http://www.bbc.com/news/health-30742774

'Designer babies' debate should start, scientists say

Rapid progress in genetics is making "designer babies" more likely and society needs to be prepared

By James Gallagher Health editor, BBC News website

Rapid progress in genetics is making "designer babies" more likely and society needs to be prepared, leading scientists have told the BBC.

Dr Tony Perry, a pioneer in cloning, has announced precise DNA editing at the moment of conception in mice. He said huge advances in the past two years meant "designer babies" were no longer HG Wells territory. Other leading scientists and bioethicists argue it is time for a serious public debate on the issue.

Designer babies - genetically modified for beauty, intelligence or to be free of disease - have long been a topic of science fiction.

Dr Perry, who was part of the teams to clone the first mice and pigs, said the prospect was still fiction, but science was rapidly catching up to make elements of it possible.

In the journal Scientific Reports, he details precisely editing the genome of mice at the point DNA from the sperm and egg come together.

Dr Perry, who is based at the University of Bath, told the BBC: "We used a pair of molecular scissors and a molecular sat-nav that tells the scissors where to cut.

"It is approaching 100% efficiency already, it's a case of 'you shoot you score'."

New era

It is the latest development of "Crispr technology" - which is a more precise way of editing DNA than anything that has come before. It was named one of the top breakthroughs in 2013, hailed as the start of a new era of genetics and is being used in a wide-range of experiments in thousands of laboratories.

As well simply cutting the DNA to make mutations, as the Bath team have done, it is also possible to use the technology to insert new pieces of genetic code at the site of the cut.

It has reopened questions about genetically modifying people.

Prof Perry added: "On the human side, one has to be very cautious.

"There are heritable diseases coded by mutations in DNA and some people could say, 'I don't want my children to have these mutations.'"

This includes conditions such as cystic fibrosis and genes that increase the risk of cancer. "There's much speculation here, but it's not completely fanciful, this is not HG Wells, you can imagine people doing this soon [in animals]. "At that time the HFEA [the UK's fertility regulator] will need to be prepared because they're going to have to deal with this issue."

He said science existed as part of a wider community and that it was up to society as a whole to begin assessing the implications and decide what is acceptable.

Time for debate

Prof Robin Lovell-Badge, from the UK Medical Research Council, has been influential in the debate around making babies from three people and uses the Crispr technology in his own lab. He said testing embryos for disease during IVF would be the best way of preventing diseases being passed down through the generations.

However, he could see such potential uses of "germ-line therapies" for men left infertile by damaging mutations. While they can have children through IVF, any sons would still have the mutations and would in turn need IVF. Genetic modification could fix that. It would also be useful in circumstances when all embryos would carry the undesirable, risky genes.

Prof Lovell-Badge told the BBC News website: "Obviously in the UK, this is not allowed and there would have to be a change in regulations, which I suspect would have enormous problems. "But it is something that needs to start to be debated. "There has been a blanket ban on germ-line therapy, so there needs to be a debate about that and some rational thought rather than knee-jerk reactions that, 'No you can't possibly do that.'"

Such a debate would also have to move beyond therapies into the field of babies designed to have desirable traits. Some alternations would only require small changes to DNA, such as some changes to eye colour or to make a child HIV-resistant.

The respected Nuffield Council on Bioethics is understood to be considering a report on the issue. Its verdict in 2012 that it was ethical to create babies from three people formed a core part of the public debate on the issue. At the time it said a much wider debate on germ-line therapy was still needed.

Complex ethics

Its director, Hugh Whittall, told the BBC: "I think this is a challenge, for all of us, we should get onto looking at this fairly rapidly now." He said the field raised questions of social justice around techniques available only to the rich and what constituted identity as well as "issues of governance and regulation".

Dr David King, from the campaign group Human Genetics Alert, echoed calls for the public to engage with the issue.

He said: "I think it's pretty inevitable that we'll get to a point where it's scientifically possible, certainly these new techniques of genome editing have made something look much more feasible than it did five years ago.

"But that does not mean to say it's inevitably the way we have to go as a society."

This is still a matter of science fiction and there is a huge amount of research - particularly on unwanted mutations, efficiency and safety - that needs to be done before any attempt of humans would even be considered.

A spokesman for the UK's Human Fertilisation and Embryology Authority said: "We keep a watchful eye on scientific developments of this kind and welcome discussions about future possible developments."

He said it "should be remembered that germ-line modification of nuclear DNA remains illegal in the UK" and that new legislation would be needed from Parliament "with all the open and public debate that would entail" for there to be any change in the law.

http://www.eurekalert.org/pub_releases/2015-01/uomh-ro011915.php

Researchers open 'Pandora's box' of potential cancer biomarkers

Analysis describes global landscape of relatively unexplored part of human genome

ANN ARBOR, Mich. - A new analysis opens the door to discovery of thousands of potential new cancer biomarkers.

Researchers at the University of Michigan Comprehensive Cancer Center analyzed the global landscape of a portion of the genome that has not been previously well-explored - long non-coding RNAs.

This vast portion of the human genome has been considered the dark matter because so little is known about it. Emerging new evidence suggests that lncRNAs may play a role in cancer and that understanding them better could lead to new potential targets for improving cancer diagnosis, prognosis or treatment.

"We know about protein-coding genes, but that represents only 1-2 percent of the genome. Much less is known about the biology of the non-coding genome in terms of how it might function in a human disease like cancer," says senior study author Arul M. Chinnaiyan, M.D., Ph.D., director of the Michigan Center for Translational Pathology and S.P. Hicks Professor of Pathology at the University of Michigan Medical School.

The researchers pulled together 25 independent datasets totaling 7,256 RNA sequencing samples. The data was from public sources such as The Cancer Genome Atlas project, as well as from the Michigan Center for Translational Pathology's archives. They applied high-throughput RNA sequencing technology to identify more than 58,000 lncRNA genes across normal tissue and a range of common cancer types.

Results of the study appear online in Nature Genetics.

"We used all of this data to decipher what the genomic landscape looks like in different tissues as well as in cancer," Chinnaiyan says. "This opens up a Pandora's box of all kinds of lncRNAs to investigate for biomarker potential."

The complete dataset, named the MiTranscriptome compendium, has been made available on a public website, http://www.mitranscriptome.org, for the scientific community to explore.

The researchers also identified one lncRNA, SChLAP1, as a potential biomarker for aggressive prostate cancer. SChLAP1 was more highly expressed in metastatic prostate cancer than in early stage disease. SChLAP1 was found primarily in prostate cancer cells, not in other cancers or normal cells, which gives researchers hope that a non-invasive test could be developed to detect SChLAP1. Such a test could be used to help patients and their doctors make treatment decisions for early stage prostate cancer.

"Some long non-coding RNAs tend to be exquisitely specific for cancer, while protein-coding genes are often not. That's what makes lncRNAs a very promising target for developing biomarkers," Chinnaiyan says. "We hope that researchers will investigate the MiTransciptome compendium and begin to nominate lncRNAs for further study and development. It's likely that only a subset of these have true function but as a previously untapped area, it holds great promise."

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http://www.eurekalert.org/pub_releases/2015-01/tcd-sfm011915.php

Scientists find major limitations with carbon nanotubes in blood facing medical devices

The research from Trinity College Dublin demonstrates the opportunities and risks involved in using these innovative technologies in clinical practice.

Scientists in the School of Pharmacy and Pharmaceutical Sciences in Trinity College Dublin, have made an important discovery about the safety issues of using carbon nanotubes as biomaterials which come into contact with blood.

The significance of their findings is reflected in their paper being published as the feature story and front page cover of the international, peer-reviewed journal Nanomedicine.

When blood comes into contact with foreign surfaces the blood's platelets are activated which in turn leads to blood clots being formed. This can be catastrophic in clinical settings where extracorporeal circulation technologies are used such as during heart-lung bypass, in which the blood is circulated in PVC tubing outside the body. More than one million cardiothoracic surgeries are performed each year and while new circulation surfaces that prevent platelet activation are urgently needed, effective technologies have remained elusive.

One hope has been that carbon nanotubes, which are enormously important as potentially useful biomedical materials, might provide a solution to this challenge and this led the scientists from the School of Pharmacy and Pharmaceutical Sciences in collaboration with Trinity's School of Chemistry and with colleagues from UCD and the University of Michigan in Ann Arbour to test the blood biocompatibility of carbon nanotubes.

They found that the carbon nanotubes did actually stimulate blood platelet activation, subsequently leading to serious and devastating blood clotting. The findings have implications for the design of medical devices which contain nanoparticles and which are used in conjunction with flowing blood.

Speaking about their findings, Professor Marek Radomski, Chair of Pharmacology, Trinity and the paper's senior author said: "Our results bear significance for the design of blood-facing medical devices, surface-functionalised with nanoparticles or containing surface-shedding nanoparticles. We feel that the risk/benefit ratio with particular attention to blood compatibility should be carefully evaluated during the development of such devices. Furthermore, it is clear that non-functionalised carbon nanotubes both soluble and surface-bound are not blood-compatible".

Speaking about the significance of these findings for Nanomedicine research, the paper's first author Dr Alan Gaffney, a Trinity PhD graduate who is now Assistant Professor of Anaesthesiology in Columbia University Medical Centre, New York said: "When new and exciting technologies with enormous potential benefits for medicine are being studied, there is often a bias towards the publication of positive findings.

The ultimate successful and safe application of nanotechnology in medicine requires a complete understanding of the negative as well as positive effects so that un-intended side effects can be prevented. Our study is an important contribution to the field of nanomedicine and nanotoxicology research and will help to ensure that nanomaterials that come in contact with blood are thoroughly tested for their interaction with blood platelets before they are used in patients."

The paper is available here: http://www.nanomedjournal.com/article/S1549-9634(14)00415-8/fulltext

http://www.eurekalert.org/pub_releases/2015-01/yu-fai011615.php

Fossil ankles indicate Earth's earliest primates lived in trees

Earth's earliest primates have taken a step up in the world, now that researchers have gotten a good look at their ankles.

New Haven, Conn. - A new study has found that Purgatorius, a small mammal that lived on a diet of fruit and insects, was a tree dweller. Paleontologists made the discovery by analyzing 65-million-year-old ankle bones collected from sites in northeastern Montana.

Purgatorius, part of an extinct group of primates called plesiadapiforms, first appears in the fossil record shortly after the extinction of non-avian dinosaurs. Some researchers have speculated over the years that primitive plesiadapiforms were terrestrial, and that primates moved into the tree canopy later. These ideas can still be found in some textbooks today.

"The textbook that I am currently using in my biological anthropology courses still has an illustration of Purgatorius walking on the ground. Hopefully this study will change what students are learning about earliest primate evolution and will place Purgatorius in the trees where it rightfully belongs," said Stephen Chester, the paper's lead author. Chester, who conducted much of the research while at Yale University studying for his Ph.D., is an assistant professor at Brooklyn College, City University of New York. Chester is also a curatorial affiliate at the Yale Peabody Museum of Natural History.

Until now, paleontologists had only the animal's teeth and jaws to examine, which left much of its appearance and behavior a mystery. The identification of Purgatorius ankle bones, found in the same area as the teeth, gave researchers a better sense of how it lived.

"The ankle bones have diagnostic features for mobility that are only present in those of primates and their close relatives today," Chester said. "These unique features would have allowed an animal such as Purgatorius to rotate and adjust its feet accordingly to grab branches while moving through trees. In contrast, ground-dwelling mammals lack these features and are better suited for propelling themselves forward in a more restricted, fore-and-aft motion."

The research provides the oldest fossil evidence to date that arboreality played a key role in primate evolution. In essence, said the researchers, it implies that the divergence of primates from other mammals was not a dramatic event. Rather, primates developed subtle changes that made for easier navigation and better access to food in the trees.

The research appears in the Jan. 19 online edition of the Proceedings of the National Academy of Sciences.

The paper's co-authors are Jonathan Bloch of the Florida Museum of Natural History at the University of Florida, who also contributed to the research as an Edward P. Bass Distinguished Visiting Environmental Scholar in the Yale Institute for Biospheric Studies; Doug Boyer of Duke University; and William Clemens of the University of California Museum of Paleontology, who collected fossils of Purgatorius and geological data over the past four decades with members of his field crews in Montana.

http://www.eurekalert.org/pub_releases/2015-01/ez-avf011915.php

A voyage from the Earth's crust to its mantle and back again

Uranium isotope cycle

From the beginning of time, uranium has been part of the Earth and, thanks to its long-lived radioactivity, it has proven ideal to date geological processes and deduce Earth's evolution.

Natural uranium consists of two long-lived isotopes uranium-238 and the lighter uranium-235. A new study of the global cycle of these uranium isotopes brings additional perspectives to the debate on how the Earth has changed over billions of years as revealed in a recently published study in the journal Nature.

From early Earth history, the continental crust (the Earth's thick solid outer skin that we live on) has accumulated mass from the underlying hot mantle. Most of the newly formed crust, however, is lost again. At mid-ocean ridges at the bottom ocean, where plates drift apart, new oceanic crust is constantly produced as basaltic rocks when hot volcanic lava emerges from the mantle and solidifies. The oceanic crust moves away from the mid-ocean-ridges and ultimately gets transported back into the underlying mantle through "subduction" at ocean trenches.

Uranium is enriched in the rocks of the continental crust; however, at Earth's surface, different environments over time have influenced its mobility. In an oxygen-free atmosphere, as prevailed on early Earth, uranium stayed immobile in rocks as tetravalent uranium (IV). Only after atmospheric oxygen was formed did uranium become oxidised to its mobile hexavalent uranium (VI). This more mobile uranium may then be released during the weathering and break-down of rocks and transported to the oceans in aqueous form. As the cooling oceanic crust moves away from the mid-ocean-ridges in the oceans, seawater eventually percolates through cracks in its rock and in the process uranium gets incorporated into the oceanic crust, in a similar way that a sponge takes up water.

"The radioactive nature of uranium isotopes has long been key in reconstructing early Earth history, but we now see that they also have another story to tell" explains Morten Andersen, a geochemist in the Department of Earth Sciences at ETH Zurich.

Uranium isotopes form specific signatures

For this work, conducted at the University of Bristol including Morten Andersen (now Earth Science, ETH Zurich) along with researchers from the Durham (UK), Wyoming and Rhode Island (US), used the 'fingerprint' carried in the ratio of the two uranium isotopes.

The specific "fingerprint" derived from the ratio of the uranium isotopes, relates to uranium oxidation processes at the Earth's surface. In particular, the researchers found that a higher ratio of uranium-238 to uranium-235 is incorporated into the modern oceanic crust, when compared to the uranium isotope signature found in meteorites. The meteorites represent the Earth's "building blocks" and, thus, yield the original uranium isotope composition of the Earth as a whole, and also the undisturbed mantle. This uranium isotope "fingerprint" of the altered oceanic crust provides a way to trace uranium that has moved from the surface and back into the Earth's interior through subduction.

In order to examine the uranium cycle (and the rock cycle), the researchers analysed mid-ocean ridge basalts (MORBs), the hot volcanic lava that is produced from the upper and well-mixed part of the mantle. The ratio of the uranium isotopes in MORBs can be compared with those found in ocean island basalts in places such as Hawaii and the Canary Islands. These islands are so-called "hot-spots" with lava formed from hot mantle plumes that up-well beneath the oceanic crust. Compared to the MORB mantle, the island basalts are made up of material transported to the surface from a much deeper, less well-mixed, mantle sources.

Heavy uranium from surface to the deep

The isotope ratios for uranium-238 to uranium-235 are significantly greater for MORBs than for ocean island basalts. The ratios are also higher than that found in meteorites. This suggests that the MORBs contain a "fingerprint" of the uranium from the oceanic crust, drawn down from the surface and into the upper part of the Earth's mantle through subduction, according to Andersen.

Through convection - slow movements of material in the upper mantle - the material was eventually mixed around and carried to the area of the mid-ocean ridges and transported back to the surface in the lavas that make up MORBs.

In contrast, the island basalts' ratios of uranium-238 to uranium-235 correspond to those of the meteorites used in the study and showed that these rocks could not have the same mantle source as the MORBs. The researchers explain that ocean island lavas comes from a deeper, less mixed, mantle source and therefore any uranium added from the surface originates from a much earlier time in Earth's history, when the surface environment was very different from today.

Study co-author Heye Freymuth of the University of Bristol explains: "Although uranium was incorporated into the oceanic crust since the initial rise in atmospheric oxygen about 2.4 billion years ago, the ocean crust did not

incorporate higher amounts of uranium-238 as the oceans did not yet have adequate supplies of oxygen."

Only during the second marked increase in atmospheric oxygen content 600 million years ago did the deep ocean become fully oxidised, which allowed the oceanic crust to gain the "fingerprint" of high uranium-238. So, despite the oceanic crust having been transported into the Earth's mantle for a long time, the uranium isotope ratio of the subducted oceanic crust first differed from the Earth's mantle only after the full oxidation of the oceans.

"An important result of this study is how changing conditions on the Earth's surface and the increase of oxygen in the atmosphere influenced the composition of deep Earth. Our results suggest that due to changes over the past 600 million years, uranium was mobilised from the surface, transported into the Earth's interior and distributed within the mantle," says Andersen.

Hot debate about Earth's early days

The study of uranium and the crust's cycle brings new perspectives to the debate about how the face of the Earth has changed over billions of years. "This is currently one of the hottest research topics for Earth scientists," Andersen points out. Particularly lively debates take place on how the concentration of oxygen in the atmosphere evolved; after all, it is associated with many other geological weathering processes, including the fate of uranium. The current study is mainly fundamental research in a relatively young research area. The identified uranium isotope signatures could in future be used commercially to detect unknown uranium deposits and help understand processes of uranium mobility. The first basic scientific work pointing to the potential of uranium-238 to uranium-235 variation on Earth was published in 2007. The study by Andersen and his colleagues is the first to use the uranium isotope ratio for the examination of igneous rock and apply it to the recycling process in deep Earth.

Andersen MB, Elliott T, Freymuth H, Sims KWW, Niu Y, Kelley KA. The terrestrial uranium isotope cycle. Nature, published online 15 January 2015. DOI: 10.1038/nature14062

http://bit.ly/1uGD37P

This 3,500-Year-Old Dagger Made a Really Great Doorstop

One man's doorstop is another man's rare, ancient artifact

By Erin Blakemore smithsonian.com

Sometimes, history is in plain view. Especially if you're using an ancient artifact as a doorstop.

The History Blog reports that a farmer in Norfolk, England, unearthed a bent piece of bronze while plowing a field. He put it to work as a doorstop, and it served that purpose for more than a decade. Eventually, the farmer started thinking about getting rid of the four-pound thing. But a friend convinced him to ask an archaeologist about its origins before consigning it to the local dump.

That's where things get interesting - because the farmer's doorstop wasn't trash at all. Experts have identified the piece as "the Rudham Dirk," a bronze ceremonial dagger dating from 1,500 B.C.

"Bending a metal object as a symbolic act of destruction before burial was a common practice in the Bronze Age," notes the History Blog. These ceremonial dirks were prestige pieces, used specifically for rituals. Historians think that the dirk may have been made by the same artisan who created the five other dirks known to exist in the world - evidence of both ancient artistry and complex trade.

Now the dirk has a new home at the Norwich Castle Museum and Art Gallery, which bought the farmer's hunk of junk for over $64,000. (Similar pieces have sold for up to $75,000 at auction.) And what of the farmer? He'll join the annals of people who have turned seemingly commonplace finds into big bucks - enough to give anyone pause before tossing a piece of so-called trash.

The ancient artifact was found in a field and used as a doorstop for years before being identified as a rare ceremonial dirk. **(Norwich Castle Museum and Art Gallery)**

http://nyti.ms/1z2ZN3k

Complexities of Choosing an End Game for Dementia

Jerome Medalie keeps his advance directive hanging in a plastic sleeve in his front hall closet, as his retirement community recommends.

By PAULA SPAN

DEDHAM, Mass. - That's where the paramedics will look if someone calls 911. Like many such documents, it declares that if he is terminally ill, he declines cardiopulmonary resuscitation, a ventilator and a feeding tube.

