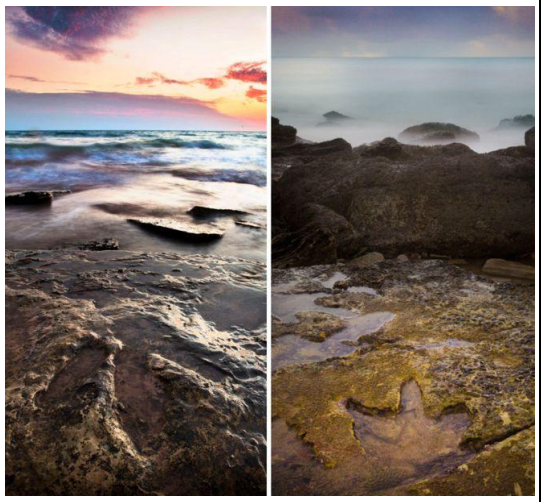
http://bbc.in/2nhMcBe

Kimberley fossil tracks are Australia's 'Jurassic Park'

Scientists have described a remarkable collection of dinosaur tracks on beaches in the Kimberley region of Western Australia.

By Jonathan Amos BBC Science Correspondent



More than 20 different types of fossil footmarks have been captured in sandstone rock. Some are over 1.5m in size, recording the movement of sauropods - the giant beasts with long necks and tails. The trackways, many only visible at low tide, were "globally unparalleled", claimed the lead scientist involved. Steve Salisbury called the 25km-long coastline collection Australia's own Jurassic Park.

The trackways are part of the oral history of the local indigenous people **Queensland University / James Cook University**

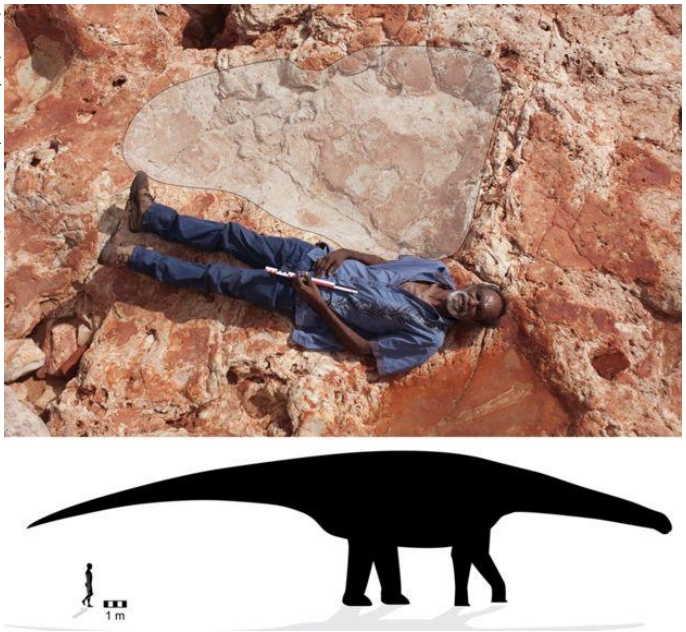
"This is the most diverse dinosaur track fauna we've ever recorded," he told BBC News.

"In this time slice (127 and 140 million years ago) in Australia, we've got no other record - there's virtually no other fossils from any part of the continent. This is only window, and what we see is truly amazing.

"Twenty-one different types. There are about six different types of tracks for meat-eating dinosaurs; about the same number for sauropod dinosaurs; about four different types of ornithopod dinosaur tracks - so, two-legged plant-eaters - and really exciting, I think, are six types of armoured dinosaur tracks, including stegosaurs, which we've never seen before in Australia."

The researcher put together a team from Queensland University and James Cook University to investigate the footprints after being invited to do so by area's Goolarabooloo Traditional Custodians.

Back in 2008, the aboriginal people of Western Australia's Kimberley region had been concerned about the possible development of a liquid natural gas facility.



The biggest sauropod prints are over a metre long **Queensland University / James Cook University**

They asked Dr Salisbury to document the beach prints as part of their campaign of opposition.

The scientist said the indigenous people had long referred to the markings in their oral history - probably for thousands of years.

"They form part of a song cycle - they relate to a creation mythology, and specifically the tracks show the journey of a creation being called Marala - the emu man. "Wherever he went he left behind three-toed tracks that now we recognise as the tracks of meat-eating dinosaurs."

Dr Salisbury's team spent more than 400 hours detailing the prints between 2011 to 2016.

Thousands of tracks are recorded at 48 discrete sites centred on Walmadany (James Price Point) on the Dampier Peninsula. The scientists examined and measured the depressions using three-dimensional photogrammetry, which builds accurate models of the

subjects under investigation by taking pictures from various angles. For a good many, they took silicone peels from which to make casts that could then be shown in museums.

Most of Australia's dinosaur fossils come from the eastern side of the continent, and are between 115 and 90 million years old.

The research has been published as the 2016 Memoir of the Society of Vertebrate Paleontology.

http://bit.ly/2o94U2e

Can People Allergic to Nuts Still Eat Some Types?

People who are allergic to one type of tree nut, such as cashews, may not be allergic to all other kinds of tree nuts, though they are often told to avoid those nuts, a new study finds.

By Cari Nierenberg, Live Science Contributor | March 27, 2017

The study's authors suggest that people who have developed allergic symptoms in the past to one tree nut, and who have been avoiding eating all other tree nuts based on medical advice may wish to undergo a properly supervised "oral food challenge" test, to see if they are truly allergic to other tree nuts. However, more research is needed to confirm the new findings.

Tree nuts are a group of eight nuts: almonds, Brazil nuts, cashews, hazelnuts, macadamia nuts, pecans, pistachios and walnuts. Researchers in the new study found that 76 percent of the participants who had an allergy to one type of tree nut could pass an oral food challenge test with a different tree nut. This test involves eating very small amounts of a food under medical supervision to see if the individual develops any symptoms of an allergic reaction, such as wheezing, a rash, an upset stomach or facial swelling.

An oral food challenge is a closely supervised medical procedure, and people with known allergies to tree nuts or peanuts should not be experimenting with eating nuts on their own, because this could trigger a severe allergic reaction known as anaphylaxis.

Passing an oral food challenge test is considered the most accurate way for people to demonstrate that they do not have a food allergy, according to a statement from the American College of Allergy, Asthma and Immunology, an association of allergy specialists that publishes the medical journal in which the new study appears.

"We found that patients with tree nut allergies can be allergic to one nut but be tolerant to another tree nut," said Dr. Christopher Couch, an allergist at the Allergy Asthma Clinic, Ltd. in Phoenix, and the lead author of the study published today (March 27) in the journal Annals of Allergy, Asthma and Immunology.

Allergies vs. sensitivities

Two other tests, a blood test and a skin-prick test, are also used to diagnose food allergies. However, a positive result on either of those tests does not always indicate that a person is truly allergic to the food being tested, Couch told Live Science. A food challenge is the next step to confirm the allergy, he said. About 1 percent of children in the United States are allergic to tree nuts, according to an estimate published in the journal Pediatrics in 2011.

In the new study, researchers analyzed data from the medical records of 109 patients who had visited allergy clinics affiliated with the University of Michigan Medical Center during an eight-year period, from 2007 to 2015. Most of the patients were children.

The study included only people with known allergies or sensitivities to a single tree nut. These participants were given an oral food challenge test at a clinic, to find out whether they were also allergic to other nuts. In the research, people who had developed allergy symptoms after eating a specific tree nut were considered to be allergic to that nut, while people who had positive blood or skin-prick test results to tree nuts but had never actually eaten that food were considered sensitized, Couch explained.

High pass rates

The study found that 76 percent of people with allergies to a specific nut passed the oral food challenge test for a different type of tree nut. In addition, 91 percent of the participants passed the food challenge if they had food sensitivities to a tree nut rather than true allergies.

Interestingly, all of the participants who ate an almond during the food challenge passed the test, whereas the passage rates for people given a walnut or a cashew were lower, at 82 percent and 79 percent, respectively.

It was surprising to find that everybody passed the almond food challenge but not those of other tree nuts, Couch said. The reasons why are not exactly clear, but it's possible that something about the structure of the almond is unique, he said.

The researchers also looked at people with peanut allergies, who had positive blood or skin-prick tests for tree nuts but had never eaten any of these nuts. (Peanuts are not tree nuts, but allergy specialists usually tell people with peanut allergies to avoid tree nuts, too.)

Results showed that 96 percent of the people with peanut allergies passed the oral food challenge with tree nuts, meaning that only 4 percent developed an allergic reaction when given a small amount of an individual tree nut. One of the limitations of the study is that the patients were drawn from only one health care system in Michigan, and so may not be representative of people throughout the United States, the authors noted.

http://bit.ly/2nz3TPB

Weather extremes: Humans likely influence giant airstreams

The increase of devastating weather extremes in summer is likely linked to human-made climate change, mounting evidence shows.

Giant airstreams are circling the Earth, waving up and down between the Arctic and the tropics. These planetary waves transport heat and moisture. When these planetary waves stall, droughts or floods can occur. Warming caused by greenhouse-gases from fossil fuels creates favorable conditions for such events, an international team of scientists now finds.

"The unprecedented 2016 California drought, the 2011 U.S. heatwave and 2010 Pakistan flood as well as the 2003 European hot spell all belong to a most worrying series of extremes," says Michael Mann from the Pennsylvania State University in the U.S., lead-author of the study now to be published in Scientific Reports.

"The increased incidence of these events exceeds what we would expect from the direct effects of global warming alone, so there must be an additional climate change effect. In data from computer simulations as well as observations, we identify changes that favor unusually persistent, extreme meanders of the jet stream that support such extreme weather events. Human activity has been suspected of contributing to this pattern before, but now we uncover a clear fingerprint of human activity."

How sunny days can turn into a serious heat wave

"If the same weather persists for weeks on end in one region, then sunny days can turn into a serious heat wave and drought, or lasting rains can lead to flooding", explains co-author Stefan Rahmstorf from the Potsdam Institute for Climate Impact Research (PIK) in Germany. "This occurs under specific conditions that favor what we call a quasi-resonant amplification that makes the north-south undulations of the jet stream grow very large. It also makes theses waves grind to a halt rather than moving from west to east. Identifying the human fingerprint on this process is advanced forensics."

Air movements are largely driven by temperature differences between the Equator and the Poles. Since the Arctic is more rapidly warming than other regions, this temperature difference is decreasing. Also, land masses are warming more rapidly than the oceans, especially in summer. Both changes have an impact on those global air movements. This includes the giant airstreams that are called planetary waves because they circle Earth's Northern hemisphere in huge turns between the tropics and the Arctic. The scientists detected a specific surface temperature distribution apparent during the episodes when the planetary waves eastward movement has been stalling, as seen in satellite data. Using temperature measurements since 1870 to confirm findings in satellite data

"Good satellite data exists only for a relatively short time - too short to robustly conclude how the stalling events have been changing over time. In contrast, high-quality temperature measurements are available since the 1870s, so we use this to reconstruct the changes over time," says co-author Kai Kornhuber, also from PIK.

"We looked into dozens of different climate models - computer simulations called CMIP5 of this past period - as well as into observation data, and it turns out that the temperature distribution favoring planetary wave airstream stalling increased in almost 70 percent of the simulations since the start of the industrial age."

Interestingly, most of the effect occured in the past four decades. "The more frequent persistent and meandering Jetstream states seems to be a relatively recent phenomenon, which makes it even more relevant," says co-author Dim Coumou from the Department of Water and Climate Risk at VU University in Amsterdam (Netherlands).

"We certainly need to further investigate this - there is some good evidence, but also many open questions. In any case, such non-linear responses of the Earth system to human-made warming should be avoided. We can limit the risks associated with increases in weather extremes if we limit greenhouse-gas emissions."

Article: Michael E. Mann, Stefan Rahmstorf, Kai Kornhuber, Byron A. Steinman, Sonya K. Miller, Dim Coumou (2017): Influence of Anthropogenic Climate Change on Planetary Wave Resonance and Extreme Weather Events. Scientific Reports [DOI: 10.1038/srep45242]
Weblink to the article once it is published: http://www.nature.com/articles/srep45242
Weblink to video that explains the planetary waves phenomenon: https://www.youtube.com/watch?v=MzW5Isbv2A0

http://huff.to/2nz0YWU

X-Rays Of The Earliest Stage Of Alzheimer's Offer Critical Clue About How It Starts

Scientists peered into the brains of mice and saw something about Alzheimer's they hadn't seen before.

