http://bit.ly/2dm749l

# Skin Proteins Reveal How Mummies Died

***Proteins from the mummies' skin and muscle samples show the people likely had cancer, lung infections and other diseases.***

An international team of researchers has identified hundreds of proteins in skin and muscle samples from 4,200-year-old Egyptian mummies, finding signs of diseases that may have caused their death.

Published in the journal Philosophical Transaction of the Royal Society A, the groundbreaking study shows that proteins isolated from ancient mummified tissue can reveal inflammation, immune response and possibly cancer.

The researchers collected four skin samples and one muscle biopsy from three mummies stored in the Egyptian Museum in Turin, Italy.

Dating back to the First Intermediate period (about 2181–2055 B.C.), the mummies were excavated in cemeteries at Assiut and Gebelein between 1911 and 1920 by an Italian archaeological mission led by Ernesto Schiaparelli.

The Assiut mummies, a female known as Khepeshet and a male known as Idi, came from elite burials and were interred, with grave goods, in sealed and decorated wooden coffins.

In contrast, the mummy from Gebelein, an unknown adult individual, was buried in a coffin made out of a hollowed out tree trunk.

"All these mummies are in poor condition, but that is what made them perfect for retrieving biopsies without causing further damage," Jana Jones, from the Department of Ancient History at Macquarie University, Australia, told Discovery News.

Analysis showed that all five samples contained large numbers of collagens and keratins, confirming previous studies that identified these proteins as very long-lived. Overall, the researchers identified more than 230 proteins in the 4,200-year-old samples, finding evidence for inflammation, infection and possible cancer.

Jones and colleagues Paul Haynes and others from the Department of Chemistry and Biomolecular Sciences, Macquarie University, Raffaella Bianucci, at the Legal Medicine Section of the University of Turin, Italy and Dong Hoon Shin, at the National University College of Medicine in Seoul, South Korea, estimate that any proteins observed at higher abundance in mummified samples of that age must have been expressed at relatively high levels in the original tissue.

"Using that approach, we have been able to show that many of the proteins still present in these samples are linked to inflammation and immune response," the researchers wrote.

Analysis of skin tissue from the mummy known as Khepeshet identified a protein signature indicative of a severe immune response.

"A subset of those proteins were strongly linked to bacterial infection in the lungs," Paul Haynes said. He noted there is a strong possibility that Khepeshet was suffering from a bacterial pulmonary infection, such as tuberculosis. "This is something you could point to as a possible cause of death," Haynes said.

Most likely, the mummy known as Idi was also suffering from a life-threatening disease. Analysis of both skin and muscle samples identified numerous proteins associated with inflammation and severe immune response. In the muscle sample in particular, the researchers found two proteins, DMBT-1, which functions as a tumor suppressor, and transglutaminase.

Haynes explained that increased abundance of both DMBT-1 and transglutaminase is generally correlated with pancreatic cancer progression. "This allows us to speculate that Idi may also have been suffering from pancreatic, or some other cancer," Haynes said.

Few proteins were identified for the third mummy, so the researchers were unable to find details about the cause of death.

"The remains were interred in a hollowed out log rather than a sealed coffin. The mummy would have been exposed to the elements over time and this may have caused protein degradation," Jones said.

She noted the First Intermediate period was Egypt's first "Dark Age."

"It was marked by political unrest, changed economic conditions, mega drought and famine," Jones said.

Although little is known about the health of the population in this period, it is no mystery that food and water shortages weaken the immune system, paving the way to infectious diseases such as malaria, tuberculosis, visceral leishmaniasis and other parasitic intestinal infections.

Groups affected by these chronic conditions are at increased risk of contracting cholera, typhoid fever and acute respiratory infections.

"Our study provides a historical context for medical conditions that are still found in the modern world," Jones said.

***http://bit.ly/2d6DQfr***

## Codeine too risky for kids, experts say, urging restrictions on use

***The American Academy of Pediatrics is urging parents and health providers to stop giving codeine to children, calling for more education about its risks and restrictions on its use in patients under age 18.***

A new AAP clinical report in the October 2016 issue of Pediatrics, "Codeine: Time to Say `No,'" cites continued use of the drug in pediatric settings despite growing evidence linking the common painkiller to life-threatening or fatal breathing reactions.

An opioid drug used for decades in prescription pain medicines and over-the-counter cough formulas, codeine is converted by the liver into morphine. Because of genetic variability in how quickly an individual's body breaks down the drug, it provides inadequate relief for some patients while having too strong an effect on others. Certain individuals, especially children and those with obstructive sleep apnea, are "ultra-rapid metabolizers" and may experience severely slowed breathing rates or even die after taking standard doses of codeine.

