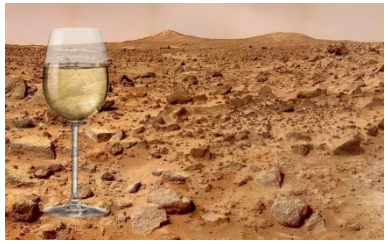
http://bit.ly/2ARYfyq

Wine on Mars? The World's Oldest Wine-Making Country Wants to Make It Happen

Early colonists on Mars may not have to give up wine!

By Brandon Specktor, Senior Writer

The first human colonists on Mars will have to forgo many of the creature comforts of Earth — things like enjoying an ozone layer, for example, or opting out of rearing genetically engineered Martian babies. Fortunately, one essential earthly amenity these hardscrabble colonists may not have to give up is wine. Georgia, a country with an 8,000-year-old viticulture tradition, is putting its top space and wine scientists to work figuring out how to grow grapes on Mars.



Cheers. **NASA/JPL-Caltech, (inset) Shutterstock**

The project, named IX Millennium, ostensibly as a nod to Georgia's ninth millennium making wine, will involve several phases of research into building an agricultural infrastructure on Mars. One critical step: identifying the grape varietals on Earth best equipped to withstand the harsh radiation, fearsome dust storms and severe temperature swings of the Red Planet. This research could help hydrate permanent settlements on Mars a soon as 2024 — the year when SpaceX founder Elon Musk intends to launch the first crewed mission there. (NASA hopes to follow in the 2030s.)

"If we're going to live on Mars one day, Georgia needs to contribute," Nikoloz Doborjginidze, founder of Georgia's Space Research Agency and an adviser on the wine project, told The Washington Post. "Our ancestors brought wine to Earth, so we can do the same to Mars." (The origins of wine are still debated, but Georgia holds a valid claim thanks to their recent discovery of an old wine-stained pot dated to 6000 B.C.)

The first wine on Mars

The new space wine project will kick off later this year with the installation of "vertical greenhouses" inside a hotel in the capital city of Tbilisi, according to Georgian news agency Agenda.ge. There, floor-to-ceiling pods of soil and seeds (including grapes, strawberries and arugula) will be left to grow under hydroponic lights with minimal human interference, simulating the possible conditions of a controlled agriculture pod on Mars.

In the meantime, Georgian wine experts are hard at work trying to figure out which grape varietals might best survive harsh Martian conditions. Over the next few years, researchers at Tbilisi's Business Technology University plan to simulate a Martian environment in the laboratory, exposing soil samples to subzero conditions, high carbon monoxide levels and thin air meant to mimic the atmospheric pressure at "20,000 feet [6,000 meters] altitude on Earth," The Washington Post reported.

These experiments likely will not bear fruit until at least 2022, but scientists already have a hunch that white wine will fare best on the Red Planet. "Whites tend to be more resistant to viruses," Levan Ujmajuridze, director of Georgia's vineyard Laboratory, told The Washington Post. "So, I'd imagine they'll do well against radiation, too. Their skin could reflect it."

These experiments could well provide future Martians with grapevines — but the actual fermenting, bottling and aging would be up to them. Nobody knows exactly how fermenting grapes in microgravity will actually work yet, but NASA scientists think it's possible.

The Georgia team's boozy experiments aren't the first foray into space agriculture. Astronauts aboard the International Space Station (ISS) have already begun growing salad crops in microgravity, while China's recently deployed Chang'e-4 lander will attempt to grow

potatoes and rockcress (a flowering plant similar to cabbage and mustard) on the moon.

The makers of Budweiser, meanwhile, have launched barley seeds into space three times in hopes of becoming "the first beer on Mars," while a batch of Ardmore scotch whisky spent three years aboard the ISS from 2011 to 2014. That project showed Earthlings that even an old drop of the pure is apparently not immune to the ravages of microgravity; the scotch reportedly came home tasting of "antiseptic lozenges" and "rubbery smoke."

https://go.nature.com/2AU9B4V

Melting sea ice makes northern winters more severe

Analysis confirms strong link between Arctic sea-ice loss and winter temperatures.

In spite of global warming, parts of Eurasia have seen a number of unusually harsh winters in the past couple of decades — a puzzling countertrend that is mainly the result of drastic sea-ice retreat in the Arctic Ocean.

Winters in temperate zones can become severe when patterns of atmospheric pressure persist that favour the transport of cold Arctic air to mid-latitudes. Climate scientists have long assumed that Arctic sea-ice cover influences atmospheric circulation in the Northern Hemisphere, but the strength of that long-distance effect has not been clear.

To reconcile differing estimates, Masato Mori and his colleagues at the University of Tokyo combined observations and outputs from repeated runs of seven global climate models. They found that existing models tend to underestimate how strongly mid-latitude winter temperatures are affected by sea-ice loss in the remote Arctic. Over central Eurasia, almost half of the observed winter cooling trend for 1995 to 2014 can be clearly attributed to shrinking sea ice in the Barents and Kara Seas, they conclude.

Nature Clim. Change (2019)

http://bit.ly/2Hm1NhJ

Study shows vitamin D supplements are of no benefit to the over 70s

There is little benefit for those over 70 taking higher dose vitamin D supplements to improve their bone strength and reduce the risk of falls, new research has revealed.

Older people are often encouraged to take supplements of vitamin D to keep bones, teeth and muscles healthy.

But a Newcastle University-led study, published in the *American Journal of Clinical Nutrition*, has backed previous research which shows there is no gain for older people taking vitamin D.

Aim of study

Almost 400 people, aged 70 years or older, were randomly allocated to one of three doses of vitamin D given once a month for a year - the doses were 300 µg, 600 µg or 1200 µg (equivalent to a daily dose of 10 µg, 20 µg or 40 µg).

The study's aim - funded by Versus Arthritis - was to measure in these older people the effect of vitamin D supplementation on the change in bone mineral density (BMD), a recognised indicator of bone strength, and changers in markers of bone metabolism.

The findings revealed that there was no change in BMD over 12 months between the three doses. However, the study did show that doses equivalent to 40 µg a day are safe in an older population and there was a beneficial effect on bone metabolism up to the highest dose.

Dr Terry Aspray, Honorary Clinical Senior Lecturer at Newcastle University's Institute of Cellular Medicine, UK, who is supported by the NIHR Newcastle Biomedical Research Centre, led the Vitamin D supplementation in older people study (VDOP).

He said: "Vitamin D deficiency is common in older people, and it may lead to bone loss, impairment of muscle function and an increased risk of falls and fractures.

"The results from previous studies assessing the effect of vitamin D on bone mineral density have yielded conflicting results, and our study is a significant contribution to the current debate.

"While our findings do not support evidence of the benefit of high dose vitamin D supplements, at least on bone mineral density, we do, however, identify that higher doses of the vitamin may have beneficial effects on bone metabolism and that they are safe for older people.

"I would suggest that older people should focus on maintaining a healthy, balanced diet, adequate sun exposure and take regular exercise to keep their bones as strong as possible.

"While some may need to take vitamin D supplements, there is little benefit to taking more than 10 µg a day."

Further studies

Further analysis is underway, including by a Newcastle University PhD student, on the effects sun exposure on vitamin D levels in older people and the impact of vitamin D supplements on muscle strength. Experts are also looking at the impact of genes and kidney function on vitamin D levels and their function in the blood.

Benjamin Ellis, Versus Arthritis Senior Clinical Policy Adviser, said: "Older people are at increased risk of falls and fractures, which are debilitating and erode people's self-confidence, depriving them of their independence.

"Vitamin D helps build and maintain strong bones and muscles. People who are deficient in vitamin D are at increased risk of falls and fractures.

"In the summer months, Vitamin D is manufactured by the body when sunlight falls on the skin. We can also get vitamin D from certain foods, or dietary supplements.

"Over the one year of this study, higher doses of vitamin D neither improved measures of bone strength nor reduced falls among older people.

"The current guidance is still that people at risk of low vitamin D should consider taking a daily vitamin D supplement, as should everyone during the winter months.

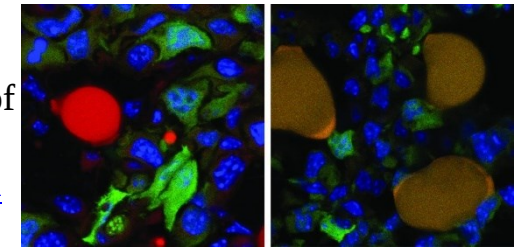
"Work is needed to implement effective strategies to prevent falls and fractures among older people, and to understand the role of medications and dietary supplements in this."

Reference Randomised controlled trial of vitamin D supplementation in older people (VDOP) to optimise bone health - Terry J Aspray et al: *American Journal of Clinical Nutrition*. Doi: 10.1093/ajcn/nqy280

http://bit.ly/2CtQXki

Conversion of breast cancer cells into fat cells impedes the formation of metastases

An innovative combination therapy can force malignant breast cancer cells to turn into fat cells.



This can be used to prevent the formation of metastases in mice, as researchers at the University of Basel's Department of Biomedicine recently reported in the journal Cancer Cell.

Cancer cells marked in green and a fat cell marked in red on the surface of a tumor (left). After treatment (right), three former cancer cells have been converted into fat cells. The combined marking in green and red causes them to appear dark yellow. **University of Basel, Department of Biomedicine**

Tumor cells can adapt dynamically to changing conditions thanks to their ability to reactivate a cellular process that is central to embryonic development. This allows the cells to alter their molecular properties and to acquire new capabilities.

As a result, resident cells can adopt the properties of other cell types and break away from their cell cluster. Once mobile, the cells migrate via the bloodstream to other regions of the body, where they undergo a further conversion before taking root and forming new tissue structures.

Adaptable cancer cells

In the embryo, this epithelial-mesenchymal transition (EMT) is instrumental to the development of organs.

Tumor cells, however, exploit the process in order to leave the primary tumor so that they can spread around the body and form metastases in distant organs.

The research group led by Professor Gerhard Christofori at the University of Basel's Department of Biomedicine researches the molecular processes that regulate the cellular EMT program. Its aim is to demonstrate new approaches to combating the development of tumors and the formation of metastases - such as in the case of breast cancer, one of the most common and malignant diseases in women.

Exploiting adaptability

Malignant cancer cells exhibit a high degree of adaptability - referred to as plasticity - as they undergo the cellular EMT program. Now, the researchers have exploited this property in order to develop a new type of therapeutic approach.

In experiments on mice, they have succeeded in using a combination of two active substances to convert breast cancer cells, which divide quickly and form metastases, into fat cells that can no longer divide and can barely be differentiated from normal fat cells. This stops the tumor from invading the neighboring tissue and blood vessels, and no further metastases can form.

This novel differentiation therapy is based on a combination of two drugs: Rosiglitazone, which is widely used to treat patients with diabetes, and Trametinib, which inhibits the growth and spread of cancer cells.