By Sarah DiGiulio

As many as 5 million Americans are living with Alzheimer's disease today, and that number could more than triple by 2025. The brain disorder is the most common form of dementia, causing memory loss that worsens over time and eventually pushes the body to shut down. (Not to mention that it's also one of the costliest health conditions in the U.S.)

Some drugs can slow down the development of Alzheimer's in some patients, but they don't work for everyone — and there is no cure.

But new research has captured more detailed images of the brain at earlier stages of Alzheimer's disease than have ever been seen before. The pictures reveal an important clue about how the illness begins, which researchers say could help them design more effective medications.

"Alzheimer's disease has been tremendously challenging for medical research mainly because it is a disease of aging that attacks the most complex thing we know: synapses, which allow us to think and remember," said study author Gunnar Gouras, a professor in experimental neurology at Sweden's Lund University.

For this research, Gouras and his colleagues used a synchrotron accelerator, a type of super-bright, high-quality X-ray machine. It was the first time the machine had been used to look at this particular early stage of Alzheimer's, Gouras said.

Researchers have previously observed certain changes in the brain - the buildup of a type of protein that creates harmful plaque and other damage - as the first stages of Alzheimer's disease. This process kills off the healthy neurons in the brain until it eventually stops functioning.

The high-powered X-ray machine allowed Gouras' team to see what was happening in the brains of mice developing Alzheimer's before those proteins started causing plaque to build up. The mice had been genetically engineered to develop the condition in the same way that people do.

The images revealed that the plaque-causing proteins have a different structure than was previously assumed. It is similar to the structure of

another abnormal protein known to cause transthyretin amyloidosis, a different rare disorder of the nervous system.

Gouras and his colleagues are excited because there is already a drug available that works to slow down transthyretin amyloidosis.

That drug isn't guaranteed to help people with Alzheimer's, Gouras said, but it might. More importantly, the study suggests a pathway for designing drugs that would better target the structure of those proteins in Alzheimer's, he said.

Better understanding Alzheimer's is an important step in finding more effective treatments, other experts have said.

"Our understanding of this very complex disease is still rudimentary at best," Bruce Lamb, executive director of the Stark Neuroscience Research Institute at Indiana University, previously told Healthline.

"We still understand very little about all of the changes occurring within the brain over the 20 to 30 years' disease course. This makes it very difficult to both identify potential targets and also know when to target these therapies over the disease course," Lamb said.

The new research may also have implications for diagnosing Alzheimer's disease at earlier stages, Gouras noted.

He emphasized that his team's focus will be finding better treatments. "The next step is to test whether [that transthyretin amyloidosis drug] might also be helpful for Alzheimer's," Gouras said.

There's not an immediate answer here for people suffering from Alzheimer's, but the medical researchers are getting closer.

http://bit.ly/2nKKq7K

Do patients want complementary and alternative treatments and will they pay cash for them?

Study shows that the majority of hospitalized patients perceive integrative services to be helpful

New Rochelle, NY - While complementary, alternative, and integrative medicine treatments such as acupuncture and massage therapy are usually offered in outpatient settings, a new study has shown that the majority of hospitalized patients perceived such integrative services to be helpful.

The study, which also examined whether patients would pay out of their own pockets for these services, is published in The Journal of Alternative and Complementary Medicine, a peer-reviewed publication from Mary Ann Liebert, Inc., publishers.

The article is available free on The Journal of Alternative and Complementary Medicine website until April 28, 2017.

In the article entitled *"Inpatients' Preferences, Beliefs, and Stated Willingness to Pay for Complementary and Alternative Medicine Treatments,"* Lori Montross-Thomas, PhD and coauthors from University of California, San Diego (UCSD), UCSD Moores Cancer Center, UCSD Center for Integrative Medicine, and True Wellness Acupuncture, San Diego, CA identify the complementary and alternative services a group of adult patients perceived to be the most helpful.

The authors also report on which integrative services the patients would agree to pay for and how the patients believed the treatments would benefit them.

The complementary services considered included acupuncture, aromatherapy, art therapy, guided imagery, healthy food, humor therapy, massage therapy, music therapy, pet therapy, Reiki, and stress management.

For all therapies but one, a majority of patients considered the treatments helpful and across the board between 33-71% of patients expressed a willingness to pay cash.

"These findings should help all decision makers in value-based hospital systems that are seeking to enhance patient-experience and better understand costs and potential cost savings," says The Journal of Alternative and Complementary Medicine Editor-in-Chief John Weeks, johnweeks-integrator.com, Seattle, WA.

http://bit.ly/2nzp6ZF

Researchers warn of hazards of smoking and need for wider use of varenicline to quit

Varenicline deemed a safe and effective way to achieve smoking cessation

More than 35 million Americans are trying to quit smoking. Smoking cigarettes causes 480,000 premature deaths each year due mainly to a two-fold risk of cardiovascular disease and a 20-fold risk of lung cancer. In a commentary published in the current issue of the American Journal of Medicine, researchers from the Charles E. Schmidt College of Medicine at Florida Atlantic University reassure clinicians and their patients that varenicline, whose brand name is Chantix, is a safe and effective way to achieve smoking cessation and that failure to use this drug has caused preventable heart attacks and deaths from cardiovascular disease.

In 2006, varenicline was approved as a safe and effective means to quit smoking and achieved permanent quit rates of approximately 25 percent. In 2009, however, varenicline received a black box warning by the FDA based on their adverse event reports of neuropsychiatric symptoms like depression and thoughts of suicide.

There were plausible alternative explanations including that nearly half of the subjects had psychiatric histories, 42 percent were taking psychotropic drugs and about 42 percent were suffering from depression. Nonetheless, since then, there has been a 76 percent decline in the number of prescriptions dispensed from a peak of about 2 million in the last quarter of 2007 to about 531,000 in the first quarter of 2014.

In their commentary, the FAU researchers emphasize that, until recently, the totality of randomized evidence on varenicline had been restricted to eight small trials, which did not demonstrate a hazard. The researchers caution that the reliable detection of small to moderate risks and benefits of drug therapies requires cogent data from large-scale randomized trials designed a priori to test the hypothesis.

Such a large randomized trial was recently completed that included both apparently healthy individuals as well as those with severe mental illness. The trial was conducted for 12 weeks on about 8,000 long-term smokers and included equal subgroups of those without as well as with psychiatric disorders. In subjects without psychiatric disorders, those treated with varenicline had less neuropsychiatric symptoms and in subjects without psychiatric disorders there were no increases in these symptoms. Both groups of participants assigned at random to varenicline achieved significantly higher abstinence rates at 12 weeks than those assigned to placebo, nicotine patch or bupropion. Just a few months ago, the FDA removed the black box warning from varenicline.

The commentary was coauthored by Dianna Gaballa, a fourth-year medical student; Joanna Drowos, D.O., M.P.H., an associate professor of integrated medical science and associate chair of the Department of Integrated Medical Science; and Charles H. Hennekens, M.D., Dr.P.H., the first Sir Richard Doll Professor and senior academic advisor to the dean, all in FAU's Charles E. Schmidt College of Medicine.

"The existing totality of evidence suggests an urgent need to increase the use of varenicline in the general population as well as in those with serious mental illness who on average die about 20 years earlier than the general population, in part, because their smoking rates may be as high as 75 percent," said Hennekens.

Quitting smoking significantly reduces risks of cardiovascular disease beginning within a matter of months and reaching the non-smoker status within a few years, even among older adults. For lung and other cancers, however, reductions do not even begin to emerge for years after quitting and, even after 10 years, quitters achieve death rates only about midway between the continuing smoker and non-smoker.

"For reducing risks of cardiovascular disease it's never too late to quit, but to reduce risks of cancer, it's never too early," said Hennekens.

The authors speculate that if use of varenicline had not plummeted by 76 percent following the black box warning in 2009, perhaps 17,000 premature deaths from cardiovascular disease may have been avoided each year during the last few years. Public health efforts and effective cessation treatments including behavioral counseling and medication have resulted in a 14 percent decrease in smoking in the U.S. while the rates are markedly increasing in developing countries.

According to the U.S. Centers for Disease Control and Prevention, heart disease is the leading killer among men and women causing approximately 600,000 deaths each year.

Among the numerous honors and recognitions Hennekens has received include the Ochsner Award for reducing premature deaths from cigarettes in 2014. From 1995 to 2005, Science Watch ranked him as the third most widely cited medical researcher in the world and five of the top 20 were his former trainees and/or fellows. In 2012, Science Heroes ranked Hennekens No. 81 in the history of the world for having saved more than 1.1 million lives. In 2016, he was ranked the No. 14 "Top Scientist in the World" with an H-index of 173.

http://bbc.in/2nGAiDP

How Tetris therapy could help patients

Tetris's immersive simplicity makes it a potentially powerful therapeutic tool

By Michelle Roberts Health editor, BBC News online

Tetris is a relatively basic yet compelling video game. The aim is to line up falling blocks so they fit together in horizontal rows. When a perfect line with no gaps is made, it will vanish, making room for more play and point-scoring. Scientists say it's Tetris's immersive simplicity that makes it a potentially powerful therapeutic tool.

Prof Emily Holmes, an expert in psychology at the University of Karolinska, has spent many years exploring the game's medical merits. "We wanted to have a task that really tapped into visual memory. With Tetris, it's the colours, shapes and movements that are very absorbing. "Other games in the lab, like pub quiz games or counting tasks, didn't work. So we think it needs to be visual."

Such is its pull, some people say that after playing the game they see falling blocks in their thoughts and dreams - a phenomenon dubbed the Tetris effect. Here's how it might help people.

Post-traumatic stress disorder

Prof Holmes has just published a study that shows Tetris therapy may lessen the psychological impact of traumatic events. Her team at the University of Oxford gave Tetris therapy to patients admitted to a large UK hospital emergency department in a state of shock following road traffic accidents. The patients were asked to visualise the crash they had just encountered and then begin playing Tetris on a Nintendo console. Twenty minutes of game play appeared to be enough of a distraction to stop disturbing memories of the accident being formed.

Prof Holmes explains: "Our findings suggest that if you engage in very visually demanding tasks soon after a trauma, this can help block or disrupt the memory being stored in an overly vivid way." She says there is roughly a six-hour window of opportunity after a traumatic event to intervene.

In the study, the group of patients who had the Tetris therapy were far less likely to experience troublesome flashbacks of their accident than those who did not receive this intervention. She says bigger studies are now needed - hers involved 71 volunteers. If those prove beneficial, it could be a treatment that other hospitals start to use.

Cravings

Scientists from Plymouth University and Queensland University of Technology, Australia, say playing Tetris can help people curb cravings for things like coffee, cigarettes and alcohol. They asked 31 students to take part in an experiment. The students were sent text messages throughout the day asking them to rate their current level of cravings for drugs, food and drink, and activities including exercise and sex. Fifteen of the students were also given an iPod to play short bursts of Tetris to see if it would have any effect. Cravings decreased in the Tetris group.

Researcher Prof Jackie Andrade explained: "We think the Tetris effect happens because craving involves imagining the experience of consuming a particular substance or indulging in a particular activity. Playing a visually interesting game like Tetris occupies the mental

processes that support that imagery; it is hard to imagine something vividly and play Tetris at the same time."

Lazy eye

A small study some years ago found an adapted version of Tetris helped treat a condition known as lazy eye or amblyopia. The video game trains both eyes to work together, which is counter to previous treatments for the disorder. Conventionally, doctors recommend covering the "good" eye with a patch to make the "lazy" one work harder.

Dr Robert Hess, from McGill University in Canada, who ran the study said: "Using head-mounted video goggles we were able to display the game dichoptically, where one eye was allowed to see only the falling objects, and the other eye was allowed to see only the ground plane objects." This forced the eyes to work together.

The researchers tested the treatment on 18 adults with amblyopia. Half played regular Tetris with the stronger eye patched, while the other half played the modified game with both eyes open. At the end of the two-week study, the group who used both eyes had more improvement in their vision than the patched group. When the monocular patching group, who had showed only a moderate improvement, switched to the dual eye training, the vision of this group also improved dramatically.

http://bit.ly/2oqjxjU

Humans are 'learning to think as a species'

Humanity is in the early stages of the most significant evolution in its history: learning to think as a species.