Despite these well-documented risks and with concerns expressed by groups including the AAP, the U.S. Food & Drug Administration and the World Health Organization, the drug still is available without a prescription in over-the-counter cough formulas from outpatient pharmacies in 28 states and the District of Columbia. In addition, according to the AAP report, it still is commonly prescribed to children after surgical procedures such as tonsil and adenoid removal. More than 800,000 patients under age 11 were prescribed codeine between 2007 and 2011, according to one study cited in the AAP report. Otolaryngologists were the most frequent prescribers of codeine/acetaminophen liquid formulations (19.6 percent), followed by dentists (13.3 percent), pediatricians (12.7 percent) and general practice/family physicians (10.1 percent).

The new clinical report outlines potential alternatives to provide pain relief in children but acknowledges that relatively few safe and effective drugs are available for pediatric use.

"Effective pain management for children remains challenging," said the report's lead author, Joseph D. Tobias, MD, FAAP, "because children's bodies process drugs differently than adults do."

The AAP report, published online Sept. 19, calls for improved education of parents and health providers about the risks of codeine use in children and formal restrictions of its use in children, as well as further research on safe and effect pain treatment in children.

*J. D. Tobias, T. P. Green, C. J. Cote. Codeine: Time To Say "No". PEDIATRICS, 2016; DOI: 10.1542/peds.2016-2396*

***http://bbc.in/2dmbdKq***

## Could turmeric really boost your health?

***Bold health claims have been made for the power of turmeric. Is there anything in them, asks Michael Mosley.***

Turmeric is a spice which in its raw form looks a bit like ginger root, but when it's ground down you get a distinctive yellowy orange powder that's very popular in South Asian cuisine. Until recently the place you would most likely encounter turmeric would be in chicken tikka masala, one of Britain's most popular dishes.

These days, thanks to claims that it can improve everything from allergies to depression, it's become incredibly trendy, not just cooked and sprinkled on food but added to drinks like tea. Turmeric latte anyone?

Now I'm usually very cynical about such claims, but in the case of turmeric I thought there could be something to it. There are at least 200 different compounds in turmeric, but there's one that scientists are particularly interested in. It gives this spice its colour. It's called curcumin.

Thousands of scientific papers have been published looking at turmeric and curcumin in the laboratory - some with promising results. But they've mainly been done in mice, using unrealistically high doses. There have been few experiments done in the real world, on humans.

This is exactly the sort of situation where we on Trust Me like to make a difference. So we tracked down leading researchers from across the country and with their help recruited nearly 100 volunteers from the North East to do a novel experiment. Few of our volunteers ate foods containing turmeric on a regular basis.

Then we divided them into three groups.

We asked one group to consume a teaspoon of turmeric every day for six weeks, ideally mixed in with their food. Another group were asked to swallow a supplement containing the same amount of turmeric, and a third group were given a placebo, or dummy pill.

The volunteers who were asked to consume a teaspoon of turmeric a day were ingenious about what they added it to, mixing it with warm milk or adding it to yoghurt. Not everyone was enthusiastic about the taste, with comments ranging from "awful" to "very strong and lingering".

But what effect was eating turmeric having on them? We decided to try and find out using a novel test developed at University College, London, by Prof Martin Widschwendter and his team.

Prof Widschwendter is not particularly interested in turmeric but he is interested in how cancers start. His team have been comparing tissue samples taken from women with breast cancer and from women without it and they've found a change that happens to the DNA of cells well before they become cancerous.

The change is in the "packaging" of the genes. It's called DNA methylation. It's a bit like a dimmer switch that can turn the activity of the gene up or down.

The exciting thing is that if it is detected in time this change can, potentially, be reversed, before the cell turns cancerous. DNA methylation may explain why, for instance, your risk of developing lung cancer drops dramatically once you give up smoking. It could be that the unhealthy methylation of genes, caused by tobacco smoke, stops or reverses once you quit.

So we asked Prof Widschwendter whether testing the DNA methylation patterns of our volunteers' blood cells at the start and end of the experiment would reveal any change in their risk of cancer and other diseases, like allergies. It was something that had not been done before.

Fortunately he was very enthusiastic. "We were delighted," he said, "to be involved in this study, because it is a proof of principle study that opens entirely new windows of opportunity to really look into how we can predict preventive measures, particularly for cancer."

So what, if anything, happened?

When I asked him that, he pulled out his laptop and slowly began to speak. "We didn't find any changes in the group taking the placebo," he told me. That was not surprising.

"The supplement group also didn't also show any difference," he went on. That was surprising and somewhat disappointing.

"But the group who mixed turmeric powder into their food," he continued, "there we saw quite substantial changes. It was really exciting, to be honest. We found one particular gene which showed the biggest difference. And what's interesting is that we know this particular gene is involved in three specific diseases: depression, asthma and eczema, and cancer. This is a really striking finding."