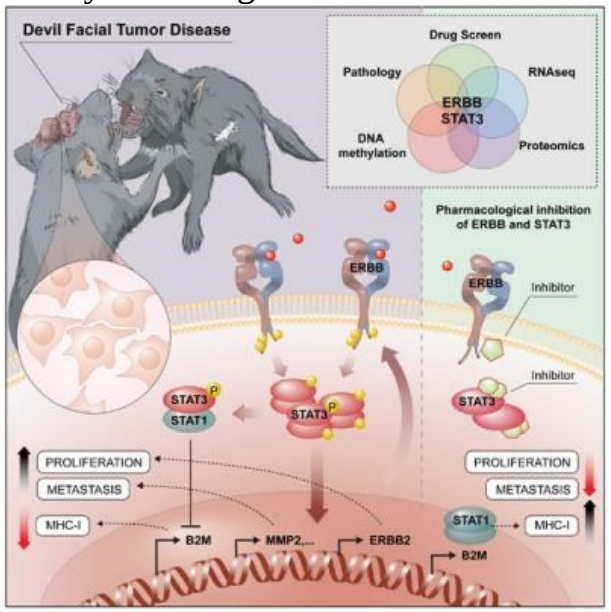
"In future, this innovative therapeutic approach could be used in combination with conventional chemotherapy to suppress both primary tumor growth and the formation of deadly metastases," says Professor Gerhard Christofori. Furthermore, the research findings show that malignant cancer cells - like stem cells - exhibit a high degree of cell plasticity, which can be exploited for therapeutic purposes.

http://bit.ly/2CsEjBY

How cancer becomes transmissible in Tasmanian devils: Molecular mechanisms elucidated

How it became transmissible and by what means it escapes its host's immune system has puzzled scientists since its discovery

Tumors usually grow exclusively in the organism where their cell of origin derives from. The same applies for human cancers: apart from some rare cases, like the accidental transmission by a cut during surgery, there are no reports of contagious cancer cells. A multitude of molecular safety measures of the immune system are? responsible for rejecting and destroying any foreign tissue.



Excessive activation of ERBB receptors and STAT3 proteins play a key role in the transmissibility of the Tasmanian devil´s facial tumor, inhibition of ERBB receptors with a drug can selectively kill the cancer cells. **Kosack et al., 2019, *Cancer Cell* 35, 1-5, January 14, 2019 © 2018 Published by Elsevier Inc. DOI: 10.1016/j.ccell.2018.11.018.**

An exception to this nearly universal rule exists among Tasmanian devils, the world's largest living carnivorous marsupial. For two decades, a deadly facial tumor has been spreading at a rapid pace among the animals and has killed, according to current estimates

around 90 percent of the wild population. Peculiarly, the cancer cells are transmitted from one Tasmanian devil to the other by bites. All collected tumor samples are genetically nearly identical and derive presumably from a single cell of origin.

How this cancer became transmissible and by what means it escapes the immune system of its otherwise healthy hosts puzzled scientists since the discovery of the mysterious disease. Researchers from CeMM and the Vienna University of Veterinary Medicine now solved an important part of this puzzle. In their latest study published in *Cancer Cell* (DOI: 10.1016/j.ccell.2018.11.018.), the research groups of Andreas Bergthaler, Principal Investigator at CeMM, and Richard Moriggl, Head of the Ludwig Boltzmann Institute for Cancer Research and Professor for Functional Cancer Genomics at the Vienna University of Veterinary Medicine and the Medical University of Vienna, revealed molecular mechanisms that are crucial for the transmissibility of the tumor.

The scientists found that receptor molecules on the surface of the cancer cells, so-called ERBB receptors, show massively increased activity. Those receptors trigger a biochemical chain reaction within the cells that eventually activates STAT3 proteins, transcription factors that alter the cell's genetic program. The result is an extensive rebuild of the cell: The number of molecules serving as identification for the immune system are reduced, while at the same time proliferation is accelerated and factors for metastasis of the tumor cells are produced.

"Our experiments show for the first time that the excessive activation of ERBB receptors and STAT3 proteins play a key role in the transmissibility of the Tasmanian devil´s facial tumor", Lindsay Kosack, team member of Bergthaler's group at CeMM and co-first author, explains. "Above that, we showed in further experiments that the inhibition of ERBB receptors with a drug can selectively kill the cancer cells. This could play an important role for the treatment of the disease, before the Tasmanian devil becomes extinct".

The study, conducted in collaboration with the Universities of Cambridge, Southampton, Toronto and Tasmania, is not only a contribution to preserve this marsupial species. "99.1 percent of the Tasmanian devil's STAT3 are identical to the human protein. And many of the genes that are activated by STAT3 in the animals are also active in human cancers", Andreas Bergthaler says. "The biological principles of invasion of new tissues are also crucial for non-transmissible tumors, especially cancer metastases. Scientific aspects of cancer, contagious diseases and inflammatory processes can be studied with this rare phenomenon".

However, it is unlikely - although not impossible - that a human cancer becomes transmissible, Bergthaler emphasizes. "Apart from the molecular mechanisms that would need to evolve are humans genetically much more diverse and resistant than the isolated population of the Tasmanian devils. The aggressive biting behavior of the animals also seems to play an important role in tumor transmission. Nevertheless a better molecular understanding of this rare disease can provide valuable insights on fundamental biological mechanisms of cancer development".

Videos: https://vimeo.com/307294048 https://doi.org/10.1016/j.ccell.2018.11.018#mmc8
(Video abstract at the Cancer Cell website will be made publicly available once the embargo lifts)

The study „The ERBB-STAT3 Axis Drives Tasmanian Devil Facial Tumor Disease" was published in Cancer Cell, on 14 January 2019, DOI: 10.1016/j.ccell.2018.11.018.

Authors: Lindsay Kosack, Bettina Wingelhofer*, Alexandra Popa*, Anna Orlova*, Benedikt Agerer, Bojan Vilagos, Peter Majek, Katja Parapatics, Alexander Lercher, Anna Ringler, Johanna Klughammer, Mark Smyth, Kseniya Khamina, Hatoon Baazim, Elvin D. de Araujo, David A. Rosa, Jisung Park, Gary Tin, Siawash Ahmar, Patrick T. Gunning, Christoph Bock, Hannah V. Siddle, Gregory M. Woods, Stefan Kubicek, Elisabeth P. Murchison, Keiryn L. Bennett, Richard Moriggl*, and Andreas Bergthaler**
**These authors contributed equally.*

The study was funded by the Austrian Academy of Sciences, the Austrian Science Fund (FWF), the European Research Council (ERC) and the Austrian Research Promotion Agency (FFG).

http://bit.ly/2U57na1

New hospital price lists are massive spreadsheets full of gibberish

From unintelligible abbreviations and jargon to $32,456.66 "headaches."

Beth Mole

At Massachusetts General Hospital in Boston, an "HC BYP FEM-ANT TIBL PST TIBL PRONEAL ART/OTH DSTL" will run you $35,014.00. If you go to Vanderbilt University Medical Center in Nashville, an "HC ECMO/ECLS INIT VENO-VENOUS" costs $51,384.00. And at Bellevue Hospital Center in New York City, a "TRLUML PERIP ATHRC ILIAC ART" goes for $22,689.83.

These mysterious prices—and tens of thousands of others—are all on the hospitals' respective new price lists, available in beastly spreadsheets downloadable from the hospitals' websites. As of January 1, hospitals around the country are now federally required to list all standard charges for common treatments and care. The goal is to make hospital billing more transparent, allowing patients to comparison shop and anticipate medical expenses.

"This is about empowering patients," Seema Verma, the administrator of the Centers for Medicare and Medicaid Services, said last week in a conference call with reporters.

But the price lists are less than helpful, to put it mildly.

For one thing, the itemized price lists can be hard, if not impossible, to interpret. Many of the entries include gibberish medical jargon and an alphabet soup of abbreviations, such as the examples above. But even if you can identify a procedure, device, or test that you'll need during a hospital stay, you still might not be able to estimate a total bill because there will likely be multiple charges. And those charges can be difficult to anticipate. Hospital bills can include room stay, medications, and a constellation of other incidental and unpredictable expenses in addition to specific procedure charges.

Then, of course, is the matter of insurance rates and coverage. The fat sticker prices hospitals list can get trimmed significantly in negotiations with insurance providers. Then, depending on individual insurance plans (network coverage, deductibles, etc) the portion of a hospital bill that a patient pays can be dramatically different—and hard to estimate.

Apples and oranges

Still, comparing hospital price lists can help patients make informed choices, right? Nope. Each hospital lists prices differently. Some describe the same procedures with different abbreviations and jargon. Others have vague descriptors or generalized fees.

For instance, Wake Forest Baptist Medical Center in Winston-Salem, North Carolina, lists the general price of surgeries by operating time, down to half-hour increments; surgeries that take between 24 and 24.5 hours cost $54,004 generally, while surgeries that last between 23.5 and 24 hours run $52,947, according their pricing guide.

George Washington University Hospital's pricing guide includes maddeningly vague charges. One item, listed simply as "viral illness," has a price estimate of $43,307.99. Another entry, listed as "headaches," has a cost of $32,456.66, and a listing of just "seizures" is priced at $68,113.41.

"To 99 percent of the consuming public, these data will be of limited utility—meaningless," Kenneth E. Raske, the president of the Greater New York Hospital Association, told *The New York Times*.

The prices even appear meaningless to the hospitals themselves. To view the lists, some hospital websites require visitors to agree to terms and conditions that state that prices are not guaranteed to be accurate, as well as subject to change and not reflective of patient bills.

As the *Times* noted, the requirement to list the prices is rooted in one sentence of the Affordable Care Act, which states that "Each hospital operating within the United States shall for each year establish (and

update) and make public (in accordance with guidelines developed by the secretary) a list of the hospital's standard charges for items and services provided by the hospital."

Legal requirements

For years after the ACA passed, the government advised hospitals that they could fulfill their obligation by making estimates available to patients upon request. The Trump administration, however, stepped up the requirements, forcing hospitals to publish full lists. But the interpretation of "standard charges" was left up to hospitals and there is currently no enforcement for the requirement. On many hospital websites, even finding the list can be difficult if not impossible.

In a November blog, Verma wrote, "We know this is just a first step," adding that the government has "actively sought input on how we can make this data easier for patients to use."

http://bit.ly/2U1G1RX

Herpes viruses and tumors evolved to learn how to manipulate the same ancient RNA

Findings could have implications for drugs and insight into diseases like Alzheimer's

New York, NY - Herpes viral infections use the ancient genetic material found in the human genome to proliferate, mimicking the same process tumors have been found to manipulate, Mount Sinai researchers have shown for the first time. These observations provide further insight about how herpes viruses can manipulate the immune system in ways that may drive neurodegenerative diseases like Alzheimer's, according to the study, published in *Nature Communications* in January.

The researchers found that herpes viruses appear to manipulate an ancient RNA species that originated several million years ago, called human satellite II RNA (HSATII RNA). HSATII RNA is normally inactive, but both herpes viruses and cancer cells have essentially learned to activate it, using this RNA to manipulate their environment to help them invade the body and grow.

The researchers believe that both viruses and cancer cells figured out how to use this RNA because they both rapidly evolve to test out different strategies to multiply and spread within the body over time. Researchers have yet to understand whether herpes and cancer came upon this strategy coincidentally or whether they work hand in hand in some cases. Several researchers involved in this work pioneered the study of how a different type of RNA affects tumor evolution.

"The evolution of tumors can teach us about viruses and vice versa, and understanding one system may help us treat the other," said one of the study's senior authors, Benjamin Greenbaum, PhD, Assistant Professor of Oncological Sciences, Pathology, and Medicine (Hematology and Medical Oncology) at The Tisch Cancer Institute at the Icahn School of Medicine at Mount Sinai. "The HSATII RNA induction seen in herpes infections and cancer cells suggests possible convergence upon common mechanisms in these seemingly disparate diseases."

The study potentially gives further insight into how herpes viruses might play a role in developing colitis and neurodegenerative diseases like Alzheimer's. It is the first step toward potentially developing diagnostic tools that look for these types of RNAs in cancer and herpes patients and using the ancient RNAs as targets for drugs in the future, said Dr. Greenbaum.

The lead author of the study was Maciej Nogalski, PhD, Postdoctoral Research Fellow in the laboratory of co-senior author Thomas Shenk, PhD, James A. Elkins Professor of Life Sciences in the Department of Molecular Biology at Princeton University.