This is the linking of human minds, values, information and solutions at lightspeed and in real time around the planet, via the internet and social media, says science writer Julian Cribb.

Global thought is opening the way to solve some of humanity's greatest threats – including climate change, famine, global poisoning, weapons of mass destruction, environmental collapse, resource scarcity and overpopulation, says Mr Cribb, who is the author of *'Surviving the 21st Century'* (Springer 2017), a new book describing the ten mega-threats and what can be done about them.

"Thanks to the internet and social media, people are for the first time communicating across the barriers of language, race, nationality, religion, region and gender. While the internet contains much rubbish and malignance, it also contains huge amounts of goodwill, trustworthy science-based advice, practical solutions to problems – and people joining hands in good causes."

Mr Cribb explains that in the second trimester of a baby's gestation a marvellous thing happens: "The nerve cells in the embryonic brain begin to connect – and a mind is born. An inanimate mass of cells becomes a sentient being, capable of thought, imagination, memory, logic, feelings and dreams.

"Today individual humans are connecting, at lightspeed, around a planet – just like the neurons in the foetal brain. We are in the process of forming a universal, Earth-sized 'mind'.

"A higher understanding, and potentially a higher intellect, is in genesis – capable of thought, reason and resolute action to counter the existential threats that are building up around us.

"We are learning to think at supra-human level by applying millions of minds simultaneously to the issues, in real time, by sharing our knowledge freely and by generating faster global consensus on what needs to be done to secure our future."

Today, hard scientific evidence confirms humanity faces 10 mega-risks, the result of our burgeoning population and the overgrowth in its demands on the Earth's natural resources and systems.

However, practical solutions to all of these problems exist – and are capable of being shared universally.

"The problem we face is that some governments and big corporations are reluctant to act. They are placing short-term self-interest above the interests of the human species in sustaining our existence on the planet.

"The internet is showing that their time is up. And their replacement will not be a 'world government'. It will be a human species that

shares thought, ideas and solutions at lightspeed. An Earth-sized democracy.

"By 2020 there will be 4.1 billion internet users. By 2030, everyone will be online. For the first time a conversation among the whole of humanity becomes possible – and what more urgent and suitable topic than the survival of the human species?" Cribb says.

"Young people and elders are reaching out to one another in real time, across the divides of race, nationality, ethnicity, language, religion, socioeconomic status and prejudice. They are learning how alike we all are. How many things we share. How we can 'like', help, support and depend on each other.

"They are also learning how deadly are the prejudices, the ignorance, the fears and the hatreds of their parents towards other humans. And how utterly pointless.

"The antidotes to ignorance and fear are knowledge and understanding. The internet can supply both. People just need to be able to discriminate between what is good for humanity – and what isn't. What is true and trustworthy, from 'fake news'. We need to become 'informed consumers' on the internet, as we do in choosing foods or other products for safety, health and sustainability."

"Above all, we need to hear more women's voices about the human future. As a rule, women do not start wars, strip-mine landscapes, plunder the oceans, clear-fell forests, exterminate wildlife or poison the food, air and water we need for survival – that's mainly masculine handiwork.

"Women tend to consider the needs of the next generation. This is the thinking, and global leadership, we now need to ensure human survival in this, the century of mega-threats.

"This isn't about feminism – it's about our survival."

'*Surviving the 21st Century*' (Springer 2017) is a powerful new book exploring the main risks facing humanity: ecological collapse, resource depletion, weapons of mass destruction, climate change, global poisoning, food crises, population and urban overgrowth, pandemic disease, dangerous new technologies and self-delusion – and what can and should be done to limit them by humanity as a whole and by individual citizens.

More information: *Surviving the 21st Century: Humanity's Ten Great Challenges and How We Can Overcome Them.* *www.springer.com/us/book/9783319412696*

http://bbc.in/2mVqc3q

Measles outbreak across Europe

Measles is spreading across Europe wherever immunisation coverage has dropped, the World Health Organization is warning.

The largest outbreaks are being seen in Italy and Romania.

In the first month of this year, Italy reported more than 200 cases. Romania has reported more than 3,400 cases and 17 deaths since January 2016.

Measles is highly contagious. Travel patterns mean no person or country is beyond its reach, says the WHO. For good protection, it's recommended that at least 95% of the population is vaccinated against the disease.

But many countries are struggling to achieve that.

Most of the measles cases have been found in countries where immunisation has dipped below this threshold and the infection is endemic - France, Germany, Italy, Poland, Romania, Switzerland and Ukraine. Preliminary information for February suggests that the number of new infections is rising sharply, says the WHO.

WHO regional director for Europe Dr Zsuzsanna Jakab said: "I urge all endemic countries to take urgent measures to stop transmission of measles within their borders, and all countries that have already achieved this to keep up their guard and sustain high immunisation coverage."

The European Centre for Disease Prevention and Control says that between 1 February 2016 and 31 January 2017 the UK reported 575 cases of measles.

The MMR (measles, mumps and rubella) vaccine is available on the NHS for babies and pre-school children.

Lagging immunisation

Robb Butler, of the WHO Regional Office for Europe, says there are a number of reasons why vaccination coverage has waned in some regions. "In some countries, like the Ukraine, there have been supply and procurement issues."

Then there's vaccine hesitancy. Some people are fearful of vaccination, while others are complacent or find it an inconvenience, he says.

In France, for example, people need to make an appointment with their doctor to get a prescription, go to the pharmacy to collect the vaccine and then rebook with their doctor to have the jab administered. "We need to get to the point where we appreciate that people have busy lives and competing priorities."

Dr Mary Ramsay, Head of Immunisation at Public Health England, said: "England's uptake of MMR vaccine by five years of age has reached the WHO's target of 95%.

"In the last year, the measles cases confirmed in England have mainly been in older adolescents and young adults with many linked to music festivals and other large public events. Individuals of any age who have not received two doses of the MMR vaccine, or those who are unsure, should speak to their GP - it's never too late to have the vaccine and measles can still be serious in adults. We are continuing to invest in programmes which encourage uptake of the vaccine to ultimately consign measles to the history books."

Measles

Unvaccinated young children are at highest risk of measles and its complications, including death

Measles is spread by direct contact and through the air by coughs and sneezes

The virus remains active and contagious on infected surfaces for up to two hours

The first signs of infection are usually a high fever and cold-like symptoms, such as a runny nose

You may notice small white spots on the inside of the cheeks as well

After several days, a rash develops, usually on the face and neck first and then spreading to the body and limbs

An infected person can pass on the virus to others from four days prior to developing the skin rash to four days after the rash erupts

There is no treatment, but two doses of vaccine can prevent infection in the first place

http://bit.ly/2nD9a76

A molecular on/off switch for CRISPR

No one has figured out exactly how these anti-CRISPRs work--until now

LA JOLLA, CA - Picture bacteria and viruses locked in an arms race.

For many bacteria, one line of defense against viral infection is a sophisticated RNA-guided "immune system" called CRISPR-Cas. At the center of this system is a surveillance complex that recognizes viral DNA and triggers its destruction. However, viruses can strike back and disable this surveillance complex using "anti-CRISPR" proteins, though no one has figured out exactly how these anti-CRISPRs work--until now.

For the first time, researchers have solved the structure of viral anti-CRISPR proteins attached to a bacterial CRISPR surveillance complex, revealing precisely how viruses incapacitate the bacterial defense system. The research team, co-led by biologist Gabriel C. Lander of The Scripps Research Institute (TSRI), discovered that anti-CRISPR proteins work by locking down CRISPR's ability to identify and attack the viral genome. One anti-CRISPR protein even "mimics" DNA to throw the CRISPR-guided detection machine off its trail.

"It's amazing what these systems do to one-up each other," said Lander. "It all comes back to this evolutionary arms race."

The new research, co-led by Blake Wiedenheft of Montana State University, was published recently in the journal Cell. If CRISPR complexes sound familiar, that's because they are at the forefront in a new wave of genome-editing technologies. CRISPR (pronounced "crisper") stands for "clustered regularly interspaced short palindromic

repeats." Scientists have discovered that they can take advantage of CRISPR's natural ability to degrade sections of viral RNA and use CRISPR systems to remove unwanted genes from nearly any organism. "Although CRISPR-Cas9 is the 'celebrity' CRISPR system, there are 19 different types of CRISPR systems, each of which may have unique advantages for genetic engineering. They are a massive, untapped resource," said Lander. "The more we learn about the structures of these systems, the more we can take advantage of them as genome-editing tools."

Using a high-resolution imaging technique called cryo-electron microscopy, the researchers discovered three important aspects of CRISPR and anti-CRISPR systems.

First, the researchers saw exactly how the CRISPR surveillance complex analyzes a virus's genetic material to see where it should attack. Proteins within the complex wrap around the CRISPR RNA like a grasping hand, exposing specific sections of bacterial RNA. These sections of RNA scan viral DNA, looking for genetic sequences they recognize. "This system can quickly read through massive lengths of DNA and accurately hit its target," said Lander. If the CRISPR complex identifies a viral DNA target, the surveillance machine recruits other molecules to destroy the virus's genome.

Next, the researchers analyzed how viral anti-CRISPR proteins paralyze the surveillance complex. They found that one type of anti-CRISPR protein covers up the exposed section of CRISPR RNA, thereby preventing the CRISPR system from scanning the viral DNA.

"These anti-CRISPR proteins keep the bacteria from recognizing the viral DNA," Lander explained. He called these anti-CRISPR proteins "exceptionally clever" because they appear to have evolved to target a crucial piece of the CRISPR machinery. If bacteria were to mutate this machinery to avoid viral attacks, the CRISPR system would cease to function. "CRISPR systems cannot escape from these anti-CRISPR proteins without completely changing the mechanism they use to recognize DNA," he said.

Another anti-CRISPR protein uses a different trick. Based on its location and negative charge, the researchers believe this anti-CRISPR protein acts as a DNA mimic, fooling CRISPR into binding this immobilizing protein, rather than an invading viral DNA.

"These findings are important because we knew that anti-CRISPR proteins were blocking bacterial defenses, but we had no idea how," said Lander.

The researchers believe this new understanding of anti-CRISPR proteins may eventually lead to more sophisticated and efficient tools for gene editing. Perhaps anti-CRISPR proteins can be used in CRISPR systems to swoop in to block gene editing -- or researchers could degrade anti-CRISPR proteins to trigger gene editing. "That might work as an on-off switch for CRISPR," Lander said.

In addition to Lander and Wiedenheft, the study, "Structure Reveals Mechanisms of Viral Suppressors that Intercept a CRISPR RNA-Guided Surveillance Complex," was led by first authors Saikat Chowdhury of TSRI and Joshua Carter of Montana State University.

Other authors of the study were MaryClare F. Rollins, Sarah M. Golden, Ryan N. Jackson and Connor Hoffmann of Montana State University; Lyn'Al Nosaka of TSRI; Joseph Bondy-Denomy of the University of California, San Francisco; Karen L. Maxwell and Alan R. Davidson of the University of Toronto, Toronto, CA; and Elizabeth R. Fischer of the National Institutes of Health's National Institute of Allergy and Infectious Diseases.

The study was supported by the National Institutes of Health (grants P20GM103500, P30GM110732-03, R01GM110270, Q1 R01GM108888, P20GM103474, F32 GM108436, DP2EB020402 and DP5-OD021344); the National Institutes of Health Intramural Research Program; the Canadian Institutes of Health Research (grant MOP-130482 and MOP-136845); the University of California, San Francisco, Program for Breakthrough Biomedical Research, funded in part by the Sandler Foundation; the National Science Foundation EPSCoR (grant EPS-110134); the M.J. Murdock Charitable Trust; and a young investigator award from Amgen. Lander is also supported as a Searle Scholar and Pew Scholar.

http://bit.ly/2oqUqGd

Knee replacement surgery may have minimal effect on quality of life & unattractive

Performance of total knee replacement in patients with less severely affected physical function seems to be economically unjustifiable

Knee replacement surgery for patients with osteoarthritis, as currently used, provides minimal improvements in quality of life and is economically unattractive, according to a study led by Mount Sinai

researchers and published today in the BMJ. However, if the procedure was only offered to patients with more severe symptoms, its effectiveness would rise, and its use would become economically more attractive as well, the researchers said.

