oxygen generated mostly by photosynthesizing algae, lifeforms could draw much more energy out of the environment. That meant the rise of multicellularity and the beginnings of a world full of the macro-sized plants and animals we know and love. That moment, full

of [weird-ass animals like \*Anomalocaris\*](#), is called the Cambrian Explosion.

The Cambrian Explosion gets a lot of play because it was the first time multicellular creatures ruled the planet. What few people (other than geologists and paleontologists) realize is that there was an even crazier time for early life. It came during the Ordovician period, right after the Cambrian came to a close 485 million years ago.



*[Enlarge](#) / During the Ordovician, life was literally great. Multicellular plants and animals diversified and moved into ecological niches throughout the globe. This is probably what it was like on a typical Ordovician day, hanging out with cephalopods, crinoids, and coral at the edge of a supercontinent that covered the South Pole. I think a colony of graptolites is floating in the distance. [Fritz Geller-Grimm](#)*

The Ordovician Radiation, also called the Great Ordovician Biodiversification Event (GOBE), saw a *quadrupling* of diversity at the genus level (that's the category one step above species). Life also started occupying new ecological niches, clinging to plants floating in the ocean's water column and burrowing deep into the seabed.

Like the Cambrian, the Ordovician was a period when all of life still existed underwater. Most of the continents had formed [a supercontinent called Gondwana](#) over the south pole, creating the largest tropical coastline in our planet's history. (There were no polar ice caps during this period.) The warm coastal waters surrounding Gondwana were perfect for new kinds of animals, like brachiopods, crinoids, ostracodes, cephalopods, corals, and bryozoans. Plus, everybody's favorite Cambrian animal, the trilobite, diversified like crazy and moved into many new habitats during this time.

One of the most emblematic animals of the Ordovician Radiation is the now-extinct graptolite. Graptolites spread successfully throughout

the world's seas. Most lived in floating colonies made from tubes of collagen or chitin that they extruded from their bodies, much like bees making wax. To get food, they poked their tentacles out of apertures in these tubes.

Environmental scientist Cole Edwards of Appalachian State University in Boone, North Carolina, worked with a team to analyze chemical signatures in ancient rocks that tell us about gases in the atmosphere millions of years ago. In [a new paper for \*Nature Geoscience\*](#), Edwards and his fellow researchers offer a possible explanation for the Ordovician Radiation: an even greater dose of oxygen in the atmosphere, which also meant more oxygenated waters in the then-shallow global oceans.

The researchers write:

***A global increase in atmospheric oxygen and oxygenation of shallow marine environments may have also eased stressful conditions for benthic animal life and expanded the range of habitable ecospace for infaunal burrowers deeper into the sediment. A more oxygenated ocean could also have supported more predators in the food chain (fish and cephalopods), setting into motion an evolutionary 'arms race.'***

Essentially, the rise in oxygen opened up new habitats, thus sparking more evolutionary adaptations to these novel environments. At the same time, there was enough energy to support more predators like cephalopods, the shell-wearing ancestors of today's squid and octopuses. Nothing like an arms race between predator and prey to cause rapid evolution as well. So there was basically a perfect storm for evolution.

[Enlarge](#) / ***Fossils of graptolites from the Ordovician period. Here you can see a few overlapping tubes, which would have held members of a graptolite colony.***

Mark A. Wilson



Unfortunately, the evolutionary free-for-all came to a terrible end during the world's first mass extinction, which closed out the Ordovician about 440 million years ago. For reasons that are still poorly understood, the planet's temperatures plummeted, ushering in two ice ages in rapid succession. All those warm coastal areas dried up and froze. As a result, more than 75 percent of all life on Earth died out. The researchers speculate in their paper that the rise in oxygen, accompanied by a lowering in carbon dioxide, might have been one factor that led to these catastrophic ice ages.

*Nature Geoscience*, 2017. DOI: [10.1038/s41561-017-0006-3](https://doi.org/10.1038/s41561-017-0006-3) ([About DOIs](#)).

<http://bit.ly/2hZ4fPD>

## **Benzodiazepines increase mortality in persons with Alzheimer's disease**

### ***Benzodiazepine use associated with a 40% increase in mortality among persons with Alzheimer's disease***

Benzodiazepine and related drug use is associated with a 40 per cent increase in mortality among persons with Alzheimer's disease, according to a new study from the University of Eastern Finland. The findings were published in the *International Journal of Geriatric Psychiatry*.

The study found that the risk of death was increased right from the initiation of benzodiazepine and related drug use. The increased risk of death may result from the adverse events of these drugs, including fall-related injuries, such as hip fractures, as well as pneumonia and stroke.

The study was based on the register-based MEDALZ (Medication Use and Alzheimer's Disease) cohort, which includes all persons diagnosed with Alzheimer's disease in Finland during 2005-2011. Persons who had used benzodiazepines and related drugs previously were excluded from this study, and therefore, the study population consisted of 10,380 new users of these drugs. They were compared with 20,760 persons who did not use these drugs.

Although several treatment guidelines state that non-pharmacological options are the first-line treatment of anxiety, agitation and insomnia in persons with dementia, benzodiazepines and related drugs are frequently used in the treatment of these symptoms. If benzodiazepine and related drug use is necessary, these drugs are recommended for short-term use only. These new results encourage more consideration for benzodiazepine and related drug use in persons with dementia.