It certainly is. But why did we see changes only in those eating turmeric, not in those taking the same amount as a supplement?

Dr Kirsten Brandt, who is a senior lecturer at Newcastle University and who helped run the experiment, thinks it may have something to do with the way the turmeric was consumed.

"It could be," she told me, "that adding fat or heating it up makes the active ingredients more soluble, which would make it easier for us to absorb the turmeric. It certainly gives us something, to work on, to try to find out exactly what's happening."

She also told me, because our volunteers all tried consuming their turmeric in different ways, that we can be confident it was the turmeric that was making the difference and not some other ingredient used to make, say, chicken tikka masala.

There is a lot more research that needs to be done, including repeating the experiment to see if these findings can be confirmed. But in light of what we've discovered will I be consuming more of the stuff? Probably. It helps that I like the taste and I've already begun experimenting with things like adding it with a touch of chilli to an omelette.

***http://bit.ly/2dc153I***

# To Be or Not To Be? Monkeys Type Shakespeare Using Brain Waves

***Monkeys with brain implants are able to type out sections of the Shakespeare play "Hamlet," new research shows.***

**By Tia Ghose, Senior Writer | September 20, 2016 07:53am ET**

What's more, the macaques are able to type at a relatively fast 12 words per minute, with fewer typos than past brain-computer interfaces. The new brain implants could one day improve communication for those who are almost completely paralyzed, such as the polymath Stephen Hawking.

"Our results demonstrate that this interface may have great promise for use in people," study co-author Paul Nuyujukian, a bioengineer who will join Stanford faculty as an assistant professor in 2017, said in a statement. "It enables a typing rate sufficient for a meaningful conversation."

## Monkey brains

Past research has shown that monkeys can control prosthetic arms, drive robotic wheelchairs, control each others' minds and even slowly type words using their minds. However, past communication systems were typically too slow for the natural pace of conversation.

Systems currently available for people are similarly limited. Stephen Hawking, who is a quadriplegic, uses a technology that uses the minute movements of facial muscles to transcribe his thoughts, while other software relies on eye-tracking for those who are paralyzed to relay their words. However, eye- and facial-muscle tracking can take time, be tiring, and may simply be out of reach for those whose paralysis is too severe, according to the researchers.

To get around this problem, Nuyujukian and his colleagues implanted multiple electrodes inside the brains of two rhesus macaques. The team then taught the monkeys to type each letter when given a specific prompt. (The old saw is that given a typewriter and an infinite amount of time and paper, a bunch of monkeys could type the entire works of William Shakespeare by random chance, but Nuyujukian and his colleagues were hoping for a more targeted effect.)

The team then prompted the monkeys one letter at a time to type the famous "To Be or Not to Be" speech from "Hamlet," as well as snippets of newspaper articles from the New York Times. The monkeys were able to type at about 12 words per minute — certainly not as speedy as the best typists but fast enough to sustain conversation, the researchers reported Sept. 12 in the journal Proceedings of the IEEE.

## Talking quickly

Of course, people will be not just transcribing words but presumably thinking of them, and may also be trying to talk in busy environments, which could increase the time it takes for the system to work.

"What we cannot quantify is the cognitive load of figuring out what words you are trying to say," Nuyujukian said.

Though the relatively slow typing speed means people who use the system would likely be conversing more slowly, there are ways to offset the speed limitation, the researchers said.

"We're not using auto completion here like your smartphone does where it guesses your words for you," which could speed up the system, Nuyujukian said.

What's more, these brain implants can remain in place safely for at least four years — the macaques experienced no side effects and showed no brain abnormalities over that length of time, the study found. The newest version of this brain-computer interface is currently being tested in humans in clinical trials, the researchers said.

***http://bit.ly/2ddwUqN***

## Artificial intelligence reveals mechanism behind brain tumor

***Researchers at Uppsala University have used computer modelling to study how brain tumours arise.***

The study, which is published in the journal EBioMedicine, illustrated how researchers in the future will be able to use large-scale data to find new disease mechanisms and identify new treatment targets.

The last ten years' progress in molecular biology has drastically changed how cancer researchers work. Instead of almost exclusively using different biological models, like cells, today large-scale statistical analyses are increasingly used to understand tumour diseases and find new therapies.

Researchers at Uppsala University, together with colleagues at the University of Gothenburg, Chalmers University of Technology and University of Freiburg, have developed a new algorithm, aSICS, that uses large amounts of data to suggest hypotheses about "what causes what" in a cancer cell.

In the study published today the researchers used aSICS to interpret data from brain tumours and they could identify a new mechanism behind mesenchymal glioblastoma, an extra aggressive brain tumour type.