"Herpes viruses have been extensively studied for many years, but once again by investigating host-virus interactions at the cellular level we were privileged to get insights into novel regulatory mechanisms of human cells. Our virus-centered studies not only

uncovered interesting aspects of viral infection, but also provided an inducible system that could accelerate investigations about possible roles HSATII RNA plays in other diseases," Dr. Nogalski says.

Researchers from Massachusetts General Hospital and the Simons Center for Systems Biology at the Institute for Advanced Study also contributed to this work. This research received funding from the National Institutes of Health (AI112951), the American Cancer Society(PF-14-116-01 MPC), the V Foundation, Stand Up to Cancer, the National Science Foundation, and the Lustgarten Foundation, the Pershing Square Sohn Research Alliance, the Mark Foundation, the Burroughs Wellcome Fund, and Affymetrix, Inc.

https://bbc.in/2RETfY4

Life-extending drug Perjeta approved for secondary breast cancer

A drug used to treat advanced breast cancer has been approved for use on the NHS in Scotland.

Pertuzumab, trade name Perjeta, can now be used in the treatment of HER2 positive metastatic breast cancer and in aggressive breast cancers which cannot be surgically removed.

The drug was rejected by the Scottish Medicine Consortium three times on cost grounds. In December it was given the go-ahead for use in early-stage breast cancer.

Perjeta was accepted following consideration through the SMC's patient and clinician engagement (Pace) process for medicines used at the end of life and for very rare conditions.

The review acknowledged that this type of breast cancer commonly affects younger women at a stage in their lives where they often have responsibility for young families, have significant work commitments or may be carers for elderly parents.

'Devastating condition'

The decision brings patients in Scotland in line with those in England, Wales and Northern Ireland who already have access to the drug.

SMC chairwoman Dr Alan MacDonald said: "We are pleased to be able to accept pertuzumab for the treatment of HER2 positive metastatic breast cancer or locally recurrent unresectable breast cancer.

"We know from the testimonies given through our Pace process how devastating this condition is for patients and their families, and we hope this decision, which offers the opportunity of extra time when the patient feels well, will be welcomed by them."

'I was one of the luckiest ladies in Scotland to get this'

Alison Tait, 49, from Edinburgh, is a single parent living with HER2-positive secondary breast cancer, which is incurable.

She told the BBC: "I was really lucky - probably one of the luckiest ladies in Scotland - that I was able to get a hold of this through private healthcare with my employer. "I took the drug for about 18 months. During that time it managed my cancer into a place where it was no longer visible through the scans I had.

"This meant I was able to return to work, had a very good social life, got myself back to the gym - keeping fit and well is really important to me - so it enabled me to really focus on that.

"The situation I am in now is that I continue to stay well, there is still no sign of the cancer in my body, so the drug has done exactly what we hoped it would achieve and it has enabled me to live a really good life while I have been on the rest of my treatment."

Health Secretary Jeane Freeman said: "We welcome the decision by the SMC to approve Perjeta for use in the treatment of HER2-positive metastatic breast cancer. This decision could extend the lives of women with incurable cancer and make a real difference to their families.

"This follows the announcement in December, that it was also approved for women with early-stage breast cancer and means even more women will be able to benefit from this treatment.

"Being diagnosed with cancer is an incredibly difficult time for all those affected, and we are committed to supporting and continually improving patient care."

'Too late for me'

Campaigner Jen Hardy, 51 from Edinburgh, is living with HER2-positive secondary breast cancer. She was denied Perjeta following her diagnosis in October 2017.

She told the BBC: "I think at the end, when my time has come, I will think, if I had had that Perjeta, I would have had another 12-18 months. "That's a good chunk of my life when I could be living, I could have seen my daughter graduate, see my daughter married, I could become a granny. "But without Perjeta, it won't happen to me. "So I am delighted that other women like me, they'll have that time."

Ashleigh Simpson from Breast Cancer Now, which led the Perjeta Now campaign, said: "We are absolutely delighted for patients that the SMC has finally been able to approve Perjeta for routine use on Scotland's NHS. "Perjeta is a truly life-changing drug and this decision will have a profound and far-reaching impact for so many Scottish women and their families.

'Robbed of their future'

Gregor McNie from Cancer Research UK said: "It's been a long road to get to this point and this decision is truly fantastic news for patients and their loved ones affected. "For patients in Scotland who have HER2-positive breast cancer that has returned to the breast or spread to other parts of the body, this decision means they now have another treatment option where few options currently exist.

Angela Harris, from Breast Cancer Care Scotland, added: "With a huge sigh of relief, we welcome this fantastic decision. It's absolutely wonderful that women across the UK diagnosed with incurable, secondary breast cancer can now access this innovative, life-extending treatment.

"Women living with this cruel disease often tell us they feel robbed of their future. For them, nothing is more important than making as many precious memories as possible, and Perjeta can offer about an extra year of invaluable time."

http://bit.ly/2Cyi79x

Hidden Beneath a Half Mile of Ice, Antarctic Lake Teems with Life

Waters of a lake deep beneath the ice sheet and a few hundred miles from the South Pole are teeming with bacterial life

By Tom Metcalfe, Live Science Contributor

The dark waters of a lake deep beneath the West Antarctic ice sheet and a few hundred miles from the South Pole are teeming with bacterial life, say scientists — despite it being one of the most extreme environments on Earth.

The discovery has implications for the search for life on other planets — in particular on the planet Mars, where signs of a buried lake of liquid saltwater were seen in data reported last year by the European Space Agency's orbiting Mars Express spacecraft.

Expedition leader John Priscu, a professor of polar ecology at the University of Montana, told Live Science in a telephone interview from Antarctica this week that early studies of water samples taken from Lake Mercer — which is buried beneath a glacier — showed that they contained approximately 10,000 bacterial cells per milliliter. That's only about 1 percent of the 1 million microbial cells per milliliter typically found in the open ocean, but a very high level for a sunless body of water buried deep beneath an Antarctic glacier.

Priscu said that the high levels of bacterial life in the dark and deeply buried lake were signs that it might support higher life-forms, such as microscopic animals like tardigrades.

"We saw lots of bacteria — and the [lake] system has enough organic matter, you would think, to support higher life-forms." Priscu said. "We are really going to get a good look for higher organisms, like animals … but that won't be done for another couple of months."

The abundance of bacterial life in Lake Mercer complements the discovery of high levels of bacterial life in Antarctica's nearby

subglacial Lake Whillans in 2013 — an expedition that was also led by Priscu.

Scientists theorize that the bacteria in Lake Whillans — and possibly Lake Mercer — are surviving on deposits of carbon laid down by photosynthesizing organisms between 5000 and 10,000 years ago, when the buried lakes may have been connected to the open ocean.

Deep, dark lake

The 25-member expedition to subglacial Lake Mercer flew back to the U.S. Antarctic base at McMurdo Station last week from their camp on the West Antarctic ice sheet, about 370 miles (600 kilometers) from the South Pole. The buried lake covers an area of about 54 square miles (139 square kilometers) under the ice sheet.

During their stay on the ice from mid-December last year, the expedition team used drills and hot water to open a borehole from their camp at the frozen surface down to the buried lake of liquid water.

Priscu said that the drill team bored through about 3,504 feet (1,068 meters) of ice, and the water below was a chilly 30.8 degrees Fahrenheit (minus 0.65 degrees Celsius), so that scientific researchers could take water samples and sediment cores from the lake, which was about 49 feet (15 m) deep at that spot.

The borehole in the ice was kept open for about 10 days, and the scientific sampling tasks were stopped twice while it was widened with hot water, he said.

The expedition returned to McMurdo Station last week with more than 15 gallons (60 liters) of water from the buried lake and a sediment core measuring more than 16 feet (5 m) in length — the deepest sediment core ever taken beneath the West Antarctic ice sheet, Priscu said.

Frozen wetlands

Priscu hopes that lab studies of the sediment cores, in particular, will help scientists learn more about the activity of the West Antarctic ice sheet for the past tens of thousands of years, "when it was last ice-free, and things of that nature," Priscu said.

The team had also lowered a specialized remotely operated underwater vehicle (ROV) into the dark waters of the buried lake, as well as several cameras, which they used to take images and make video of the lake floor, he said.

Priscu believes that the more than 400 buried liquid-water lakes across the frozen continent of Antarctica form a unique ecosystem of liquid water, sandwiched beneath the thick ice shelf and the frozen rocks of the Antarctic continental crust.

"I've been proposing that the entire ice sheet is a big wetland, with rivers and lakes — and some of the rivers, they span an area the size of the Amazon, though with not as much water," he said.

"Here you've got 70 percent of the world's freshwater — it just doesn't make sense that there is no life under there. And now we've proven that there is, we have transformed that view," Priscu said.

Priscu also thinks that any life below the frozen surface of the planet Mars might follow the patterns seen in Antarctica's subglacial lakes. "The new knowledge that our research has provided on subglacial environments, particularly the fact that they harbor a diverse microbial assemblage, will provide us with information on the type of life that may have existed on Mars" he said. "This is particularly important for Mars 2020, which will be taking shallow cores from the planet's surface."

Future expeditions to Antarctica's buried liquid-water lakes are likely to focus on the largest bodies of buried liquid water — like Lake Vostok in East Antarctica, although any expedition to that region would face severe challenges, Priscu said.

"Vostok is 1,000 meters (3,280 feet) deep and under 4,000 meters (13,123 feet) of ice, so that would be a heck of a challenge. And it is also up at 4,000 meters altitude to work at," he said. "So that would be a tough one."

http://bit.ly/2FLdA75

Common genetic disorder linked to more disease than previously thought

Symptoms often mistaken for normal signs of aging, but treatment is safe and effective if started early, say researchers

The most common genetic disorder in people from northern Europe is associated with substantially higher levels of disease than previously thought, despite being easy to detect and treat, finds a study published in The BMJ today.

The findings show that a larger proportion than previously thought of people with two copies of a faulty gene (HFE C282Y) develop haemochromatosis (a build up of iron in the body that can damage vital organs such as the liver and heart). The study also found that the faulty genes often lead to serious health problems, including in later life.

Haemochromatosis can be prevented if spotted early, and is easily treated by regular removal of iron-rich blood (phlebotomy), but typical symptoms such as extreme tiredness and joint pain are often mistaken for normal signs of ageing. Previous studies also suggest that very few people with the faulty gene develop haemochromatosis, and therefore health problems are rare.

So to better understand the impact of this disorder, researchers led by Professor David Melzer at the University of Exeter compared levels of illness and death among those with and without the gene mutations. They analysed data for 2,890 people aged 40 to 70 years (average age 63) with HFE C282Y mutations from the UK Biobank, a large database of more than half a million British men and women recruited between 2006 and 2010.

Participants were monitored for an average of seven years, and hospital records were used to identify diagnosed conditions and deaths during that time.

After taking account of age and other genetic factors, haemochromatosis was diagnosed in 21.7% of men and 9.8% of women with HFEC282Y mutations by the end of the follow-up period - substantially higher than previous estimates suggest.

What's more, at the end of the follow-up period, when their sample had an average age of 63, one in five more men and one in 10 more women with HFE C282Y mutations had developed liver disease, diabetes, osteoarthritis or rheumatoid arthritis, compared with people with no HFE C282Y mutations.

More disease developed at older ages, and there was also a nominally significant increase in mortality in the HFE C282Y mutations group overall, including 14 deaths from liver cancer.

To show the impact of these additional diseases on health services, the researchers estimate that 1.6% of all hip replacements and nearly 6% of all liver cancers in men in their sample occurred in those with HFE C282Y mutations.

This is an observational study, and as such, can't establish cause, and the researchers point to limitations that may have influenced their findings. Nevertheless, they say this is the largest study of its kind and findings were similar after additional analyses to test the strength of the results.