"Given its limited effectiveness in individuals with less severely affected physical function, performance of total knee replacement in these patients seems to be economically unjustifiable," said Bart Ferket, MD, PhD, Assistant Professor, Department of Population Health Science and Policy at the Icahn School of Medicine at Mount Sinai and lead author on the study. "Considerable cost savings could be made by limiting eligibility to patients with more symptomatic knee osteoarthritis. Our findings emphasize the need for more research comparing total knee replacement with less expensive, more conservative interventions, particularly in patients with less severe symptoms."

About 12 percent of adults in the United States are affected by osteoarthritis of the knee. The annual rate of total knee replacement has doubled since 2000, mainly due to expanding eligibility to patients with less severe physical symptoms. The number of procedures performed each year now exceeds 640,000 at a total annual cost of about $10.2 billion, yet health benefits are higher in those with more severe symptoms before surgery.

A team of researchers from the Icahn School of Medicine at Mount Sinai and Erasmus University Medical Center in Rotterdam, the Netherlands, set out to evaluate the impact of total knee replacement on quality of life in people with knee osteoarthritis. They also wanted to estimate differences in lifetime costs and quality adjusted life years or QALYs (a measure of years lived and health during these years) according to level of symptoms.

They analyzed data from two U.S. cohort studies: one with 4,498 participants aged 45-79 with or at high risk for knee osteoarthritis from the Osteoarthritis Initiative (OAI), and the other involving 2,907 patients from the Multicenter Osteoarthritis Study (MOST). OAI participants were followed up for nine years and MOST patients were followed up for two years. Quality of life was measured using a recognized score of physical and mental function, known as SF-12, and using some osteoarthritis-specific quality of life scores.

They found that quality of life outcomes generally improved after knee replacement surgery, although the effect was small. The improvements in quality of life outcomes were found higher when patients with lower physical scores before surgery were operated on.

In a cost-effectiveness analysis, current practice was more expensive and in some cases seemed even less effective compared with scenarios in which total knee replacement was performed only in patients with lower physical function.

"Our findings show opportunity for optimizing delivery of total knee replacement in a cost-effective way, finding the patients who will benefit the most, delivering the treatment at the correct point in their disease progression, and optimizing the cost so we can deliver the benefit to all who need it," said Madhu Mazumdar, PhD, Director of the Institute for Healthcare Delivery Science at the Mount Sinai Health System, Professor of Biostatistics, Department of Population Health Science and Policy at the Icahn School of Medicine at Mount Sinai, and co-author of the study.

Funding for the cohort studies used in the analysis was provided by the National Institutes of Health, Merck Research Laboratories, Novartis Pharmaceuticals Corporation, GlaxoSmithKline, and Pfizer. Dr. Ferket is supported by the American Heart Association. The researchers have no competing interests to disclose.

http://bit.ly/2oiHRSQ

Man with quadriplegia employs injury bridging technologies to move again -- just by thinking

First recipient of implanted brain-recording and muscle-stimulating systems reanimates limb that had been stilled for 8 years

CLEVELAND--Bill Kochevar grabbed a mug of water, drew it to his lips and drank through the straw.

His motions were slow and deliberate, but then Kochevar hadn't moved his right arm or hand for eight years.

And it took some practice to reach and grasp just by thinking about it.

Kochevar, who was paralyzed below his shoulders in a bicycling accident, is believed to be the first person with quadriplegia in the world to have arm and hand movements restored with the help of two temporarily implanted technologies.

A brain-computer interface with recording electrodes under his skull, and a functional electrical stimulation (FES) system* activating his arm and hand, reconnect his brain to paralyzed muscles.

Holding a makeshift handle pierced through a dry sponge, Kochevar scratched the side of his nose with the sponge. He scooped forkfuls of mashed potatoes from a bowl--perhaps his top goal--and savored each mouthful.

"For somebody who's been injured eight years and couldn't move, being able to move just that little bit is awesome to me," said Kochevar, 56, of Cleveland. "It's better than I thought it would be."

A video of Kochevar can be found at: https://youtu.be/OHsFkqSM7-A

Kochevar is the focal point of research led by Case Western Reserve University, the Cleveland Functional Electrical Stimulation (FES) Center at the Louis Stokes Cleveland VA Medical Center and University Hospitals Cleveland Medical Center (UH). A study of the work will be published in the The Lancet March 28 at 6:30 p.m. U.S. Eastern time.

"He's really breaking ground for the spinal cord injury community," said Bob Kirsch, chair of Case Western Reserve's Department of Biomedical Engineering, executive director of the FES Center and principal investigator (PI) and senior author of the research. "This is a major step toward restoring some independence."

When asked, people with quadriplegia say their first priority is to scratch an itch, feed themselves or perform other simple functions with their arm and hand, instead of relying on caregivers.

"By taking the brain signals generated when Bill attempts to move, and using them to control the stimulation of his arm and hand, he was able to perform personal functions that were important to him," said Bolu Ajiboye, assistant professor of biomedical engineering and lead study author.

Technology and training

The research with Kochevar is part of the ongoing BrainGate2* pilot clinical trial being conducted by a consortium of academic and VA institutions assessing the safety and feasibility of the implanted brain-computer interface (BCI) system in people with paralysis. Other investigational BrainGate research has shown that people with paralysis can control a cursor on a computer screen or a robotic arm.

"Every day, most of us take for granted that when we will to move, we can move any part of our body with precision and control in multiple directions and those with traumatic spinal cord injury or any other form of paralysis cannot," said Benjamin Walter, associate professor of Neurology at Case Western Reserve School of Medicine, Clinical PI of the Cleveland BrainGate2 trial and medical director of the Deep Brain Stimulation Program at UH Cleveland Medical Center.

"The ultimate hope of any of these individuals is to restore this function," Walter said. "By restoring the communication of the will to move from the brain directly to the body this work will hopefully begin to restore the hope of millions of paralyzed individuals that someday they will be able to move freely again."

Jonathan Miller, assistant professor of neurosurgery at Case Western Reserve School of Medicine and director of the Functional and Restorative Neurosurgery Center at UH, led a team of surgeons who implanted two 96-channel electrode arrays--each about the size of a baby aspirin--in Kochevar's motor cortex, on the surface of the brain.

The arrays record brain signals created when Kochevar imagines movement of his own arm and hand. The brain-computer interface extracts information from the brain signals about what movements he intends to make, then passes the information to command the electrical stimulation system.

To prepare him to use his arm again, Kochevar first learned how to use his brain signals to move a virtual-reality arm on a computer

screen. "He was able to do it within a few minutes," Kirsch said. "The code was still in his brain."

As Kochevar's ability to move the virtual arm improved through four months of training, the researchers believed he would be capable of controlling his own arm and hand.

Miller then led a team that implanted the FES systems' 36 electrodes that animate muscles in the upper and lower arm.

The BCI decodes the recorded brain signals into the intended movement command, which is then converted by the FES system into patterns of electrical pulses.

The pulses sent through the FES electrodes trigger the muscles controlling Kochevar's hand, wrist, arm, elbow and shoulder. To overcome gravity that would otherwise prevent him from raising his arm and reaching, Kochevar uses a mobile arm support, which is also under his brain's control.

New Capabilities

Eight years of muscle atrophy required rehabilitation. The researchers exercised Kochevar's arm and hand with cyclical electrical stimulation patterns. Over 45 weeks, his strength, range of motion and endurance improved. As he practiced movements, the researchers adjusted stimulation patterns to further his abilities.

Kochevar can make each joint in his right arm move individually. Or, just by thinking about a task such as feeding himself or getting a drink, the muscles are activated in a coordinated fashion.

When asked to describe how he commanded the arm movements, Kochevar told investigators, "I'm making it move without having to really concentrate hard at it...I just think 'out'...and it goes."

Kocehvar is fitted with temporarily implanted FES technology that has a track record of reliable use in people. The BCI and FES system together represent early feasibility that gives the research team insights into the potential future benefit of the combined system.

Advances needed to make the combined technology usable outside of a lab are not far from reality, the researchers say. Work is underway to make the brain implant wireless, and the investigators are improving decoding and stimulation patterns needed to make movements more precise. Fully implantable FES systems have already been developed and are also being tested in separate clinical research.

Kochevar welcomes new technology--even if it requires more surgery--that will enable him to move better. "This won't replace caregivers," he said. "But, in the long term, people will be able, in a limited way, to do more for themselves."

The investigational BrainGate technology was initially developed in the Brown University laboratory of John Donoghue, now the founding director of the Wyss Center for Bio and Neuroengineering in Geneva, Switzerland. The implanted recording electrodes are known as the Utah array, originally designed by Richard Normann, Emeritus Distinguished Professor of Bioengineering at the University of Utah.

The report in today's Lancet is the result of a long-running collaboration between Kirsch, Ajiboye and the multi-institutional BrainGate consortium. Leigh Hochberg, MD, PhD, a neurologist and neuroengineer at Massachusetts General Hospital, Brown University and the VA RR&D Center for Neurorestoration and Neurotechnology in Providence, Rhode Island, directs the pilot clinical trial of the BrainGate system and is a study co-author.

"It's been so inspiring to watch Mr. Kochevar move his own arm and hand just by thinking about it," Hochberg said. "As an extraordinary participant in this research, he's teaching us how to design a new generation of neurotechnologies that we all hope will one day restore mobility and independence for people with paralysis."

Other researchers involved with the study include: Francis R. Willett, Daniel Young, William Memberg, Brian Murphy, PhD, and P. Hunter Peckham, PhD, from Case Western Reserve; Jennifer Sweet, MD, from UH; Harry Hoyen, MD,and Michael Keith, MD, from MetroHealth Medical Center and CWRU School of Medicine; and John Simeral, PhD from Brown University and Providence VA Medical Center.

**CAUTION: Investigational Device. Limited by Federal Law to Investigational Use.*

http://bbc.in/2ohAzhJ

Menstrual cycle recreated 'in a dish'

US scientists say they have made a mini working replica of the female reproductive tract using human and mouse tissue.

Although the palm-sized device looks nothing like a womb, fallopian tubes and ovaries, the researchers say it should help with understanding diseases of these organs and tissues. It also provides a novel way to test new treatments. The work is part of a project to create the entire human "body on a chip".

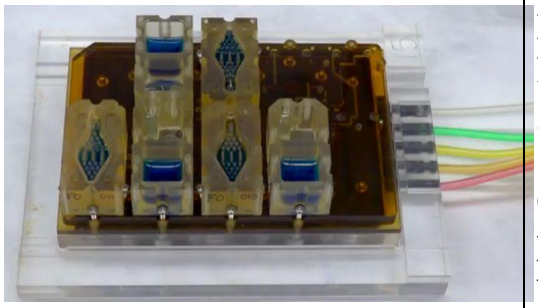


Image copyright Woodruff Lab

The ultimate goal would be to take cells from any given individual in order to create a personalised model of their body to test drugs and treatments on, Nature Communications reports.

Menstrual cycle in a dish

The 3D model is made up of a series of cubes that each represent the different parts of the female reproductive system.

Each cube contains collections of living cells from the respective bits of this system - fallopian tubes, uterus, cervix and vagina (all human cells), and the ovaries (taken from mice).

The cubes are connected together with small tubes, which allow special fluid to flow through the entire system, much like blood.

This also means the "mini organs" can communicate with each other using hormones, mimicking what happens in a woman's body during a "typical" 28-day human menstrual cycle.

One of the cubes represents the human liver because this organ plays an important role in drug metabolism, say the scientists.

Tests suggested that the tissues in the system responded to the cyclical ebb and flow of hormones, in a similar way to those of the female body.

Research Dr Joanna Burdette, from Northwestern University, said: "It's a biological representation of the female reproductive tract, so we call it Evatar."

Co-worker Dr Ji-Yong Julie Kim said: "Understanding how the uterus responds to hormones is really important. There is no animal model for a lot of the stuff that we study."

Experts welcomed the advance.

Prof Jan Brosens from the University of Warwick said: "This is genuinely a remarkable technical achievement.

"I am entirely confident that this novel technology represents a step-change in our ability to pinpoint defects that cause infertility and early pregnancy loss. However, it is not a system that can recapitulate all the specialised functions of the reproductive tract or replace IVF."

Dr Channa Jayasena, from Imperial College London and the Society for Endocrinology, said: "The results are exciting and represent an important innovation. However, we must remember that the rodent and human reproductive systems have important differences."

http://bit.ly/2nDLqjh

Most marathon runners get kidney damage

Think running a marathon is a healthy thing to do? Think again. Andrew Masterson reports.