'According to the computer model, mesenchymal glioblastoma is partly caused by alterations in a gene called Annexin A2. To validate the relevance of this prediction we examined samples from patients and could show that mesenchymal glioblastoma have an increased activity of Annexin A2. Subsequently, we tested to inhibit the expression of Annexin A2 in cancer cells from patients and found that the cancer cells either died or changed to a less aggressive form, says Sven Nelander at the Department of Immunology, Genetics and Pathology at Uppsala University,' who has led the study together with a colleague in Freiburg.

The results show that data analyses can be used to predict which genes or proteins influence the development of a tumour, and then confirm the prediction with experiments in the lab. The aSICS method has also been tested on other kinds of cancer, with promising results, although further studies are needed to fine-tune the settings.

*Teresia Kling, Roberto Ferrarese, Darren Ó hAilín, Patrik Johansson, Dieter Henrik Heiland, Fangping Dai, Ioannis Vasilikos, Astrid Weyerbrock, Rebecka Jörnsten, Maria Stella Carro, Sven Nelander. Integrative Modeling Reveals Annexin A2-mediated Epigenetic Control of Mesenchymal Glioblastoma. EBioMedicine, 2016; DOI: 10.1016/j.ebiom.2016.08.050*

***http://wb.md/2dmiz0s***

## Choosing Commercial or Compounded Medicines

***Use of commercially available products to treat patients is basic recommendation***

**Richard M. Plotzker, MD September 20, 2016**

My professional organization, the Endocrine Society, issued a brief statement[1] about 2 months ago on the role of individually compounded products custom-made by trained pharmacists to physicians' specifications. To distill what must have been arduous professional deliberations and literature reviews, the committee basically recommended just using commercially available products to treat patients.

Unfortunately, in order to be invited to a committee of that distinction, the members would be expected to have experience in testing commercial products—which they did and included in their financial

disclosures. This might leave room for a certain amount of finger-pointing from compounding pharmacists, but there's no credible challenge to the genuine expertise of the committee members.

However, a very real question remains. Are the medicines that we usually prescribe really good enough, or might there be room for improvements that never make it to the patients who might benefit because large-scale developments to assure safety and efficacy have gotten beyond the reach of individual innovators?

At one time, all medicinals were custom-assembled. Most US high schoolers, myself among them, had to either delight in or suffer through Shakespeare's Romeo and Juliet, which included a bit part for the apothecary who was asked to create not a curative substance, but a poisonous one.

Over the centuries, if you were wounded in war, somebody would create some form of Atomic Balm to apply over broken skin for a combination of relief and healing. People figured out that foxglove might have some cardiac benefit and that rauwolfia could lower blood pressure—sometimes a good tradeoff for suicidal ideation, sometimes not.

But for every successful innovation, there were others that probably enabled a certain amount of human experimentation without what we would regard as informed consent.

Thorough analysis of safety did not really appear until legislation mandated it, starting with the Pure Food and Drug Act of 1906, which required products to contain what the label said they did. Subsequent additions were directed at products not being unsafe even if they were labeled accurately. In the 1960s, products were required to be not only safe but also efficacious.

Regulation has had both favorable and unfavorable consequences. Our products are well-tested. Barriers to just anybody entering the market have enabled the many innovative therapeutic options that we enjoy (though often at premium prices) to commonly manage diseases that were once fatal or disabling.

Some products still get pulled from the market as safety concerns emerge that were not apparent in testing. Such was the case with Synthroid® in the 1990s. This otherwise respected product had a manufacturing glitch: The pills that were perfectly fine in an amber tube degraded while sitting atop reflective foil in the sample blister packs, which were distributed to physicians' offices. The company representative had the unenviable task of coming to my office and confiscating all my samples.

So, as the committee concluded, we have quite a lot of good products that can manage most patients reasonably safely and that are made by companies that are fully accountable for their quality.

However, this doesn't really address the question of whether we really have as many products as we should if we create barriers to new options. That's where the advocates of compounding emerge. Because physician prescribers order the custom product, these specific custom adaptations are part of the wish lists that physicians often have.

One of the classics of endocrinology would be the treatment of thyrotoxic crisis in a critically ill NPO patient in the intensive care unit. It would be nice to have a parenteral thionamide for these patients, but there is no commercial value to its development.

The dire need of the patient demands something that doesn't exist, so we adapt what is available by having the hospital pharmacist modify propylthiouracil so that it can be administered rectally. It is a form of custom compounding, though one driven more by desperation than trendiness.

For some medicines, the optimal dose falls between the available pill strengths, so there may be a very legitimate reason to tweak something that has already been deemed appropriate treatment.

However, there is quite a difference between minor modifications to meet a specific need and the more widespread issue of compounding custom products on the basis of a prescriber's druthers—bypassing the known safety and efficacy of available products that would at least be good enough, if not optimal.