But Mr. Medalie's directive also specifies something more unusual: If he develops Alzheimer's disease or another form of dementia, he refuses "ordinary means of nutrition and hydration." A retired lawyer with a proclivity for precision, he has listed 10 triggering conditions, including "I cannot recognize my loved ones" and "I cannot articulate coherent thoughts and sentences."

If any three such disabilities persist for several weeks, he wants his health care proxy - his wife, Beth Lowd - to ensure that nobody tries to keep him alive by spoon-feeding or offering him liquids. VSED, short for "voluntarily stopping

eating and drinking," is not unheard-of as an end-of-life strategy, typically used by older adults who hope to hasten their decline from terminal conditions. But now ethicists, lawyers and older adults themselves have begun a quiet debate about whether people who develop dementia can use VSED to end their lives by including such instructions in an advance directive.

Experts know of just a handful of people with directives like Mr. Medalie's. But dementia rates and numbers have begun a steep ascent, already afflicting an estimated 30 percent of those older than 85. Baby boomers are receiving a firsthand view of the disease's devastation and burdens as they care for aging parents.

They may well prove receptive to the idea that they shouldn't be kept alive if they develop dementia themselves, predicted Alan Meisel, the director of the University of Pittsburgh's Center for Bioethics and Health Law.

"People in their 50s and 60s frequently say: 'I don't want to be in that situation. I don't want to put my family in that situation,' " he said. "And people will increasingly voice those views to others, sometimes in a formal way through advance directives."

Mr. Medalie, fierce-eyed at 88, has seen people close to him die lingering deaths from dementia and has already decided. His motto, pithy enough for a T-shirt: "If I'm not me, I don't want to be."

Dementia, though a terminal diagnosis, presents unique obstacles for those who want some control over the way they die. It generally kills slowly, over years, and "there is often no plug to pull," said Dr. Stanley Terman, a psychiatrist in Carlsbad, Calif., who specializes in end-of-life decision-making and estimates that several hundred people have requested copies of his Natural Dying Living Will. "There's no high-tech, life-sustaining treatment that can be withdrawn or withheld."

Even in the few states where physicians can legally prescribe lethal medication for the terminally ill, laws require that patients be mentally competent and able to ingest those drugs themselves. Mr. Medalie would prefer that option if he were to become demented, preferably with the barbiturates dissolved in "a little vodka."

But demented patients don't qualify for so-called death with dignity. VSED is a lawful way to hasten death for competent adults who find life with a progressive, irreversible disease unendurable. Several medical studies have reported that, with proper oral and palliative care, it can also be a comfortable way to die.

The question for proponents of VSED by advance directive is whether the practice can also provide a humane exit for those who, years later, no longer remember or understand why they wanted to use it.

Proponents of the approach acknowledge that dementia patients and their health care proxies will face great controversy if they try to cut off food and water; so will the professionals who care for them. Nourishment carries connotations, from infancy, that make stopping it feel different from rejecting medical machinery. "It's the rhetoric more than anything," said Mr. Meisel, the author of the legal treatise "The Right to Die." "You can apply the word 'starvation.'"

If those opposed to removing patients from ventilators had thought to call it "suffocation," he adds, the issue might be similarly contentious.

Moreover, the legal status of VSED by advance directive remains untested. In a recent article in The Hastings Center Report, two advocates argued that food and water should not be withdrawn until severe dementia has eroded the patient's quality of life and "the self has withered."

That approach would probably pass legal muster, said Paul Menzel, philosophy professor emeritus at Pacific Lutheran University, and an author of the piece. Spoon-feeding may constitute basic care, however, more akin to changing sheets or bathing than to medical interventions.

"People get in trouble - nursing homes, even family members - for inadequate nutrition or letting someone dehydrate," said Thaddeus Pope, the director of the Health Law Institute at Hamline University School of Law. "Neglecting basic human comfort care is a big source of elder abuse complaints and criminal prosecutions." And if a patient demands that his basic care be withheld in the event of dementia? "Nobody from a legal perspective has really meaningfully grappled with that," he said.

In several states, including New York, Wisconsin, Minnesota and New Hampshire, legislatures have banned the withdrawal of oral nutrition or hydration at all, no matter what a directive or a proxy says. A court case unfolding in British Columbia shows just how tricky these judgments can be.

Margo Bentley, 83, is a retired nurse with advanced Alzheimer's disease. Her advance directive specified "no nourishment or liquids" if she became incapacitated. When her husband and daughter attempted to honor her wishes, the care facility where she lived refused, sending the family to court.

Last February, a judge ruled that although a health care provider could legally honor such a directive, Ms. Bentley's feeding should continue in part because she swallows food placed in her mouth. That constitutes consent, the judge ruled. The family has appealed.

If swallowing is all it takes to legally invalidate an advance directive, Mr. Pope said, then patients will never be able to specify that they want for food and water

The moral and ethical aspects are even more dizzying. Can one's current, competent self make decisions on behalf of one's future demented self - who may

find modest pleasure, years later, in a life once deemed intolerable? What if that later self asks for, or points to, applesauce? “I can imagine people saying, ‘You’re starving this vulnerable person who’s dependent on us for care when this person is willing to eat,' ” said Rebecca Dresser, professor of law and medical ethics at Washington University in St. Louis.

At the other end of the ideological spectrum, Dena Davis, a Lehigh University bioethicist who has published articles on “pre-emptive suicide,” disputes the notion that withholding food should wait until the advance directive writer has reached a severe stage of dementia. By that point, “you lost your dignity a long time ago; you’ve probably been a burden on your family for six or seven years,” she said. “It’s too little, too late for me.”

Religious organizations, disability groups and uneasy nursing home administrators will also surely weigh in if patients and families try to enforce VSED as detailed in advance directives. Catholic authorities, for example, have generally opposed removing terminally ill patients’ feeding tubes or IV fluids.

“We should not encourage people to think their life has no meaning or value because they’re in a fragile, vulnerable and terrible situation,” said John Brehany, a former executive director of the Catholic Medical Association.

He predicted that Catholic-affiliated hospitals and nursing homes wouldn’t honor such directives.

None of this remotely dissuades Jerome Medalie. For now, “life is exceptionally good.” A veteran of bypass surgery, multiple angioplasties and two knee replacements, he exercises daily, canoes on the nearby Charles River with his grandchildren in summer, and uses a voice-controlled computer to counter the effects of macular degeneration.

His wife and children - and nearly everyone he has met in the last 20 years - are fully aware of his desires and instructions, however, and they are committed to carrying them out. “I want to go out on my own terms,” he said. “I don’t want any church, the government, any doctor or hospital or even any member of my family to contradict what I want for my death.”

But he hasn’t persuaded everyone. Dr. Susan Mitchell, a Harvard Medical School geriatrician and researcher, has met Mr. Medalie and read his advance directive. If she encountered a future Jerome Medalie, bed-bound and suffering from advanced dementia, she said, “I would not feel comfortable not gently offering him at least a sip of water and a spoonful of ice cream.”

http://bit.ly/1CNZiY2

Is There a Biological Basis for the 7-Year Itch?

Helen Fisher, a biological anthropologist at Rutgers University and author of Anatomy of Love: The Natural History of Monogamy, Adultery and Divorce, responds:

Several years ago I embarked on a project to see if the seven-year itch really exists. I began by studying worldwide data on marriage and divorce and noticed that although the median duration of marriage was seven years, of the couples who divorced, most did so around their fourth year together (the “mode”). I also found that divorce occurred most frequently among couples at the height of their reproductive and parenting years - for men, ages 25 to 29, and for women, ages 20 to 24 and 25 to 29 - and among those with one dependent child.

To try to explain these findings, I began looking at patterns of pair bonding in birds and mammals. Although only about 3 percent of mammals form a monogamous bond to rear their young, about 90 percent of avian species team up. The reason: the individual that sits on the eggs until they hatch will starve unless fed by a mate. A few mammals are in the same predicament. Take the female fox: the vixen produces very thin milk and must feed her young almost constantly, so she relies on her partner to bring her food while she stays in the den to nurse.

But here's the key: although some species of birds and mammals bond for life, more often they stay together only long enough to rear their young through infancy and early toddlerhood. When juvenile robins fly away from the nest or maturing foxes leave the den for the last time, their parents part ways as well.

Humans retain traces of this natural reproductive pattern. In more contemporary hunter-gatherer societies, women tend to bear their children about four years apart. Moreover, in these societies after a child is weaned at around age four, the child often joins a playgroup and is cared for by older siblings and relatives. This care structure allows unhappy couples to break up and find a more suitable partner with whom to have more young.

In fact, serial pair bonding may have been beneficial to survival among our forebears because having children with more than one partner produces offspring with greater genetic variety and a wider range of skills. Hence, in the changeable environment of ancient Africa, some offspring would have had a better chance of enduring. The four-year divorce peak among modern humans may represent the remains of an ancestral reproductive strategy to stay bonded at least long enough to raise a child through infancy and early toddlerhood. Thus, we may have a natural weak point in our unions. By understanding this susceptibility in our human nature, we might become better able to anticipate, and perhaps be able to avoid, the four-year itch.

http://bit.ly/1Jlu8eY

Scientists Test Out Tiny Robots Meant to Travel Inside a Human Body

The first test of micro-machines on a living mouse marks a breakthrough in the field of nano-robotics

By Laura Clark smithsonian.com

Robots aren't just taking over the skies - they're taking over our bodies. Or, at least, they could be soon. A team of researchers from the University of California has recently published a study describing the first successful tests, within a living creature, of nano-robots intended to carry and disperse drugs within the body.

As io9 reported, the acid-fueled micro-machines were implanted in a mouse and found to do just what they were designed to - deliver treatment to an otherwise difficult to access part of the body without causing ill effects. Before this experiment, nano-bots had been tried out only on cell cultures.

So how did this brand of nano-bot go to work? io9 explains:

To make it happen, the researchers constructed polymer tubes coated with zinc. The miniscule machines were a mere 20 micrometers long, which is about the width of a strand of human hair. Once implanted in the gut of a live mouse, the zinc reacted to the acid in the stomach by producing bubbles of hydrogen, which propelled the nanobots into the stomach lining. Once attached, they began to dissolve, thereby delivering their nanoparticle contents within the stomach tissue.

Micro-machines may be our medical future. Recent advancements in nanotechnology indicate that relatively soon the smaller-than-tiny robots might be capable of more than drug delivery; they could help detect diseases and even repair or manipulate damaged cells, potentially providing humans with longer lifespans.

The reality of having a team of mini-robots doing maintenance on your body, though, is still years away. But medical researchers are already incorporating machines into our bodies more initimately than ever before: French doctors have released word that a man who received an artificial heart in August has just returned home to live a normal life, signaling that the medical community is one step closer to commercializing permanent artificial replacement hearts.

http://www.eurekalert.org/pub_releases/2015-01/ohri-hfp011615.php

Hospitalized for pneumonia? Your risk of cardiovascular disease is higher

Ottawa, Ontario, Canada - Your chance of having a heart attack or stroke increases significantly if you have been hospitalized for pneumonia, according to a paper published today in the influential JAMA (Journal of the American Medical Association).

"The main conclusion from our study is that someone hospitalized for pneumonia should be considered at greater risk of developing cardiovascular disease," said lead author Dr. Vicente Corrales-Medina, an infectious diseases physician and researcher at The Ottawa Hospital, and assistant professor with the University of Ottawa's Faculty of Medicine.

"This means two things. First, it provides yet another reason to do everything we can to prevent pneumonia from occurring in the community, through vaccination and basic hand hygiene, for example," he continued. "This is especially important for the elderly and those with other risk factors for cardiovascular disease, such as diabetes, smoking and high cholesterol."

"Second, once pneumonia has occurred, physicians should develop a care plan understanding that these patients are more likely to develop cardiovascular disease in the weeks, months and years following their recovery from this infection," added Dr. Corrales-Medina. "Such measures could include screening and primary prevention strategies for cardiovascular disease."

While other studies have made the connection between pneumonia hospitalization and cardiovascular disease, this is the first to only look at pneumonia patients with no previous history of cardiovascular disease while also taking into account the effect of other established cardiovascular risk factors. By doing so, their results strongly indicate that hospitalization for pneumonia should be considered its own risk factor for future cardiovascular disease.

The JAMA paper used records of 3,813 people from two community health studies, both based in the United States. One enrolled participants aged 65 and older and the other enrolled participants aged 45 to 64. The JAMA study analysed health data of 1,271 pneumonia patients against 2,542 control patients (matched by age) over a period of 10 years.

Results showed that these pneumonia patients had a raised level of risk for cardiovascular disease over the entire 10 years, with the highest risk experienced in the first year. For example, in the group aged 65 and older, a pneumonia patient was four times more likely to develop cardiovascular disease in the first 30 days following the infection. In the tenth year, they were a little less than twice as likely to develop cardiovascular disease.

Another way of looking at it: The 10-year risk of developing cardiovascular disease for a 72-year-old woman with two cardiovascular risk factors (hypertension and smoking) increases from 31% to 90% if she is hospitalized for pneumonia.

Results from the group aged 45 to 64 showed that the risk was higher in the first two years, but not significantly raised after that. In this younger group, a

pneumonia patient was 2.4 times more likely to develop cardiovascular disease in the first 90 days after the infection.

Dr. Corrales-Medina's current research is focused on trying to determine what biological mechanisms are responsible for this raised risk of cardiovascular disease after pneumonia, in order to develop therapies to prevent the subsequent onset of cardiovascular disease.

The paper "Association Between Hospitalization for Pneumonia and Subsequent Risk of Cardiovascular Disease" was published online today by JAMA. Dr. Corrales-Medina worked on this paper with a team from the University of Pittsburgh. The last author is Dr. Sachin Yende, with the Clinical Research Investigation and Systems Modeling of Acute Illness (CRISMA) Center at the University of Pittsburgh.

Funding for this paper was provided by National Heart, Lung and Blood Institute (CHS and ARIC), National Institute of Neurological Disorders (CHS) and Stroke, National Institute on Aging (CHS), The Ottawa Hospital Foundation, The Ottawa Hospital's Department of Medicine, and National Institute of General Medical Sciences.

http://www.eurekalert.org/pub_releases/2015-01/qmuo-nh011615.php

New 'microcapsules' have potential to repair damage caused by osteoarthritis

New 'microcapsule' treatment delivery method develcould reduce inflammation in cartilage

A new 'microcapsule' treatment delivery method developed by researchers at Queen Mary University of London (QMUL) could reduce inflammation in cartilage affected by osteoarthritis and reverse damage to tissue. The research was funded by Arthritis Research UK and the AO Foundation.

A protein molecule called C-type natriuretic peptide (CNP), which occurs naturally in the body, is known to reduce inflammation and aid in the repair of damaged tissue. However, CNP cannot be used to treat osteoarthritis in patients because it cannot target the damaged area even when the protein is injected into the cartilage tissue. This is because CNP is easily broken down and cannot reach the diseased site.

The researchers constructed tiny microcapsules, just 2 microns in diameter, with individual layers containing CNP that could release the protein slowly and therefore deliver the treatment in the most effective way.

In experiments on samples of cartilage taken from animals, they showed that the microcapsules could deliver the anti-inflammatory CNP in a highly effective way.

The researchers believe that injections of microcapsules could in the future be used to heal damaged cartilage in people with osteoarthritis. The injections could be delivered easily by a GP.

Dr Tina Chowdhury from QMUL's School of Engineering and Materials Science, who leads the research, said:

"If this method can be transferred to patients it could drastically slow the progression of osteoarthritis and even begin to repair damaged tissue.

"CNP is currently available to treat other conditions such as skeletal diseases and cardiovascular repair. If we could design simple injections using the microcapsules, this means the technology has the potential to be an effective and relatively cheap treatment that could be delivered in the clinic or at home."

Dr Stephen Simpson, Director of Research at Arthritis Research UK said:

"Current treatment options for osteoarthritis are limited, and therefore developing new ways to treat this painful and debilitating condition is currently a major area of research. The focus is not only about identifying promising new targets, as delivery of a drug to the appropriate site can often be as challenging as developing the treatment itself, and can hinder getting otherwise effective medicines to patients. This work represents a good example of how researchers are developing innovative new approaches to get around this problem."

http://www.eurekalert.org/pub_releases/2015-01/cshl-hdf012015.php

Harnessing data from Nature's great evolutionary experiment

Scientists develop a computational method to estimate the importance of each letter in the human genome

Cold Spring Harbor, NY - There are 3 billion letters in the human genome, and scientists have endlessly debated how many of them serve a functional purpose. There are those letters that encode genes, our hereditary information, and those that provide instructions about how cells can use the genes. But those sequences are written with a comparative few of the vast number of DNA letters. Scientists have long debated how much of, or even if, the rest of our genome does anything, some going so far as to designate the part not devoted to encoding proteins as "junk DNA."

In work published today in Nature Genetics, researchers at Cold Spring Harbor Laboratory (CSHL) have developed a new computational method to identify which letters in the human genome are functionally important. Their computer program, called fitCons, harnesses the power of evolution, comparing changes in DNA letters across not just related species, but also between multiple individuals in a single species. The results provide a surprising picture of just how little of our genome has been "conserved" by Nature not only across species over eons of time, but also over the more recent time period during which humans differentiated from one another.

"In model organisms, like yeast or flies, scientists often generate mutations to determine which letters in a DNA sequence are needed for a particular gene to function," explains CSHL Professor Adam Siepel. "We can't do that with humans. But when you think about it, Nature has been doing a similar experiment on a

very large scale as species evolve. Mutations occur across the genome at random, but important letters are retained by natural selection, while the rest are free to change with no adverse consequence to the organism."

It was this idea that became the basis of their analysis, but it alone wasn't enough. "Massive research consortia, like the ENCODE Project, have provided the scientific community with a trove of information about genomic function over the last few years," says Siepel. "Other groups have sequenced large numbers of humans and nonhuman primates. For the first time, these big data sets give us both a broad and exceptionally detailed picture of both biochemical activity along the genome and how DNA sequences have changed over time."

Siepel's team began by sorting ENCODE consortium data based on combinations of biochemical markers that indicate the type of activity at each position. "We didn't just use sequence patterns. ENCODE provided us with information about where along the full genome DNA is read and how it is modified with biochemical tags," says Brad Gulko, a Ph.D. student in Computer Science at Cornell University and lead author on the new paper. The combinations of these tags revealed several hundred different classes of sites within the genome each having a potentially different role in genomic activity.

The researchers then turned to their previously developed computational method, called INSIGHT, to analyze how much the sequences in these classes had varied over both short and long periods of evolutionary time. "Usually, this, kind of analysis is done comparing different species - like humans, dogs, and mice - which means researchers are looking at changes that occurred over relatively long time periods," explains Siepel. But the INSIGHT model considers the changes among dozens of human individuals and close relatives, such as the chimpanzee, which provides a picture of evolution over much shorter time frames.

The scientists found that, at most, only about 7% of the letters in the human genome are functionally important. "We were impressed with how low that number is," says Siepel. "Some analyses of the ENCODE data alone have argued that upwards of 80% of the genome is functional, but our evolutionary analysis suggests that isn't the case." He added, "other researchers have estimated that similarly small fractions of the genome have been conserved over long time evolutionary periods, but our analysis indicates that the much larger ENCODE-based estimates can't be explained by gains of new functional sequences on the human lineage. We think most of the sequences designated as 'biochemically active' by ENCODE are probably not evolutionarily important in humans."

According to Siepel, this analysis will allow researchers to isolate functionally important sequences in diseases much more rapidly. Most genome-wide studies implicate massive regions, containing tens of thousands of letters, associated with disease. "Our analysis helps to pinpoint which letters in these sequences are likely to be functional because they are both biochemically active and have been preserved by evolution." says Siepel. "This provides a powerful resource as scientists work to understand the genetic basis of disease."

This work was supported by US National Institutes of Health, a David and Lucile Packard Fellowship for Science and Engineering and the Cornell Center for Comparative and Population Genomics.