More than 80% of marathon runners incur acute kidney disease, new research has shown. A team of scientists led by Yale University medical school's Chirag Parikh tested a small group of runners before and after the Hartford marathon in 2015, looking at markers such as creatinine serum levels and proteins in urine.

The results were startling: 82% of the runners tested showed symptoms of Stage 1 acute kidney injury (AKI) after the event.

AKI used to be known as sudden renal failure, and is primarily characterised by the inability of the kidneys to adequately remove waste material from the blood, and too little urine leaving the body.

In mild cases symptoms can include shortness of breath, fatigue, nausea and swollen legs. More serious cases result in chest pain,

seizures, and coma. Although traditionally associated with the elderly, recent research has identified extended periods of heavy physical exercise – in particular, mine work and military training – with elevated AKI risk.

Parikh's team is the first to test marathon runners for the condition, and the results throw into question the contention that for well-trained people running 42 kilometres (26 miles) non-stop is a healthy thing to do.

More than 30,000 people took part in the Chongqing marathon in China on March 19 this year. On the numbers, more than 27,000 of them had acute kidney disease by the end. **Getty Images**

"The kidney responds to the physical stress of marathon running as if it's injured, in a way that's similar to what happens in hospitalised patients when the kidney is affected by medical and surgical complications," says Parikh.

Potential causes of AKI for marathon runners include high core body temperature, decreased blood flow to the kidneys, and dehydration. The symptoms recorded in the runners tested all resolved after 48 hours, but Parikh warns against complacency.

"We need to investigate this further," he says. "Research has shown there are also changes in heart function associated with marathon running. Our study adds to the story – even the kidney responds to marathon-related stress."

The study is published in the American Journal of Kidney Diseases.

http://bit.ly/2oputsC

World's 1st transplant performed using retinal cells from another's iPS cells

Pioneering transplant surgery conducted utilizing so-called induced pluripotent stem cells from another person

KOBE – A Japanese team on Tuesday performed a pioneering transplant surgery utilizing so-called induced pluripotent stem cells, or iPS cells, to treat an older man suffering from wet-type age-related macular degeneration, a retinal degenerative disease that often leads to blindness.

In a procedure at Kobe City Medical Center General Hospital that took about an hour, the team transplanted retinal cells grown from artificially derived stem cells taken from one person, and into a patient in his 60s.

The surgery was performed after a health ministry panel in February approved the procedure, which could shorten the preparation time and reduce the cost of transplants involving iPS cells. During the surgery, a team including researchers from the Japanese government-backed Riken institute injected retinal cells - grown from iPS cells - into the right eye of the patient and attached them to the retina.

Masayo Takahashi, a researcher at Riken who heads the team, told a press conference in Kobe that it will take a few years to judge whether the operation was successful. The patient will be watched to see that the transplanted cells do not grow into tumors, and if the operation prevents the patient from losing his eyesight.

The procedure utilized iPS cells that have shown a lower risk of rejection by the immune system. The cells came from Kyoto University, where Shinya Yamanaka, a 2012 Nobel Prize winner in medicine for discovering iPS cells, heads efforts to turn into reality the promise of using such cells to treat potentially many illnesses and injuries.

In 2014, Takahashi and others succeeded for the first time in the world in transplanting into a woman retinal cells grown from iPS cells from herself. That patient has not developed any abnormality over the past two years. But preparations for that operation took 11 months and the transplant cost around 100 million yen ($904,000).

Tuesday's procedure was performed only two months after the team solicited a patient for the clinical trial. The team plans to carry out similar transplants on four more patients.

http://huff.to/2optzwa

Great News! A Hot Bath Could Have Similar Benefits To Exercise *grabs bath oil*

This is not a drill. A steamy bath could have a couple of health benefits similar to those produced by exercise, according to a recent study.

By Lindsay Holmes

Research published in the journal Temperature found that an hour-long soak in hot water produced similar anti-inflammatory and blood sugar responses as 60 minutes of moderate physical activity.

Sound too good to be true? While the research on these effects is still preliminary, there is a plausible explanation for this.

"It seems that activities that increase heat shock proteins may help to improve blood sugar control and offer an alternative to exercise," lead study author Steve Faulkner from Loughborough University wrote. "These activities — such as soaking in a hot tub or taking a sauna — may have health benefits for people who are unable to exercise regularly."

A team from the U.K.'s National Centre for Sport & Exercise Medicine examined 14 lean and overweight men and analyzed their metabolic health (a function that helps in regulating blood sugar). The participants were either assigned to an hour-long session of cycling or an hour-long session in a 104-degree bath.

The scientists discovered that both groups were better able to control their blood sugar levels in the 24 hours following the activities — and the bathers perhaps were even better off: Their peak blood sugar levels after eating following their soak were approximately 10 percent lower than the peak blood sugar levels of those who exercised.

Researchers say this implies that "passive heating" (a means of rising your body temperature) could assist in lowering blood sugar levels, which could be promising for those with diabetes or other metabolic-related health issues.

Passive heating can affect proteins in the body called heat shock proteins, which help regulate blood sugar. People with type 2 diabetes tend to have lower levels of heat shock proteins, Business Insider reported. Passive heating can raise these levels.

Spending time in hot water also helped with inflammation, according to the study's results. Bathers experienced an anti-inflammatory response in the body similar to what happens after people exercise, which could be good news for those who have chronic illnesses (like type 2 diabetes) that are associated with inflammation.

Other studies have shown that it can lower blood pressure, which Faulkner said his experiment also found.

It's critical to point out a few limitations of the study. For starters, the experiment only monitored men, so it's difficult to say if the same effect would happen in women. It also only included 14 volunteers, which is an extremely small sample size. More research needs to be conducted before scientists can come to any official conclusion. And, of course, you should still continue to exercise regularly.

That being said, the study does offer some more promising insight into the healing effects of hot water. The science of hot baths is seemingly only delivering good news. And if anyone needs some more volunteers to test it out, we're available. Just saying.

http://bit.ly/2mVTH4R

New research explains why even targeted therapies eventually fail in lung cancer

Nearly 50 years into the "war" on cancer, doctors possess weapons that once would have seemed magical in their tumor-killing specificity.

Cold Spring Harbor, NY - The drug Tarceva (erlotinib), for example, can virtually erase all traces of aggressive lung cancer tumors in a subset of patients who bear a particular disease-driving mutation in a gene called EGFR.

The problem with this and other drugs of the targeted-treatment era is that usually they afford only a respite. Within a year or two, most

people suffer a recurrence. They can be treated again, but with disappointing results: typically, the length of remissions shrinks, and before long the cancer wins the battle and kills the patient.

Now, a team led by Raffaella Sordella, Ph.D., an associate professor at Cold Spring Harbor Laboratory (CSHL), proposes a novel theory of how some cancers circumvent the killing power of targeted therapies. Her team, which studies mechanisms of tumor resistance, has published evidence in the journal eLife suggesting how a tiny subset of cells in or around a cancerous tumor, if left undisturbed by initial cancer treatment, can change characteristics over time and become the seeds of what the patient experiences as a fatal relapse.

"It's well known that individual tumors are heterogeneous. They're made up of cells that look and behave very differently from one another. These basic differences among cells within a single tumor can be caused by non-genetic mechanisms," Sordella says, "including cell-to-cell signaling, which can include the release of cytokines, small proteins that engage cells of the patient's immune system and alter tumor dynamics."

Sordella adds, "Genetic mutations can occur as the tumor is evolving over time. Sometimes these mutations cause changes in the activity of other genes, further destabilizing the cell." Her team's new results "provide evidence that phenotypic diversity - non-genetic changes of a tumor cell's shape, surface markings, behavior - can actually be the cause of genetic diversity in the tumor, helping it to survive, thrive, and eventually kill the patient," Sordella says.

The team's key discovery concerns the activation of a pathway involving the multi-faceted signaling molecule TGF-β (transforming growth factor-beta). In tumor-derived cell lines and tissue samples from people with lung cancer, they found that TGF-β is activated in a particular subset of cancer cells generated via a non-genetic mechanism. TGF-β in these cells decreases the expression of genes that are involved in DNA repair. Because the repair of DNA damage in these cells is less active than normal, these cells tend to disproportionately accumulate gene copy number alterations (CNAs). Consequently, the overall population of these tumor cells become more diverse.

Sordella says, "It was great not only to be able to describe these findings in the context of traditional in vitro cancer cell line models, but also in real patients. This was possible thanks to our collaboration with the thoracic surgery departments of Huntington Hospital and LIJ, spurred and supported by the new alliance between CSHL and the Northwell Health system."

Sordellanotes that it has already been shown in other biological systems that increased genetic diversity can enable populations of bacteria or viruses, for instance, to better adapt to changing conditions. Sordella's team succeeded in showing that the accumulation of genetic diversity in cancer cells with damaged DNA repair mechanisms could contribute to the occurrence of resistance after the exposure of the cells to drugs used to treat tumors.

"A corollary to this discovery," Sordella says, "is that killing cancer cells that are more genetically unstable in the earlier stages of tumorigenesis could result in improved outcomes in currently used cancer treatments."

In an effort to identify a possible Achilles' heel of these cancer cells, Sordella collaborated with Gregory Hannon, Ph.D., Professor at Cancer Research UK-Cambridge Institute and a CSHL adjunct professor. They identified multiple possible targets, Among them was IL-6 (interleukin 6), an immune system component that protects cells from diverse injuries.

Since multiple IL-6 inhibitors have been developed and tested in clinical trials, it is possible, says Sordella, that novel therapeutic approaches, perhaps involving a combination of targeted therapy plus therapy locally targeting IL-6, will yield improved results in patients. She notes that tests are under way for agents that target IL-6 and might be combined with other forms of anti-cancer therapy.

The research described here was supported by: NCI P01 CA129243-06 target for therapy for carcinomas in the lung; Elisabeth R. Woods Foundation; Swim Across America.

"TGF-β reduces DNA ds-break repair mechanisms to heighten genetic diversity and adaptability of CD44+/CD24- cancer cells" appeared online January 16, 2017 in eLife. The authors are Debjani Pal, Anja Pertot, Nitin H. Shirole, Zhan Yao, Naishitha Anaparthy, Tyler Garvin, Hilary Cox, Kenneth Chang, Fred Rollins, Jude Kendall, Leyla Edwards, Vijay A. Singh, Gary C. Stone, Michael C. Schatz, James Hicks, Gregory J. Hannon and Raffaella Sordella. The accepted paper can be accessed at: https://elifesciences.org/content/6/e21615

http://bit.ly/2ntnGxu

ALS linked to occupational exposure to electromagnetic fields

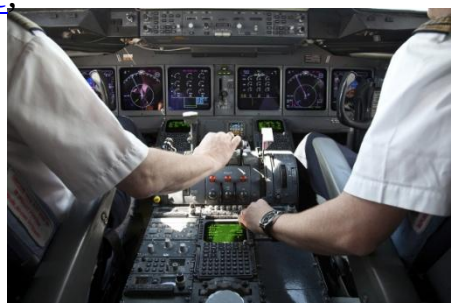
Workplace exposure to electromagentic fields is linked to a higher risk of developing the most common form of motor neurone disease.

By New Scientist staff and Press Association

Amyotrophic lateral sclerosis (ALS) is a disease that ravages the body's nerve cells, leaving people unable to control their bodies. People can die as soon as two years after first experiencing symptoms.

"Several previous studies have found that electrical workers are at increased risk of ALS," says Neil Pearce, at the London School of Hygiene and Tropical Medicine.

"We don't know why the risk is higher, but the two most likely explanations involve either electrical shocks, or ongoing exposure to extremely low frequency magnetic fields."



High exposure to low frequencies **Werner Bartsch/Plainpicture**

Now an analysis of data from more than 58,000 men and 6,500 women suggests it is the latter. Roel Vermeulen, at Utrecht University in the Netherlands, and his team found that people whose jobs exposed them to high levels of very low frequency magnetic fields were twice as likely to develop ALS as people who have never had this kind of occupational exposure.

Jobs with relatively high extremely low frequency electromagnetic fields levels include electric line installers, welders, sewing-machine operators, and aircraft pilots, says Vermuelen. "These are essentially jobs where workers are placed in close proximity to appliances that use a lot of electricity."

Causal link?

The team have stressed that this study is observational – it has not proven that the fields themselves cause ALS, just that this factor is linked to a person's likelihood of developing the disease.