We also can't overlook the role of compounding in what seems like one of commercial medicine's soft underbellies: profiteering without regard to patient need. As a prolific prescriber of diabetic testing supplies for very mainstream management of the often challenging patients with diabetes who get referred to specialty care, forms to obtain test strips await my signature in sufficient volume.

About a year or two ago, more of those forms than I care to count started arriving, prefilled by the company for more frequent testing than medically justified, along with prefilled requests for compounded wound creams and topical analgesics where I was clearly not the expected prescriber.

Many of my patients had no pain problems or chronic wounds. These forms would invariably derive from companies that I had not heard of despite my years of experience.

Sometimes, all it takes is a busy provider who needs to move through forms quickly in order to spend more time in the exam rooms to get snookered into authorizing something that is lucrative to the supplier but was not requested by the treating physician at all.

My response to this was to cross out the unwanted product and handwrite "OMIT THIS" or to send the form back unsigned, with a request for a blank form. Somebody must have done some whistle-blowing, because these requests, once common, have slowed to a trickle.

Was the distinguished panel of the Endocrine Society correct in their judgment?

I think that fundamentally, they were. Unless we have an uncommon specific problem to solve, the commercial products with demonstrated safety and efficacy—or at least knowing what to expect for medicines that have serious but known adverse effects—have an advantage over those for which claims are made without presenting evidence.

*Santoro N, Braunstein GD, Butts CL, Martin KA, McDermott M, Pinkerton JV. Compounded bioidentical hormones in endocrinology practice: an Endocrine Society scientific statement. J Clin Endocrinol Metab. 2016;101:1318-1343.*

***http://bit.ly/2ddDbZO***

# World's hardiest animal has evolved radiation shield for its DNA

***They are the toughest known animals on Earth and now the secret to one of their superpowers – resistance to radiation – is out.***

**By Andy Coghlan**

Tardigrades, also known as water bears or moss piglets, are tiny, eight-legged creatures that live in small bodies of water in habitats such as moss across the planet and are renowned for their extreme survival skills. They can survive in the vacuum of outer space, withstand temperatures ranging from close to absolute zero to nearly 100°C, cope with pressures six times greater than those at the bottom of the deepest ocean and survive dehydration and being frozen for years on end.

***Extreme survival skills*** **Meckes + Ottawa/SPL**

They can also defy hefty amounts of radiation that would be lethal to most other life on the planet – and now we know how they do it.

It is mainly down to a bizarre protective protein they evolved that somehow shields their DNA from radiation damage. Short for "Damage suppressor", Dsup appears to work by physically cuddling up to DNA and cocooning it from harm, but without disrupting its normal functions. It may also help by somehow mopping up DNA-damaging agents called reactive oxygen species.

"We guess that Dsup binds densely to DNA to provide a shield against environmental stress, somehow making DNA inaccessible to any damaging agents," says Takekazu Kunieda at the University of Tokyo. "To our knowledge, this is the first identification of a DNA-associating protein which confers DNA protection and improved tolerance to radioactivity in animal cells."

Kunieda and his colleagues discovered Dsup after sequencing the genome of *Ramazzottius varieornatus*, one of the most stress-tolerant tardigrade species. To their surprise, the protein also protected human kidney cells against radiation damage when the cells were genetically engineered to make Dsup themselves.

"The human cells that made Dsup saw a reduction of around 40 to 50 per cent in the DNA damage caused by X-rays compared with control cells," says Kunieda. This protection disappeared almost completely when his team used RNA to sabotage the *Dsup* gene, demonstrating that it is the key protective factor.

Kunieda says that transferring the *Dsup* gene into animals through genetic engineering might increase their resistance to radiation damage, although this would be trickier to do in a whole animal than in lab cultures of individual cells. "As Dsup improved the radiation-tolerance of human cultured cells, I hope it might be possible to improve the radiation-tolerance of individual animals," he says.

Applications in the distant future might protect healthy human cells from cancer treatment or cosmic rays. "It could be helpful for space flight, radiotherapy and radiation workers in the far future," says Kunieda.

But just because more cells could theoretically survive in a Dsup-producing animal, this would not guarantee the animal's survival, as some vital cells and organs might be lost despite the improved DNA protection, he says.

Trawling through the tardigrade genome, Kunieda also found that the animals have extra copies of other protective genes. They have 16 copies of enzymes that neutralise reactive oxygen species compared with just 10 in most other creatures, and four copies of *MRE11* genes that repair DNA instead of the single copy normally found in animal cells.

A 2015 study concluded that tardigrades had scavenged up to one-sixth of their DNA - and many of their protective genes - from bacteria and other organisms by a process called horizontal gene transfer. It was unclear how they would have done that, but we do know that their DNA breaks into small pieces when they are desiccated, while their nucleus becomes leaky when they rehydrate, perhaps allowing the entry of foreign DNA that could then mix with the water bear's own genes.