"A method for calculating probabilities of fitness consequences for point mutations across the human genome" appears online in Nature Genetics on January 19, 2015. The authors are: Brad Gulko, Melissa Hubisz, Ilan Gronau, and Adam Siepel. The paper can be obtained online at: http://dx.doi.org/10.1038/ng.3196

http://www.eurekalert.org/pub_releases/2015-01/anu-ofd011815.php

Ocean floor dust gives new insight into supernovae

Extraterrestrial dust from the depths of the ocean could change the way we understand supernovae.

Scientists have found the amount of plutonium in the dust is much lower than expected. Scientists plumbing the depths of the ocean have made a surprise finding that could change the way we understand supernovae, exploding stars way beyond our solar system. They have analysed extraterrestrial dust thought to be from supernovae, that has settled on ocean floors to determine the amount of heavy elements created by the massive explosions.

"Small amounts of debris from these distant explosions fall on the earth as it travels through the galaxy," said lead researcher Dr Anton Wallner, from the Research School of Physics and Engineering at The Australian National University (ANU). "We've analysed galactic dust from the last 25 million years that has settled on the ocean and found there is much less of the heavy elements such as plutonium and uranium than we expected."

The findings are at odds with current theories of supernovae, in which some of the materials essential for human life, such as iron, potassium and iodine are created and distributed throughout space. Supernovae also create lead, silver and gold, and heavier radioactive elements such as uranium and plutonium.

Dr Wallner's team studied plutonium-244 which serves as a radioactive clock by the nature of its radioactive decay, with a half-life of 81 million years.

"Any plutonium-244 that existed when the earth formed from intergalactic gas and dust over four billion years ago has long since decayed," Dr Wallner said. "So any plutonium-244 that we find on earth must have been created in explosive events that have occurred more recently, in the last few hundred million years."

The team analysed a 10 centimetre-thick sample of the earth's crust, representing 25 million years of accretion, as well as deep-sea sediments collected from a very stable area at the bottom of the Pacific Ocean.

"We found 100 times less plutonium-244 than we expected," Dr Wallner said. "It seems that these heaviest elements may not be formed in standard supernovae after all. It may require rarer and more explosive events such as the merging of two neutron stars to make them."

The fact that these heavy elements like plutonium were present, and uranium and thorium are still present on earth suggests that such an explosive event must have happened close to the earth around the time it formed, says Dr Wallner.

"Radioactive elements in our planet such as uranium and thorium provide much of the heat that drives continental movement, perhaps other planets don't have the same heat engine inside them," he said.

http://bit.ly/1yGSTil

Ancient Scrolls Blackened by Vesuvius Are Readable at Last

X-ray scans can just tease out letters on the warped documents from a library at Herculaneum

By Victoria Jaggard

The lavish villa sat overlooking the Bay of Naples, offering bright ocean views to the well-heeled Romans who came from across the empire to study. The estate's library was stocked with texts by prominent thinkers of the day, in particular a wealth of volumes by the philosopher Philodemus, an instructor of the poet Virgil. But the seaside library also sat in the shadow of a volcano that was about to make terrible history.

The 79 A.D. eruption of Mount Vesuvius is most famous for burying Pompeii, spectacularly preserving many artifacts - and residents - in that once bustling town south of Naples. The tumbling clouds of ash also entombed the nearby resort of Herculaneum, which is filled with its own wonders. During excavations there in 1752, diggers found a villa containing bundles of rolled scrolls, carbonized by the intense heat of the pyroclastic flows and preserved under layers of cement-like rock. Further digs showed that the scrolls were part of an extensive library, earning the structure the name Villa of the Papyri.

Blackened and warped by the volcanic event, the roughly 1,800 scrolls found so far have been a challenge to read. Some could be mechanically unrolled, but hundreds remain too fragile to make the attempt, looking like nothing more than clubs of charcoal. Now, more than 200 years later, archaeologists examining two of the scrolls have found a way to peer inside them with x-rays and read text that has been lost since antiquity.

"Anybody who focuses on the ancient world is always going to be excited to get even one paragraph, one chapter, more," says Roger Macfarlane, a classicist at Brigham Young University in Utah. "The prospect of getting hundreds of books more is staggering."

Most of the scrolls that have been unwrapped so far are Epicurean philosophical texts written by Philodemus - prose and poetry that had been lost to modern scholars until the library was found. Epicurus was a Greek philosopher who developed a school of thought in the third century B.C. that promoted pleasure as the main goal of life, but in the form of living modestly, foregoing fear of the afterlife and learning about the natural world. Born in the first century B.C. in what is now Jordan, Philodemus studied at the Epicurean school in Athens and became a prominent teacher and interpreter of the philosopher's ideas.

Modern scholars debate whether the scrolls were part of Philodemus' personal collection dating to his time period, or whether they were mostly copies made in the first century A.D. Figuring out their exact origins will be no small feat - in addition to the volcano, mechanical or chemical techniques for opening the scrolls did their share of damage, sometimes breaking the delicate objects into fragments or destroying them outright. And once a page was unveiled, readability suffered.

"Ironically, when someone opened up a scroll, they would write on a separate sheet what they could read, like a facsimile, and the original ink, once exposed to air, would start to fade," says Brent Seales, a computer scientist at the University of Kentucky who specializes in digital imaging. What's more, the brute-force techniques usually left some pages stuck together, trapping hidden layers and their precious contents.

From 2007 to 2012, Seales collaborated with Daniel Delattre at the French National Center for Scientific Research in Paris on a project to scan scrolls in the collections of the Institut de France - former treasures of Napoleon Bonaparte, who received them as a gift from the King of Naples in 1802. Micro-CT scans of two rolled scrolls revealed their interior structure - a mass of delicate whorls akin to a fingerprint. From that data the team estimated that the scrolls would be between 36 and 49 feet long if they could be fully unwound. But those scans weren't sensitive enough to detect any lettering.

The trouble is that papyri at the time were written using a carbon-based ink, making it especially hard to digitally tease out the words on the carbonized scrolls. Traditional methods like CT scans blast a target with x-rays and look for patterns created as different materials absorb the radiation - this works very well when scanning for dense bone inside soft tissue (or for peering inside a famous violin), but the method fails at discerning carbon ink on blackened scrolls.

Now a team led by Vito Mocella of the Italian National Research Council has shown for the first time that it is possible to see letters in rolled scrolls using a twist on CT scanning called x-ray phase-contrast tomography, or XPCT. Mocella, Delattre and their colleagues obtained permission to take a fragment from an opened scroll and a whole rolled scroll from the Paris institute to the European Synchrotron in Grenoble. The particle collider was able to produce the high-energy beam of x-rays needed for the scans.

A rolled scroll from Herculaneum, once a gift to Napoleon. **(D. Delattre © Bibliothèque de l'Institut de France)**

Rather than looking for absorption patterns, XPCT captures changes in the phase of the x-rays. The waves of x-rays move at different speeds as they pass through materials of various density. In medical imaging, rays moving through an air-filled organ like a lung travel faster then those penetrating thick muscle, creating contrast in the resulting images. Crucially, the carbon-based ink on the scrolls didn't soak into the papyrus - it sits on top of the fibers. The microscopic relief of a letter on the page proved to be just enough to create a noticeable phase contrast.

Reporting today in the journal Nature Communications, Mocella and his team show that they were able to make out two previously unreadable sequences of capital letters from a hidden layer of the unrolled scroll fragment. The team interprets them as Greek words: ΠΙΠΤΟΙΕ, meaning "would fall", and ΕΙΠΟΙ, meaning "would say". Even more exciting for scholars, the team was able to pick out writing on the still-rolled scroll, eventually finding all 24 letters of the Greek alphabet at various points on the tightly bundled document.

Even though the current scans are mostly a proof of concept, the work suggests that there will soon be a way to read the full works on the rolled scrolls, the team says. "We plan to improve the technique," says Mocella. "Next spring we have an allowance to spend more time at the Grenoble synchrotron, where we can test a number of approaches and try to discern the exact chemical composition of the ink. That will help us improve the energy setting of the beam for our scan."

"With the text now accessible by virtue of specialized images, we have the prospect of going inside the rolled scrolls, and that's really exciting," says Macfarlane. Seales agrees: "Their work is absolutely crucial, and I am delighted to see a way forward using phase contrast."

Seales is currently working on ways to help make sense of future scans. With support from the National Science Foundation and Google, Seales is developing software that can sort through the jumbled letters and figure out where they belong on the scroll. The program should be able to lump letters into words and fit words into passages.

"It turns out there are grains of sand sprinkled all the way through the scrolls," says Seales. "You can see them twinkling in the scans, and that constellation is fixed." Using the sand grains like guide stars, the finished software should be able to orient the letters on the whorled pages and line up multiple scans to verify the imagery.

The 24 letters of the Greek alphabet could be read inside the rolled scroll via the phase-contrast technique. **(Mocella et al., Nature Communications)**

The projects offer hope for further excavations of the Herculaneum library. "They stopped excavating at some point for various reasons, and one was, Why should we keep pulling things out if they are so hard to read?" says Seales. But many believe there is a lower "wing" of the villa's collection still buried, and it may contain more 1st-century Latin texts, perhaps even early Christian writings that would offer new clues to Biblical times.

"Statistically speaking, if you open up a new scroll of papyrus from Herculaneum, it's most likely going to be a text from Philodemus," says MacFarlane. "But I'm more interested in the Latin ones, so I would not be unhappy at all to get more Latin texts that are not all banged up."

For Mocella, being able to read even one more scroll is crucial for understanding the library and the workings of a classical school of philosophy. "Regardless of the individual text, the library is a unique cultural treasure, as it is the only ancient library to survive almost entire together with its books," he says. "It is the library as whole that confers the status of exceptionality."

The scanning method could also be useful for texts beyond the Roman world, says Seales. Medieval books often cannibalized older texts to use as binding, and scans could help uncover interesting tidbits without ruining the preserved works. Also, letters and documents from the ill-fated Franklin expedition to the Northwest Passage in the 19th century have been recovered but are proving difficult to open without doing damage. "All that material could benefit from non-invasive treatment," says Seales.

http://bit.ly/1wvCyr4

The Wine of the Future Could Be Aged Underwater

A historic shipwreck inspired a new way to age wine

By Erin Blakemore

When Jim Dyke, Jr. dropped 48 bottles of Cabernet Sauvignon into the waters of Charleston Harbor, he wasn't wasting booze - he was testing out a theory that could change the way vintners age wine. And his grand experiment with what he calls "aquaoir" was inspired by a happy historical accident.

Dyke, who owns Mira Winery in Napa Valley, tells Beverage Daily's Rachel Arthur that the discovery of still-bubbly champagne in the hold of a historical shipwreck got his wheels turning. Could something in the salt water affect how wine aged, he wondered?

He began a series of experiments that involve submerging cages filled with wine bottles in salt water. The goal: to understand the ways in which factors like light, motion, temperature and pressure affect wine's character. "We were stunned," he told Arthur. "[The wine's taste was] not only different, but it seemed as if the ocean had expedited the aging process while maintaining the core characteristics."

By aging wine in water, Dyke is fighting against the industry's long-held assumption that wine is best aged underground or in a warehouse. He looks forward to a future in which wine's interaction with the water in which it ages (what he calls its "aquaoir") is just as important as the terroir of the soil in which its grapes are cultivated.

The champagne shipwreck that sparked Dyke's curiosity wasn't the only instance of alcohol faring well under the sea: a 2014 find uncovered unexpectedly drinkable wine in a 200-year-old bottle. And Dyke's underwater inspiration is only the latest in a series of interdisciplinary inspiration for oenophiles. Wine scientist Erika Szymanski cites an unlikely source of alcoholic inspiration - famed anthropologist Jane Goodall.

http://bit.ly/1wvCyr4

High-Speed Video Shows When The Smell of Rain Begins

Now we can see exactly how raindrops create petrichor, the name given to smells kicked up by light rain

By Marissa Fessenden

Most people can readily identify the smell of rain. It's more than the sense of moisture in the air - depending on where you live, a light shower might smell sweet, musty and earthy when it hits the soil or it might carry the stench of warm garbage and hot concrete. Whatever the mix of odors is, we have a name for it: petrichor. Petrichor is a mash-up of two greek roots: ichor, which the Atlantic translates as the "ethereal essence" that courses through the veins of gods, and petros, or stones.

Australian scientists first described petrichor in 1964. Given what it smelled like, they figured that its molecules came from decaying plant and animal matter - oils, hydrocarbons and alcohols - that attached themselves to mineral and clay surfaces. Somehow rain drops would release those compounds into the air for us to smell. Now, researchers from MIT have captured this phenomenon on video.

They deployed high-speed cameras to watch water droplets hit different surfaces and saw them trap tiny air bubbles. "As in a glass of champagne, the bubbles then shoot upward, ultimately bursting from the drop in a fizz of aerosols," the MIT News Office explains. Those aerosols can carry with them all the compounds we smell, including some microbes, the researchers say. Moderate or light rains on sandy or clay soils produce the most aerosols, they found. They published their work in Nature Communications.

"This finding should be a good reference for future work, illuminating microbes and chemicals existing inside soil and other natural materials, and how they can be delivered in the environment, and possibly to humans," Youngsoo Joung, a postdoctoral student and one of the researchers, says in the statement. It could even explain how some microbes have been found high in the atmosphere - breezes can pick up the aerosols containing bacteria, reports Rachel Feltman for the Washington Post.

Rain and storms bring other smells, as well. Lightning's charge creates ozone high in the atmosphere, and thunderstorms' powerful downdrafts deliver it to us, along with the sharp tang of its scent, explains Daisy Yuhas for Scientific American. After the rains fall, the heavy aroma of damp earth and must fills the air. This smell, called geosmin, is produced by bacteria that make their homes in decaying matter and soil. It also lends beets their earthy flavor and can taint wine.

Human noses aren't the only ones that perk up when rain falls. Yuhas writes;

> ***Some biologists suspect that petrichor running into waterways acts as a cue to freshwater fish, signaling spawning time. Microbiologist Keith Chater at the John Innes Center in England has proposed that geosmin's fragrance may be a beacon, helping camels find their way to desert oases. In return, the bacteria that produce geosmin use the camels as carriers for their spores.***

The heady aroma, however it reaches our nostrils, is sure to evoke memories. Smell is wired a little bit differently than our other senses, Natalie Angier writes for the New York Times.

Instead of sending new signals to the thalamus, which is serves as a "structural way station" before the signals go to the regions of the brain that can interpret the input, odor receptors send messages to the olfactory cortex. We don't get a chance

to decode the smells before we experience them. Smell is tied in with feelings, as this olfactory cortex lives in the part of the brain where emotional memories are stored.

So whether rainfall reminds you of summer soccer games, puddle-splashing with siblings or a terrifying storm, thank (or blame) the planets, microbes and minerals that give petrichor such a distinctive odor.

http://bit.ly/1zJfD2R

Millions of Dollars Worth of Gold And Silver Lurk in Sewage

A city with one million people could have $13 million worth of metals in sewage sludge

By Marissa Fessenden

Most people would rather not think about their waste once the toilet flushes (or even before), but fortunately some do. We can thank those people for figuring out what to do with that waste, along with effluent from manufacturing and stormwater draining off city streets. We can also thank them for finding the value that would otherwise be left behind. There's gold in them thar sewage. There's millions in it.

Researchers from Arizona State University recently estimated exactly how much gold, silver and other metals end up in sewage sludge. Sludge is the "goo left behind when treating sewage," reports Warren Cornwall for Science.

The team ran sludge samples from around the U.S. through a mass spectrometer, an instrument that can analyze exactly what kind of elements are in a sample by ionizing them in plasma.

They found that a million person city can produce about $13 million worth of metal annually, including $2.6 million in silver and gold. That shakes out to about $280 per ton of sludge of the 13 most valuable elements - silver, copper, gold, platinum and more, they reported in the journal Environmental Science & Technology.

How does that gold and other precious metal get into the sewage? It might be waste from mining, electroplating, electronics and jewelry manufacturing. Already, metals in sewage pose a problem for disposal, so removing it could be doubly useful.

The study didn't take into account how expensive it might be to get the treasure out of the trash, but study author and environmental engineer Paul Westerhoff told Science that figuring out a way might be worth it. Cornwall writes:

One city in Japan has already tried extracting gold from its sludge. In Suwa in Nagano Prefecture, a treatment plant near a large number of precision equipment manufacturers reportedly collected nearly 2 kilograms of gold in every metric ton of ash left from burning sludge, making it more gold-rich than the ore in many mines.

U.S. sewage plants haven't tried to get gold out yet, but the idea that sewage is just waste has changed. About 60 percent of sludge is used to fertilize fields and forests, Caldwell reports. The rest is incinerated or put in landfills. At some point, when technology has advanced and our need is great, mining those landfills might even pay off.

http://bit.ly/1yYAnki

Life Extension May Add Just Bad Time

Strains of the lab workhorse roundworm C. elegans that lived longer added more time being frail and had the same portion of their lives being healthy as normal worms. The work has implications for life-extension ideas such as caloric restriction. Dina Fine Maron reports

Download MP3

Living longer doesn't necessarily mean living better. That's the lesson from the tiny roundworm called C. elegans, long a workhorse in basic biology lab work. The research is in the Proceedings of the National Academy of Sciences. [Ankita Bansal et al, Uncoupling lifespan and healthspan in Caenorhabditis elegans longevity mutants]

In the study, thousands of normal C. elegans competed against strains that live days or weeks longer than their brethren, because of factors like genetic mutations or very low-calorie diets.

But a battery of tests to see how the all older worms moved or responded to stress revealed some hard truths: increased life span did not usually come with a prolonged period of health and strength. Indeed, the "good times" for each of the worms was roughly the same, regardless of their overall life span. In other words, the longer-living worms spent a greater proportion of their lives in a diminished state - with less mobility and stress resistance.

Aging worms are not aging humans. But if the findings do extend to people, then life-extension efforts, such as calorie restriction, may not shake out to a better old age, just more years of frailty. With associated healthcare cost increases and quality of life decreases. The researchers suggest that it's time to start thinking about what they call "healthspan" - and maximizing "healthspan," rather than just tacking on years of poor quality.

http://www.eurekalert.org/pub_releases/2015-01/uoc-nto011615.php

New type of antibiotic resistance living in hiding

Aggressive infections constitute an increasing health problem all over the world.

The development of bacterial resistance development is immense, and in the USA, resistant staphylococci cause more deaths than AIDS on an annual basis. Traditionally, antibiotic resistance is associated with genetic mutations in the

bacteria, but researchers at the University of Copenhagen can now show that this is not necessarily the case:

We have shown that bacteria do not need DNA changes to demonstrate resistance to known antibiotics. Even though the genetic fingerprints of bacteria indicate one thing, their behaviour can, under special circumstances, change fatally, says Professor Hanne Ingmer, Department of Veterinary Disease Biology, University of Copenhagen.

Coated overcoat

The researchers have found that the methicillin-resistant Staphylococcus aureus (MRSA) bacteria - which in themselves are quite serious - build up an even tougher and hardy cell wall if subjected to the drug colistin. The drug is used to treat serious bacterial infections.

You could say that the bacteria change their expression when influenced by colistin, giving the 'overcoat' an extra coating. But the genetic core remains intact, enabling the resistant properties to live hidden from doctors and their test tools that specifically target genetically determined changes. It can have fatal consequences if a patient treated with colistin contracts a staphylococcal infection:

We can see that MRSA under the influence of colistin to an alarming degree behaves as the feared VISA bacteria, which are very hard to combat.

The standard test is useless, as the resistance does not appear genetically, which can be decisive for major treatment failure in the healthcare sector, says Hanne Ingmer.

She fears that there may be several drugs with the same effect, as results in the recently published study show that other antibiotics could also lead to this development of non-genetic resistance. The research was conducted in collaboration with Stanford University by postdoc Jakob Haaber and PhD student Cathrine Friberg, Department of Veterinary Disease Biology.

The soldiers must be tested on the battlefield

Our findings can be used to explain cases of incurable infections where antibiotic treatment should have worked.