In light of this evidence, and as treatment is safe and effective if started early, they say issues involved in offering screening and improving early detection of HFE C282Y mutations need re-examining to help prevent unnecessary disease, including at older ages.

http://bit.ly/2DkquHB

'Zebra' tribal bodypaint cuts fly bites 10-fold: study

Traditional white-striped bodypainting reduces the number of potentially harmful horsefly bites by up to 10-fold

Traditional white-striped bodypainting practiced by indigenous communities mimics zebra stripes to reduce the number of potentially harmful horsefly bites a person receives by up to 10-fold, according to new research published Wednesday.

Tribes in Africa, Australia and southeast Asia have practiced bodypainting in cultural ceremonies for generations.

Traditionally mixed from clay, chalk, ash and cattle dung, the white or grey paint is widely thought to help individuals moderate body heat in soaring bush and savanna temperatures.

Traditionally mixed from clay, chalk, ash and cattle dung, the white or grey body paint is widely thought to help individuals moderate body heat amid soaring bush and savanna temperatures

But scientists now believe that the striking striped patterns also slash the amount of biting insects attracted to the naked flesh of people living in Nature.

It is known that zebras get bitten far less than animals with a single fur colour, so a team of researchers decided to see if the light stripes painted on humans would have a similar deterrent effect.

They used three shop mannequins—one with dark skin, one with lighter skin, and a dark-skinned model painted with white stripes—and coated each with a thin layer of adhesive to capture creepy crawlies.

They then stuck them in the middle of a meadow for eight weeks in summer, and counted the number of horseflies and other biting insects each one attracted.

The results were startling: the dark-skinned mannequin was 10 times more attractive to horseflies than the striped model and twice as attractive than the light-skinned dummy.

The team behind the study believe that the stripes disrupt the polarisation of light reflected off human bodies, making them less delicious-looking to horseflies and other bugs.

"Traditional bodypaintings with their typical white-striped patterns on a brown body surface have the advantage of deterring blood-sucking horseflies as these patterns are unattractive to these parasitic insects," the authors wrote in the journal *Royal Society Open Science*.

Bites from horseflies and other pests can be dangerous as well as irritating, as they suck a host's blood, transmitting diseases such as the potentially deadly swamp fever.

Because of their need to lay their larvae in ponds and lakes, they often come into contact with indigenous people seeking reliable water sources.

Gabor Horvath, from the Department of Biological Physics at Hungary's Eotvos Lorand University, told AFP that the fly-repellant effect was a happy by-product of the cultural significance of bodypainting: the purpose of the paint is not to stop fly bites, it just happens to be good at doing so.

"Essentially, the use of white-striped bodypaintings can be considered as an example for behavioural evolution/ecology and an adaptation to the environment."

More information: *Striped bodypainting protects against horseflies, Royal Society Open Science, rsos.royalsocietypublishing.or … /10.1098/rsos.181325*

https://wb.md/2sE8Isl

15 Studies That Challenged Medical Dogma in 2018

My favorite scientific papers are the ones that challenge the prevailing wisdom, or dogma. Here are 15 such articles from 2018, in no particular order. (Some are from the tail end of 2017.)

Eric J. Topol, MD

***1. Maybe the womb isn't sterile after all, according to a news feature in* Nature.**

2. Probiotics (with antibiotics) may delay gut healing rather than speeding it up, a study in* Cell *found.

3. *Is it somatic mutations that increase the risk for cancer as we age, or a decline in the immune system, as this paper in the* **Proceedings of the National Academy of Sciences** *(PNAS) argues?*
4. *A "speech and language gene" thought to have gained prominence in humans by positive selection may not be specific to humans at all, said this study in* **Cell.**
5. *Type 1 diabetes is being diagnosed until age 60, long after the age once thought, according to a paper in* **The Lancet.**
6. *The benefits of combination chemotherapy go beyond additivity and synergy, said a study in* **Cell** *(2017).*
7. *"[F]ocusing on end-of-life spending does not necessarily identify 'wasteful spending,'" a new analysis in* **Science** *found.*
8. *Dairy products: not so bad for health? (***The Lancet***)*
9. *Low-dose aspirin doesn't protect against cardiovascular events and may in fact increase risk, according to a study in the* **New England Journal of Medicine.**
10. *Salt intake may be dangerous for those at risk for cardiovascular events and stroke, but only in populations that consume more than 5 g per day, said a paper in* **The Lancet.**
11. *Diclofenac, widely used as a painkiller, "poses a cardiovascular health risk compared with non-use, paracetamol use, and use of other traditional non-steroidal anti-inflammatory drugs," a study in the* **BMJ** *found.*
12. *It has been unclear what macrophages do in the heart, but apparently they play roles in conduction and remodeling, according to a study in* **Cell** *(2017) and Nature Medicine.*
13. *She has her father's mitochondria: A study in PNAS suggests that mitochondrial DNA doesn't only pass through eggs.*
14. *Vitamin D to prevent bone fractures? Maybe not, said a meta-analysis in* **The Lancet Diabetes & Endocrinology.**
15. *"[A] new cellular narrative for airways disease": What's happening in cystic fibrosis? (***Nature***)*

http://bit.ly/2ATYWHj

Scientists grow perfect human blood vessels in a petri dish

Breakthrough technology advances research of vascular diseases like diabetes

Scientists have managed to grow perfect human blood vessels as organoids in a petri dish for the first time.

The breakthrough engineering technology, outlined in a new study published today in Nature, dramatically advances research of vascular diseases like diabetes, identifying a key pathway to potentially prevent changes to blood vessels--a major cause of death and morbidity among those with diabetes.

An organoid is a three-dimensional structure grown from stem cells that mimics an organ and can be used to study aspects of that organ in a petri dish.

"Being able to build human blood vessels as organoids from stem cells is a game changer," said the study's senior author Josef Penninger, the Canada 150 Research Chair in Functional Genetics, director of the Life Sciences Institute at UBC and founding director of the Institute for Molecular Biotechnology of the Austrian Academy of Sciences (IMBA).

"Every single organ in our body is linked with the circulatory system. This could potentially allow researchers to unravel the causes and treatments for a variety of vascular diseases, from Alzheimer's disease, cardiovascular diseases, wound healing problems, stroke, cancer and, of course, diabetes."

Diabetes affects an estimated 420 million people worldwide. Many diabetic symptoms are the result of changes in blood vessels that result in impaired blood circulation and oxygen supply of tissues. Despite its prevalence, very little is known about the vascular changes arising from diabetes. This limitation has slowed the development of much-needed treatment.

To tackle this problem, Penninger and his colleagues developed a groundbreaking model: three-dimensional human blood vessel organoids grown in a petri dish. These so-called "vascular organoids" can be cultivated using stem cells in the lab, strikingly mimicking the structure and function of real human blood vessels.

When researchers transplanted the blood vessel organoids into mice, they found that they developed into perfectly functional human blood vessels including arteries and capillaries. The discovery illustrates that it is possible to not only engineer blood vessel organoids from human stem cells in a dish, but also to grow a functional human vascular system in another species.

"What is so exciting about our work is that we were successful in making real human blood vessels out of stem cells," said Reiner Wimmer, the study's first author and a postdoctoral research fellow at IMBA. "Our organoids resemble human capillaries to a great extent, even on a molecular level, and we can now use them to study blood vessel diseases directly on human tissue."

One feature of diabetes is that blood vessels show an abnormal thickening of the basement membrane. As a result, the delivery of oxygen and nutrients to cells and tissues is strongly impaired, causing a multitude of health problems, such as kidney failure, heart attacks, strokes, blindness and peripheral artery disease, leading to amputations.

The researchers then exposed the blood vessel organoids to a "diabetic" environment in a petri dish.

"Surprisingly, we could observe a massive expansion of the basement membrane in the vascular organoids," said Wimmer. "This typical thickening of the basement membrane is strikingly similar to the vascular damage seen in diabetic patients."

The researchers then searched for chemical compounds that could block thickening of the blood vessel walls. They found none of the current anti-diabetic medications had any positive effects on these blood vessel defects. However, they discovered that an inhibitor of γ-secretase, a type of enzyme in the body, prevented the thickening of the blood vessel walls, suggesting, at least in animal models, that blocking γ-secretase could be helpful in treating diabetes.

The researchers say the findings could allow them to identify underlying causes of vascular disease, and to potentially develop and test new treatments for patients with diabetes

https://bbc.in/2HiXSm4

Liver transplant 'game changing' treatment approved

A new procedure for storing livers donated for transplant has been hailed a "game changer" and approved for use on the NHS.

The National Institute for Health and Care Excellence (NICE) say perfusion machines could increase the number of livers that can be safely used for transplantation.

They store donated livers at body temperature, which slows the deterioration of the organ.

Usually donor livers are kept on ice.

This can cause damage to the liver and limit how long it can be stored. About 20% of patients die while waiting for a liver transplant and about a third of donated livers are unable to be used for transplantation.

The normothermic perfusion machine pumps oxygenated blood and nutrients into livers outside the body **David Nasralla**

These could include livers taken from elderly people or those in poor health and those damaged while the organ was removed from the donor's body or while being kept in ice.

The perfusion machine allows the liver to recover from any damage and it can be flushed with blood at body temperature and given

oxygen, medications and nutrients allowing its viability and function to be assessed.

This could mean that livers that might have previously been considered unsuitable can be used safely.

The machines can also extend how long the liver can be stored to allow more flexibility in the timing of the transplant operation.

Prof Kevin Harris, at NICE, said: "It offers another way of preserving the liver and assessing whether livers which might have previously been considered unsuitable can be used safely.

"By using this procedure, more patients on the organ transplant waiting list could be offered a chance of a transplant and thereby potentially extending their lives."

Darius Mirza, professor of transplant surgery at University Hospitals Birmingham, said the machine was a "game changer".

"In the 30 years I've been involved with transplantation, there have been three or four events which have been game changers and I'm absolutely certain we are looking at a game changer that will change the way we practise organ storage and transplantation."

Liver perfusion is currently performed on the NHS in a small number of specialist centres in the UK.

Sue Bennett, from Ranton, Staffordshire, had a liver transplant using this new technique in 2015

"I signed up for the trial not knowing I would be one of the first to have this procedure in the country. Before my transplant I was very ill. I was losing weight, I couldn't sleep and my quality of life was quite low.

"I had a transplant after the hospital found a donor who was a match. The liver was kept alive using this procedure overnight and I was able to have the operation the following day. Nine days later I was back home.

"Having a transplant has changed my life. I've joined the gym, got fit and gone back to work and did some voluntary work for the Staffordshire Search and Rescue team and I also compete nationally and internationally in the Transplant Games as a member of the Team GB transplant team.

"My life is unbelievably wonderful. I'm very healthy, I'm very happy and very active. I think I've been very lucky."

Vanessa Hebditch, from the British Liver Trust, said every year hundreds of people with advanced liver disease died while waiting for a transplant and this procedure offered "real hope".

"It is an exciting development that has the potential to shorten waiting list times and reduce mortality rates from advanced liver disease," she said.

"After transplant, the vast majority of people go on to lead full and healthy lives and it is truly amazing to see the transformation."

For the year 2017-18, there were 1,043 liver transplants in the UK and 359 patients on the UK active transplant list.

The latest evidence from trials reviewed by a NICE committee concluded that the procedure "worked well and was safe to be offered to patients who had been fully informed of the risks and benefits".