*Research article: Saarelainen L, Tolppanen A-M, Koponen M, Tanskanen A, Tiihonen J, Hartikainen S, Taipale H. Risk of death associated with new benzodiazepine use among persons with Alzheimer's disease - a matched cohort study. International Journal of Geriatric Psychiatry, published online November 15, 2017. DOI:10.1002/gps.4821*

<http://bit.ly/2Apn5a6>

## **Use of Prostate Health Index test reduces unnecessary biopsies**

### ***Study shows use of diagnostic test cuts down on over diagnosis and superfluous procedures***

The Prostate Health Index (phi) is a cost-effective tool used by urologists to detect prostate cancer. It reduces the risk of over diagnosis, and cuts down on the need to send men for unnecessary and often uncomfortable biopsies. So says Jay White of Carolina Urology Partners in the US, lead author of a study in the journal Prostate Cancer and Prostatic Diseases, published by Springer Nature. The research included urologists from four large specialized practices across the US and is the first study to consider the value of the index within a multi-centre private practice setting.

The decision to send a patient for a biopsy isn't always straightforward. It becomes especially difficult when a blood test shows that a patient has an elevated level of a substance called prostate-specific antigen (PSA) but their digital rectal exam (DRE) shows nothing suspicious. Over two-thirds of such biopsies are typically found to be benign when the patient's PSA level ranges from 4 to 10 nanograms per millilitre (ng/mL). These men may be unnecessarily put through the discomfort of such procedures, which also hold the risk of bleeding, pain and infection.

The Beckman Coulter Prostate Health Index (phi) was approved by the US Food and Drug Administration in 2012 for use as an aid in the diagnosis of prostate cancer for men presenting with total PSA levels from 4 to 10 ng/mL and non-suspicious DRE findings. It combines the results of three quantitative kallikrein immunoassays (total PSA, free PSA and p2PSA) into a single numerical phi score. Other studies have also shown that elevated phi scores are associated with higher-grade prostate cancers.

In this multi-centre study, White and his colleagues used a two-part questionnaire to find out whether phi scores influence a physician's decision to perform a biopsy or merely monitor their patients further. In a second part of the study, the biopsy procedures performed on 506 patients were compared to that of a similar group of 683 patients who visited the practices before the test was implemented. The study is the largest of its kind to date.

In 73 percent of the cases, the phi scores were found to influence doctors' decisions about how to manage their patients. Only 36 percent of men received biopsies when phi testing was included in the assessment, compared to the 60 percent who had to undergo such procedures before the index was available. There was also an overall reduction in the percentage of low-grade prostate cancers detected.

"Physicians were less inclined to do a biopsy on patients receiving a low phi score, and more inclined to recommend biopsy for patients receiving an intermediate to high-risk phi score," explains White. "It also improved a physician's ability to communicate their recommendation to the patient, and helped alleviate patient anxiety in cases where the phi score was low."

"The appropriate use of the Prostate Health Index can significantly modify physician behavior patterns and improve their ability to diagnose and manage their patients," adds White.

*Reference: White, J. et al (2017). Clinical Utility of the Prostate Health Index (phi) for Biopsy Decision Management in a Large Group Urology Practice Setting, Prostate Cancer and Prostatic Diseases DOI: 10.1038/s41391-017-0008-7*

<http://bit.ly/2jPVHLo>

## Previous evidence of water on Mars now identified as grainflows

### *Planet appears to have water-restricted environment*

Dark features previously proposed as evidence for significant liquid water flowing on Mars have now been identified as granular flows, where sand and dust move rather than liquid water, according to a new article published in Nature Geoscience by the U.S. Geological Survey.



*This HiRISE image cutout shows Recurring Slope Lineae in Tivat crater on Mars in enhanced color. The narrow, dark flows descend downhill (towards the upper left). Analysis shows that the flows all end at approximately the same slope, which is similar to the angle of repose for sand. NASA/JPL/University of Arizona/USGS*

These new findings indicate that present-day Mars may not have a significant volume of liquid water. The water-restricted conditions that exist on Mars would make it difficult for Earth-like life to exist near the surface of the planet.

Scientists from the USGS, the University of Arizona, Durham University (England) and the Planetary Science Institute analyzed narrow, down-slope trending surface features on Mars that are darker than their surroundings, called Recurring Slope Lineae, or RSL. These RSL features grow incrementally, fade when inactive and recur annually during the warmest time of year on Mars. RSL are mostly found on steep rocky slopes in dark regions of Mars, such as the southern mid-latitudes, Valles Marineris near the equator, and in Acidalia Planitia on the northern plains. The appearance and growth of these features resemble seeping liquid water, but how they form remains unclear, and this research demonstrated that the RSL flows seen by HiRISE are likely moving granular material like sand and dust.

"We've thought of RSL as possible liquid water flows, but the slopes are more like what we expect for dry sand," said USGS scientist and lead author Colin Dundas. "This new understanding of RSL supports other evidence that shows that Mars today is very dry."

The terminal end of the RSL slopes, said Dundas, are identical to the slopes of sand dunes where movement is caused by dry granular flows. Water almost certainly is not responsible for this behavior, which would require the volume of liquid to correspond to the length of slope available, producing more liquid on longer slopes. Instead, the 151 RSL examined by the study authors all end on similar slopes despite very different lengths. Additionally, said the scientists, water is unlikely to be produced only near the tops of slopes at these angles and if it were, it should be able to flow onto lower slopes.

This new research finds that these RSL features are flows of granular material and thus, align with the long-standing hypothesis that the surface of Mars lacks flowing water. Small amounts of water could still be involved in their initiation in some fashion, as hydrated minerals have been detected at some RSL locations. The authors conclude that liquid on present-day Mars may be limited to traces of dissolved moisture from the atmosphere and thin films of water.

*This study was done in cooperation with the NASA Mars Reconnaissance Orbiter project.*