We know horizontal transfer happens occasionally , but most cases involve less than 1 per cent of an organism's genes. If water bears could really steal such a large proportion of DNA from other organisms, this would change how we think about evolution and the inheritance of genetic material: the tree of life would become a web with genes crossing between branches.

But that evidence was disputed earlier this year — the putative foreign DNA may have just been the result of sample contamination. That study found instead that water bears have only around 1 per cent of foreign genes, as one would expect.

Now, Kunieda's team have also found that, while some protective genes were imported — such as those producing enzymes that detoxify reactive oxygen species — most were "home-grown".

"It lays to rest the proposal that tardigrades acquired their extreme survival biology through massive acquisition of genes from other species," says Mark Blaxter at the University of Edinburgh, UK.

*Journal reference: Nature Communications, DOI: 10.1038/ncomms12808*

***http://bit.ly/2cZoyFY***

## Companies use instincts to elicit behavior from consumers, employees

***The obvious strategy for a clothing retailer is to have as much product on the sales floor as possible to yield high sales. The clothing needs to be available to be bought, right?***

For women, it turns out, that's a counterproductive strategy. Research shows that women want to feel a sense of individuality when buying clothes. They don't want to know that hundreds of other women in town also bought that dress.

The clothing store, Zara, capitalized on this instinctual behavior by limiting the quantity of items and regularly moving those items around the store, so each time a woman shops at Zara, she's not sure whether those pants she loved last time will be there or if they'll ever go on sale. This tactic makes her think that she should buy them as soon as possible or they might be gone.

Purdue University Professor Karthik Kannan calls the concept employed by Zara "design for instincts," and it has far-reaching effects, from creating products to developing processes for multinational corporations.

As businesses grow in this age of rapid technology changes, they're having to pivot more quickly as technological innovation happens. Design for instincts essentially tells businesses they need to stop and consider the consumer -- and human nature -- to be successful. This seems obvious, but it can get lost on our "next big thing" technology landscape.

"It's a very simple, but yet profound, concept," says Kannan, a professor in Purdue's Krannert School of Management.

He will explore how the concept may play into the future economy and how to best prepare the next generation for it during his presentation at Dawn or Doom '16, a conference on the risks and rewards of new technology at Purdue University. Dawn or Doom will be held Monday and Tuesday, Oct. 3 and 4, on the Purdue West Lafayette campus.

A focus on human instincts also is important to major companies like General Electric, a big employer of Purdue graduates, both from the perspective of its customers and its employees. To keep up with rapid change, and to attract top talent, GE decided it would have to develop intentional and dynamic processes and policies. This led to the technique called "FastWorks."

FastWorks incorporates a cross-section of departments to form teams that are then in constant communication with the consumer. This way, they're better able to stay on top of what works and what doesn't, regardless of trends.

"It's thinking about what the consumer need is and designing systems with their input," Kannan says. "Before they would do all the deep data dives and then figure out what best to do. They're now saying, 'Let me go ask the consumer;' it's about understanding the end user."

Employee policy-wise, GE is trying something less common in companies of its size and maturity, but in place routinely at some startups in Silicon Valley: unlimited vacation days. The idea is that managers and executives are responsible for seeing that what needs to get done gets done, and as long as it does work schedules are fluid. Kannan says this appeals to an employee's instinctual desire to be independent in their job.

He thinks that soon we'll see many traditional jobs become much like jobs at GE and at tech startups. They'll require a "value-add" component, where employees need to be constantly innovating and finding new ways of reaching consumers, are adept at teamwork and have a level of freedom in their work that would have seemed odd in the past.

*Purdue University. "Companies use instincts to elicit behavior from consumers, employees." ScienceDaily. ScienceDaily, 20 September 2016.*
*www.sciencedaily.com/releases/2016/09/160920135813.htm.*

***http://bit.ly/2csDnP8***

## Health benefits of evening classes revealed

***Scientists have confirmed that taking part in the weekly sessions can boost wellbeing, regardless of the subject studied.***

Those with a taste for adult education classes have long known it, but now Oxford University scientists have confirmed that taking part in the weekly sessions can boost wellbeing -- regardless of the subject studied.

In partnership with the Worker's Educational Association (WEA), the largest voluntary sector provider of adult education in England and Scotland, a team from Oxford's department of experimental

psychology studied attendees at seven separate day-time adult education classes. Their findings are published in a series of papers.

Each class took place over seven months and included a break in the middle. Attendees completed questionnaires before and after their class three times over the seven months: at the beginning of their courses, after 3 months, and at the end of the seven months. Participants were involved in one of three activities: singing, crafts or creative writing.