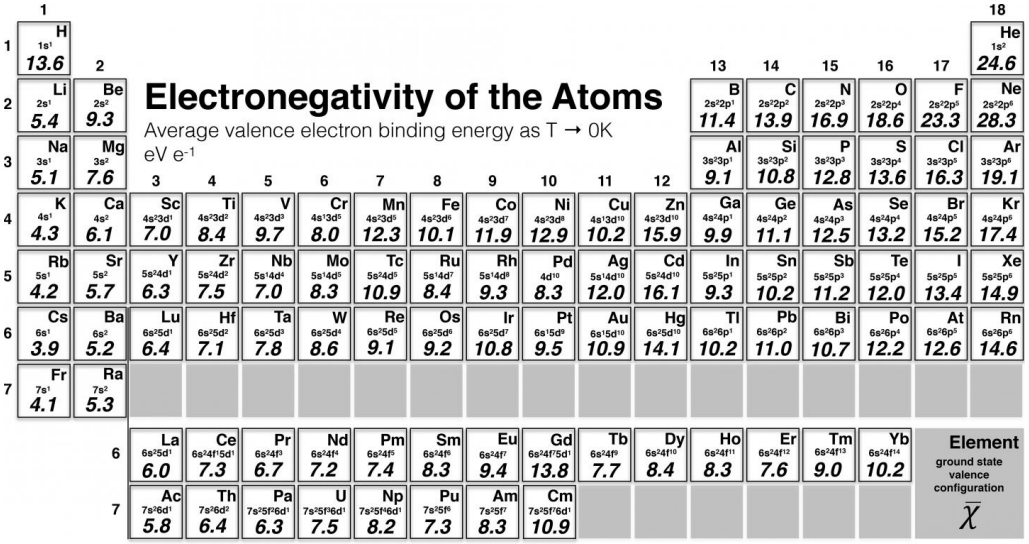
Doctors need to seek approval from their trust's management and record all data from the procedure in a database to further monitor its success.

http://bit.ly/2AWLjHh

New scale for electronegativity rewrites the chemistry textbook

Redefining the concept with a new, more comprehensive scale

Electronegativity is one of the most well-known models for explaining why chemical reactions occur. Now, Martin Rahm from Chalmers University of Technology, Sweden, has redefined the concept with a new, more comprehensive scale. His work, undertaken with colleagues including a Nobel Prize-winner, has been published in the *Journal of the American Chemical Society*.



This is a periodic table showing the values of the first 96 elements in the new scale of electronegativity, published in the article in the Journal of the American Chemical Society. **Martin Rahm/Chalmers University of Technology**

The theory of electronegativity is used to describe how strongly different atoms attract electrons. By using electronegativity scales, one can predict the approximate charge distribution in different molecules and materials, without needing to resort to complex quantum mechanical calculations or spectroscopic studies. This is vital for understanding all kinds of materials, as well as for designing new ones. Used daily by chemists and materials researchers all over the world, the concept originates from Swedish chemist Jöns Jacob Berzelius' research in the 19th century and is widely taught at high-school level.

Now, Martin Rahm, Assistant Professor in Physical Chemistry at Chalmers University of Technology, has developed a brand-new scale of electronegativity.

"The new definition is the average binding energy of the outermost and weakest bound electrons - commonly known as the valence electrons," he explains.

"We derived these values by combining experimental photoionization data with quantum mechanical calculations. By and large, most elements relate to each other in the same way as in earlier scales. But the new definition has also led to some interesting changes where atoms have switched places in the order of electronegativity. Additionally, for some elements this is the first time their electronegativity has been calculated."

For example, compared to earlier scales, oxygen and chromium have both been moved in the ranking, relative to elements closest to them in the periodic table. The new scale encompasses 96 elements, a marked increase from previous versions. The scale now runs from the first element, hydrogen, to the ninety-sixth, curium.

One motivation for the researchers to develop the new scale was that, although several different definitions of the concept exist, each is only able to cover parts of the periodic table. An additional challenge for chemists is how to explain why electronegativity is sometimes unable to predict chemical reactivity or the polarity of chemical bonds.

A further advantage of the new definition is how it fits into a wider framework that can help explain what happens when chemical reactions are not controlled by electronegativity. In these reactions, which can be hard to understand using conventional chemical models, complex interactions between electrons are at work. What ultimately determines the outcomes of most chemical reactions is the change in total energy. In the new paper, the researchers offer an equation where the total energy of an atom can be described as the sum of two values. One is electronegativity, and the second is the average electron interaction. The magnitude and character of these values as they change over a reaction reveals the relative importance of electronegativity in influencing the chemical process.

There are endless ways to combine the atoms in the periodic table to create new materials. Electronegativity provides a first important indicator of what can be expected from these combinations.

"The scale is extensive, and I hope it will greatly affect research in chemistry and material science. Electronegativity is routinely used in chemical research and with our new scale a number of complicated quantum mechanical calculations can be avoided. The new definition of electronegativity can also be useful for analysing electronic structures calculated through quantum mechanics, by making such results more comprehensible," says Martin Rahm.

Martin Rahm's paper, Electronegativity Seen as the Ground-State Average Valence Electron Binding Energy has been published in the Journal of the American Chemical Society. *The work was undertaken together with Roald Hoffmann, Nobel Laureate in Chemistry, from Cornell University, USA, and Tao Zeng at Carleton University in Canada.*

http://bit.ly/2FEqyUF

60 percent of coffee varieties face 'extinction risk'

Three in five species of wild coffee are at risk of extinction as a deadly mix of climate change, disease and deforestation puts the future of the world's favourite beverage in jeopardy, new research warned Wednesday.

by Patrick Galey With Manuel Ausloos In London

More than two billion cups of coffee are consumed every day, but the multi-billion-dollar industry is reliant on wild varieties grown in just a few regions to maintain commercial crop variety and adapt to changing threats posed by pests.

Scientists at Britain's Kew Royal Botanic Gardens used the latest computer modelling techniques and on-the-ground research to predict how the 124 coffee varieties listed as endangered might fare as the planet continues to warm and ecosystems are decimated.

Some 75 coffee species were assessed as being threatened with extinction: 13 classed as critically endangered, 40 as endangered, including coffea arabica, and 22 as vulnerable.

"Overall, the fact that the extinction risk across all coffee species was so high—nearly 60 percent—that's way above normal extinction risk figures for plants," Aaron Davis, head of coffee research at Kew, told AFP. "It's up there with the most endangered plant groups. In another way, it's hardly surprising because a lot of species are hard to find, grow in restricted areas... some have a population only the size of a football pitch."

Global coffee production currently relies on just two species: arabica and robusta. Arabica, prized for its acidity and flavour, accounts for roughly 60 percent of all coffee sold worldwide. It exists in the wild in just two countries: Ethiopia and South Sudan.

The team at Kew accessed climate data recorded in Ethiopia going back more than 40 years to measure how quickly the coffee's natural habitat was being eroded by deforestation and rising temperatures.

They found that nearly a third of all wild Arabica species were grown outside conservation areas.

"You've also got the fact that a lot of those protected areas are still under threat from deforestation and encroachment, so it doesn't mean they are secure," said Davis, lead author of the research published in the journal *Science Advances*.

'Fair price'

As well as the inconvenience—not to mention sleepiness—consumers would face from a coffee shortfall, the authors expressed concern over the livelihoods of farmers, many of whom are being forced to relocate as climate change ravages their crops.

"Ethiopia is the home of Arabica coffee," said Tadesse Woldermariam Gole, senior researcher for environment, climate change and coffee at the Forest Forum.

"Given the importance of Arabica coffee to Ethiopia, and the world, we need to do our utmost to understand the risks facing its survival."

Davis said wholesalers needed to ensure producers were paid a fair price so they could future-proof production by investing in better growing practices and conserving a varied stock.

In addition, governments must preserve and regenerate forests to help both wild and farmed coffee grow more easily, said the team behind the research.

Davis was keen to point out however that there is no current shortage of one of the world's most valuable commodities. "As a coffee drinker you don't need to worry in the short term," he said. "What we are saying is that in the long term if we don't act now to preserve those key resources we don't have a very bright future for coffee farming."

The new study found the enigmatic coffea stenophylla, known as the highland coffee of Sierra Leone, which is said to surpass arabica in flavour. It had not been seen in the wild since 1954, and has all but vanished from coffee plantations and botanic gardens.

But a December 2018 expedition to the last known locality found a single plant followed by others after several hours of trekking.

More information: *A.P. Davis el al., "High extinction risk for wild coffee species and implications for coffee sector sustainability," Science Advances (2018). DOI: 10.1126/sciadv.aav3473 , http://advances.sciencemag.org/content/5/1/eaav3473*

http://bit.ly/2sCNnje

UCLA scientists create a renewable source of cancer-fighting T cells

Could point the way toward "off-the-shelf " T cell therapies that are more readily available to patients

A study by UCLA researchers is the first to demonstrate a technique for coaxing pluripotent stem cells -- which can give rise to every cell type in the body and which can be grown indefinitely in the lab -- into becoming mature T cells capable of killing tumor cells.

The technique uses structures called artificial thymic organoids, which work by mimicking the environment of the thymus, the organ in which T cells develop from blood stem cells.

T cells are cells of the immune system that fight infections, but also have the potential to eliminate cancer cells. The ability to create them from self-renewing pluripotent stem cells using the UCLA technique could lead to new approaches to cancer immunotherapy and could spur further research on T cell therapies for viral infections such as HIV, and autoimmune diseases. Among the technique's most promising aspects is that it can be combined with gene editing approaches to create a virtually unlimited supply of T cells able to be used across large numbers of patients, without the need to use a patient's own T cells.

The study, which was published in the journal Cell Stem Cell, was led by senior author Dr. Gay Crooks, a professor of pathology and laboratory medicine and of pediatrics and co-director of the Eli and Edythe Broad Center of Regenerative Medicine and Stem Cell Research at UCLA.

T cell therapies, including CAR T-cell therapy, have shown great promise for treating certain types of cancer. Current approaches involve collecting T cells from a patient, genetically engineering the T cells with a receptor that helps them recognize and destroy cancer cells, and then infusing the cells back into the patient. But engineered T cells do not always function well, treatment is expensive because it is tailored to each patient, and some people with cancer don't have enough T cells to undergo the therapy.

Therefore, a technique that produces T cells without relying on collecting them from patients is an important step toward making T cell therapies more accessible, affordable and effective.

"What's exciting is the fact that we start with pluripotent stem cells," Crooks said. "My hope for the future of this technique is that we can

combine it with the use of gene editing tools to create 'off-the-shelf' T cell therapies that are more readily available for patients."

Other researchers have been only partially successful in their attempts to generate T cells using methods that involve combining pluripotent stem cells with a layer of supporting cells. But the T cells produced in those previous studies did not mature to become fully functional T cells.

Crooks and her team previously demonstrated that the 3D structure of an artificial thymic organoid allowed mature T cells to develop from adult blood stem cells, and hypothesized that they would also support mature T cell production from pluripotent stem cells.

"The 3D structure of the artificial thymic organoid seems to provide the right supportive signals and environment needed for mature T cells to properly develop," she said.

The research demonstrated that the artificial thymic organoids can efficiently make mature T cells from both kinds of pluripotent stem cells currently used in research: embryonic stem cells, which originate from donated embryos, and induced pluripotent stem cells, which are created by reprogramming adult skin or blood cells back to an embryonic-like state.

The researchers also showed they could genetically engineer pluripotent stem cells to express a cancer-targeting T cell receptor and, using artificial thymic organoids, generate T cells capable of targeting and killing tumor cells in mice.

"Once we create genetically edited pluripotent stem cell lines that can produce tumor-specific T cells in artificial thymic organoids, we can expand those stem cell lines indefinitely," said Amélie Montel-Hagen, the study's first co-author and an associate project scientist in Crooks' lab. Having an unlimited supply of T cells capable of fighting various types of tumors would be a major turning point for cancer treatment.