When you test for bacteria and cultivate samples in a Petri dish, the aggressive properties disappears. A demonstration of multi-resistant bacteria should therefore not just be based on bacterial genetics, but on bacterial properties in the body under attack.

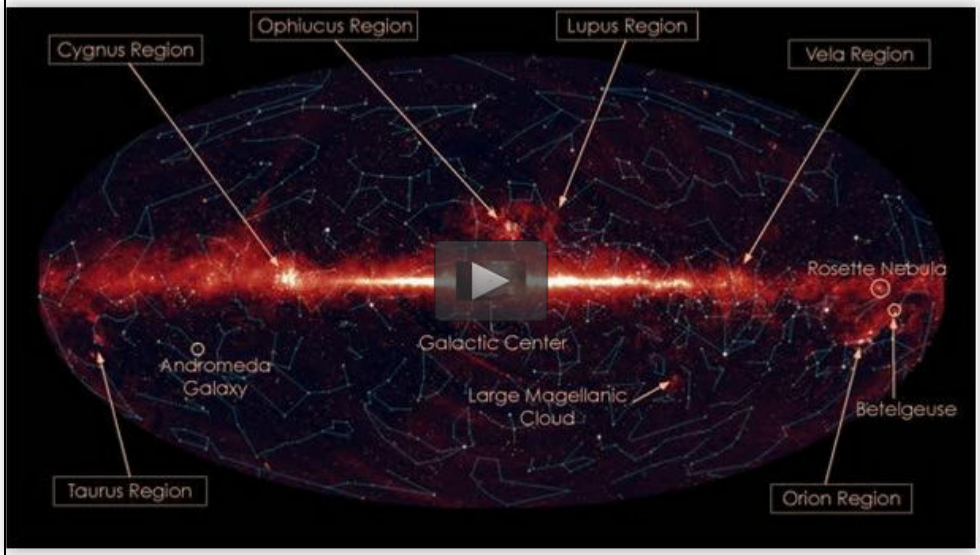
We need to find a way to test the bacteria while they - so to speak - are still fighting on the battlefield, concludes Hanne Ingmer.

The new research findings have just been published in mBio which is published by the American Society for Microbiology.

http://www.eurekalert.org/pub_releases/2015-01/isoa-itb012115.php

Inside the big wormhole

In theory, the Milky Way could be a 'galactic transport system'



VIDEO: ***The (hypothetical) wormhole proposed by Kuefettig, Salucci et al. connecting the center with a very far position of our galaxy when one passes through its throat.***

Credit: SISSA (Salucci)

"If we combine the map of the dark matter in the Milky Way with the most recent Big Bang model to explain the universe and we hypothesise the existence of space-time tunnels, what we get is that our galaxy could really contain one of these tunnels, and that the tunnel could even be the size of the galaxy itself. But there's more", explains Paolo Salucci, astrophysicist of the International School for Advanced Studies (SISSA) of Trieste and a dark matter expert. "We could even travel through this tunnel, since, based on our calculations, it could be navigable. Just like the one we've all seen in the recent film 'Interstellar'". Salucci is among the authors of the paper recently published in Annals of Physics.

Although space-time tunnels (or wormholes or Einstein-Rosen bridges) have only recently gained great popularity among the public thanks to Christopher Nolan's sci-fi film, they have been the focus of astrophysicists' attention for many years. "What we tried to do in our study was to solve the very equation that the astrophysicist 'Murph' was working on. Clearly we did it long before the film came out" jokes Salucci. "It is, in fact, an extremely interesting problem for dark matter studies".

"Obviously we're not claiming that our galaxy is definitely a wormhole, but simply that, according to theoretical models, this hypothesis is a possibility". Can it ever be tested experimentally? "In principle, we could test it by comparing two galaxies - our galaxy and another, very close one like, for example, the Magellanic Cloud, but we are still very far from any actual possibility of making such a comparison".

To reach their conclusions the astrophysicists combined the equations of general relativity with an extremely detailed map of the distribution of dark matter in the Milky Way: "the map was one we obtained in a study we carried out in 2013", explains Salucci. "Beyond the sci-fi hypothesis, our research is interesting because it proposes a more complex reflection on dark matter".

As Salucci points out, scientists have long tried to explain dark matter by hypothesising the existence of a particular particle, the neutralino, which, however, has never been identified at CERN or observed in the universe. But alternative theories also exist that don't rely on the particle, "and perhaps it's time for scientists to take this issue 'seriously'", concludes Salucci. "Dark matter may be 'another dimension', perhaps even a major galactic transport system. In any case, we really need to start asking ourselves what it is".

In addition to Salucci, the other scientists who took part in the study included Farook Rahaman (first author), from Jadavpur University in India, and a group of Indian and North American researchers.

http://www.eurekalert.org/pub_releases/2015-01/hms-bsl012015.php

Biological safety lock for genetically modified organisms

The creation of genetically modified and entirely synthetic organisms continues to generate excitement as well as worry.

Written by Stephanie Dutchen

Such organisms are already churning out insulin and other drug ingredients, helping produce biofuels, teaching scientists about human disease and improving fishing and agriculture. While the risks can be exaggerated to frightening effect, modified organisms do have the potential to upset natural ecosystems if they were to escape.

Physical containment isn't enough. Lab dishes and industrial vats can break; workers can go home with inadvertently contaminated clothes. And some organisms are meant for use in open environments, such as mosquitoes that can't spread malaria.

So attention turns to biocontainment: building in biological safeguards to prevent modified organisms from surviving where they're not meant to. To do so, geneticists and synthetic biologists find themselves taking a cue from safety engineers.

"If you make a chemical that's potentially explosive, you put stabilizers in it. If you build a car, you put in seat belts and airbags," said George Church, Robert Winthrop Professor of Genetics at Harvard Medical School and core faculty member at the Wyss Institute.

And if you've created the world's first genomically recoded organism, a strain of Escherichia coli with a radically changed genome, as Church's group announced in 2013, you make its life dependent on something only you can supply.

Church and colleagues report Jan. 21 in Nature that they further modified their 2013 E. coli to incorporate a synthetic amino acid in many places throughout their genomes. Without this amino acid, the bacteria can't perform the vital job of translating their RNA into properly folded proteins.

The E. coli can't make this unnatural amino acid themselves or find it anywhere in the wild; they have to eat it in specially cooked-up lab cultures.

A separate team reports in Nature that it was able to engineer the same strain of E. coli to become dependent on a synthetic amino acid using different methods. That group was led by a longtime collaborator of Church's, Farren Isaacs of Yale University. The two studies are the first to use synthetic nutrient dependency as a biocontainment strategy, and suggest that it might be useful for making genetically modified organisms safer in an open environment.

In addition, "We now have the first example of genome-scale engineering rather than gene editing or genome copying," said Church. "This is the most radically altered genome to date in terms of genome function. We have not only a new code, but also a new amino acid, and the organism is totally dependent on it."

Church's team, led by first authors Dan Mandell and Marc Lajoie, HMS research fellows in genetics, also made the E. coli resistant to two viruses, with plans to expand that list.

The modifications offer theoretically safer E. coli strains that could be used in biotechnology applications with less fear that they will be contaminated by viruses, which can be financially disastrous, or cause ecological trouble if they spill. (E. coli is one of the main organisms used in industry.)

Hooked on amino acids

Scientists have been exploring two main biocontainment methods, but each has weaknesses. Church was determined to fix them.

One method involves turning normally self-sufficient organisms like E. coli into auxotrophs, which can't make certain nutrients they need for growth. Humans are auxotrophs, which is why we need to include vitamins and other "essential" nutrients in our diets.

Altering the genetics of E. coli so they can't make a naturally occurring nutrient doesn't always work, said Church, because some of them manage to scavenge the

nutrient from their surroundings. He lowered that risk by making the E. coli dependent on a nutrient not found in nature.

Another pitfall of making auxotrophs is that some E. coli could evolve a way to synthesize the nutrient they need. Or they could acquire the ability while exchanging bits of DNA with other E. coli in a process called horizontal gene transfer.

Church believes his team protected against those possibilities because it had to make 49 genetic changes to the E. coli to make them dependent on the artificial nutrient. The chance one of the bacteria could randomly undo all of those changes without also acquiring a harmful mutation, he said, is incredibly slim.

Church's solution also took care of concerns he had with another biocontainment technique, in which genetic "kill switches" make bacteria vulnerable to a toxin so spills can be quickly neutralized. "All you have to do to kill a kill switch is turn it off," which can be done in any number of ways, Church said. Routing around the dependency on the artificial amino acid is much harder.

Church determined that another key to making a successful "synthetic auxotroph" was to ensure that the E. coli's lives depended on the artificial amino acid. Otherwise, escaped E. coli could keep rolling along even if they couldn't make or scavenge it. So his group targeted proteins that drive the essential functions of the cell. "If you put it off on the periphery, like on the paint job of your car, the car will still run," he explained. "You have to embed the dependency smack in the middle of the engine, like the crank shaft, so it now has a particular part you can only get from, say, one manufacturer in Europe."

Building a safer bacterium

The need to choose a process essential to E. coli survival and a nutrient not found in nature "limited us to a small number of genes," Church said. His team used computational tools to design proteins that might cause the desired "irreversible, inescapable dependency." They took the best candidates, synthesized them and tested them in actual E. coli.

They ended up with three successful redesigned essential proteins and two dependent E. coli strains. "Using three proteins together is more powerful than using them separately," Church said. He envisions future E. coli modified to require even more synthetic amino acids to make escape virtually impossible.

As it was, the escape rate - the number of E. coli able to survive without being fed the synthetic amino acid - was "so low we couldn't detect it," Church said.

The group grew a total of 1 trillion E. coli cells from various experiments, and after two weeks none had escaped. "That's 10,000 times better than the National Institutes of Health's recommendation for escape rate for genetically modified organisms," said Church.

The weaknesses in Church's methods remain to be seen. For now, he is satisfied with the results his group has obtained by pushing the limits of available testing. "As part of our dedication to safety engineering in biology, we're trying to get better at creating physically contained test systems to develop something that eventually will be so biologically contained that we won't need physical containment anymore," said Church. In the meantime, he said, "we can use the physical containment to debug it and make sure it actually works."

This work was funded by the U.S. Department of Energy (grant DE-FG02-02ER63445).

http://www.eurekalert.org/pub_releases/2015-01/uoc-doa011915.php

Death of a dynamo - A hard drive from space

The dying moments of an asteroid's magnetic field have been successfully captured by researchers, in a study that offers a tantalising glimpse of what may happen to the Earth's magnetic core billions of years from now.

Using a detailed imaging technique, the research team were able to read the magnetic memory contained in ancient meteorites, formed in the early solar system over 4.5 billion years ago. The readings taken from these tiny 'space magnets' may give a sneak preview of the fate of the Earth's magnetic core as it continues to freeze. The findings are published today (22 January) in the journal Nature.

Using an intense beam of x-rays to image the nanoscale magnetisation of the meteoritic metal, researchers led by the University of Cambridge were able to capture the precise moment when the core of the meteorite's parent asteroid froze, killing its magnetic field. These 'nano-paleomagnetic' measurements, the highest-resolution paleomagnetic measurements ever made, were performed at the BESSY II synchrotron in Berlin.

The researchers found that the magnetic fields generated by asteroids were much longer-lived than previously thought, lasting for as long as several hundred million years after the asteroid formed, and were created by a similar mechanism to the one that generates the Earth's own magnetic field. The results help to answer many of the questions surrounding the longevity and stability of magnetic activity on small bodies, such as asteroids and moons.

"Observing magnetic fields is one of the few ways we can peek inside a planet," said Dr Richard Harrison of Cambridge's Department of Earth Sciences, who led the research. "It's long been assumed that metal-rich meteorites have poor magnetic memories, since they are primarily composed of iron, which has a terrible memory - you wouldn't ever make a hard drive out of iron, for instance. It was thought that the magnetic signals carried by metal-rich meteorites would have been written and rewritten many times during their lifetime, so no-one has ever bothered to study their magnetic properties in any detail."

The particular meteorites used for this study are known as pallasites, which are primarily composed of iron and nickel, studded with gem-quality silicate crystals. Contained within these unassuming chunks of iron however, are tiny particles just 100 nanometres across - about one thousandth the width of a human hair - of a unique magnetic mineral called tetrataenite, which is magnetically much more stable than the rest of the meteorite, and holds within it a magnetic memory going back billions of years. "We're taking ancient magnetic field measurements in nanoscale materials to the highest ever resolution in order to piece together the magnetic history of asteroids - it's like a cosmic archaeological mission," said PhD student James Bryson, the paper's lead author.

The researchers' magnetic measurements, supported by computer simulations, demonstrate that the magnetic fields of these asteroids were created by compositional, rather than thermal, convection - meaning that the field was long-lasting, intense and widespread. The results change our perspective on the way magnetic fields were generated during the early life of the solar system.

These meteorites came from asteroids formed in the first few million years after the formation of the Solar System. At that time, planetary bodies were heated by radioactive decay to temperatures hot enough to cause them to melt and segregate into a liquid metal core surrounded by a rocky mantle. As their cores cooled and began to freeze, the swirling motions of liquid metal, driven by the expulsion of sulphur from the growing inner core, generated a magnetic field, just as the Earth does today.

"It's funny that we study other bodies in order to learn more about the Earth," said Bryson. "Since asteroids are much smaller than the Earth, they cooled much more quickly, so these processes occur on shorter timescales, enabling us to study the whole process of core solidification."

Scientists now think that the Earth's core only began to freeze relatively recently in geological terms, maybe less than a billion years ago. How this freezing has affected the Earth's magnetic field is not known. "In our meteorites we've been able to capture both the beginning and the end of core freezing, which will help us understand how these processes affected the Earth in the past and provide a possible glimpse of what might happen in the future," said Harrison.

However, the Earth's core is freezing rather slowly. The solid inner core is getting bigger, and eventually the liquid outer core will disappear, killing the Earth's magnetic field, which protects us from the Sun's radiation. "There's no need to panic just yet, however," said Harrison. "The core won't completely freeze for billions of years, and chances are, the Sun will get us first."

The research was funded by the European Research Council (ERC) and the Natural Environment Research Council (NERC).

http://www.eurekalert.org/pub_releases/2015-01/sp-cpu012115.php

Classic psychedelic use protective with regard to psychological distress and suicidality

Classic psychedelics, such as LSD, psilocybin mushrooms and mescaline, previously have been shown to occasion lasting improvements in mental health.

But researchers led by University of Alabama at Birmingham School of Public Health investigators wanted to advance the existing research and determine whether classic psychedelics might be protective with regard to suicidal thoughts and behaviors.

Approximately 30,000 lives in the United States are claimed by suicide every year, and more than 90 percent of victims have been diagnosed with mental illness, according to the National Alliance on Mental Illness.

Using data from more than 190,000 respondents of the National Survey on Drug Use and Health from 2008-2012, the researchers found that those who reported ever having used a classic psychedelic drug in their lifetime had a decreased likelihood of psychological distress in the past month, and decreased suicidal thinking, planning and attempts in the past year.

"Despite advances in mental health treatments, suicide rates generally have not declined in the past 60 years. Novel and potentially more effective interventions need to be explored," said Peter S. Hendricks, Ph.D., assistant professor in the Department of Health Behavior and lead study author. "This study sets the stage for future research to test the efficacy of classic psychedelics in addressing suicidality as well as pathologies associated with increased suicide risk (e.g., affective disturbance, addiction and impulsive-aggressive personality traits)."

Hendricks says the take-home message from this study is that classic psychedelics may hold great promise in the prevention of suicide and evaluating the therapeutic effectiveness of classic psychedelics should be a priority for future research.

This study was recently published in the Journal of Psychopharmacology.

http://www.eurekalert.org/pub_releases/2015-01/uosc-usf012015.php

USC study finds blood vessels in older brains break down, possibly leading to Alzheimer's

Advanced image analysis suggests breakdown in brain's memory and learning center can be detected before cognitive loss begins, suggesting important implications for Alzheimer's and dementia patients

University of Southern California (USC) neuroscientists may have unlocked another puzzle to preventing risks that can lead to Alzheimer's disease.

Researchers at Keck Medicine of USC used high-resolution imaging of the living human brain to show for the first time that the brain's protective blood barrier

becomes leaky with age, starting at the hippocampus, a critical learning and memory center that is damaged by Alzheimer's disease.

The study indicates it may be possible to use brain scans to detect changes in blood vessels in the hippocampus before they cause irreversible damage leading to dementia in neurological disorders characterized by progressive loss of memory, cognition and learning. These findings would have broad implications on conditions that will affect 16 million Americans over age 65 by 2050, according to the latest figures from the Alzheimer's Association. The research appears in the Jan. 21, 2015, edition of the peer-reviewed scientific journal Neuron.

"This is a significant step in understanding how the vascular system affects the health of our brains," said Berislav V. Zlokovic, M.D., Ph.D., director of the Zilkha Neurogenetic Institute (ZNI) at the Keck School of Medicine, the Mary Hayley and Selim Zilkha Chair for Alzheimer's Disease Research and the study's principal investigator. "To prevent dementias including Alzheimer's, we may need to come up with ways to reseal the blood-brain barrier and prevent the brain from being flooded with toxic chemicals in the blood. Pericytes are the gate-keepers of the blood-brain barrier and may be an important target for prevention of dementia."

Alzheimer's disease is the most common type of dementia, a general term for loss of memory and other mental abilities. According to the Alzheimer's Association, roughly 5.2 million people of all ages in the United States today have Alzheimer's disease, an irreversible, progressive brain disease that causes problems with memory, thinking and behavior. Post-mortem studies of brains with Alzheimer's disease show damage to the blood-brain barrier, a cellular layer that regulates entry of blood and pathogens into the brain. The reasons why and when this damage occurs, however, remain unclear.

In the Neuron study, Zlokovic's research team examined contrast-enhanced brain images from 64 human subjects of various ages and found that early vascular leakage in the normally aging human brain occurs in the hippocampus, which normally shows the highest barrier properties compared to other brain regions. The blood-brain barrier also showed more damage in the hippocampal area among people with dementia than those without dementia, when controlling for age.

To validate the research method, the USC team examined brain scans of young people with multiple sclerosis without cognitive impairment, finding no difference in barrier integrity in the hippocampus between those of the same age with and without the disease. The researchers also looked at the subjects' cerebrospinal fluid (CSF), which flows through the brain and spinal cord. Individuals who showed signs of mild dementia had 30 percent more albumin, a blood protein, in their CSF than age-matched controls, further indicating a leaky blood-brain barrier. The CSF of individuals with dementia also showed a 115 percent increase of a protein related to pericyte injury. Pericytes are cells that surround blood vessels and help maintain the blood brain barrier; previous research has linked pericytes to dementia and aging.

Study participants were recruited through the USC Alzheimer's Disease Research Center and Huntington Medical Research Institute. Other USC co-authors include Axel Montagne, Melanie D. Sweeney, Matthew R. Halliday, Abhay P. Sagare, Zhen Zhao, Arthur W. Toga, Collin Y. Liu, Lilyana Amezcua, Helena C. Chui and Meng Law. The study was supported by various National Institutes of Health agencies (grants R37NS34467, R37AG23084, R01AG039452, R21EB013456, UL1TR000130, P50AG05142, 7P41EB015922, EB000993), the Zilkha Senior Scholar program and L. K. Whittier Foundation.

http://www.eurekalert.org/pub_releases/2015-01/guf-nbl012115.php

New bacterial language discovered

Communication by bacteria as a therapeutic target for medicines

FRANKFURT. Bacteria communicate by means of chemical signals and can develop common characteristics through this "agreement" and also develop their potential pathogenic effects in this way.

Scientists working with Dr. Helge B. Bode, an Merck-endowed professor for molecular biotechnology at the Goethe University in Frankfurt, and Dr. Ralf Heermann from the department of microbiology at the Ludwig Maximilian University in Munich, have now described a hitherto unknown communication pathway that appears to be widely distributed. They report on this in the journal Proceedings of the National Academy of Science.

The investigation of bacterial communication is also of medical interest. This is because the bacterial communication pathways are a possible therapeutic target for new medicines. If the relevant communication options are prevented, the bacteria cannot develop their pathogenic properties.