However, it provides the best evidence yet that magnetic fields could be to blame for the disease. "This study has much better information on exposure to magnetic fields than previous studies," says Pearce. "It shows that the increased risk of ALS in electrical workers is most likely due to magnetic field exposure, rather than to electrical shocks."

But Christian Holscher, at Lancaster University, UK, says the results should be interpreted with caution. "The effect of extremely low frequency magnetic fields on ALS development is not clear," he says. The study only just crosses the threshold for statistical significance, and because only 82 people in the analysis developed the disease, the finding may well be a false positive, he says.

"Motor neurone disease is a devastating and complex disease, and it is likely that a wide range of triggers, from environmental to genetic, will cause an individual to get the condition," says Brian Dickie, of UK charity the Motor Neurone Disease Association.

Journal reference: Occupational & Environmental Medicine, DOI: 10.1136/oemed-2016-103780

http://bit.ly/2mYraf9

Blind tadpoles learn visually with eyes grafted onto tail, neurotransmitter drug treatment

Strategy could provide road map for promoting innervation in regenerative medicine

MEDFORD/SOMERVILLE, Mass - Blind tadpoles were able to process visual information from eyes grafted onto their tails after being treated with a small molecule neurotransmitter drug that augmented innervation, integration, and function of the transplanted organs, according to a paper published online today by researchers at the Allen Discovery

Center at Tufts University in *npj Regenerative Medicine*, a Nature Research journal.

The work, which used a pharmacological reagent already approved for use in humans, provides a potential road map for promoting innervation - the supply of nerves to a body part - in regenerative medicine.

Blind tadpoles with eyes grafted onto their tails were able to process visual information after being treated with a small molecule neurotransmitter drug.
Allen Discovery Center at Tufts University

The researchers sought to better understand how the nascent nerves of re-grown or implanted structures integrate into a host. A lack of innervation and integration can be a barrier in regenerative medicine, particularly for sensory organs that must form connections with the host to communicate auditory, visual and tactile information.

In an effort to identify ways to increase innervation, researchers grafted eyes onto the trunk of the tails of blind tadpoles. They then treated the animals with Zolmitriptan, a compound that activates serotonin receptors 1B and 1D (5-HT1B/D), which have been associated with neural development. Treated tadpoles showed a significant increase in graft innervation without changes to the host's original nervous system.

The researchers then tested the tadpoles' ability to distinguish color by creating a test in which the tadpoles were discouraged from occupying a red space in favor of a blue one. Seventy-six percent of sighted tadpoles passed the test. Only 3 percent of blind tadpoles passed the test, while 11 percent of blind tadpoles with eye grafts did so. But among tadpoles with eye grafts that had been treated with 5-HT1B/D and seen graft innervation as a result, 29 percent passed the test.

In addition to testing the tadpoles' ability to detect color, the researchers also tested true image-forming vision, by determining the tadpoles' ability to follow optical patterns rotating in clockwise and counterclockwise directions. Dishes of tadpoles were placed above an LCD screen displaying patterns of triangular clusters rotating slightly every second. Eighty percent of sighted tadpoles followed the pattern compared to 38 percent of blind tadpoles and 32 percent of tadpoles with untreated eye grafts. By contrast, 57 percent of tadpoles with innervated eye grafts induced by exposure to the 5-HT1B/D agonist drug were able to follow the rotating patterns. Importantly, this drug is currently in use for treatment of migraine in human patients, providing a proof-of-principle of repurposing neurotransmitter drugs for regenerative medicine in general, and for control of innervation and transplanted organ functionality specifically.

"For regenerative medicine to move forward and enable the repair of damaged tissues and organ systems, we need to understand how to promote innervation and integration of transplanted organs," said the paper's corresponding author, Michael Levin, Ph.D., Vannevar Bush professor of biology and director of the Allen Discovery Center at Tufts and the Tufts Center for Regenerative and Developmental Biology. "This research helps illuminate one way to promote innervation and establish neural connections between a host central nervous system and an implant, using a human-approved small molecule drug."

While studies have examined how human-machine interfaces - including cochlear implants and retinal prosthetics - may be used to treat deafness and blindness, this research examines brain-body plasticity using novel neurogenesis to integrate biological implants, added co-author Douglas Blackiston, post-doctoral associate, Department of Biology and Center for Regenerative and Developmental Biology, Tufts University.

"The fact that the grafted eyes in our model system could transmit visual information, even when direct connections to the brain were absent, suggests the central nervous system contains a remarkable ability to adapt to changes both in function and connectivity," said Blackiston.

Work was supported by the Allen Discovery Center program through The Paul G. Allen Frontiers Group, and The G. Harold and Leila Y. Mathers Charitable Foundation.

Blackiston, D., Vien, K., Levin M. "Serotonergic stimulation induces nerve growth and promotes visual learning via posterior eye grafts in a vertebrate model of induced sensory plasticity". npj Regenerative Medicine. *Published online March 30, 2017. DOI: 10.1038/s41536-017-0012-5.*

http://bit.ly/2nqkLVl

Penn State study shows aphasia may not solely be a language disorder

Aphasia, a language disorder commonly diagnosed in stroke patients, may not be solely a language issue as traditionally believed, according to a Penn State study.

The study adds to a growing body of research highlighting other cognitive functions affected by aphasia, and indicates that the consequences of brain damage in aphasia patients may be more extensive than originally thought.

"The findings are significant because they can influence how patients with aphasia are treated to ensure a more complete recovery," said Chaleece Sandberg, assistant professor of communication sciences and disorders at Penn State and principal investigator of the study.

"Aphasia is considered to be strictly a language deficit, but as a field we are starting to embrace the notion that language is not distinct from other functions, and that it is really integrated with many other functions," Sandberg said. The findings appeared in the February edition of Frontiers in Human Neuroscience.

Aphasia is a communication disorder caused by damage to parts of the brain that control language, according to the American Speech-Language-Hearing Association. The most common cause of aphasia is stroke. Patients diagnosed with aphasia can have difficulty speaking and understanding spoken words as well as difficulty reading and writing.

Sandberg's study of adults with aphasia compared to same-age healthy adults indicates that issues may extend beyond language portions of the brain and therefore require additional intervention programs to ensure patients' full recovery. Specifically, Sandberg studied resting-state fMRI data, meaning subjects were awake, but not performing any task. "Regions involved in hearing, vision, motor processing, attention and executive functions like organization and planning -- even when at rest -- are still all highly connected and talking to each other, forming distinct networks," Sandberg said.

However, in brains at rest in people with aphasia, networks involved in hearing, motor processing, attention and executive functions were not as strongly connected as the same networks in the control group.

"The regions in these networks are not talking to each other as much as healthy adults of the same age, even in networks where brain damage didn't occur. This suggests widespread problems beyond the specific site of damage, which may cause problems for communication in the whole system, not only in networks that have specific damage," Sandberg said.

The study is one of the first pieces of neuroimaging evidence to support a broader approach to aphasia treatment.

"When we are looking at ways to help people with aphasia recover their language function, we really need to look at the whole brain system and think about aspects of cognition such as attention and memory and how they may be affecting recovery of language function."

The study was funded by an F31 Ruth L. Kirchstein National Research Service Award from the National Institutes of Health, National Institutes on Deafness and other Communication Disorders, and a New Centuries Scholars Grant from the American Speech-Language-Hearing Foundation.

http://bit.ly/2ntO0XX

Sleep-inducing herb: The key component identified

Can't sleep? Your sleep problems may be improved if you try an Indian herb, Ashwagandha.

Researchers in the sleep institute in Japan found that an active component of Ashwagandha leaves significantly induces sleep.

Ashwagandha (Withania somnifera) is a central herb in Ayurveda, the traditional home medicine native to India. As signified by its Latin name somnifera, meaning sleep-inducing, it has been recommended for sound sleep through centuries. Even though scientific studies also

support that crude powder of Ashwagandha promotes sleep, the active component with sleep-inducing property remains unknown.

The research group led by Mahesh K. Kaushik and Yoshihiro Urade of the International Institute for Integrative Sleep Medicine (WPI-IIIS), University of Tsukuba, investigated the effect of various components of Ashwaganda on sleep in mice by recording electroencephalogram and electromyography. The water extract of Ashwaganda leaf containing rich in triethylene glycol (TEG) promoted non-rapid eye movement (NREM) sleep significantly and changed rapid eye movement (REM) sleep slightly, while the alcoholic extract containing active withanolides showed no effect on sleep. The sleep induced by TEG was similar to normal sleep. Furthermore, commercially available TEG also increased the amount of NREM sleep. They thus concluded that TEG is the active component that induces physiologically sound sleep.

Sleeplessness and other sleep disorder such as restless leg syndrome are common complaints among the middle-aged population. Insomnia is one of the most common neuropsychiatric disorders, with an estimated incident of 10-15% in general population and 30-60% in elderly population. It is closely linked with certain other diseases including obesity, cardiovascular diseases, depression, anxiety, mania deficits etc. Currently available synthetic drugs often show severe side effects. On the other hand, Ashwagandha crude powder including the significant amount of TEG can be consumed for better sleep without any side effects. The findings in this study could revolutionize the natural plant-based therapies for insomnia and sleep related disorders.

However, the clinical application of TEG to treat insomnia is still in the immature status, because the TEG is primarily used for industrial purpose and very little is known about its applicability and toxicity to the biological systems. Further studies will thus be needed to confirm the safety of TEG.

According to the authors, they are currently evaluating the effect of TEG administration on stress, because Ashwagandha is believed to mitigate stress and correct imbalance of various nervous systems. Future studies also include the identification of target brain area of TEG, its BBB permeability and the mechanism through which TEG induces sleep.

This study was conducted in collaboration with Renu Wadhwa and Sunil Kaul of National Institute of Advanced Industrial Science and Technology (AIST), Japan.

http://bit.ly/2nu6wzs

Link between common prostate cancer treatment, dementia detailed in new Penn study

Analysis elaborates on correlation between dementia and testosterone-lowering therapy

PHILADELPHIA - A new analysis of patients who have undergone treatment for prostate cancer shows a connection between androgen deprivation therapy (ADT) -- a testosterone-lowering therapy and a common treatment for the disease -- and dementia, according to researchers from the Perelman School of Medicine at the University of Pennsylvania. Their previous studies have shown men who undergo ADT may be at an increased risk of dementia, including Alzheimer's disease, compared to men who were not treated with the therapy. This new analysis -- the largest of its kind ever performed on this topic -- shows that all existing studies taken together support the link to dementia and show a possible link to Alzheimer's. The findings are published this week in Prostate Cancer and Prostatic Diseases. "Since publishing our initial findings, there has been a lot of other research on this topic, and we wanted to see what that research was saying," said the study's lead author Kevin Nead, MD, MPhil, a resident in Radiation Oncology at Penn. "This analysis tells us that the composite message of existing studies is that androgen deprivation therapy is associated with dementia."

The team compiled data from four different global databases looking at studies on ADT patients and dementia and Alzheimer's. An analysis of more than 50,000 patients worldwide showed a consistent statistical link between men who underwent ADT for prostate cancer and men

who developed dementia. Nead says the numbers show correlation, not causation at this point, but that there is evidence of a direct connection.

"Research shows androgens play a key role in neuron maintenance and growth, so the longer you undergo this therapy to decrease androgens, the more it may impact the brain's normal functions," Nead said.

The analysis was less conclusive on the question of Alzheimer's. While there was still a connection, it was not as clearly defined as the link to dementia. Nead says evidence for a link between ADT and neurocognitive dysfunction is growing and should be part of the conversation between doctors and patients.

"There's enough evidence of these links that patients should know about them when considering their options," Nead said.

Nead's work is supported in part by his membership in the American board of Radiology Holman Research Pathway.

http://bit.ly/2ntqKsC

For the first time, we know what Tyrannosaur faces really looked like

No feathers, but specialized scales on its snout could sense vibration, heat.

Annalee Newitz - 3/31/2017, 3:45 AM

New scientific discoveries about Tyrannosaurs have upended our understanding of the giant predators whose massive populations extended from Asia to the Americas. They had feathers. They ran like birds. And now, a new species that lived approximately 100 to 66 million years ago in Montana has given us our first real look at these dinosaurs' faces.

Carthage College paleontologist Thomas Carr and his team describe the scaly visage of *Daspletosaurus horneri* in a new paper from *Scientific Reports*. A typical member of this species would have been about nine meters long and 2.2 meters tall, with its large skull covered in bony ridges and different skin types.