One of the remaining challenges for the UCLA scientists is that the T cells created using the artificial thymic organoids have additional molecules on their surface that are not matched to each individual patient. Those extra molecules could cause a patient's body to reject the transplanted cells, Montel-Hagen said.

"Our next step will be to create T cells that have the receptors to fight cancer but do not have the molecules that cause the rejection of the cells, which would be a major step toward the development of universal T cell therapies," said Dr. Christopher Seet, the study's first co-author and a clinical instructor in the division of hematology-oncology at UCLA.

Kite, a Gilead Company, holds a license to the artificial thymic organoid method for cancer therapy, which is patented by the Regents of the University of California. The method is not yet available in clinical trials and has not been approved by the FDA for use in humans.

The study was supported by the National Institutes of Health (through the National Heart, Lung, and Blood Institute; the National Cancer Institute; and the National Center for Advancing Translational Sciences), the UCLA Clinical and Translational Science Institute, the Tower Cancer Research Foundation, and the UCLA Broad Stem Cell Research Center's training program, including support from the Eli and Edythe Broad Foundation.

http://bit.ly/2T2KlQL

Mystery Mummy May Have Been Pharaoh's Personal Eye Doctor

Among the ancient Egyptian pharaohs, queens and religious elites who elected to be immortalized through mummification, there was also at least one ophthalmologist.

By Brandon Specktor, Senior Writer

Meet Nespamedu, a 2,200-year-old eye doctor made quite the spectacle of himself in the afterlife, according to some new research shared by the National Archaeological Museum (MAN) in Madrid, Spain. According to a series of recent papers published in the museum's in-house journal, the lavishly decorated mummy was once a priest and doctor thought to minister to none other than the pharaoh Ptolemy II (and possibly his successor Ptolemy III). The doc is thought to have lived sometime between 300 B.C. and 200 B.C.

Bedecked in five intricately inscribed gold plates and crowned with a painted-on face and wig, Nespamedu's mummified remains were initially thought to be a woman's when the museum first received them from a donor in 1925.

Inscriptions on the mummy's golden encasement revealed him to be a priest named Nespamedu from Saqqara, Egypt, but little else could be discerned about who the bandage-wrapped man had been.

Museum researchers used a CT scanner to take nearly 3,000 images of the mummy and discovered that the man may have been the pharaoh Ptolemy II's personal eye doctor. **Museo Arqueológico Nacional/CC BY 4.0**

In 2016, museum officials put some of their questions to rest when they sent the mummy (along with three other corpses from their collection) to receive computed tomography (CT) scans at the Quirónsalud Madrid University Hospital. After taking nearly 3,000 images of the mummy, the researchers discovered that Nespamedu had died at about 55 years of age — but not before achieving the immense social status that would have allowed for a lavish afterlife.

Under the mummy's golden sheath and bandages, researchers found several dozen religious charms and plaques depicting various spiritual scenes. Several of these plaques showed images of the God Thoth (the ibis-faced deity of science and medicine, among other things), who healed fellow deity Horus' eye after a nasty God fight. Museum researchers hypothesized that the images on these plaques were evidence that Nespamedu may have been the pharaoh's personal eye doctor.

"There is nothing casual about the iconography and it is clear that he wanted to register his beliefs and the responsibilities that had elevated him to the upper echelons of society," museum researchers wrote in their latest report on the mummy (translated into English by the Spanish news site El Pais). "The fact that he was the pharaoh's doctor makes us think that part of his life was lived in Alexandria, where Ptolemy II had his court."

The researchers concluded that, by the end of his life, the good doctor had become one of Egypt's elite, hobnobbing with pharaohs and artisan mummifiers who knew their way around a sheet of gold leaf. Little is known of Nespamedu's grandmother, but one can imagine she would have been very, very proud.

https://wb.md/2RC9k0I

Cholesterol, Diabetes, BP Meds May Help Treat Serious Mental Illness

Research suggesting a number of drugs already licensed for other indications may have positive effects on psychiatric symptoms

Megan Brooks

UPDATED *January 17, 2019* // Statins, calcium channel blockers, and metformin may have a role in treating serious mental illness, new research suggests.

In a large observational study, investigators found individuals with schizophrenia, bipolar disorder (BPD), or nonaffective psychosis (NAP) were less likely to experience psychiatric hospitalization during periods of exposure to any of these agents compared with unexposed periods. In addition, people with schizophrenia or BPD were less likely to self-harm during exposure periods.

"There has been a lack of new drug development for these devastating disorders, but there is some research suggesting that a number of drugs already licensed for other indications may have positive effects on psychiatric symptoms," first author Joseph Hayes, PhD, from the Division of Psychiatry, University College London, UK, told *Medscape Medical News*.

The study was published online January 9 in *JAMA Psychiatry*.

New Life for Old Drugs?

The researchers analyzed data on 142,691 patients, including 76,759 with BPD, 30,954 with schizophrenia, and 34,978 with NAP. They focused on patients prescribed statins to reduce cholesterol/heart disease, L-type calcium channel (LTCC) antagonists (such as verapamil) to treat hypertension, or biguanides (such as metformin) to treat diabetes.

Periods of exposure to statins, LTCC antagonists, and biguanides were significantly associated with reduced rates of psychiatric hospitalization in BPD, schizophrenia, and NAP.

Adjusted Hazard Ratios for Psychiatric Hospitalization During Exposure (95% CI)

Disorder	Statins	LTCC Antagonists	Biguanides
BPD	0.86 (0.83 - 0.89)	0.92 (0.88 - 0.96)	0.80 (0.77 - 0.84)
Schizophrenia	0.75 (0.71 - 0.79)	0.80 (0.74 - 0.85)	0.73 (0.69 - 0.77)
NAP	0.80 (0.75 - 0.85)	0.89 (0.83 - 0.96)	0.85 (0.79 - 0.92)

In addition, self-harm was reduced in patients with BPD and schizophrenia during exposure to all study drugs and in patients with NAP during exposure to LTCC antagonists.

"At this stage, we are not suggesting people with these mental illnesses change their treatment and we wouldn't recommend using these medications instead of conventional medication for severe mental illness," said Hayes.

"However, there is evidence that people with schizophrenia, bipolar disorder, and other psychotic illnesses tend to have their physical health undertreated. Particularly, they are at increased risk of cardiovascular disease, hypertension, and diabetes; illnesses these medications are designed to treat. It is therefore worth patients working with their doctors to optimize prescribing for these physical conditions, which may then have additional beneficial effects on mental health," he added.

Hayes noted that a number of randomized controlled trials of these medications for severe mental illness are underway globally and his team hopes to "reproduce their findings in other large datasets available around the world."

It will also be important to clarify the central nervous system (CNS) effects of these classes of drugs "as there may be potential for optimization of effectiveness or new drug development," Hayes said.

Although none of these drugs have been comprehensively investigated as repurposed agents to improve mental disorders, each has a theoretical basis for effectiveness. Potential mechanisms for statins in psychiatric illness include anti-inflammatory effects or potentially increased absorption and CNS uptake of antipsychotics.

As for calcium channel blockers, calcium dysregulation in BPD is well known and calcium signaling is implicated in the etiology of schizophrenia. Metformin is also hypothesized to improve cognitive and mood dysfunction symptoms by mitigating metabolic disturbances.

Encouraging Findings

Commenting on the findings for *Medscape Medical News*, Hon-Cheong So, MBBS, PhD, assistant professor, School of Biomedical Sciences, The Chinese University of Hong Kong, said "drug repositioning may serve as a cost-effective way to uncover new therapies for severe mental illnesses such as schizophrenia, as there has not been much progress in developing new agents for these disorders."

"This article," said So, "is very interesting and employs a large database to look for relationships between several classes of quite widely used drugs and serious mental illness. The results are encouraging and help to prioritize drugs for further randomized trials."

Timothy Sullivan, MD, chair of psychiatry and behavioral sciences, Staten Island University Hospital, New York City, also welcomed the study.

"Drug development takes time and is expensive, so clinical researchers are always alert to unexpected signals, from other lines of research, that may recommend the utility of compounds developed for another purpose but shown to have some effect on mental illnesses or symptoms," he told *Medscape Medical News*.

"There is a long tradition of this type of research: indeed, lithium, antipsychotic medications, and some antidepressants all came into use following the serendipitous but thoughtful observations of clinicians noting clinical responses to medications used, for example, in surgical anesthesia (lithium, and also chlorpromazine, the 'grandfather' antipsychotic) that might provide insights into the management of mental illnesses," said Sullivan.

The authors of this study, he added, "rightly point out that if these findings are verified, repurposing the drugs mentioned above for use as adjuncts in the treatment of serious mental illness could rapidly improve outcomes and avoid the risks and delays associated with standard drug studies. As such, clinicians and researchers alike will welcome these findings while awaiting confirmation from other centers before instituting de novo adjunctive therapy with agents not yet approved for this type of use."

The study was supported by the Wellcome Trust, University College London Hospitals, National Institute for Health Research Biomedical Research Centre, and Swedish Research Council. Hayes and So have reported no relevant financial relationships.

JAMA Psychiatry. Published online January 9, 2019. Full text

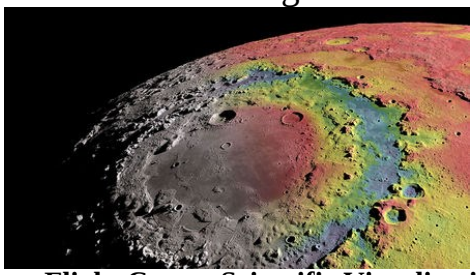
http://bit.ly/2U554DL

Moon's craters reveal recent spike in outer space impacts on Earth

Evidence of 2.5 times increase in the number of impacts striking Earth in the past 300 million years

By Paul Voosen Jan. 17, 2019 , 2:00 PM

It has long been thought that as the solar system grows older and stodgier, the number of asteroids and comets colliding with Earth and other planets has steadily gone down. But a new study reveals what appears to be a dramatic 2.5 times increase in the number of impacts striking Earth in the past 300 million years.



Ernest Wright, NASA/Goddard Space Flight Center Scientific Visualization Studio

Earth's surface is dotted with impact craters from the past billion years, but old craters are rarer than younger ones, a bias attributed to the crust-eating churn of plate tectonics, volcanism, and erosion. By looking at the moon, which doesn't deal with the same forces but faces the same bombardment, scientists can probe the past of both bodies.

Scientists used a thermal camera on NASA's Lunar Reconnaissance Orbiter to examine the number of large, heat-retaining rocks in the moon's craters; those rocks are eventually ground to dust by minute meteorite impacts. By looking at previously dated craters, these rocks have been established as a reliable dating technique—the more intact the rocks, the younger the crater.

In the new study, the team found a surprising abundance of young craters, seemingly matching the number on Earth. That means, they write today in *Science*, that in its modern geological history, Earth is much better at retaining the features of impact craters than once thought, and that the recent proliferation coincides with an actual increase in the number of bombarding asteroids or comets.

But scientists still don't know what caused the uptick. Perhaps several large asteroids collided or otherwise broke up some 300 million years ago, their chunks slowly migrating out from the asteroid belt to bombard Earth, the researchers say. And that could

have included the giant impact, 66 million years ago, that wiped out most of the dinosaurs.

http://bit.ly/2MjGhsY

Ultraviolet disinfection 97.7 percent effective in eliminating pathogens in hospital settings

UV disinfection technology eliminated up to 97.7 percent of pathogens in operating rooms

New Hyde Park, Ny - Using ultraviolet (UV) disinfection technology to reduce the risk of hospital-acquired infections eliminated up to 97.7 percent of pathogens in operating rooms (ORs), according to a study published in the American Journal of Infection Control.