"When pathogens are no longer destroyed by antibiotics as we have seen to date, but rather be impaired beforehand the formation of the pathogenic properties, the danger of resistance development would be substantially reduced", says Bode.

Different types of bacteria also have different methods of communication. The team lead by Heerman and Bode had already discovered a new bacterial communication pathway in 2013. Now they have succeeded in decoding a further new and widely distributed chemical type of bacterial communication.

To date, the best known communication between bacteria occurs via the N-acyl homoserine lactone (AHL): The enzyme Luxl produces signals that are recognised by the LuxR receptor, at which point the bacteria develop certain properties and modulate their behaviour towards one another. Since a certain number of bacteria must be available for this to occur, this process is known as "quorum sensing".

However, Heermann's and Bode's working groups investigate bacteria that possess a LuxR receptor, but not the enzyme Luxl. In the current study, the microbiologists have investigated the bacteria Photorhabdus asymbiotica, which is a deadly pathogen in insects, which also infects humans and can cause skin infections. These bacteria communicate via the signal molecule dialkylresorcinol, which recognised the associated LuxR receptor. "The influence on the pathogenic properties of the bacteria is at its strongest in this 'quorum sensing' system. P. asymbiotica requires dialkylresorcinol and in this way coordinates the communication with the conspecifics for the successful infection of the larvae", says Helge Bode, whose group in 2013 also described the biosynthesis of this new signal molecule.

The researchers have not only investigated P. asymbiotica, but also a series of other bacterial genomes. The newly discovered signal pathway appears to be widely distributed. "We were able to identify several other bacteria that are pathogenic to humans that also do not express Luxl and also possess this ability for forming these signals", says Heerman.

Sophie Brameyer, Darko Kresovic, Helge B. Bode and Ralf Heermann: Dialkylresorcinols as bacterial signaling molecules In: PNAS 112 (2), 572-577. DOI: 10.1073/pnas.1417685112
http://www.pnas.org/cgi/doi/10.1073/pnas.1417685112

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Depression Tweaks the Brain's Disappointment Circuit

An unusual chemical balancing act helps explain why people with depression attend more closely to negative information

Dec 18, 2014 |By Simon Makin

People with depression process emotional information more negatively than healthy people. They show increased sensitivity to sad faces, for instance, or a weaker response to happy faces. What has been missing is a biological explanation for these biases. Now a study reveals a mechanism: an unusual balance of chemicals in a brain area crucial for the feeling of disappointment.

A team led by Roberto Malinow of the University of California, San Diego, studied the lateral habenula, a evolutionarily ancient region deep in the brain [see diagram on bottom]. Neurons in this region are activated by unexpected negative events, such as a punishment out of the blue or the absence of an anticipated reward. For example, studies have shown that primates trained to expect a reward, such as juice, after a visual cue show heightened activity in the lateral habenula if the reward is withheld. Such findings have led to the idea that this area is a key part of a "disappointment circuit."

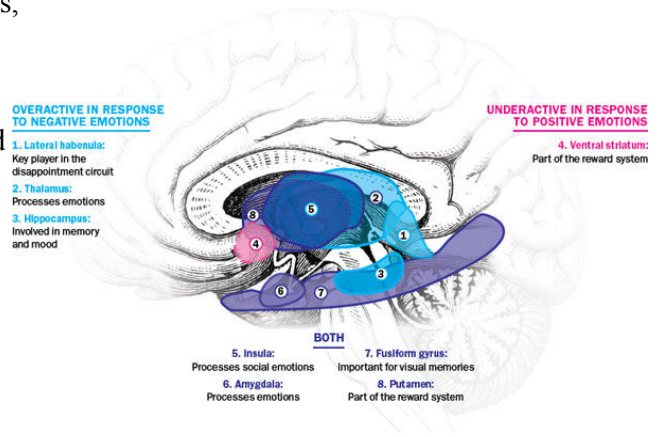
Past studies have also shown that hyperactivity in the lateral habenula is linked with depressionlike behavior in rodents. In people with depression, low levels of serotonin, the brain chemical targeted by antidepressants, are linked with a rise in lateral habenula activity.

The region is unusual because it lacks the standard equipment the brain uses to reduce overactivity: opposing sets of neurons that either increase activity by secreting the chemical glutamate or decrease activity by secreting the chemical GABA. The lateral habenula has very few neurons that decrease activity, so Malinow and his colleagues set out to discover how the brain tamps down activity there.

The team found that some nerve endings in the region secrete both glutamate and GABA. This rare mechanism has been seen in only two other regions and generally only in still developing brains. The researchers also showed that rats displaying depressive behaviors release less activity-dampening GABA and that rats treated with an antidepressant release more. This finding suggests that the balance of chemicals released controls the processing of negative events and that this balance can be shifted by drugs.

"These findings reveal a potential mechanism whereby antidepressants act to correct negative bias in depression," says Catherine Harmer, a neuroscientist at the University of Oxford, whose team has found that antidepressants shift these negative biases within hours, despite taking weeks to improve mood.

"The hope is that by studying pathways involved in processing reward and punishment, we can come up with drugs that act on these pathways more selectively than those we use now," lead author Steven Shabel says. "And those might be better antidepressants."



The Draining Brain of Depression Many regions in the brain that process emotions and reward behave differently in depression, skewing a person's experience toward the negative. **ISTOCKPHOTO**

http://bit.ly/1CVEmP6

Japan might get to name the most alien worlds

***Who gets to name exoplanets? As efforts to officially christen alien worlds gets under way, it looks like Japanese astronomy fans will get the deciding* vote.**

16:32 21 January 2015 by Jacob Aron

Currently, planets outside the solar system are saddled with dull scientific designations like GJ 667 Cc or HD 40307 g. Last year the International Astronomical Union (IAU), the scientific body that oversees cosmic naming rights, announced its NameExoWorlds contest to give the public a chance to choose more evocative names for a handful of exoplanets out of more than 1800 discovered so far.

Rather than allow people to choose names directly, the IAU decided to enlist astronomy clubs and non-profit organisations from around the world to suggest names that would then be put to a public vote. This week the process has entered its first stage, in which the clubs will choose which 20 or so planets from a list of 305 will get names.

New Scientist's analysis of the 365 clubs currently signed up to NameExoWorlds reveals that 121 of them are based in Japan. This far outstrips the number of groups from any other country – the second most-represented nation, the US, only has 27. This suggests that although the whole world will get to vote on exoplanet names, the list of choices may be heavily determined by a single nation.

Sorry, Vulcan

The IAU's general secretary Thierry Montmerle says they have extended the deadline for clubs to sign up, and hope to get wider participation. "The problem is not, why are there so many Japanese clubs, but rather why they are not more numerous elsewhere," he says. "In the case of the US, for example, the number is unexpectedly low, and for the moment we don't understand why."

You might think there are bigger things to worry about than naming alien worlds, but passions run high among space enthusiasts. In 2013 a public vote to name a newly discovered moon of Pluto after Vulcan, a planet from Star Trek, was overruled by the IAU for violating its naming guidelines, prompting disappointment from Star Trek actor William Shatner.

"Star Trek fans have had it rough. First JJ [Abrams] blows up Vulcan and now [the IAU] finds a loophole to deny it from coming back!" he tweeted.

Meanwhile, US-based start-up Uwingu has started selling the right to submit names for exoplanets, a strategy the IAU has criticised.

What's in a name?

It's an issue set to get even more heated as our ability to detect these worlds improves. "Planets are places," says Jason Wright, an astronomer at Pennsylvania State University in State College. "No one really cares what a too-faint-to-see star might be called by astronomers, but it's easy to be persuaded that places need names."

"I agree that no country should dominate the naming," says Geoff Marcy of the University of California, Berkeley, who is part of the planet-hunting Kepler space telescope team. "I have always wanted to name each exoplanet with the word for 'peace' in different languages," he says. "Every language would have a voice in the heavens, expressing our greatest quest as a species."

If we ever manage to detect life on another planet, its name, however it is chosen, will go down in history books. Of course, its inhabitants may already have picked a name for it, in which case we would have to choose whether to use ours or thiers.

"If, by some cosmic coincidence, aliens have a name for their home world, in the sense that we think of names, and if humans can pronounce it, I'm sure some people will try," says Wright.

http://nyti.ms/1yj1ine

How the Brain Stores Trivial Memories, Just in Case

New Study finds emotion that makes memories so vivid can also reach back in time to strengthen recall of mundane things happening just earlier and are relevant

By BENEDICT CAREY JAN. 21, 2015

The surge of emotion that makes memories of embarrassment, triumph and disappointment so vivid can also reach back in time, strengthening recall of seemingly mundane things that happened just beforehand and that, in retrospect, are relevant, a new study has found.

The report, published Wednesday in the journal Nature, suggests that the television detective's standard query - "Do you remember any unusual behavior in the days before the murder?" - is based on solid brain science, at least in some circumstances.

The findings fit into the predominant theory of memory: that it is an adaptive process, continually updating itself according to what knowledge may be important in the future.

The new study suggests that human memory has, in effect, a just-in-case file, keeping seemingly trivial sights, sounds and observations in cold storage for a time in case they become useful later on.

But the experiment said nothing about the effect of trauma, which shapes memory in unpredictable ways. Rather, it aimed to mimic the arousals of daily life: The study used mild electric shocks to create apprehension and measured how the emotion affected memory of previously seen photographs.

In earlier work, researchers had found plenty of evidence in animals and humans of this memory effect, called retroactive consolidation. The new study shows that the effect applies selectively to related, relevant information.

"The study provides strong evidence for a specific kind of retroactive enhancement," said Daniel L. Schacter, a professor of psychology at Harvard who was not involved in the research. "The findings go beyond what we've found previously in humans."

He and other experts cautioned that the details of retroactive consolidation were still far from clear. No one knows which past memories an emotional experience flags, how far back in time it reaches or, indeed, whether it also suppresses some details. Memories are not fixed when encoded, experts said, and can be weakened by later events, as well as strengthened.

The study, done at New York University, had several stages. In the first one, the 119 participants sat in front of a computer watching photographs scroll by, and categorized each one as a tool (hammer, saw, ladder) or an animal (horse, eagle, kangaroo). They saw 30 tools and 30 animals, in no particular order.

Five minutes later, the men and women again sat in front of the computer, only this time with electrode wires attached to one wrist. The research team, led by Joseph Dunsmoor, a postdoctoral fellow in cognitive neuroscience, calibrated a shock level for each person that was uncomfortable but not painful. The participants then categorized a new set of 60 photographs, 30 tools and 30 animals, in random order. Half of the group received a shock most times they saw an animal, and half received one most times they saw a tool.

The research team then gave the participants a surprise test, measuring how well they remembered all the photographs, particularly the first set. The results varied depending on when people took the test.

Those who took it right away remembered as many tools as they did animals; the shocks had no apparent effect. But those who took the test six hours or a day later recalled about 7 percent more items from the "shocked" category. For example, they remembered more tools if they had been zapped seeing tools.

"The emotional experience of the shocks strengthened or preserved the memories of things that, at the time they were encoded, seemed mundane," Dr. Dunsmoor said in an interview. "At least when it's tested hours or a day later."

Dr. Dunsmoor's co-authors on the study were Vishnu Murty, Lila Davachi and Elizabeth Phelps.

The fact that the retroactive strengthening took time to happen - none was evident in people tested immediately - leaves the timing unclear.

"That's the most surprising finding to me, that the enhancement depends on some consolidation process we don't yet understand," Dr. Schacter said.

This finding raises at least as many questions as it answers. How long are items stored in the "just in case" mode? Are some too weak to be consolidated? Are others, which are not very relevant, also somewhat strengthened - or weakened? And do rewarding experiences enhance past details in the same way?

The TV detective would want to know, and so do the scientists. "All questions for further research," Dr. Dunsmoor said.

http://bit.ly/1EKqybz

This Woman Can't Feel Fear

Damage from a rare genetic condition appears to have knocked out the "fear center" in her brain

By Marissa Fessenden smithsonian.com

When Antonio Damasio, a neuroscientist at the University of Southern California, first met a woman now known as SM, he noticed that she would get unusually close to other people. In most people, this might seem like an odd personality quirk, but for SM it was a symptom of her very rare condition. "The woman couldn't feel fear — literally could not experience that emotion," explains NPR correspondent Alix Spiegel on the radio show "Invisibilia."

In last week's show, called "Fearless," Spiegel and her co-host, Lulu Miller, explored what living without fear is like. SM has participated in neuroscience research for years, but the show is the first time she has granted an interview, though it was conducted via an intermediary, one of her doctors, Daniel Tranel of the University of Iowa. Her fearlessness actually makes SM vulnerable, "To make the point very clearly, if she would be threatened - and she has been in her life - she would not register the fear that that would immediately cause in you or me," Damasio says.

SM's condition is due to the rare genetic disorder called Urbach-Wieth disease. Only 400 people in the world have the disorder, which causes a raspy voice, easily damaged skin and calcium deposits in the brain, writes Rachel Feltman for the Washington Post. SM's deposits have hardened structures deep in the brain that help people feel fear — the amygdalae. "[I]n SM's case, they've been totally calcified since she was a young woman," Feltman writes. "Now in her 40s, her fear-center is as good as gone."

On the show, Miller explains:

That bit of brain couldn't signal to the rest of her body that it was time for her heart to start racing and her palms to sweat. It's also why SM was so profoundly valuable to the scientists who studied her, like Damasio, and the fear researcher Ralph Adolphs that you heard earlier because fear seems critical to survival. But here was SM, alive and also completely normal in other ways. She had normal intelligence and no problem with any other emotion.

Her experience has helped researchers figure out how the amgydalae are involved in fear, writes Ed Yong for Discover. Justin Feinstein, of the University of Iowa, suspects that the brain structure serves as a go-between for the parts of the brain that interpret sensory inputs and the sections of the brainstem that "initiate fearful actions."

Before her amgydalae were calcified, SM remembers experiencing what she thinks was fear when her dad caught a big catfish on a fishing trip. "I didn't want to touch the doggone fish," she says. But when her ability to experience fear was lost, she had to be held back to keep from touching dangerous snakes researchers showed her in tests.

Fear became alien to her. In one of Damasio's studies, she couldn't even figure out how to draw a frightened face, even though she is a talented artist. When a man she encountered in a park held a knife to her throat and threatened to kill her her response was atypical: "I said, go ahead and cut me. And I said, I'll be coming back and I'll hunt your ass." He let her go.

"Without fear, trauma is not traumatizing," Speigel says. And perhaps as a result, SM reports that her outlook on life is quite sunny. "You know, there's some days that I could be on top of the world, and there's some days that, you know, I can be — [I've] got the blues," she says. "But 9 out of 10, I'd say happy."

http://nyti.ms/1BcgiVY

Measles Cases Linked to Disneyland Rise, and Debate Over Vaccinations Intensifies

Measles outbreak that began at Disneyland is spreading across California and beyond, prompting health officials to move aggressively to contain it

By ADAM NAGOURNEY and ABBY GOODNOUGH JAN. 21, 2015

LOS ANGELES - A measles outbreak that began at Disneyland is spreading across California and beyond, prompting health officials to move aggressively to contain it - including by barring unvaccinated students from going to school in Orange County.

The outbreak has increased concerns that a longstanding movement against childhood vaccinations has created a surge in a disease that was declared eliminated in the United States in 2000.

Health officials said 59 cases of measles had been diagnosed in California as of Wednesday, with an additional eight related cases spread through Utah, Washington, Oregon, Colorado and Mexico.

Among those infected are five workers at Disneyland, where the outbreak was spotted in mid-December; 42 of the 59 California cases have been linked to the Disneyland outbreak.

The cases were a continuation of what health officials said was a worrisome increase in measles in Orange County and other places where parents had resisted the urging of health professionals to inoculate their children. The Centers for Disease Control and Prevention reported 644 cases of measles from 27 states last year, by far the largest number since 2000.

Before measles vaccines became commonplace in 1963, about three million to four million Americans a year contracted the disease, the agency said, and 400 to 500 died from it.

The latest outbreak has renewed a heated debate about an anti-vaccination movement championed largely by parents who believe discredited research linking vaccines to autism, or who believe that the risks of some vaccines, including the measles inoculations, outweigh any potential benefit.

"We can expect to see many more cases of this preventable disease unless people take measures to prevent it," said Dr. Gilberto F. Chávez, the deputy director of the California Center for Infectious Diseases. "I am asking unvaccinated Californians to consider getting vaccinated against measles."

Dr. James Cherry, a specialist in pediatric infectious diseases at the University of California, Los Angeles, said the outbreak was "100 percent connected" to the anti-immunization campaign. "It wouldn't have happened otherwise — it wouldn't have gone anywhere," he said. "There are some pretty dumb people out there."

Health officials in Orange County issued a letter to parents saying that students who could not prove they had received a measles shot could be barred from class; more than 20 were sent home from an Orange County high school this week.

"The majority of the cases that we are seeing here are underimmunized," said Dr. Eric G. Handler, the public health officer for Orange County, referring to children who had not been vaccinated or had received only one of the two necessary shots. "This is a serious contagious disease that is preventable. The message is absolutely critical that if you are not vaccinated, you need to get vaccinated."

The vaccination exemption rate among kindergarten students in California - cases in which parents said they did not want their children vaccinated for health, religious or other reasons - was 3.1 percent in the 2013-14 school year, according to the C.D.C. report.

Oregon had an exemption rate of 7.1 percent, the nation's highest, the report found. Health officials said the vaccination rate needed to be above 95 percent in all communities to prevent outbreaks.

Still, the California figure can be deceiving. Health officials said there were pockets across the state, including wealthy neighborhoods in Los Angeles and Orange Counties and enclaves in Northern California, where the exemption rate

jumped into the double digits. California has long been viewed as particularly prone to this kind of outbreak because of its population size and the number of people arriving from overseas.

"The problem is that there are these pockets with low vaccination rates," said Dr. Jane Seward, the deputy director of the viral diseases division at the C.D.C. "If a case comes into a population where a lot of people are unvaccinated, that's where you get the outbreak and where you get the spread."

Organizations that have led the campaign of doubts about vaccinations suggested that it was too soon to draw such a conclusion. The groups cautioned parents not to be pressured into having their children receive vaccinations, which the organizations say have been linked to other diseases. Health professionals say those claims are unfounded or vastly overstated.

"It's premature to blame the increase in reports of measles on the unvaccinated when we don't have all the facts yet," said Barbara Loe Fisher, the president of the National Vaccine Information Center, a group raising concerns about inoculations.

"I do know this: Fifty-seven cases of measles coming out of Disneyland in a country with a population of 317 million people is not a lot of cases. We should all take a deep breath and wait to see and get more information."

A handful of doctors seem sympathetic to these views. Dr. Jay Gordon, a Santa Monica pediatrician who has cautioned against the way vaccines are used, said he had "given more measles vaccines" than ever before but did not like giving the shot to younger children.

"I think whatever risk there is - and I can't prove a risk - is, I think, caused by the timing," he said, referring to when the shot is administered. "It's given at a time when kids are more susceptible to environmental impact. Don't get me wrong; I have no proof that this vaccine causes harm. I just have anecdotal reports from parents who are convinced that their children were harmed by the vaccine."

The battle has moved to state legislatures, where lawmakers have sought to make it easier for parents to obtain exemptions from vaccination requirements.

However, all 31 bills introduced from 2009 to 2012 that would have loosened the exemption process were defeated, said Saad B. Omer, an infectious disease epidemiologist at Emory University who studies vaccine refusal. Three out of five bills that sought to tighten the requirement passed, he said.

California tightened its "personal belief" exemption law last year, requiring parents to submit a form signed by a health care provider. But Gov. Jerry Brown, a Democrat, added a religious exemption at the last minute; parents who choose that option do not need a doctor's signature.

http://www.eurekalert.org/pub_releases/2015-01/uok-eha012215.php

Early human ancestors used their hands like modern humans

New research suggests pre-Homo human ancestral species, such as Australopithecus africanus, used human-like hand postures much earlier than was previously thought.