The researchers write that *D. horneri* is "critical to understanding the evolutionary transition from nonbeak to beak along the line to birds, since beaks are specialized epidermal structures." In other words, it's not just badass to reconstruct what a tyrannosaur's face looked like—it also gives us a glimpse of the in-between stages as snouts evolved into beaks.

By carefully examining the textures on different parts of a well-preserved skull of a *D. horneri*, the researchers were able to reconstruct what kinds of tissues and systems of nerves would have covered them.

Their work was helped in part by a massive database of tyrannosaur bones, which they could use for comparison, ruling out textures that might have been created by damage during fossilization. Once they were certain these textures were created by tissues attached to the skull, the team compared the skull to those of modern birds and crocodiles, whose facial bones show nearly identical patterns.

Immediately, they found that the tyrannosaur's lower jaw showed evidence of having "neurovasculature that is also seen in birds." Specifically, it seems that *D. horneri* had a trigeminal nerve, an ancient piece of anatomy found in many animals whose faces are highly sensitive to vibration, infrared radiation, electricity, and even magnetic fields.

© Dino Pulerà

New research reveals that the face in tyrannosaurs was covered by an extensive mask of large, flat scales, and regions of armor-like skin on the snout, jaws, and ornamental horns. The large horn behind the eye was covered by the same material that makes human fingernails. The small bumps on the flat scales are Integumentary Sensory Organs (ISOs), as are seen in crocodiles, that provide extreme tactile sensitivity.

Louisiana State University researcher Jayc Sedlmayr, who worked on the paper, told the *Guardian* that this nerve "has an evolutionary history of developing into wildly different 'sixth senses' in different animals."

In some creatures, whiskers provide sensory input to the trigeminal nerve. But in *D. horneri*, this nerve would have been connected to highly sensitive flat scales on the tyrannosaur's nose and around its mouth.

Each of these scales would have been packed with nerves, acting as what biologists call integumentary sensory organs (ISOs). These nerves, write the scientists, were so dense that they could transmit "high resolution tactile sensations from the skin, making their snouts more sensitive than human fingertips."

Today's crocodiles also have scaly ISOs on their faces, which makes sense because crocs share a common ancestor with tyrannosaurs. Crocodiles mostly use these sensors to detect small vibrations in the water to locate prey, but it's unlikely that tyrannosaurs hunted much in the water. Still, Carr and his colleagues believe that other types of crocodile behavior offer clues about how *D. horneri* used its sensitive scales. As they write:

As in crocodylians, female tyrannosaurids would have relied upon ISOs on the snout for detecting the optimal temperature of a nest site, and for maintaining nest temperature and the nest materials; also, ISOs would have aided adult tyrannosaurids in harmlessly picking up eggs and nestlings and, in courtship, tyrannosaurids might have rubbed their sensitive faces together as a vital part of pre-copulatory play.

Yep, tyrannosaurs were probably rubbing their faces together to stimulate those nerve endings before sex. We've discovered the secret of megafauna foreplay.

But what, exactly, would you see if you looked a tyrannosaur in the face?

Given that they had so many sensitive scales, it's extremely unlikely they would have sported feathers. There would have been many flat scales around their noses and mouths and harder plates covering the regions around the back of their jaw and neck. *D. horneri* in particular had a lot of ridges above and behind its eyes, made from the same material as human fingernails or goat horns.

Basically, we're talking about a giant, crocodile-faced chicken at this point. And it would have rubbed faces with other giant, crocodile-faced chickens before having sex. Just try to get that image out of your mind.

Scientific Reports, *2017. DOI: 10.1038/srep44942*

http://bit.ly/2nwfuwk

Set strawberry alarm clock for post-apple bloom

Growers who time their strawberries to bloom just after apples do can reap a better harvest, according to new research.

March 31, 2017 by Krishna Ramanujan

When apple trees blossom, the sheer abundance of flowers attracts most of the pollinators, which leaves fewer bees for other nearby crops such as strawberries and lowers their yields. But if growers time their strawberries to flower directly after a neighboring apple bloom, strawberries produce higher yields than they would if there were no apple trees nearby.

The findings, published in the March 27 issue of Nature Scientific Reports, offers growers a sustainable method for boosting yields of crops that bloom around the same time as apples.

Previous research showed that strawberries can have as much as 40 percent yield increase when bees and other pollinators visit, compared with relying on wind pollination alone.

"We are trying to figure out ways that growers can use ecosystem services to promote crop yield rather than relying on external inputs, such as fertilizers and pesticides," said lead author Heather Grab, a doctoral student in the lab of co-author Bryan Danforth, professor of entomology.

Planting natural habitats around farm fields can lead to improved health of pollinators and a boost in their services, according to research. But for many growers in agriculturally dense areas, increasing natural habitats is not an option.

"Those growers need some more sustainable agriculture options," Grab said. "If growers pay attention to timing of when crops are blooming and manipulate that by planting apple varieties and strawberry varieties that don't overlap, you can get a boost in yield that is almost equivalent to having natural habitat nearby."

Growers often also use mulching systems to delay strawberry blooms.

The researchers, who conducted the study in the Finger Lakes region of Upstate New York, discovered diverse pollinator communities in the area, with at least 65 species visiting either apples or strawberries, with substantial overlap in species that visited both crops. The most abundant apple pollinators – ground nesting bees – were also the most abundant strawberry pollinators.

Grab and her colleagues set up experimental plots of potted strawberry plants in commercial strawberry fields, so they could control water, soil quality, deer herbivory and the timing of strawberry blooms. These plots were located across a gradient with apple orchards nearby in some locations and with no apples present in others. They also set up bee traps in these plots.

They put out the pots of strawberries at three distinct time periods; during early apple bloom, at full-peak apple bloom, and just as apple blooms were dying out.

Future work will investigate whether this strategy also holds benefits for the pollinators, as food sources are spread out over time rather than having a large glut of food that is followed by less availability.

More information: Heather Grab et al. Temporally dependent pollinator competition and facilitation with mass flowering crops affects yield in co-blooming crops, Scientific Reports (2017). DOI: 10.1038/srep45296

Heather Connelly et al. Landscape simplification decreases wild bee pollination services to strawberry, Agriculture, Ecosystems & Environment (2015). DOI: 10.1016/j.agee.2015.05.004

http://bit.ly/2opxLPx

Nineteen miles up, experiment reveals Earth microbes' likely fate on Mars

NASA experiment determines the likely fate of any bacterial stowaways on future spacecraft destined for Mars

March 31, 2017 by Abby Tabor

Understanding the limits on what microbial life can endure is important for preventing contamination of the Red Planet with terrestrial microbes when our human and robotic explorers arrive. It's also necessary for avoiding false positives from organisms we may have brought with us, when searching for life beyond our own planet. One of the fundamental questions that NASA aims to answer is whether Mars was ever home to microbial life, and whether it is today.

In October 2015, a giant research balloon carrying a NASA experiment launched to an altitude of 19 miles (31 kilometers) above the Earth to determine the likely fate of any bacterial stowaways on future spacecraft destined for Mars. The study found that within a day of direct exposure to light, a vast majority of the bacteria will be destroyed by ultraviolet (UV) radiation from the sun, on the Martian surface.

Led by David J. Smith of NASA's Ames Research Center in Silicon Valley, the Exposing Microorganisms in the Stratosphere or E-MIST experiment carried samples of a very hardy microbe in a protective, dormant state, called an endospore, that some bacteria adopt when environments are unfavorable. Exposing them to the harsh conditions of Earth's stratosphere offers a good simulation of the surface of Mars, since both locations are similarly stressful for life as we know it: extremely cold and dry, with low air pressure and fierce radiation.

Once the bacterial samples were parachuted back to Earth for analysis, Smith's team found that after just eight hours of exposure, 99.999% of the bacteria were dead. The researchers checked the genes of the few that had survived the onslaught of UV rays above the protective layers of Earth's atmosphere, and found several small differences in their

DNA compared to a population of the same bacteria kept on the ground. This result suggests that if any microbes hitching a ride on a spacecraft to Mars did manage to survive the journey, they could potentially experience genetic changes. However, more studies will be needed to determine if those mutations would have any consequences for the bacteria or their ability to survive.

"Another point for consideration is that we only tested a single bacterial strain with this flight," said Smith. "Follow-on studies will be needed with more test species so we can find out if every 'bug' dies as quickly. What about the ones under a pile of dead endospores, or covered in dust? We don't know. These will be topics for future scientific balloon flights."

The E-MIST experiment was conducted in coordination with the NASA Balloon Program Office, managed by the agency's Wallops Flight Facility in Virginia. E-MIST was funded by the Core Technical Capabilities Special Studies at the Kennedy Space Center in Florida, and the Space Biology Project at Ames. The results were published online on March 21, 2017 in the journal Astrobiology.

More information: To learn more about the E-MIST experimental hardware, visit: www.nasa.gov/content/nasas-e-mist-experiment-soars-in-earths-atmosphere

Christina L. Khodadad et al. Stratosphere Conditions Inactivate Bacterial Endospores from a Mars Spacecraft Assembly Facility, Astrobiology (2017). DOI: 10.1089/ast.2016.1549

http://bit.ly/2nwWQEw

How sloppy science creates worthless cures and wastes billions

New book explains everything that's going wrong, why it matters, and what to do.

Diana Gitig - 4/1/2017, 9:00 PM

Richard Harris titled his book Rigor Mortis, referring to the stiffening of the body after death, to convey that biomedical science as it is currently practiced suffers from a lack of rigor. It is a pun he must like, because he employs it very early and very often.

The problem Harris is bemoaning is large and legitimate. Drug trials are incredibly expensive in terms of the time and money spent by the government and researchers—as well as the pain, dashed hopes, and even deaths of the patients enrolled. These drug trials are often based on suggestive findings from basic research done in academic labs, findings like compound X (green tea, vitamin E, whatever) fixes cells or cures animals with disease Y (diabetes, cancer, etc.). If that basic research is flawed, of course, the drug trials will fail.

Harris reports that drug trials do, in fact, often fail. Their failure, he writes, is largely, though not completely, because much of the basic research upon which they are based is enormously flawed.

Reproducibility

Harris, who is an NPR science correspondent, starts off Rigor Mortis by describing the widely documented "reproducibility crisis." Although problems with reproducibility are most often associated with psychology, the same issues turn out to be endemic throughout much of biomedical science. Although the notion that a researcher's results should be reproducible in any other lab in the world is sacred, in reality, this notion is rarely tested. And when people started testing it, results did not fare well. Not only did other labs fail to reproduce seminal results that were widely cited in their respective fields; often, the original researchers could not even reproduce their own results.

Some of the reasons lab results can be wrong—or at least irreproducible—are technical. One, which would seem silly if its effects weren't so wide-ranging and tragic, is that researchers don't validate their cell type before each experiment. Harris claims that "between 18 and 36 percent of all cell experiments use misidentified cell lines." This can be because of accidental contamination or an honest mistake when the cell line was first isolated decades ago. But misidentification means that labs that think they're working with breast cancer cells, for example, may in fact be using melanoma cells. Hence failed drug trials. Other vital reagents, like antibodies, similarly go untested.

Another obstacle to reproducibility is the reliance on animal models. Mice, clearly, are not men; researchers have been able to cure diabetes

in mice a couple of hundred times over. Harris writes, “one reason everybody uses mice: everybody else uses mice.” The infrastructure and technology are all in place and therefore convenient, and the alternatives are limited. But the clinical relevance and applicability of these studies is still very variable.

Cells and animals are also both subject to batch effects. These are properties that differ from lab to lab and day to day. Even if they can be identified, batch effects often can’t be controlled. Mice react differently to male and female researchers (males stress them out and alter their hormone levels); they react differently when music is playing. Cells act differently when grown in one brand of Petri dish as opposed to another, and they are responsive to the temperature and humidity levels in a room. This means that samples that were not handled at the same time—be they separated by miles, years, or even hours—cannot always be meaningfully compared to each other.

Genomes and solutions

Genomic studies provide a whole new set of technical issues. Researchers are now combing through bytes upon bytes upon bytes of data every hour searching for tiny but “statistically significant” correlations between genetic sequences and clinical outcomes. Because these studies are trying to be exquisitely sensitive to finding small effects, they also end up being exquisitely vulnerable to red herrings. Many biologists are not trained in statistics and do not properly apply statistical methods to their data sets. With big data come big mistakes and big problems.