The study examined a UV light technology platform deployed by New York-based PurpleSun that can be used for a range of disinfection applications for ORs, patient rooms and other health care settings. Unlike other disinfecting tools, which includes chemicals that can take minutes to inactivate pathogens and at times can leave bacteria on surfaces due to human and product error, PurpleSun reaches multiple surfaces in seconds with UV light. The study found that it all but eliminates human and product error in the proliferation pathogens that can contribute to the spread of pathogens that contribute to infection.

PurpleSun's focused multivactor ultraviolet (FMUV) device can be deployed to surround equipment on all sides, with foldable partitions whose light hits five different surface points and uses higher levels of UV intensity in 90-second intervals. More than 3,000.microbiological samples following 100 different surgical cases were taken in and around the ORs at three different hospitals in the New York metropolitan area. The observational study is believed to be the first to use five-point multisided sampling in testing the effect of UV disinfection technology.

"Ultraviolet light technology will not replace manual cleaning and disinfection with chemicals, but it is has a place in health care settings. This technology can optimize environmental cleanliness, resulting in decreased pathogens that could potentially cause infection," said Donna Armellino, RN, DNP, vice president of infection prevention at Northwell Health and lead author of the study, called: "Assessment of focused multivector ultraviolet disinfection with shadowless delivery, using five-point multisided sampling of patient care equipment without manual-chemical disinfection."

Dr. Armellino says the intent of the study was to determine if UV technology reduces environmental pathogens for the purpose of making health care facilities safer and improving the patient experience.

Dr. Armellino's co-authors were Thomas J. Walsh, MD, and Vidmantas Petraitis, MD, both of Weill Cornell Medicine of Cornell University; and Wladyslaw Kowalski, PhD, of Purple Sun.

The trial utilizing FMUV was conducted at Long Island Jewish Medical Center in New Hyde Park. Northwell's for-profit entity, True North Enterprises, is an investor in PurpleSun. To view the study, click here.

http://bit.ly/2B50HSf

Many hepatitis infections go undiagnosed in cancer patients

Alarmingly high rate of undiagnosed acute and chronic hepatitis B and C

Results from the largest study of hepatitis B and C and HIV infection prevalence in cancer patients show an alarmingly high rate of undiagnosed acute and chronic hepatitis B and C. Hepatitis B and C are serious but treatable viral infections that cancer patients should know they have - because these viruses can cause life-threatening complications when certain cancer treatments are used.

Investigators from SWOG Cancer Research Network, an international cancer clinical trials group funded by the National Cancer Institute (NCI), part of the National Institutes of Health, conducted the study, the results of which appear today in *JAMA Oncology*. The SWOG team found that a substantial portion of newly

diagnosed cancer patients with hepatitis B or C were unaware of their viral infection. Many had no identifiable risk factors for these infections, such as injection drug use.

The findings suggest that universal screening for hepatitis B or C may be warranted in community cancer clinics - a move that would allow physicians to help patients avoid liver failure, kidney disease, or other complications from hepatitis. Universal testing would also help care teams make more informed choices about cancer treatments, including avoiding those that may cause hepatitis viruses to reactivate and spread - making cancer patients even sicker. There is some evidence that anti-CD20 therapies, such as the drug rituximab, as well as hematopoietic cell transplantation, both treatments for lymphomas and leukemias, can cause some infection-causing viruses to reactivate and multiply.

"As a cancer patient, or physician, I would want to know the results of a hepatitis screening test," said Scott Ramsey, MD, PhD, a SWOG investigator and a director of the Hutchinson Institute for Cancer Outcomes Research (HICOR) at Fred Hutchinson Cancer Research Center. "The presence of a potentially life-threatening infection could guide care in very important ways. In medicine, more knowledge is always better."

The SWOG study, known as S1204, is notable for its large size and its diverse patient sample.

Between 2013 and 2017, 3,051 eligible patients were enrolled and received a simple blood test checking for the presence of the HIV virus, as well as the presence of the hepatitis B virus and the hepatitis C virus. Patients lived in both rural and urban areas and were treated at 18 different academic and community hospitals across the county, from Montana to Massachusetts. The median age was 60.6 years, and 60 percent of participants were female. Minority enrollment was high; Of total patients enrolled, 18 percent were Latino and 18 percent were African-American. The most common types of cancer study participants were being treated for included breast, blood, bone marrow, colorectal, and lung.

S1204 is also notable for its results. Despite varying oncology practice guidelines on viral screening for cancer patients, there is very little evidence to base those guidelines on. Ramsey and his team sought to inform the debate over universal screenings in the cancer community by understanding how prevalent HIV and hepatitis are among newly diagnosed patients.

Here's what they found:

- ***6.5 percent of patients had past hepatitis B, 0.6 percent had chronic hepatitis B, 2.4 percent had hepatitis C, and 1.1 percent had HIV - infection rates similar to those found in the general U.S. population.***
- ***Importantly, a substantial proportion of patients with past (87.3 percent) and chronic (42.1 percent) hepatitis B infections were undiagnosed prior to the study screening, as well as a large proportion of people with hepatitis C infections (31 percent).***
- ***No evidence of large numbers of undiagnosed HIV infections, although 5.9 percent of people with HIV were newly diagnosed through the study.***
- ***Many patients had no risk factors for their viral infections - 27.4 percent for past hepatitis B, 21.1 percent of patients with chronic hepatitis B, 32.4 percent with hepatitis C and 20.6 percent with HIV.***

"While our results don't suggest that universal HIV screening is necessary for cancer patients, they do provide new evidence to inform a discussion in the oncology community about whether we should require hepatitis screenings," Ramsey said. "Screening may be especially important now that we've entered the age of immunotherapies for cancer - treatments that may affect cancer patients' immune systems and alter the course of their viral infections. While we don't know much about the impact of immunotherapies on patients with cancer and hepatitis and other viral infections, oncologists should know as much as possible about the overall health of the people they treat."

Joseph Unger, PhD, a SWOG biostatistician also based at Fred Hutch, said universal screening for hepatitis is an important debate for the cancer care and research community to engage in, especially given the large proportion of hepatitis cases that S1204 showed are undiagnosed.

"From a public health perspective, chronic hepatitis B and hepatitis C are a significant challenge, since these infections affect millions of Americans, including many patients with cancer," Unger said. "Testing cancer patients for these diseases could catch a lot of undiagnosed cases and help modify their cancer care to improve outcomes."

Currently, Ramsey is analyzing results of a separate SWOG study that would determine whether universal hepatitis and HIV screenings of cancer patients would be cost effective.

While blood tests for viral infections are fairly cheap - the ones used in S1204 cost no more than $80 to process at a lab and were largely covered by insurance - more than 1.7 million Americans were estimated to be diagnosed with cancer in 2018. That's a lot of tests - and a lot of money. Results of the cost effectiveness study will be released later this year.

This SWOG study was conducted using specially designated Office of AIDS Research funding allocated to National Cancer Institute and supported by the National Institutes of Health under grants CA189974, CA180888, and CA180819.

Ramsey's SWOG team includes Joseph Unger, PhD of Fred Hutch; Laurence Baker, DO, of University of Michigan; Richard Little, MD, of the National Cancer Institute; Rohit Loomba, MD, of the University of California San Diego Moores Cancer Center; Jessica Hwang, MD, MPH, of the University of Texas MD Anderson Cancer Center; Rashmi Chugh, MD, of University of Michigan; Monica Konerman, MD, of University of Michigan; Kathyn Arnold, MS, of Fred Hutch; Alex Menter, MD, of Kaiser-Permanente-Lonetree; Eva Thomas, MD, of Kaiser Permanente Medical Center Oakland; Ross Michels, MD, NCORP of the Carolinas; Carla Walker Jorgensen, MD, NCORP of the Carolinas; Gary Burton, MD, of Gulf South MU-NCORP/Louisiana State University; Nishin Bhadkamkar, MD, of the University of Texas MD Anderson Cancer Center; and Dawn L. Hershman, MD, of NewYork-Presbyterian/Columbia University Irving Medical Center.

http://bit.ly/2RHIZ1d

Cassini Team Finds Evidence of Summer Rainfall at Titan's North Pole

Observations from NASA's Cassini spacecraft provide evidence of rainfall on the north pole of Saturn's moon Titan. The rainfall would be the first indication of the start of a summer season in the northern hemisphere of the hazy moon.

by News Staff / Source

Cassini arrived in the Saturnian system in the southern summers of 2004. As expected, the Cassini team observed cloud cover, storms and precipitation on the south pole of Titan.

Like Earth, the moon has an axial tilt (27 degrees) and its seasons vary over its year (30 Earth years). Ever since this shift in season began, the researchers eagerly waited for observations indicating cloud-cover and precipitation that went missing from the northern latitudes.

It's raining on Titan. **David A. Hardy, AstroArt / NASA.**

"The whole Titan community has been looking forward to seeing clouds and rains on Titan's north pole, indicating the start of the northern summer, but despite what the climate models had predicted, we weren't even seeing any clouds," said Rajani Dhingra, a doctoral student at the University of Idaho.

"People called it the curious case of missing clouds."

Dhingra and co-authors identified a reflective feature near Titan's north pole on an image taken June 7, 2016, by Cassini's Visual and Infrared Mapping Spectrometer.

The feature covered approximately 46,332 square miles (120,000 km^2) and did not appear on images from previous and subsequent Cassini passes.

Analyses of the short-term reflective feature suggested it likely resulted from sunlight reflecting off a wet surface.

The study attributes the reflection to a methane rainfall event, followed by a probable period of evaporation.

“It’s like looking at a sunlit wet sidewalk,” Dhingra said.

This reflective surface represents the first observations of summer rainfall on the moon’s northern hemisphere.

“Summer is happening. It was delayed, but it’s happening. We will have to figure out what caused the delay, though,” Dhingra said.

“Additional analyses suggest the methane rain fell across a relatively pebble-like surface.”

“A rougher surface generates an amorphous pattern as the liquid settles in crevasses and gullies, while liquid falling on a smooth surface would puddle in a relatively circular pattern.”

The findings were published in the journal *Geophysical Research Letters*.

Rajani D. Dhingra et al. *Observational evidence for summer rainfall at Titan’s north pole.* Geophysical Research Letters, *published online January 16, 2019; doi: 10.1029/2018GL080943*

https://bbc.in/2RSF5C7

Saturn's spectacular rings are 'very young'

We're looking at Saturn at a very special time in the history of the Solar System, according to scientists.

By Jonathan Amos BBC Science Correspondent

They've confirmed the planet's iconic rings are very young - no more than 100 million years old, when dinosaurs still walked the Earth.

The insight comes from the final measurements acquired by the American Cassini probe.

The satellite sent back its last data just before diving to destruction in the giant world's atmosphere in 2017.

"Previous estimates of the age of Saturn's rings required a lot of modelling and were far more uncertain. But we now have direct measurements that allows us to constrain the age very well," Luciano Iess from Sapienza University of Rome, Italy, told BBC News.

The professor's team has published an account of its work with Cassini in Science magazine.

There has long been a debate about the age of Saturn's rings. Some had argued these gorgeous loops of icy particles most likely formed along with the planet itself, some 4.5 billion years ago.

Others had suggested they were a recent phenomenon - perhaps the crushed up remains of a moon or a passing comet that was involved in a collision.

The US-European Cassini mission promised to resolve the argument in its last months at the gas giant.

The satellite's end days saw it fly repeatedly through the gap between the rings and the planet's cloudtops.

These manoeuvres made possible unprecedented gravity measurements.

Cassini essentially weighed the rings, and found their mass to be 20 times smaller than previous estimates: something on the order of 15,400,000,000,000,000 tonnes, or about two-fifths the mass of Mimas - the Saturn moon that looks like the "Death Star" weapon in the Star Wars movies.