Anthropologists from the University of Kent, working with researchers from University College London, the Max Planck Institute for Evolutionary Anthropology in Leipzig (Germany) and the Vienna University of Technology (Austria), have produced the first research findings to support archaeological evidence for stone tool use among fossil australopiths 3-2 million years ago.

The distinctly human ability for forceful precision (e.g. when turning a key) and power "squeeze" gripping (e.g. when using a hammer) is linked to two key evolutionary transitions in hand use: a reduction in arboreal climbing and the manufacture and use of stone tools. However, it is unclear when these locomotory and manipulative transitions occurred.

Dr Matthew Skinner, Senior Lecturer in Biological Anthropology and Dr Tracy Kivell, Reader in Biological Anthropology, both of Kent's School of Anthropology and Conservation, used new techniques to reveal how fossil species were using their hands by examining the internal spongey structure of bone called trabeculae. Trabecular bone remodels quickly during life and can reflect the actual behaviour of individuals in their lifetime.

The researchers first examined the trabeculae of hand bones of humans and chimpanzees. They found clear differences between humans, who have a unique ability for forceful precision gripping between thumb and fingers, and chimpanzees, who cannot adopt human-like postures. This unique human pattern is present in known non-arboreal and stone tool-making fossil human species, such as Neanderthals.

The research, titled Human-like hand use in Australopithecus africanus, shows that Australopithecus africanus, a 3-2 million-year-old species from South Africa traditionally considered not to have engaged in habitual tool manufacture, has a human-like trabecular bone pattern in the bones of the thumb and palm (the metacarpals) consistent with forceful opposition of the thumb and fingers typically adopted during tool use. These results support previously published archaeological evidence for stone tool use in australopiths and provide skeletal evidence that our early ancestors used human-like hand postures much earlier and more frequently than previously considered.

Human-like hand use in Australopithecus africanus, (Matthew M. Skinner, Nicholas B. Stephens, Zewdi J. Tsegai, Alexandra C. Foote, N. Huynh Nguyen,Thomas Gross, Dieter H. Pahr, Jean-Jacques Hublin,Tracy L. Kivell) is published on 23 January in Science magazine.

http://www.eurekalert.org/pub_releases/2015-01/uof-rsa012215.php

Research suggests anti-inflammatory protein may trigger plaque in Alzheimer's disease

researchers have uncovered the mechanism by which anti-inflammatory processes may trigger Alzheimer's

GAINESVILLE, Fla. -- Inflammation has long been studied in Alzheimer's, but in a counterintuitive finding reported in a new paper, University of Florida researchers have uncovered the mechanism by which anti-inflammatory processes may trigger the disease.

This anti-inflammatory process might actually trigger the build-up of sticky clumps of protein that form plaques in the brain. These plaques block brain cells' ability to communicate and are a well-known characteristic of the illness.

The finding suggests that Alzheimer's treatments might need to be tailored to patients depending on which forms of Apolipoprotein E, a major risk factor for Alzheimer's disease, these patients carry in their genes.

The researchers have shown that the anti-inflammatory protein interleukin 10, or IL-10, can actually increase the amount of apolipoprotein E, or APOE, protein -- and thereby plaque -- that accumulates in the brain of a mouse model of Alzheimer's, according to the study, published online today (Jan. 22) in the journal Neuron.

In the 1990s, researchers theorized that using nonsteroidal anti-inflammatory drugs, or NSAIDs, might protect people from the onset of Alzheimer's by dampening inflammation that released a cascade of harmful proteins. Though NSAIDs were shown to be effective in some studies, other research that evaluated a group of participants taking NSAIDs over time failed to show any clear protective benefit.

"There are many different kinds of NSAIDs," said Todd Golde, M.D., Ph.D., director of the Center for Translational Research in Neurodegenerative Disease and the paper's lead author. "Not all NSAIDs are equal, and it wasn't clear what else they were doing when they were addressing their intended target."

Previously, researchers hypothesized that a flood of proteins, called cytokines, involved in promoting inflammation in the brain contributed to the formation of plaque in Alzheimer's disease. However, in this publication, the UF researchers provide new evidence that anti-inflammatory stimuli may actually increase plaque.

"This is another piece of evidence that overturns the long-held hypothesis that a 'cytokine storm' creates a self-reinforcing, neurotoxic feedback loop that promotes amyloid-beta (plaque) deposition," said Paramita Chakrabarty, Ph.D., a member of the UF Center for Translational Research in Neurodegenerative Disease, an assistant professor in the UF College of Medicine department of neuroscience and the paper's co-author.

The researchers said that a person's risk of developing Alzheimer's hinges on the relationship between IL-10 and APOE. APOE clears the cell of many different proteins, including the protein amyloid-beta, which contributes to the buildup of plaque. But there are several different forms of APOE in cells, which differ from each other by only one or two amino acids. The form called APOE4 is the largest known genetic risk factor in Alzheimer's disease, while APOE2 is thought to be protective, Golde said. "About 15 to 17 percent of the population has the APOE 4 allele, and about 50 percent of people with Alzheimer's have it," Golde said.

In this case, the authors showed that the anti-inflammatory protein IL-10 actually increases levels of all types of mouse APOE, which resembles human APOE. In the mouse model, APOE binds with amyloid-beta rather than clearing it from the brain, accelerating buildup of plaque in the brain of a mouse with Alzheimer's.

How an anti-inflammatory therapy based on IL-10 expression might alter risk for Alzheimer's may depend on the genetic variant of APOE protein the person is carrying. If the person has an APOE4 allele the researchers predict the risk for Alzheimer's would increase.

"In one way, this study offers additional insight into how environmental influences interacts with people's underlying genotypes to alter their risk for diseases," Golde said. "We know that people are exposed to various inflammatory or anti-inflammatory stimuli throughout their lives. Depending on what their genotype is, that exposure may in some cases protect them from Alzheimer's, or, in other cases, increase their risk for Alzheimer's."

The research was funded in part through an $8.4 million grant to speed up the process of finding therapies for Alzheimer's disease from the National Institutes of Health's Office of the Director, with additional funding from the National Institute on Aging and the Ellison Medical Foundation. Next, the researchers plan to carry out more thorough and mechanistic studies to exactly understand how an increase in APOE protein induced by IL-10 will affect amyloid plaque deposition in mice carrying different alleles of human APOE.

http://www.eurekalert.org/pub_releases/2015-01/mu-bio012215.php

Blame it on your brain: Salt and hypertension

Study sheds new light on link between salt intake and blood pressure

An international research team led by scientists at McGill University has found that excessive salt intake "reprograms" the brain, interfering with a natural safety mechanism that normally prevents the body's arterial blood pressure from rising. While the link between salt and hypertension is well known, scientists until now haven't understood how high salt intake increased blood pressure. By studying the brains of rats, a team led by Prof. Charles Bourque of McGill's Faculty of

Medicine discovered that ingesting large amounts of dietary salt causes changes in key brain circuits.

"We found that a period of high dietary salt intake in rats causes a biochemical change in the neurons that release vasopressin (VP) into the systemic circulation", says Bourque who is also a researcher at the The Research Institute of the McGill University Health Centre (RI-MUHC). "This change, which involves a neurotrophic molecule called BDNF (brain-derived neurotrophic factor), prevents the inhibition of these particular neurons by other cells".

The team's findings, published today in the journal Neuron, found that high salt intake prevents the inhibition of VP neurons by the body's arterial pressure detection circuit. The disabling of this natural safety mechanism allows blood pressure to rise when a high amount of salt is ingested over a long period of time.

While the team's discovery advances the understanding of the link between salt intake and blood pressure, more work is needed to define new targets that could potentially be explored for therapeutic intervention. Among the questions for further research: Does the same reprogramming effect hold true for humans? If so, how might it be reversed?

In the meantime, Bourque says, the message remains: limit dietary salt.

Scientists from the University of North Texas Health Sciences Centre, Neurocentre Magendie, France and Centre for Neuroendocrinology, University of Otago, New Zealand also contributed to this study.

The research was supported by the Canadian Institutes of Health Research, National Institutes of Health, and the Fonds de recherche du Québec - Santé.

"High Salt Intake Increases Blood Pressure via BDNF Mediated Downregulation ofKCC2 and Impaired Baroreflex Inhibition of Vasopressin Neurons" Katrina Y. Choe, Su Y. Han, Perrine Gaub, Brent Shell, Daniel L. Voisin, Blayne A. Knapp, Philip A. Barker, Colin H. Brown, J. Thomas Cunningham, and Charles W. Bourque. Neuron, Jan. 22, 2015.

http://www.eurekalert.org/pub_releases/2015-01/uom-tyg012215.php

Trust your gut: E. coli may hold one of the keys to treating Parkinson's

Protein in E. coli that inhibits the accumulation of potentially toxic amyloids

ANN ARBOR - E. coli usually brings to mind food poisoning and beach closures, but researchers recently discovered a protein in E. coli that inhibits the accumulation of potentially toxic amyloids - a hallmark of diseases such as Parkinson's.

Amyloids are formed by proteins that misfold and group together, and when amyloids assemble at the wrong place or time, they can damage brain tissue and cause cell death, according to Margery Evans, lead author of the University of Michigan study, and Matthew Chapman, principal investigator and associate professor in U-M Molecular, Cellular, and Developmental Biology.

The findings could point to a new therapeutic approach to Parkinson's disease and a method for targeting amyloids associated with such neurodegenerative diseases.

A key biological problem related to patients with Parkinson's is that certain proteins accumulate to form harmful amyloid fibers in brain tissues, which is toxic to cells and causes cell death.

While these amyloids are a hallmark of Parkinson's and other diseases such as Alzheimer's, not all amyloids are bad. Some cells, those in E. coli included, assemble helpful amyloids used for cell function.

E. coli make amyloid curli on the cell surface, where it's protective, rather than toxic. The curli anchor the bacteria to kitchen counters and intestinal walls, where they can cause infections and make us sick.

These helpful amyloids that E. coli produce do not form on the inside of the cell where they would be toxic.

"It means that something in E. coli very specifically inhibits the assembly of the amyloid inside the cell.

Therefore, amyloid formation only occurs outside the cell where it does not cause toxicity," said Evans, a doctoral student in molecular, cellular, and developmental biology.

Evans and the U-M team went on a biochemical hunt to understand how E. coli prevented amyloids from forming inside cells and uncovered a protein called CsgC that is a very specific, effective inhibitor of E. coli amyloid formation.

U-M researchers have been collaborating with scientists from Umeå University in Sweden and Imperial College in London, and in the current study found that the CsgC protein also inhibits amyloid formation of the kind associated with Parkinson's.

Another implication of the research is that the curli could be a target for attacking biofilms, a kind of goo created by bacteria, which acts as a shield to thwart antibiotics and antiseptics.

These bacteria can cause chronic infections, but treating these infections using molecules that block curli formation may degrade the biofilm and leave the bacteria more vulnerable to drug therapy.

The study, "The bacterial curli system possesses a potent and selective inhibitor of amyloid formation," is scheduled to appear Jan. 22 in the online edition of Molecular Cell.

Evans, who conducted the research while at U-M will be a postdoctoral fellow at Washington University in St. Louis.

Other authors include: Fei Li of U-M Molecular, Cellular, and Developmental Biology; Erik Chorell, Jörgen Åden, Anna Göteson, Pernilla Wittung-Stafshede and Fredrik Almqvist of Umeå University; Jonathan Taylor, Marion Koch, Lea Sefer and Steve Matthews of Imperial College London.

The work was funded in part by the National Institutes of Health.

http://www.eurekalert.org/pub_releases/2015-01/uoe-dco011915.php

Doubt cast on global firestorm generated by dino-killing asteroid

Pioneering new research has debunked the theory that the asteroid that is thought to have led to the extinction of dinosaurs also caused vast global firestorms that ravaged planet Earth.

Pioneering new research has debunked the theory that the asteroid that is thought to have led to the extinction of dinosaurs also caused vast global firestorms that ravaged planet Earth.

A team of researchers from the University of Exeter, University of Edinburgh and Imperial College London recreated the immense energy released from an extra-terrestrial collision with Earth that occurred around the time that dinosaurs became extinct. They found that the intense but short-lived heat near the impact site could not have ignited live plants, challenging the idea that the impact led to global firestorms.

These firestorms have previously been considered a major contender in the puzzle to find out what caused the mass extinction of life on Earth 65 million years ago.

The researchers found that close to the impact site, a 200 km wide crater in Mexico, the heat pulse - that would have lasted for less than a minute - was too short to ignite live plant material. However they discovered that the effects of the impact would have been felt as far away as New Zealand where the heat would have been less intense but longer lasting - heating the ground for about seven minutes - long enough to ignite live plant matter.

The experiments were carried out in the laboratory and showed that dry plant matter could ignite, but live plants including green pine branches, typically do not.

Dr Claire Belcher from the Earth System Science group in Geography at the University of Exeter said: "By combining computer simulations of the impact with methods from engineering we have been able to recreate the enormous heat of the impact in the laboratory. This has shown us that the heat was more likely to severely affect ecosystems a long distance away, such that forests in New Zealand would have had more chance of suffering major wildfires than forests in North America that were close to the impact. This flips our understanding of the effects of the impact on its head and means that palaeontologists may need to look for new clues from fossils found a long way from the impact to better understand the mass extinction event."

Plants and animals are generally resistant to localised fire events - animals can hide or hibernate and plants can re-colonise from other areas, implying that wildfires are unlikely to be directly capable of leading to the extinctions. If however some animal communities, particularly large animals, were unable to shelter from the heat, they may have suffered serious losses. It is unclear whether these would have been sufficient to lead to the extinction of species.

Dr Rory Hadden from the University of Edinburgh said: "This is a truly exciting piece of inter-disciplinary research. By working together engineers and geoscientists have tackled a complex, long-standing problem in a novel way. This has allowed a step forward in the debate surrounding the end Cretaceous impact and will help Geoscientists interpret the fossil record and evaluate potential future impacts. In addition, the methods we developed in the laboratory for this research have driven new developments in our current understanding of how materials behave in fires particularly at the wildland-urban-interface, meaning that we have been able to answer questions relating to both ancient mass extinctions at the same time as developing understanding of the impact of wildfires in urban areas today."

The results of the study are published in the Journal of the Geological Society.
The research was supported by a European Research Council Starter Grant, a Marie Curie Career Integration Grant, the Leverhulme Trust, the EPSRC and the Austrian Science Fund.

http://www.eurekalert.org/pub_releases/2015-01/uob-iga012115.php

Is glass a true solid?

Does glass ever stop flowing?

Researchers at the University of Bristol and Kyoto University have combined computer simulation and information theory, originally invented for telephone communication and cryptography, to answer this puzzling question.

Watching a glass blower at work we can clearly see the liquid nature of hot glass. Once the glass has cooled down to room temperature though, it has become solid and we can pour wine in it or make window panes out of it.

On a microscopic scale, solidification means that molecules have settled into a crystalline structure. And yet, when looked at under the microscope, it appears glass never settles down but keeps flowing, albeit extremely slowly - so slowly, in fact, that it would take over 10 million years for a window pane to flow perceptibly.

This puzzle of a material which seems solid to any observer while appearing fluid under the microscope is an old one. And even with the help of today's supercomputers it seems impossible to verify in simulations whether a glass ever stops flowing.

To answer the question of what happens at very low temperature, and whether the whole material becomes truly solid, researchers in Bristol's Schools of Physics, Chemistry and Mathematics led by Dr Paddy Royall and Dr Karoline Wiesner, teamed up with Professor Ryoichi Yamamoto of Kyoto University.

The researchers discovered that the size of the solid-like regions of the material increases over time and that atoms in the solid-like regions organize into geometrical shapes, such as icosahedra. Such icosahedral configurations were predicted in 1952 by Sir Charles Frank at the University of Bristol's HH Wills Physics Laboratory.

Dr Karoline Wiesner said: "Information theory provided us with the mathematical tools to detect and quantify the movements of atoms, which turned out to move as if they were in communication with each other."

Dr Paddy Royall added: "We found that the size of the solid regions of icosahedra would grow until eventually there would be no more liquid regions and so the glass should be a true solid."

The research, which was carried out as part of the Bristol-Kyoto agreement and Bristol Centre for Complexity Sciences, is published today in Nature Communications.

'Mutual information reveals multiple structural relaxation mechanisms in a model glass former' by Andrew J. Dunleavy, Karoline Wiesner, Ryoichi Yamamoto and C. Patrick Royall in Nature Communications

http://bit.ly/1GWM9Cp

Anti-radiation drug could work days after exposure

After a nuclear meltdown, exposure to DNA-damaging radiation levels can happen in minutes – but accessing therapies that might combat the effects can take days.

- **18:45 22 January 2015 by Colin Barras**

A new drug could help: in mice, it reduced death rates from radiation sickness even if given three days after exposure. It may one day protect astronauts heading for Mars from harmful cosmic rays.

Cells try to repair damage to their DNA after radiation exposure, says Gábor Tigyi at the University of Tennessee Health Science Center in Nashville, but the process isn't foolproof. If the cell doesn't recognise the errors left in its DNA it might ultimately turn cancerous. But if the cell does recognise the errors the outcome is even worse: it will self-destruct, and if enough cells follow that route, death will follow within weeks.

Tigyi and his colleagues have spent 10 years exploring the power of lysophosphatidic acid (LPA), a naturally occurring signalling molecule that seems to give cells a better chance against radiation exposure.

Through a mechanism that remains unclear, LPA can buy the cell more time to repair its DNA, says Tigyi. "Our data also show that LPA has the ability to enhance the repair process and potentially increase its fidelity," he says - which means more cells are saved from turning cancerous or self-destructing.

Up the power

In 2007, the researchers developed a drug that interacts with LPA receptors on cells to reduce the effects of radiation sickness in bone marrow and in the digestive system – two of the areas most commonly affected by radiation exposure.

But the drug wasn't potent enough to be medically useful.

Now they have used a computer model to subtly tweak the drug's molecular structure and create DBIBB, a new drug that should be much more potent. Their tests in mice seem to bear this out.

A radiation dose of 3 or 4 grays may kill a human. So Tigyi and his colleagues started off exploring whether DBIBB could help mice exposed to much higher radiation doses of 15.7 grays. Without treatment, 12 of 14 mice died two weeks after exposure. But after prompt treatment with DBIBB, beginning 26 hours after exposure, 13 of 14 mice were still alive two weeks later.

In reality, prompt treatment isn't always possible, so the researchers next ran tests to see what would happen if they didn't give mice DBIBB until 72 hours after exposure to 8.5 grays. One month later, 12 of 15 untreated mice had died – but 14 of the 15 mice that received delayed DBIBB therapy were still alive.

Delayed dose

Although there are no approved anti-radiation drugs on the market, a number of other therapies are in development, but most must be given within about 24 hours of exposure. "A drug that would be effective 72 hours after radiation exposure would be useful," says Martin Hauer-Jensen at the University of Arkansas in Little Rock, who is leading work on another potential therapy.

Tigyi and his colleagues will continue to develop DBIBB at RxBio Inc, a biotech company they founded together.

"It protects approximately 90 per cent of the mice but we think we can and will do better," he says.

Clinical trials in people are not possible for obvious ethical reasons, but Tigyi says the US Food and Drug Administration can approve drugs that fall into this category if they are shown to be safe and effective in two animal models, safe in humans, and if their mechanism of action is fully understood.

Although a future version of the drug could be stockpiled in case of nuclear meltdowns or terrorist attacks, Tigyi hopes it would be more commonly used to treat side effects of radiation in cancer therapy or to protect astronauts on long sorties outside Earth's shielding magnetosphere from cosmic rays – "on their journey to Mars and beyond", he says.

Journal reference: Chemistry & Biology, DOI: 10.1016/j.chembiol.2014.12.009

http://www.eurekalert.org/pub_releases/2015-01/uol-aic012315.php

Arctic ice cap slides into the ocean

Satellite images have revealed that a remote Arctic ice cap has thinned by more than 50 metres since 2012 - about one sixth of its original thickness - and that it is now flowing 25 times faster.