Other problems plaguing lab research are cultural. One issue is that mistakes are built into the scientific method: researchers base their hypotheses upon the best available evidence and then revamp their hypotheses when new evidence becomes available. This is how the system is supposed to work, and we need to be aware of how provisional some results may be.

Complicating matters is that scientists are rewarded with funding and with tenure for being first, not for being right. If their published results are later disproved, well, getting their work into that high-profile publication was probably still worth it. This is not because scientists are especially greedy or ambitious or egotistical (no more so than any other humans), but funding and tenure are very, very, very hard to come by.

What next

All is not doom and gloom, though; Harris offers solutions. Things like validating cell lines and antibodies are pretty straightforward; other fixes will be more complicated. Currently, research labs are often like little fiefdoms, with each investigator passing on techniques learned at the feet of his or her mentor. Biomedical research has no checklist like Atul Gawande promoted in medicine or standards like the good institutional practice that exist in the pharmaceuticals industry. These can be mandated and implemented, and a movement to do just that is already in the works.

There is also a movement for basic scientists to register their hypotheses in advance. This means they won’t be able to move the goalposts after the data come in and claim to have found something they were never actually looking for in the first place. This registration has been required of clinical trials since 1997 (although it has not been implemented as extensively as it could be).

Rigor Mortis is rife with examples of things that go awry in medical studies, how they happen, and how they can be avoided and fixed. For the most part, academic biomedical scientists are not evil, malicious, or liars at heart. Harris knows that they are predominantly seekers of Truth who cannot follow their curiosity wherever it leads them because they have to make a living, like everyone else. They are stuck in a system that only funds conservative research and rewards Important, Ground-Breaking Results™.

Presumably, these scientists are part of the target audience of Rigor Mortis. But as the author himself points out, they are probably too busy writing grant applications to get to the book and hear its potentially life-saving message.

http://bit.ly/2nOnUBy

No more 'superbugs'? Maple syrup extract enhances antibiotic action

Maple syrup extract that dramatically increases the potency of antibiotics

SAN FRANCISCO - Antibiotics save lives every day, but there is a downside to their ubiquity. High doses can kill healthy cells along with infection-causing bacteria, while also spurring the creation of "superbugs" that no longer respond to known antibiotics. Now, researchers may have found a natural way to cut down on antibiotic use without sacrificing health: a maple syrup extract that dramatically increases the potency of these medicines.

The researchers will present their work today at the 253rd National Meeting & Exposition of the American Chemical Society (ACS). ACS, the world's largest scientific society, is holding the meeting here through Thursday. It features more than 14,000 presentations on a wide range of science topics.

"Native populations in Canada have long used maple syrup to fight infections," says Nathalie Tufenkji, Ph.D. "I've always been interested in the science behind these folk medicines."

The idea for the project really gelled when Tufenkji, who had been studying the antimicrobial effects of cranberry extracts, learned of the anti-cancer properties of a phenolic maple syrup extract. "That gave me the idea to check its antimicrobial activity," Tufenkji says. "So, I sent my postdoc to the store to buy some syrup."

Using the same extraction approach as other researchers have in the past, Tufenkji's team at McGill University separated the sugar and water from the syrup's phenolic compounds, which contribute to maple syrup's signature golden hue.

In an initial test, the team exposed several disease-causing bacterial strains to the extract, but they didn't see much of an effect. Rather than give up on maple syrup altogether, Tufenkji decided to check whether the extract could enhance the antimicrobial potency of the commonly used antibiotics ciprofloxacin and carbenicillin. When her team mixed the phenolic extract with either of these medicines, they indeed found a synergistic effect, allowing them to get the same antimicrobial effect with upwards of 90 percent less antibiotic. The approach worked on a variety of bacterial strains, including E. coli, which can cause gastrointestinal problems; Proteus mirabilis, responsible for many urinary tract infections; and Pseudomonas aeruginosa, which can cause infections often acquired by patients in hospitals.

Building on this work, Tufenkji's team next tested the extract in fruit flies and moth larvae. The researchers dosed fly food with pathogenic bacteria and antibiotic, with and without the phenolic extract. Flies with meals doused in maple syrup extract lived for days longer than those denied the syrupy topper. The researchers observed a similar outcome with the moth larvae.

To figure out how the extract makes antibiotics work better, the researchers investigated whether the extract changed the permeability of bacterial cells. The extract increased the permeability of the bacteria, suggesting that it helps antibiotics gain access to the interior of bacterial cells. Another experiment suggested that the extract may work by a second mechanism as well, disabling the bacterial pump that normally removes antibiotics from these cells.

Currently, the researchers are testing the maple syrup extract in mice. While it is likely to be years before it would be available to patients as a prescribed medical protocol, and a pharmaceutical company would likely need to purify the extract further to avoid any potential allergic reactions, Tufenkji says, she's hopeful that it may have an edge over other would-be medications thanks to its source. "There are other products out there that boost antibiotic strength, but this may be the only one that comes from nature," she says.

http://bit.ly/2oskwxu

Former Chernobyl Neighbors Diagnosed with Rare Cancer Years Later, in NYC

When 10 people in New York City developed a very rare form of eye cancer over just a 4-year period, doctors were puzzled.

By Sara G. Miller, Staff Writer | April 2, 2017 08:09pm ET

WASHINGTON — The cancer, called vitreoretinal lymphoma, had been diagnosed in the U.S. only a handful of times over the previous 20 years. The doctors investigated what may have caused this rare cancer in these 10 patients, all of whom were diagnosed between 2010 and 2013, and they discovered that six of the patients had an interesting connection: They all had lived near the Chernobyl Nuclear Power Plant.

The Chernobyl disaster is considered the worst nuclear power plant accident in history: On April 26, 1986, an explosion occurred at the plant in Ukraine, leaking massive amounts of cancer-causing radiation into the atmosphere.

Vitreoretinal lymphoma is a type of eye cancer that affects white blood cells in the retina, the optic nerve or the vitreous humor (the gel-like substance found inside the eye), said Roxana Moslehi, a genetic epidemiologist at the University at Albany, State University of New York, and the senior author of the study on the New York cases. The doctors who diagnosed the cancers had reached out to Moslehi when they realized they were seeing something strange happening with the rates of this cancer, she said.

Moslehi set out to determine if the cases of vitreoretinal cancer represented a "cluster" — in other words, a group of cases that are close together in time and location and occur at higher rates than expected. She presented her findings here today (April 2) at the American Association for Cancer Research's annual meeting. The findings have not been published in a peer-reviewed journal.

Based on data from the New York State Cancer Registry, Moslehi found that statistically, there should be only one case of vitreoretinal lymphoma in New York state in a 4-year period. So to find 10 cases in New York City alone in that same time period was certainly "unanticipated," and represented a cluster, she said. Moslehi also looked at national rates of the disease, and also found incredibly low rates.

To figure what could be causing this cluster, the researchers looked for commonalities among the patients, Moslehi said. They noted that eight of the 10 were of Ashkenazi Jewish descent, she said.

But even more interesting was that six of the 10 patients had lived near Chernobyl at the time of the disaster, Moslehi said. Four of the patients had lived in Ukraine, one patient had lived in Poland and one patient had lived in the country of Moldova, according to the case report.

"It was very surprising to discover this," Moslehi told Live Science. The cause of vitreoretinal lymphoma is unknown, "so any clues that you get as to possible causes make you very excited," she said.

Indeed, looking through the literature, the researchers found several studies linking other types of lymphoma to exposure to radiation, Moslehi said.

For example, clean-up workers at Chernobyl have been shown to have higher rates of a type of cancer called chronic lymphocytic leukemia, she said. And rates of leukemia in children and adults are increased in people who were exposed to either Chernobyl or the atomic bombs that the U.S. dropped on Japan during World War II, she said. (Both leukemia and lymphoma affect white blood cells.)

The NYC patients who had lived near Chernobyl ranged in age from 62 to 85 at the time of their diagnosis, according to the case report. The diagnoses took place between 24 and 27 years after the nuclear disaster, meaning that a number of the patients were in their late 30s when the disaster took place. Moslehi is still looking at the cases in the other four patients, who did not live near Chernobyl, for clues to those cases, she said.

There was also another cluster of cases that involved related conditions, called myeloproliferative disorders, that was found in Israel, Moslehi said. Myeloproliferative disorders cause blood cells proliferative abnormally. Similar to the group in New York City, the patients in Israel also were of Ashkenazi Jewish ethnicity and lived near Chernobyl at the time of the disaster.

Moslehi noted that they "still cannot link this disease or lymphoma to radiation per se" — more studies are needed to fully understand the cause. For example, it may be that Ashkenazi Jews are more susceptible to the effects of radiation, she said.

Editor's note: This story was corrected from the original version. The Israeli cluster had myeloproliferative disorders, not vitreoretinal lymphoma.

http://bit.ly/2oAEGCI

'Sniffing' urine to detect prostate cancer could prevent unnecessary biopsies

Molecules likely responsible for the scent of prostate cancer identified, which could be detected by chemically "sniffing" urine

SAN FRANCISCO -- On the list of dreaded medical tests, a prostate biopsy probably ranks fairly high. The common procedure requires sticking a needle into the prostate gland to remove tissue for assessment. Thousands of men who undergo the uncomfortable procedure, prompted by a positive PSA (prostate-specific antigen) test, ultimately don't require cancer treatment.

Today, scientists report progress toward minimizing unnecessary biopsies: They have identified the molecules likely responsible for the scent of prostate cancer, which could be detected by chemically "sniffing" urine.

The researchers will present their results today at the 253rd National Meeting & Exposition of the American Chemical Society (ACS). ACS, the world's largest scientific society, is holding the meeting here through Thursday. It features more than 14,000 presentations on a wide range of science topics.

"The idea for this project started with a study published in 2014 showing that trained canines could detect prostate cancer with greater than 97 percent accuracy," says Mangilal Agarwal, Ph.D., the project's principal investigator. His team had already been working on a sensor to sniff hypoglycemia on a person's breath as dogs have also been shown to do.

When the prostate cancer study appeared in the Journal of Urology, Agarwal's lab set out to determine what molecules the dogs might be sensing.

"If dogs can smell prostate cancer, we should be able to, too," says Amanda Siegel, Ph.D., who is presenting the work at the meeting. Both Agarwal and Siegel are at the Integrated Nanosystems Development Institute of Indiana University-Purdue University Indianapolis (IUPUI) and the Richard L. Roudebush VA Medical Center.

Prostate cancer is the third most common type of cancer in the United States. In 2016, more than 180,000 new cases were diagnosed, according to the U.S. National Institutes of Health's National Cancer Institute. Early detection has been critical to saving the lives of many men with prostate cancer. But diagnosing the disease can be fraught with challenges.

The screening test that doctors use now to determine whether to perform a biopsy assesses PSA levels in a blood sample. The prostate gland normally produces this protein in small amounts. Increased levels, however, can indicate many different conditions besides cancer, including prostate infection. As a result, the test is widely recognized as flawed and often leads to unnecessary biopsies.

"Currently, about 60 percent of men who get a biopsy to test for prostate cancer don't need to get one," Siegel says. "We hope our research will help doctors and patients make better-informed decisions about whether to have a biopsy, and to avoid unwarranted procedures."

To determine which molecules wafting from urine could indicate prostate cancer in a patient, the IUPUI and VA team collected urine samples from 100 men undergoing prostate biopsies.

To avoid issues that similar studies have had with sample degradation, Agarwal's team developed a pre-processing step -- adding sodium chloride and neutralizing the pH -- to ensure the samples would remain intact during the analysis.

Then, they used gas chromatography-mass spectrometry to identify the volatile organic compounds floating in the "headspace" above the urine samples.

With this method, the researchers pinpointed a small set of molecules that showed up in 90 percent of the samples from patients with prostate cancer but not in samples from those who did not have the disease.

Next, the team plans to conduct large-scale tests at multiple health centers to validate their findings. They have also submitted a proposal for funding to confirm the molecular signature they identified by collaborating with a local dog trainer and comparing their technique's results to those obtained with a canine nose.

Depending on the outcome of these projects, Siegel and Agarwal say their test could become available to patients and doctors within the next few years. In the short-term, urine samples would have to be sent to a lab for analysis, but the researchers say their ultimate goal is to design a sensor that can yield results in a doctor's office.

The researchers acknowledge support and funding from the Richard L. Roudebush VA Medical Center.