Overall, attendees at all seven classes had improved mental and physical health and reported more satisfaction with their lives at the end of their courses.

Dr Eiluned Pearce led the research. She said: 'The students reported benefits including increased self-confidence, a greater feeling of control over their lives and more willingness to take on new challenges. Some said the classes made them more motivated to be more active, despite the classes not specifically involving physical activity.

'Participants also said that the classes broadened their networks of friends and gave them an increased sense of belonging. We also found that the more someone felt part of their group, the more their health and wellbeing improved.'

An intriguing finding was in the singing and creative writing classes. Building on the results of an earlier paper from the same study, which found that people in singing classes felt closer to their group more quickly than those in the other classes, the team looked at how relationships formed between individuals in the classes. Each person was asked to name those other people in the class whose name they could remember, whether or not they felt connected to each person they named, and whether they had talked to that person during class.

Dr Pearce said: 'The results showed that those in the singing and creative writing groups built up relationships with other individuals more quickly than the crafters, and singers felt more connected to the class as a whole more quickly than both the other groups.

'While this confirms our earlier finding that singing has an 'ice-breaker effect' compared to other activities, it shows that other activities may enable people to increase their social networks just as much, even if it takes them longer to feel connected to their group as a whole.'

Co-author Dr Jacques Launay adds: 'While much of our previous work has demonstrated the importance of music, it is likely that the most socially bonding activities are always those that are personally chosen and enjoyed. This research adds to growing support for the relevance of creative activities in creating happy communities and improving health and well-being, with consequent benefits for public services and society.'

Dr Pádraig Mac Carron, Dr Anna Machin and Professor Robin Dunbar were also involved in the research.

Howard Croft, WEA Regional Education Manager, said: 'The findings reiterate the feedback that we have had from our students over the years: learning is a fantastic way to boost your self-esteem and confidence. Also of note, is its therapeutic effect. For many students, creative courses are a means of finding a new outlet for expressing their feelings. This can be of immense help during times of personal difficulty or emotional upheaval, such as divorce or bereavement. Simply going to a course can offer much-needed respite.

'For others, learning can be an opportunity to reignite a former passion. This could be anything from a subject which you enjoyed at school to an area which you are interested in. Whatever your reason, there are so many benefits to be gained by signing up to a course.'

1. *Eiluned Pearce, Jacques Launay, Anna Machin, Robin I. M. Dunbar*. ***Is Group Singing Special? Health, Well-Being and Social Bonds in Community-Based Adult Education Classes***. Journal of Community & Applied Social Psychology, *2016; DOI: 10.1002/casp.2278*

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3. *E. Pearce, J. Launay, P. MacCarron, R. I. M. Dunbar*. ***Tuning in to others: Exploring relational and collective bonding in singing and non-singing groups over time***. Psychology of Music, *2016; DOI: 10.1177/0305735616667543*

http://bit.ly/2cZc82j

# Can nicotine protect the aging brain?

***Everyone knows that tobacco products are bad for your health.***

Everyone knows that tobacco products are bad for your health, and even the new e-cigarettes may have harmful toxins. However, according to research at Texas A&M, it turns out the nicotine itself -- when given independently from tobacco -- could help protect the brain as it ages, and even ward off Parkinson's or Alzheimer's disease.

***Nicotine molecular structure. Texas A&M research shows how this component of cigarettes might actually be beneficial on its own.***

**Credit: © Dario Lo Presti / Fotolia**

Ursula Winzer-Serhan, PhD, an associate professor at the Texas A&M College of Medicine, and her collaborators found that nicotine's ability to be neuroprotective may be partly due to its well-known ability to suppress the appetite. Their research is published in the Open Access Journal of Toxicology.

Using animal models, Winzer-Serhan and her collaborators added nicotine to the animal's drinking water. There were three different groups that received nicotine at three different concentrations (low, medium and high) corresponding to occasional, low and medium smokers, respectively, in addition to a control group that did not receive any nicotine.

The two groups that received nicotine at low and medium doses didn't show any levels of the drug in their blood and they experienced no changes in food intake, body weight or number of receptors in the brain where nicotine acts.

In contrast, the group getting the highest concentration of nicotine ate less, gained less weight and had more receptors, indicating that at higher doses, the drug gets into the brain where it can impact behavior. However, even at high doses, it didn't seem to have worrying behavioral side effects like making the individuals more anxious, which the researchers were concerned could happen.

"Some people say that nicotine decreases anxiety, which is why people smoke, but others say it increases anxiety," Winzer-Serhan said. "The last thing you would want in a drug that is given chronically would be a negative change in behavior. Luckily, we didn't find any evidence of anxiety: Only two measures showed any effect even with high levels of nicotine, and if anything, nicotine made animal models less anxious."

The next step is to test nicotine's potential anti-aging effects using aged animal models.