A team led by scientists from the Centre for Polar Observation and Modelling (CPOM) at the University of Leeds combined observations from eight satellite missions, including Sentinel-1A and CryoSat, with results from regional climate models, to unravel the story of ice decline.

The findings show that over the last two decades, ice loss from the south-east region of Austfonna, located in the Svalbard archipelago, has increased significantly. In this time, ice flow has accelerated to speeds of several kilometres per year, and ice thinning has spread more than 50km inland - to within 10km of the summit.

"These results provide a clear example of just how quickly ice caps can evolve, and highlight the challenges associated with making projections of their future contribution to sea level rise," said the study's lead author Dr Mal McMillan, a member of the CPOM team from the University of Leeds.

The study, published in Geophysical Research Letters and reported online today by the European Space Agency (ESA), is the first to make use of measurements from ESA's latest Earth observation satellite, Sentinel-1A.

Sentinel-1A, the first satellite developed for Europe's Copernicus programme, was launched in April last year, while CryoSat has been in orbit since 2010.

Dr McMillan said: "New satellites, such as the Sentinel-1A and CryoSat missions, are essential for enabling us to systematically monitor ice caps and ice sheets, and to better understand these remote polar environments."

Melting ice caps and glaciers are responsible for about a third of recent global sea level rise. Although scientists predict that they will continue to lose ice in the future, determining the exact amount is difficult, due both to a lack of observations and the complex nature of their interaction with the surrounding climate.

"Glacier surges, similar to what we have observed, are a well-known phenomenon," said Professor Andrew Shepherd from the University of Leeds, the Director of CPOM.

"However, what we see here is unusual because it has developed over such a long period of time, and appears to have started when ice began to thin and accelerate at the coast."

There is evidence that the surrounding ocean temperature has increased in recent years, which may have been the original trigger for the ice cap thinning.

"Whether or not the warmer ocean water and ice cap behaviour are directly linked remains an unanswered question. Feeding the results into existing ice flow models may help us to shed light on the cause, and also improve predictions of global ice loss and sea level rise in the future," said Professor Shepherd.

Long-term observations by satellites are the key to monitoring such climate-related phenomena in the years and decades to come.

The research paper, "Rapid dynamic activation of a marine-based Arctic ice cap", was published online by Geophysical Research Letters as an Early Access article on 23 December 2014. http://goo.gl/Enx3gS

http://www.eurekalert.org/pub_releases/2015-01/isoa-tbe012315.php

The brain's electrical alphabet

Timing and rate underlie neural information

Nerve signals consist of sequences of electrical pulses ("spikes") that travel along communication channels, or neural circuits. What alphabet do these sequences use to transmit the information? In other words, what makes up the brain's language? According to a new study published in Current Biology, the information is contained in both the rate and the precise, detailed temporal distribution of pulses. To distinguish one message from another, the rate of spikes varies over a relatively long time span of tens of milliseconds. This "spike rate code" has been known for many years. What's new is the demonstration of a "spike timing code" operating on a millisecond scale. In addition, the research found that, contrary to what was thought until now, spike timing may be even more influential than spike rate, and that the two codes complement each other to form a more informative message. The study was coordinated by Mathew Diamond, professor at SISSA in Trieste, and Stefano Panzeri, research team leader at the Centre for Neuroscience and Cognitive Systems of the IIT in Rovereto.

"The two coding systems, one based on spike rate and the other on timing, give rise to multiple channels along the same transmission line", explains Diamond. "If we take tactile sensation, for example, the brain uses these multiple channels to communicate aspects of the stimulus - intensity of the touch, texture of the surface, shape of the object and so on - which could not be conveyed by a single communication channel" adds Panzeri.

"We demonstrated that, contrary to what was believed until now, the exact timing of spikes encodes highly important information that complements and surpasses, in our experiments, the information conveyed by spike rate", explains Diamond. "The timing of spikes for example, provides a greater amount of information since the potential number of messages exceeds that produced by rate alone. And the timing of spikes leads to the brain's final interpretation of the stimulus".

"Thanks to this discovery we have a greater understanding of how to imitate the brain's language, and hence reproduce it", concludes Stefano Panzeri. "We can, in fact, foresee developing robotic prostheses, such as limbs for amputees, capable of communicating with the brain in a complex, bi-directional manner, so as to restore not only motor function but also the senses, like the sense of touch".

More in detail...

In the experiments conducted during the study rats explored surfaces of varying texture with their whiskers. Discrimination of the surface texture generated neural activity in the cortex of the brain, which the researchers recorded and analysed. The study showed not only that the spike timing conveyed a greater amount of information than spike rate alone, but also that the combination of the two channels was more accurate than either taken separately.

"We discovered that the brain encodes part of the information at very fast time scales, in particular in pulse sequences emitted with precision better than 5 milliseconds," concludes Panzeri. "Another part of the information is instead encoded at a slower time scale, with the pulses transmitting the message over tens of milliseconds. The message is the same, of course, but it is read at two different resolutions, as if the brain were first viewing it through a naked eye and then through a magnifying glass" .

"Our results indicate that information transmitted through the detailed timing of spikes should not be underestimated, and that the nervous system communicates by opening several channels to convey every message", comments Diamond. "This is probably one of the secrets underlying the richness of our perceptions".

http://www.eurekalert.org/pub_releases/2015-01/gsu-rdg012315.php

Researchers discover genetic links to size of brain structures

Five genetic variants that influence the size of structures within the human brain have been discovered

ATLANTA--Five genetic variants that influence the size of structures within the human brain have been discovered by an international team that included a Georgia State University researcher.

In the study led by Drs. Sarah Medland, Margie Wright, Nick Martin and Paul Thompson of the QIMR Berghofer Medical Research Institute in Australia, nearly 300 researchers analyzed genetic data and magnetic resonance imaging (MRI) scans from 30,717 individuals from around the world. They evaluated genetic data from seven subcortical brain regions (nucleus accumbens, caudate, putamen, pallidum, amygdala, hippocampus and thalamus) and intracranial volume from MRI scans. Their findings were reported this week in the journal Nature.

This is the largest analysis of brain structure and genetics ever done, said Dr. Jessica Turner, associate professor of psychology and neuroscience at Georgia State, who organized some of the teams collecting and evaluating data from participants with schizophrenia.

The goal was to determine how common genetic variants affect the structure of these seven subcortical brain regions, which are associated with memory, movement, learning and motivation. Changes in these brain areas can lead to abnormal behavior and predisposition to disease.

Previous research has shown the brain's structure is strongly shaped by genetic influences. Identifying genetic variants could provide insight into the causes for variation in human brain development and help to determine how dysfunction in the brain occurs.

"The team looked at several million base pairs or locations on the human genome," Turner said. "Through a large-scale, international data sharing and data-analysis-sharing effort, we were able to actually successfully identify genetic effects on the hippocampus, putamen and other brain regions that no one had ever successfully identified genetics effects on before."

The researchers discovered five new genetic variants that influenced the volumes of the putamen and caudate nucleus. They also found stronger evidence for three locations in the genome that influence the size of the hippocampus and intracranial areas of the brain. The strongest genetic effects were observed for the putamen.

"Those are brain regions," Turner said, "that we know are involved in various psychiatric and neurodegenerative disorders. In trying to figure out the genetics that make them either larger or smaller, it could have great benefits for understanding mechanisms of these disorders."

http://bit.ly/1zMnLzB

It Isn't Only Dogs; Cats May Pick Up on Emotional Cues, Too

New research shows that, like babies and dogs, our feline friends look to us for clues on how to react to new situations

By Laura Clark

You know the old stereotype: Cats are assumed to be cold and detached from their human housemates, absorbed in their own little whiskered world. Dogs, on the other hand, are supposed to be attuned to our feelings—capable of knowing when we're sad or excited or scared, and willing to proceed accordingly.

There's actually scientific evidence that dogs have the ability to read the emotion behind human voices. Babies have this ability, too, through a process called social referencing. When confronted with unfamiliar people, places or things, they look to Mom and Dad for voice and facial cues indicating how they should best react.

But a new study recently highlighted by NPR's Barbara J. King suggests that cats may use social referencing, too—and maybe don't fully deserve the wrap they've been getting for egotism.

The study, published in the journal Animal Cognition, involved 24 felines and evaluated, as the authors write, "whether cats use the emotional information provided by their owners about a novel/unfamiliar object to guide their own behaviour towards it."

To answer that question, researchers set up a room with a screen on one side obscuring the exit and, on the other side, an electric fan with ribbons attached. Then they introduced a cat and its human to the space and asked the owner "first to regard the fan with neutral affect, then to respond either positively or negatively to it," writes King. As they responded, the human subjects were told to glance between their pet and the fan.

King continues:

More than three-quarters of the cats, 79 percent, looked between the owner and the fan when the owner was in the neutral phase at the start of the experiment. This percentage closely matched the results for dogs in a similar setup, and shows that cats, too, rely on us for emotional cues when faced with unfamiliarity.

Furthermore, the cats whose owners had expressed a negative reaction to the fan were found more likely to look towards the exit than those who experienced positive owner reactions. This potentially suggests that cats from the negative group were worried and wanted out.

Does this mean that we should be more conscious of how we behave around cats in unfamiliar situations? Yes, Isabella Merola, the study's lead author, told NPR's King. (Though Merola did point out that further studies are needed to "better investigate this communication and the valence of voice vs. facial expression or body posture.")

So, even if that aloof little face staring at you from the couch cushion makes you think otherwise, your cat really does care what you think - or at least it has the ability to.

http://bit.ly/18izLgE

Is Orange Juice More Nutritious?

New research challenges the assumption that fruit trumps juice

By Erin Blakemore

Call it fruit essentialism: it's common knowledge that fruit juice is less nutritious than just eating the piece of fruit itself. Or is it? New research is reviving this debate—about drinking orange juice, at least.

NPR's Maria Godoy reports on a new study that goes against the common assumption that sugary, fiber-free juice isn't nutritious. When a team of Saudi and German scientists looked at different ways of consuming oranges, whether whole, pulpy or juiced, they noticed significant similarities no matter what the form. "[Researchers] analyzed the fruit in three forms: peeled segments, a mashed-up puree and as juice, both fresh-squeezed and pasteurized," says Godoy. "They found that levels of vitamin C and carotenoids were basically the same in the juice and the unprocessed fruit, while levels of flavonoids were significantly lower." (Cartenoids and flavonoids are both nutrients that are foudn in plants and are, as a rule, good for humans.)

What the researchers found next was even more striking: when they ran digestion-like tests on the juice, it released even more carotenoids—39.5 percent in pasteurized juice and 28 percent in unpasteurized juice, compared to just 11 percent in the fruit itself. That's big news, because carotenoids don't just give oranges their color. They also act as antioxidants, enhance immune function and play a role in healthy vision.

But if this news has you bolting for that carton of OJ, you might want to think twice. No matter what the nutrient profile of orange juice, some fruit juice has as many calories as a glass of soda—and the World Health Organization recently adviced consumers to cut back on juice as well as soft drinks to keep sugar intake below five percent of daily consumption.

http://www.bbc.com/news/uk-30967337

Ebola nurse: Pauline Cafferkey 'happy to be alive'

Nurse Pauline Cafferkey: "I pretty much lost a week of my life that I just can't remember"

UK nurse Pauline Cafferkey has said she is "very happy to be alive", having been discharged from hospital after making a full recovery from Ebola. Speaking to the BBC in her first broadcast interview, Ms Cafferkey, 39, admitted she had felt like "giving up" as her condition became critical. She said she was now looking forward to returning to "normal life" and had no current plans to return to West Africa.

She is the second Briton to recover from Ebola during the current outbreak. Speaking after being discharged from the Royal Free Hospital, in London, Ms Cafferkey, from Cambuslang, in South Lanarkshire, thanked staff who she said had saved her life. "I am just happy to be alive. I still don't feel 100%, I feel quite weak, but I'm looking forward to going home," she added.

'Definitely frightened'

Ms Cafferkey - who had volunteered with Save the Children at a treatment centre in Kerry Town, in Sierra Leone - was diagnosed with Ebola on 29 December, after returning to Glasgow via London. Her temperature was tested seven times before she flew from Heathrow to Glasgow and she was cleared to travel, before

later falling ill. She was placed in an isolation unit at Glasgow's Gartnavel Hospital after becoming feverish, before being transferred by a RAF Hercules plane to London on 30 December. She was then transferred to the specialist isolation unit at the Royal Free, where she has been treated since.

Speaking to BBC health correspondent Branwen Jeffreys, she said: "My first few days I was very well - I just couldn't understand all the fuss."

Pauline Cafferkey Ms Cafferkey travelled to Sierra Leone with a group of NHS workers in November last year. However, she said she was "definitely frightened" having witnesses the virus first hand in Sierra Leone. "Obviously at the back of my mind I had seen what could happen and what could potentially happen to me."

After three or four days Ms Cafferkey said her condition began to deteriorate, with the hospital announcing she had become critically ill on 4 January.

Asked if there was a point she felt she would not make it, Ms Cafferkey said: "There was a point, which I remember clearly. I do remember saying: 'That's it, I've had enough'." She said she had "no sense of time" in hospital and cannot remember an entire week when the virus took hold.

'Selflessness and courage'

She said she received letters and cards from people around the world, including people in Sierra Leone and from other nurses who wrote to say she made them proud of their profession.

Asked if she wanted to return to Sierra Leone, she said: "I would have to think seriously about it. I am definitely going to give aid work a break for a while. "I just want to go back to my normal job, my normal life and I think my family will be happy with that as well."

Dr Michael Jacobs, from the hospital's infectious diseases team, said Ms Cafferkey had now completely recovered and was "not infectious in any way". He said Ms Cafferkey was treated with blood plasma from an Ebola survivor and an experimental treatment drug closely related drug to ZMapp, which UK nurse Will Pooley was treated with after he contracted Ebola.

The patient being transferred from hospital in Glasgow She was diagnosed with the deadly disease after returning to Glasgow, and was then transferred to London

Nurses and patients at the Blantyre Health Centre, in South Lanarkshire, where Ms Cafferkey works as a public health nurse, were "overjoyed" to hear the news of her recovery, BBC Scotland reporter Laura Bicker said.

Prime Minister David Cameron said Ms Cafferkey had been "extraordinarily brave" and that it was "great" to see her "looking so well".

Health Secretary Jeremy Hunt said he was "delighted" the nurse had been discharged from hospital, hailing her "selflessness and courage".

"She represents the very best of NHS values," he added.

Chief medical officer, Dame Sally Davies, said Ms Cafferkey's recovery was testament to the "hard work and dedication" of the team at the Royal Free who had "worked around the clock to help bring about this happy outcome".

Meanwhile, Scotland's First Minister Nicola Sturgeon said her recovery was "a tremendous tribute to the work of the NHS staff who have been committed to her care over the last few weeks".

Chief executive of Save The Children, Justin Forsyth, described Ms Cafferkey as a "dedicated humanitarian" and said he was "delighted" for her and her family.

Save the Children is investigating how Ms Cafferkey contracted the disease.

http://nyti.ms/1uPi1nx

Obama to Request Research Funding for Treatments Tailored to Patients' DNA

President Obama will seek hundreds of millions of dollars for a new initiative to develop medical treatments tailored to genetic and other characteristics of individual patients, administration officials say.

By ROBERT PEAR JAN. 24, 2015

WASHINGTON - The proposal, mentioned briefly in his State of the Union address, will be described in greater detail in his budget in the coming weeks. The effort is likely to receive support from members of both parties, lawmakers said.

"This is an incredible area of promise," said Senator Bill Cassidy, Republican of Louisiana and a gastroenterologist. "There will be bipartisan support."

Mr. Obama called it precision medicine, but the terms "personalized medicine" and "individualized medicine" are also widely used to describe the evolving field in which, for example, a doctor prescribes a medication that targets a specific mutation in a patient's genes.

The money would support biomedical research at the National Institutes of Health and the regulation of diagnostic tests by the Food and Drug Administration, officials at the two agencies said. The tests analyze the DNA in normal or diseased tissue. Doctors use that information to identify patients with cancer or other diseases who are most likely to benefit from a particular treatment - and those who would be harmed or not respond at all.

"In some patients with cystic fibrosis, this approach has reversed a disease once thought unstoppable," Mr. Obama said in his address to Congress last week.

The gene responsible for cystic fibrosis was discovered by a team that included Dr. Francis S. Collins, who is now director of the National Institutes of Health and an architect of the new initiative. The F.D.A. has approved a drug for patients with a genetic mutation responsible for some cases of the disease, which clogs the lungs with thick, sticky mucus.

A patient taking that drug, William Elder Jr., a 27-year-old medical student in Ohio, was a guest of Michelle Obama at the State of the Union speech.
Representative Fred Upton, Republican of Michigan and chairman of the Energy and Commerce Committee, and Representative Diana DeGette, a Colorado Democrat who is on the committee, welcomed Mr. Obama's proposal. After holding hearings and round-table discussions last year, they said they were drafting a bill to encourage biomedical innovations, including personalized medicine.
As a senator in 2006 and 2007, Mr. Obama offered a bill to do just that - the Genomics and Personalized Medicine Act. Senator Richard M. Burr, Republican of North Carolina, was a co-sponsor of the 2007 bill. "Personalized medicine represents a revolutionary and exciting change in the fundamental approach and practice of medicine," Mr. Obama said then. He cited the drug Herceptin, for the treatment of a particularly aggressive form of breast cancer, as an example.
Scientists said they now viewed breast cancer not as a single disease, but rather as a group of several subtypes, each with a distinct molecular signature. This, they said, helps explain why some tumors respond better than others to specific cancer-fighting drugs. "Most medical treatments have been designed for the average patient," said Jo Handelsman, associate director of the White House Office of Science and Technology Policy. "In too many cases, this one-size-fits-all approach is not effective."
Dr. Ralph Snyderman, a former chancellor for health affairs at Duke University, often described as the father of personalized medicine, said he was excited by the president's initiative. "Personalized medicine has the potential to transform our health care system, which consumes almost $3 trillion a year, 80 percent of it for preventable diseases," Dr. Snyderman said.
Although the new tests and treatments are often expensive, he added, personalized medicine can save money while producing better results. "It focuses therapy on individuals in whom it will work," he said. "You can avoid wasting money on people who won't respond or will have an adverse reaction."
The new techniques can also help prevent disease by predicting patients' susceptibility, Dr. Snyderman said. "If an individual has a much greater likelihood of developing colon cancer, a genetically based disease," he said, "you can begin screening at a much younger age, 30 rather than 50, for example."
Dr. Margaret A. Hamburg, the F.D.A. commissioner, has reorganized her agency to speed the review of drugs and diagnostic tests used in personalized medicine. But Senator Cassidy said he was still skeptical. To fulfill the promise of personalized medicine, he said, will require "a much more nimble federal bureaucracy."

On Friday, federal officials released a proposal under which Medicare would cover genetic tests of tumors in some people with advanced lung cancer. The tests could help identify Medicare beneficiaries who would respond favorably to particular cancer drugs.
"This is a watershed event," said Dr. Bruce Quinn, a health-policy specialist at the law firm Foley Hoag. "It means that policy makers now believe these tests are worth paying for."
Mr. Obama's budget will also propose increased federal spending to combat antibiotic-resistant bacteria. The plan would nearly double spending from its current level of $450 million a year.
White House officials described antibiotic resistance as a threat to public health and national security. They said at least 23,000 people in the United States die each year as a result of infections caused by such drug-resistant germs.

http://www.bbc.com/news/health-30974649

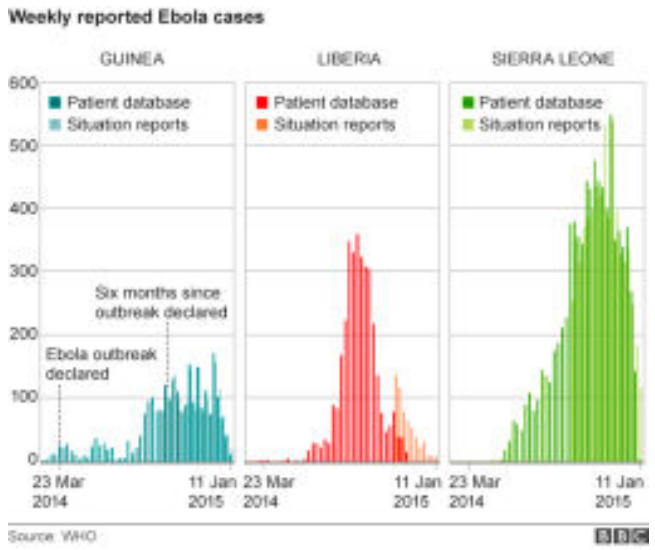
Ebola crisis: 'Too slow' WHO promises reforms

The World Health Organization (WHO) has set out plans for reform, admitting that it was too slow to respond to the deadly Ebola outbreak in West Africa.