Knowing the mass was a key piece in the puzzle for researchers.

From Cassini's other instruments, they already knew the proportion of dust in the rings and the rate at which this dust was being added.

Having a definitive mass for the rings then made it possible to work out an age.

Prof Iess's team says this could be as young as 10 million years but is no older than 100 million years. In terms of the full age of the Solar System, this is "yesterday".

The calculation agrees with one made by a different group which last month examined how fast the ring particles were falling on to Saturn - a rate that was described as being equivalent to an Olympic-sized swimming pool every half-hour.

This flow, when all factors were considered, would probably see the rings disappear altogether in "at most 100 million years", said Dr Tom Stallard from Leicester University, UK.

"The rings we see today are actually not that impressive compared with how they would have looked 50-100 million years ago," he told BBC News.

"Back then they would have been even bigger and even brighter. So, whatever produced them must have made for an incredible display if you'd been an astronomer 100 million years ago."

Cassini's investigations cannot shed much light on the nature of the event that gave rise to the rings, but it would have been cataclysmic in scale.

It was conceivable, said Dr Stallard, that the geology of the moons around Saturn could hold important clues. Just as rock and ice cores drilled on Earth reveal debris from ancient meteorite and comet impacts, so it's possible the moons of Saturn could record evidence of the ring-forming event in their deeper layers.

Maybe we'll get to drill into the likes of Mimas and Enceladus... one day.

http://bit.ly/2Hi9RA6

25,000 Years Later, Javelin Is Still Embedded in Mammoth's Rib

First evidence that ice age people in Europe used weapons to hunt mammoths

By Laura Geggel, Senior Writer

About 25,000 years ago, ice age hunters in what is now Poland threw a light spear known as a javelin at a mammoth. Now, the discovery of that javelin, still embedded in the mammoth's rib, has revealed a major surprise: the first evidence that ice age people in Europe used weapons to hunt the giant beasts.

Previously, researchers wondered whether our ancestors had killed mammoths by trickery, for instance, by chasing them into pits or off cliffs. Or, perhaps ice age hunters targeted weak or sick mammoths that were easy to finish off.

But now, "we finally have a smoking gun, the first direct evidence of how these animals were hunted," Piotr Wojtal, an archaeozoologist at the Institute of Systematics and Evolution of Animals at the Poland Academy of Sciences in Kraków, told Science in Poland, a site run by the Ministry of Science and Higher Education.

Deadly weapon

Researchers initially found the mammoth rib in 2002, at a mammoth hotspot in Kraków, where scientists, over the years, have discovered the remains of at least 110 mammoths that lived between 30,000 and 25,000 years ago, the researchers said.

"Among tens of thousands of bones, during a detailed analysis of the remains, I came across a damaged mammoth rib," Wojtal told Science in Poland. "It turned out that a fragment of a flint arrowhead was stuck in it."

It wasn't until February 2018 that they took a detailed look at the specimen.

During this examination, scientists found the 0.3-inch-long (7 millimeters) fragment of the flint tip, which likely broke when a hunter drove the spear into the mammoth's body.

"The spear was certainly thrown at the mammoth from a distance, as evidenced by the force with which it stuck into an animal," Wojtal told Science in Poland. "The blade had to pierce 2-centimeters-thick [0.7 inches] skin and an 8-centimeter [0.04 inches] layer of fat to finally reach the bone."

This blow probably didn't kill the mammoth, but if the hunt involved several armed hunters, it's likely that strikes from other weapons,

"probably directly into soft tissues and one of the organs," killed the giant, Wojtal said.

Ice age hunters?

Over the past 20 years, researchers have found mammoth remains containing human-made weapons at two sites in Siberia, but "I believe this is the first find of a weapon embedded in a mammoth bone in Europe," said Adrian Lister, a professor of vertebrates and anthropology at the Natural History Museum in London, who wasn't involved with the finding.

"It is important because it proves beyond reasonable doubt that mammoths were hunted," Lister told Live Science. Until now, there was only circumstantial evidence that ice age people in Europe hunted mammoths. For instance, the Polish site of Kraków Spadzista Street contains burnt bones involved in supporting the tongue, indicating that ancient people feasted on roasted mammoth tongue, Lister said.

"But you can never be absolutely sure that such animals were actually hunted rather than scavenged," Lister said. Or, if the mammoths did appear to be hunted, it remained a mystery what weapons were used against them, such as spears or traps.

The new find shows, without a doubt, that a spear was used against the beast, Lister said.

What killed off the mammoths?

Mammoths lived in Europe starting about 500,000 years ago and started dying out about 15,000 years ago. However, they survived longer in Alaska and lived on Wrangel Island, off northeast Russia, until about 4,000 years ago.

A mix of changing climatic conditions (the ice age was ending) and hunting likely caused the mammoth's extinction, but researchers still debate which played a larger role. In this case, however, this specific example is not necessarily evidence that humans played a big role in their extinction, Lister said.

"That doesn't prove people killed them in [large enough] quantities to drive them to extinction," Lister said. Moreover, this particular mammoth died about 25,000 years ago, at least 10,000 years before mammoths died out in Europe, "so 'sustainable' hunting is implied, at least at that time," Lister said.

http://bit.ly/2RBtxno

Biologists discover deep-sea fish living where there is virtually no oxygen

Biologists recently discovered large schools of fishes living where there is virtually no oxygen

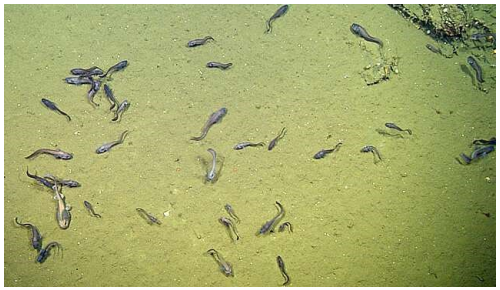
by Kim Fulton-Bennett, Monterey Bay Aquarium Research Institute

Oxygen—it's a basic necessity for animal life. But marine biologists recently discovered large schools of fishes living in the dark depths of the Gulf of California where there is virtually no oxygen. Using an underwater robot, the scientists observed these fishes thriving in low-oxygen conditions that would be deadly to most other fish. This discovery could help scientists understand how other marine animals might cope with ongoing changes in the chemistry of the ocean.

The researchers described their discovery in a recent article in the journal *Ecology*. The lead author of the article, Natalya Gallo, is a graduate student at the Scripps Institution of Oceanography. She worked closely with other Scripps researchers on the paper, as well as with MBARI biologist Jim Barry, who led the research cruise.

In 2015, Barry, Gallo, and eight other researchers conducted a series of dives in several deep ocean basins in the Gulf of California using MBARI's remotely operated vehicle (ROV) Doc Ricketts—a state-of-the-art underwater robot. Gallo was particularly interested in these areas because her Ph.D. thesis focuses on animals that live in very low-oxygen environments. The deep waters of the Gulf of California have some of the most extreme low-oxygen habitats in the world.

"I could hardly believe my eyes," Gallo wrote in MBARI's cruise blog following an ROV dive in the Cerralvo Trough. "We observed cusk eels, grenadiers, and lollipop sharks actively swimming around in areas where the oxygen concentration was less than one percent of typical surface oxygen concentrations. We were in a suboxic habitat, which should exclude fish, but instead there were hundreds of fish. I immediately knew this was something special that challenged our existing understanding of the limits of hypoxia [low-oxygen] tolerance."



Cusk eels, lollipop sharks, and grenadiers congregate on the seafloor in the Gulf of California. **MBARI**

In fact, instruments on the ROV showed that these fish were living in an environment where oxygen concentrations were one-tenth to one-fortieth as low as those tolerated by other low-oxygen fish. In fact, two species of fish—cusk eels and lollipop sharks—seemed to prefer these low-oxygen areas over areas where oxygen concentrations were higher.

"Many other types of fish are considered tolerant of low-oxygen conditions," Barry commented." But the fish in these parts of the Gulf are like the winners among a group of elite Olympic athletes."

One of Barry's goals of the cruise was to use the large natural variations in oxygen and temperature found in the Gulf to study how seafloor animal communities might change in response to warmer and reduced-oxygen conditions that have been predicted by some climate models

The researchers still don't know exactly how these fish are able to survive, and even thrive, under such harsh conditions. Both the cusk eels and cat sharks have large heads with vibrant red gills, which may be particularly good at absorbing oxygen from the surrounding water. The fish are also small—less than 30 centimeters (one foot) long—with soft flabby bodies and thin, weakly developed bones—all traits that might help them conserve energy.

Why the fish congregate in these particular areas is another mystery. Barry speculates that they might be finding food or avoiding predators. In some low-oxygen areas the researchers saw snails, sea stars, and sea pens on the seafloor. But in the lowest-oxygen areas, the muddy seafloor looked like a barren moonscape, suggesting that even small invertebrates had a hard time surviving.

"We hope to go back to the Gulf soon to try and address some of these questions," Barry said.

More information: *Natalya D. Gallo et al. Home sweet suboxic home: remarkable hypoxia tolerance in two demersal fish species in the Gulf of California, Ecology (2018). DOI: 10.1002/ecy.2539*

https://bbc.in/2HzuCYr

Two dead after pigeon dropping infection at hospital

Two patients have died after contracting a fungal infection caused by pigeon droppings at the Queen Elizabeth University Hospital.

NHS Greater Glasgow and Clyde said an elderly patient died but from an unrelated cause. Another infected patient has also died but the factors contributing to the death are still being investigated.

A non-public room, thought to contain machinery, was identified as a likely source. An investigation is under way.

A NHSGGC spokesman said: "Our thoughts are with the families at this distressing time. "Due to patient confidentiality we cannot share further details of the two cases. "The organism is harmless to the vast majority of people and rarely causes disease in humans."

NHSGGC confirmed a small number of vulnerable paediatric and adult patients are receiving medication to protect them against the airborne infection, which is a Cryptococcus species. Portable HEPA

air filter units have been installed in specific areas as an additional precaution.

Earlier on Saturday Teresa Inkster, lead consultant for infection control, said: "Cryptococcus lives in the environment throughout the world. It rarely causes infection in humans.

"People can become infected with it after breathing in the microscopic fungi, although most people who are exposed to it never get sick from it. "There have been no further cases since the control measures were put in place."

Ms Inkster said experts are continuing to monitor the air quality.

She added: "It remains our priority to ensure a safe environment for patients and staff."

'Very unusual'

Prof Hugh Pennington, of Aberdeen University, said he was surprised to learn of the infection.

The epidemiologist said: "It is very unusual in the UK.

"It is quite common in other parts of the world, particularly in tropical parts and in the US and in countries like that, where they have more problems with this particular kind of fungus."

Prof Pennington said people with weak immune systems are most at risk. He added: "When it gets into the blood stream a lot of people have fairly straightforward infections and it settles in the lungs but the big problem with this is that it can cause meningitis and, as we know, meningitis can be a very serious infection."

Prof Pennington said anti-fungal drugs are used to treat the infection but warned it can be fatal if it is not diagnosed.

Airborne infection

The expert said a key priority would have been stopping the airborne infection from entering the hospital's ventilation system.

He added: "Obviously they have stopped the pigeons getting into the machine room. "It surprises me slightly that there was any there in the first place."

During the investigation, a separate issue arose with the sealant in some of the shower rooms. NHSGGC said repairs are underway and our maintenance team are working to remedy this issue as quickly as possible with the minimum disruption.

As a further precaution, a specific group of patients are being moved within the hospital due to their clinical diagnosis and ongoing treatment.

The £842m QEUH opened in April 2015 and featured in the BBC series Scotland's Superhospital.