At an emergency session in Geneva, director-general Margaret Chan said Ebola had taught the world and the WHO how they must act in the future. She said the corner had been turned on infections but warned over complacency.
More than 8,500 people have died in the outbreak, the vast majority in Sierra Leone, Guinea and Liberia.

Contingency fund

Dr Chan said: "This was West Africa's first experience with the virus and it delivered some horrific shocks and surprises.



The WHO says patient database figures give the best representation of the history of the epidemic. However, data for more recent weeks are sometimes less complete than in the regular situation reports

The world, including WHO, was too slow to see what was unfolding before us. Ebola is a tragedy that has taught the world, including WHO, many lessons about how to prevent similar events in the future."

Dr Chan said that although disease outbreaks would continue to deliver shocks, "never again should the world be caught by surprise, unprepared".

The reforms announced included a "dedicated contingency fund to support rapid responses to outbreaks and emergencies". There would also be improvements in international co-ordination and greater support for countries that needed to respond quickly to emergencies. This would also require vaccines and drugs to be brought to the market more speedily. Liberia announced on Friday that it was down to just five confirmed cases - there were 500 a week in September. Guinea and Sierra Leone have both also experienced falls in infection rates.

Dr Chan said the worst-case scenario had been avoided, but warned: "We must maintain the momentum and guard against complacency and donor fatigue."

WHO figures show 21,724 reported cases of Ebola in the outbreak , with 8,641 deaths.

http://www.eurekalert.org/pub_releases/2015-01/bc-tt012215.php

The 'fifth taste,' umami, could be beneficial for health

The special series in open-access journal Flavour also finds that 'kokumi' substances, which modify flavor, could improve the taste of low-fat foods

The umami taste could have an important and beneficial role in health, according to research published in the open access journal Flavour. The journal's special series of articles 'The Science of Taste' also finds that 'kokumi' substances, which modify flavour, could improve the taste of low-fat foods.

Guest editor Ole Mouritsen, professor of biophysics at the University of Southern Denmark, said: "In general, our understanding of taste is inferior to our knowledge of the other human senses. An understanding and description of our sensory perception of food requires input from many different scientific disciplines. "In addition to the natural and life sciences, human sciences, social sciences, as well as the arts, each contribute their perspectives on what we call 'taste'. For this special series, we've brought together researchers from a range of different disciplines with the aim of providing a composite mosaic of our current understanding of taste."

Despite the widely held belief that monosodium glutamate (MSG) is an unhealthy addition to food, researchers from Tohoku University Graduate School of Dentistry, Japan, show that the taste it triggers, umami, is important for health, especially in elderly people.

In a small study of 44 elderly patients, the researchers showed that some elderly patients suffer a loss of the umami taste sensation, and that all of the patients studied complained of appetite and weight loss, resulting in poor overall health. Umami taste receptors also reportedly exist in the gut, suggesting that the umami taste sensation functions in nutrient sensation and modulating digestion in the gut, which could be important for maintaining a healthy daily life.

The researchers suggest that diseases suffered by elderly patients and side effects from their medications could cause taste disorders and reduced salivation. They also found that treatment to improve salivary flow had a beneficial effect on the patients' taste sensations and could help patients with reduced umami sensitivity.

In a separate review, Kumiko Ninomiya of the Umami Information Center, Japan, discusses umami's discovery and the hundred-year delay in its global recognition as a basic taste. Exploring the differences in culinary culture between Europe and Japan, Ninomiya highlights recent collaborative studies with chefs and researchers on the different taste profiles for Japanese and Western soup stocks, and explains why umami has been more easily accepted by the Japanese. But she says a recent exchange on cooking methods and diverse types of umami-rich foods in different countries has facilitated a new approach to culinary science and could bring healthier and tastier solutions.

'Kokumi' substances, as found in garlic, onions and scallops, are known to enhance basic tastes when combined with other flavours, despite having no taste themselves. In a study of 29 people, published in Flavour, researchers showed that the addition of a kokumi substance significantly enhanced thick flavour, aftertaste, and oiliness in reduced-fat peanut butter. This suggests that kokumi substances could improve the flavour of low-fat foods.

Editorial

The Science of Taste Ole G Mouritsen Flavour 2015 DOI: 10.1186/s13411-014-0028-3
URL after embargo: http://dx.doi.org/10.1186/s13411-014-0028-3

Research

Flavour improvement of reduced-fat peanut butter by addition of a kokumi peptide, gamma-glutamyl-valyl-glycine Naohiro Miyamura, Shuichi Jo, Motonaka Kuroda and Tohru Kouda Flavour 2015 DOI: 10.1186/2044-7248-4-16
URL after embargo: http://dx.doi.org/10.1186/2044-7248-4-16

Research

Effect of a kokumi peptide, gamma-glutamyl-valyl-glycine, on the sensory characteristics of chicken consommé Takashi Miyaki, Hiroya Kawasaki, Motonaka Kuroda, Naohiro Miyamura and Tohru Kouda Flavour 2015 DOI: 10.1186/2044-7248-4-17
URL after embargo: http://dx.doi.org/10.1186/2044-7248-4-17

Short Report

The important role of umami taste in oral and overall health Takashi Sasano, Shizuko Satoh-Kuriwada, Noriaki Shoji and Noriaki Shoji Flavour 2015 DOI: 10.1186/2044-7248-4-10
URL after embargo: http://dx.doi.org/10.1186/2044-7248-4-10

Opinion

Science of umami taste: adaptation to gastronomic culture Kumiko Ninomiya Flavour 2015 DOI: 10.1186/2044-7248-4-13URL after embargo: http://dx.doi.org/10.1186/2044-7248-4-13

http://bit.ly/1D8ygLI

Is MSG a silent killer or useful flavour booster?

Given all the scare stories about MSG, should we really be recommending it? We look at the evidence

- **01:00 26 January 2015 by Jessica Hamzelou**

Some elderly people lose the ability to taste umami – the savoury taste that defies the other flavour categories of sweet, sour, salty and bitter – as Takashi Sasano and his colleagues at Tohoku University in Sendai, Japan, discovered several years ago. Now, the team has found that they can boost these people's umami taste buds – along with their overall appetite – by feeding them MSG-rich kelp tea, which delivers a huge umami kick. But given all the scare stories about MSG, should we really be recommending it? We look at the evidence.

What is MSG?

Monosodium glutamate is a salt that contains glutamate – an amino acid present in our bodies, and one that plays a role in metabolism and communication between neurons. MSG was first produced by the Japanese chemist Kikunae Ikeda, who was also the first to describe the umami taste, in 1908. Ikeda identified glutamate as the key compound that gives dried seaweed its umami flavour, and went on to develop it in the form of MSG, which could easily be put in food. Glutamate, and salts of it containing either sodium, potassium, magnesium, ammonium or calcium, are now routinely added to foods as flavour enhancers – and not just Chinese food. In Europe, these salts are listed as E-numbers (E620 to E625) in food labelling. But foods with high levels of glutamate, such as mushrooms, cheeses and fruit juice, won't be labelled.

How much MSG are we eating?

Research carried out in the 1990s found that people in the UK consume around half a gram of MSG added to food every day. The figure is higher in Asian countries such as Japan and Korea, where people consume between 1.2 and 1.5 grams of added MSG every day.

Why does MSG have such a bad rep?

MSG has been called the silent killer lurking in your kitchen cabinets. A small fraction of people who eat MSG-rich foods report symptoms including nausea, headache and tingling sensations, collectively lumped under the banner of "Chinese restaurant syndrome". MSG has also been blamed for obesity, high blood pressure and even snoring.

It sounds as if we should avoid foods containing MSG?

No: none of the above claims stands up to scientific scrutiny. The evidence that MSG is harmful tends to be based on poorly conducted studies with lots of confounding factors.

Some studies have found that large amounts of glutamate in the brain can cause damage – it is thought to be responsible for some of the tissue damage caused by stroke, for example. But this doesn't translate to dietary MSG. Almost all of the glutamate that we eat, including that from MSG, is used up as an energy source by cells in the gut before it has a chance to get to any other parts of the body.

So there's little point in buying foods advertised as free from MSG?

"MSG-free" foods are widely marketed, but claims made for them are misleading, says the Canadian government health department, Health Canada, because up to a quarter of food proteins contain glutamate naturally. And the amount of MSG added to convenience foods – typically between 0.1 and 0.8 per cent by weight – is in line with the proportion of glutamate found in foods such as tomatoes and parmesan cheese.

And why does kelp tea seem to boost elderly people's appetite?

Sasano's team thinks that the umami flavour of the tea stimulates the production of saliva. The researchers found that their volunteers produced more saliva in response to umami than to sour, salty, sweet and bitter flavours.

Saliva plays an important role in our ability to taste – it is thought to break down food into chemicals that our taste buds pick up, as well as protect taste receptors from damage. Sasano and his colleagues think that, by boosting the production of saliva, MSG can enhance the taste of food, stimulating a healthy appetite, something that tends to decline with age.

Journal reference: Flavour, DOI: 10.1186/2044-7248-4-10

http://bit.ly/1zf8nME

Were Cellular Powerhouses Once Parasites?

Mitochondria may have started out stealing energy rather than producing it

Jan 20, 2015 |By Annie Sneed

Mitochondria, the organelles known to every junior high school student as “the powerhouses of the cell,” go back some two billion years. Although these energy producers were identified in the 1800s, how they became fixtures in cells is still under debate.

Mitochondria's ancestor was a free-living bacterium that another single-celled organism ingested. Most biologists think that the bacterium benefited the host: in one hypothesis, these premitochondria supplied hydrogen to make energy. Other researchers think that when atmospheric oxygen rose sharply in that era, anaerobic cells needed the bacteria to clear out the gas, which is toxic to them. However the match was made, the two lived so harmoniously that they eventually became mutually dependent and formed a long-term relationship.

A new analysis of evolutionary relationships by Martin Wu and Zhang Wang, both then at the University of Virginia, brings up the possibility that the mitochondrial progenitor was actually a parasite. Their claim derives from their recently constructed evolutionary tree for mitochondria, which resolves ancestral relationships among the organelles and their closest living bacterial relatives based on their genomes. Those DNA data led Wu to deduce that mitochondria sit within an order of parasitic and pathogenic bacteria called Rickettsiales and that they evolved from an ancestor that produced an energy-stealing protein. At some point, this parasitic predecessor lost the klepto gene and gained another that enabled it to supply energy to its host, as mitochondria do today. The researchers published their findings in October 2014 in the journal PLOS ONE.

But other scientists take issue with the paper's conclusions. Dennis Searcy, who studies the origin of mitochondria at the University of Massachusetts Amherst, says the authors interpreted their evolutionary tree wrongly when they decided that mitochondria descended from Rickettsiales. Such a miscalculation would clearly corrupt their analysis. And Michael Gray, who researches mitochondrial evolution at Dalhousie University in Nova Scotia, thinks that the rapid evolution of the organelles makes it difficult to say with certainty where the once free-living entities sit within their branch of the tree.

Wu maintains that the study minimized errors as much as possible, while acknowledging that better models are necessary to assign definitive relationships. “There is definitely more work to be done,” he says. “There are still very large gaps in the tree.”

http://bbc.in/1yUeSCK

Heartburn 'possible cancer sign' warning

A health campaign is urging people not to ignore heartburn, because it could be a sign of stomach or oesophageal cancer.

According to Public Health England, people should go to their doctor if they have persistent heartburn or difficulty swallowing food for three weeks or more. But it said most people were not aware of the symptoms. Stomach and oesophageal cancers are the fifth most common cancers in England.

PHE figures show that around 12,900 people in England are diagnosed with these cancers each year and approximately 10,000 people die from the diseases annually. Yet, around 950 lives could be saved each year if survival rates for oesophago-gastric cancers matched the best in Europe, it says.

Spotting the signs

At present, the UK has the highest rate of oesophageal cancer in men and women in the EU, which may be due to smoking, rising obesity levels, a lack of fruit and vegetables in our diet and regular alcohol consumption. The earlier the cancers are diagnosed, the more likely the treatment is to be successful. This is why Public Health England's "Be Clear on Cancer" campaign is focusing on how to spot the signs of oesophageal or stomach cancer.

These can include:

- ***indigestion on and off for three weeks or more***
- ***feeling food sticking in your throat when you swallow***
- ***losing weight for no obvious reason***
- ***trapped wind and frequent burping***
- ***feeling full very quickly when eating***
- ***nausea or vomiting***
- ***pain or discomfort in upper tummy area***

Sean Duffy, national clinical director for cancer at NHS England, said early diagnosis of cancer was critical to improving survival. "Patients with possible early signs and symptoms should visit their GP so where necessary they can be referred for tests, and treatment can start quickly."

Prof Michael Griffin, professor of surgery at the Northern oesophago-gastric unit, said people should not feel they are bothering their GP unnecessarily. "You won't be wasting your doctor's time - you will either get reassurance that it isn't cancer, or if it is, you will have a better chance of successful treatment."

Stiff upper lip

Research published in the British Journal of General Practice, and funded by Cancer Research UK, looked at why people dismiss obvious cancer warning symptoms. Sometimes it was because they feared a cancer diagnosis or they adopted a stuff upper lip approach to their health problems. Others lacked confidence in their GP or just assumed the problem was down to ageing.

The good news for Public Health England, however, is that health campaigns appeared to encourage people to seek help.

Dr Katriina Whitaker, study author and senior research fellow at University College London, said: "Some people made the decision to get symptoms checked out after seeing a cancer awareness campaign or being encouraged to do so by family or friends - this seemed to almost legitimise their symptoms as important."

Sara Hiom, director of early diagnosis at Cancer Research UK, said the findings were a useful insight into the British psyche.

"International comparisons have already shown us that the British public are far more worried about being a burden on the health system or wasting the doctor's time than in other developed countries." She said the study could help find ways to encourage everyone with worrying symptoms to seek help as early as possible.

http://bit.ly/1uuyiZn

Balloon Pilots in Quest of World Records Take Off from Japan

Two balloonists took flight from Japan on Saturday in a bid to break world records for distance and duration for gas balloon travel, in what they hope will be at least a six-day trans-Pacific flight

By Joseph Kolb

Albuquerque, N.M. - Two balloonists took flight from Japan on Saturday in a bid to break world records for distance and duration for gas balloon travel, in what they hope will be at least a six-day trans-Pacific flight reaching the U.S. West Coast, officials said.

The distance record of 5,209 miles (8,383 km) for gas balloons was set on the only previous manned trans-Pacific flight, in 1981, while the duration record of more than 137 hours aloft was set in 1978 by a team crossing the Atlantic.

"It goes to the philosophy of man," said Ray Bair, an official observer with the National Aeronautic Association based at Mission Control in Albuquerque, New Mexico. "You always try to attain new heights and distances. That's what this is all about."

The balloon, which relies solely on an enclosed chamber of helium gas for lift, is different from hot air balloons and so-called Roziere balloons, which rely on both hot air and lighter-than-air gas.

Roziere balloons have by far the greatest range of the three types.

Balloon pilots Troy Bradley, an American, and Leonid Tuikhtyaev, of Russia, collectively dubbed "Two Eagles," successfully took off after bad weather and poor wind trajectories had repeatedly delayed their launch, Bair said.

They will subsist on a diet that includes fresh fruit, freeze-dried hikers' meals, beef jerky and the occasional hot meal prepared on a small stove, and will be equipped with cold weather gear including sleeping bags and a heater.

If they make it to the U.S. West Coast south of Oregon they will have broken the distance record, Bair said, adding that they could also attempt to fly further, as the craft is believed capable of staying aloft for 10 days. (Editing by Jonathan Kaminsky and Leslie Adler)

http://www.eurekalert.org/pub_releases/2015-01/ehs-ddi012315.php

Daily drinking increases risk of alcoholic cirrhosis

Results also suggest that recent alcohol consumption, and not lifetime alcohol consumption, is the strongest predictor, according to report in the Journal of Hepatology

Amsterdam, The Netherlands - Approximately 170,000 people die from alcoholic cirrhosis of the liver in Europe every year. Although alcohol is the most important risk factor, less is known about the significance of different patterns of drinking. Currently scientists believe that cirrhosis is a function of the volume of alcohol consumed irrespective of patterns of drinking. Investigators have now established that alcohol drinking pattern has a significant influence on the risk of cirrhosis and that daily drinking increases that risk compared with drinking less frequently. Results are published in the Journal of Hepatology.

"For the first time, our study points to a risk difference between drinking daily and drinking five or six days a week in the general male population, since earlier studies were conducted on alcohol misusers and patients referred for liver disease and compared daily drinking to 'binge pattern' or 'episodic' drinking," observed lead investigator Gro Askgaard, MD, of the Department of Hepatology, Copenhagen University Hospital, Rigshospitalet, and the National Institute of Public Health, University of Southern Denmark, Copenhagen, Denmark. "Since the details of alcohol induced liver injury are unknown, we can only speculate that the reason may be that daily alcohol exposure worsens liver damage or inhibits liver regeneration."

To examine the patterns of drinking associated with alcoholic cirrhosis, researchers in Denmark investigated the risk of alcoholic cirrhosis among nearly 56,000 participants aged between 50 and 64 in the Danish Cancer, Diet, and Health study (1993-2011). All participants first completed a detailed food-frequency questionnaire along with a questionnaire regarding lifestyle and background factors (alcohol, smoking, physical activity, and years of education) as well as a brief physical examination including measurement of waist circumference. Amount of alcohol intake was reported as the average amount per week of specific types of alcohol: beer, wine, and liquor. Participants were also asked to report their average amount of alcohol intake when they were 20-29, 30-39, 40-49, and 50-59 years old. Follow-up information came from national registers.

The researchers calculated hazard ratios (HRs) for alcoholic cirrhosis in relation to drinking frequency, lifetime alcohol amount, and beverage type.

Among the 55,917 participants, 257 men and 85 women developed alcoholic cirrhosis, corresponding to an incidence rate of 66 in men and 19 in women per 100,000 person-years. There were no cases of alcoholic cirrhosis among lifetime abstainers.

In men, the results showed that daily drinking increases the risk of alcoholic cirrhosis compared with drinking less frequently. The results also suggest that recent alcohol consumption, and not lifetime alcohol consumption, is the strongest predictor of alcoholic cirrhosis.

Compared with beer and liquor, wine seems to be associated with a lower risk of alcoholic cirrhosis up to a moderate level of weekly alcohol amount. Among

women, researchers were unable to draw firm conclusions due to low statistical power, though in general they found the same trends.

"Earlier studies regarding lifetime alcohol consumption and risk of alcoholic cirrhosis reached opposite conclusions, for instance, whether a previous high level of alcohol amount predicted future risk, even after having cut down," commented Dr. Askgaard. "From a clinical point of view, this is relevant in order to execute evidence-based counselling, and from a public health perspective, it may guide health interventions for the general population."

"This is a timely contribution about one of the most important, if not the most important risk factor for liver cirrhosis globally, because our overall knowledge about drinking patterns and liver cirrhosis is sparse and in part contradictory," said noted expert Jürgen Rehm, PhD, Director of the Social and Epidemiological Research Department of the Centre for Addiction and Mental Health, Toronto. "The work of Askgaard and colleagues not only increases our knowledge, but also raises questions for future research. The question of binge drinking patterns and mortality is far from solved, and there may be genetic differences or other covariates not yet discovered, which play a role and could explain the different empirical findings."