Although early results indicate that nicotine can keep older individuals from gaining weight like the control group does, Winzer-Serhan hasn't yet determined whether this lower body mass index translates into less degeneration of the brain.

It is also unclear if nicotine's effects are related only to its ability to suppress appetite, or if there are more mechanisms at work.

Because there are still so many unknowns, Winzer-Serhan urges caution. "I want to make it very clear that we're not encouraging people to smoke," she said. "Even if these weren't very preliminary results, smoking results in so many health problems that any possible benefit of the nicotine would be more than cancelled out.

However, smoking is only one possible route of administration of the drug, and our work shows that we shouldn't write-off nicotine completely."

Still, Winzer-Serhan cautions people not to purchase nicotine-containing products just yet. "Although the results are intriguing, we would need large-scale clinical trials before suggesting anyone change their behavior," she said. "At the end of the day, we haven't proven that this addictive drug is safe -- and it certainly isn't during childhood or adolescence -- or that the benefits outweigh the potential risks."

*See the full report at: http://juniperpublishers.com/oajt/pdf/OAJT.MS.ID.555552.pdf*

http://bit.ly/2cV3XXt

# The most detailed look yet at how early humans left Africa

**By Emily Benson**

All non-Africans living today can trace the vast majority of their ancestry to a group of pioneers who left Africa in a single wave, tens of thousands of years ago. We still don't know the exact timing of that migration, precisely where it began, nor the details of movements and how individual populations developed within Africa.

But the discovery of a single exit is a major advance in illuminating the earliest days of humanity's global sprawl, says Joshua Akey at the University of Washington in Seattle.

"The more we understand about this particular event in human history, the more it provides a complete picture of our past," he says.

Modern humans arose in Africa, but where and when our earliest ancestors went next has been fiercely debated. Did they leave that continent in just a single wave, between 40,000 and 80,000 years ago, or in multiple pulses, beginning tens of thousands of years earlier?

Successful explorers

Archaeological finds show that humans were living outside Africa more than 100,000 years ago, Akey says, but many of these groups died out. The migrants who survived, however, passed their DNA to their descendants. To track those successful explorers, scientists turned to the genetic evidence buried in the cells of modern humans.

Developing a fuller picture of our ancestry requires the study of a range of diverse human populations. Collectively, the authors of three new studies took on that challenge by analysing the genomes of 787 people from more than 270 populations scattered across the globe.

Genetic similarities between populations show clear evidence for a single exit from Africa, says David Reich at Harvard University. Reich and his colleagues also determined that our African ancestors had already begun diverging into separate groups 200,000 years ago.

The researchers also looked for a mutation that might have occurred between 50,000 and 80,000 years ago, when human technology and culture took off, with advances in art, burial rituals and tool use.

But the team failed to find a genetic smoking gun, suggesting that progress was instead propelled by an environmental or lifestyle change, Reich says. "This genetics study sort of unseats genetics as a driving force behind the big changes," he says.

## Climate factor

Environmental conditions, such as temperature and plant growth, may have prompted some early human migrations (see box below). And geographical barriers such as mountains and deserts may have kept populations separate, perpetuating genetic differences around the world, according to another of the genetics studies, led by Luca Pagani and Mait Metspalu at the Estonian Biocentre in Tartu.

Pagani and Metspalu and their colleagues also concluded that most modern non-Africans are descended from a single, out-of-Africa migration. But about 2 per cent of the genome of people from Papua New Guinea comes from an earlier exodus, Pagani says.

"We see vestiges of an earlier out-of-Africa expansion," Metspalu says. But, in the end, the main migration almost completely overwhelmed that small, early wave, he adds.

In the first comprehensive study of genetic diversity among Indigenous Australians, Eske Willerslev at the University of Copenhagen in Denmark and his colleagues found that different indigenous groups within Australia are genetically quite distinct, but that they are all descended from a single, founding wave of people from Africa.

## Diabetes clues

Because Indigenous Australians are prone to diabetes, studying their DNA could explain the genetic drivers behind the disease, Willerslev says. "They could potentially hold the key as to why other non-Africans also have diabetes," he says.

That kind of medical insight is one reason to delve into humanity's genetic history, says Akey. Another is simple curiosity about where we came from. But solving that riddle will require contributions from fields outside genetics, too, Akey says, such as archaeology and ecology. "People are just inherently interested in their past," he says.

*Journal references: Nature, DOIs: 10.1038/nature18299; 10.1038/nature18964; 10.1038/nature19792; 10.1038/nature19365*

***http://bit.ly/2djMCqP***

## Earth Wobbles May Have Driven Ancient Humans Out of Africa

***Ancient human migrations out of Africa may have been driven by wobbles in Earth's orbit and tilt that led to dramatic swings in climate, a new study finds.***

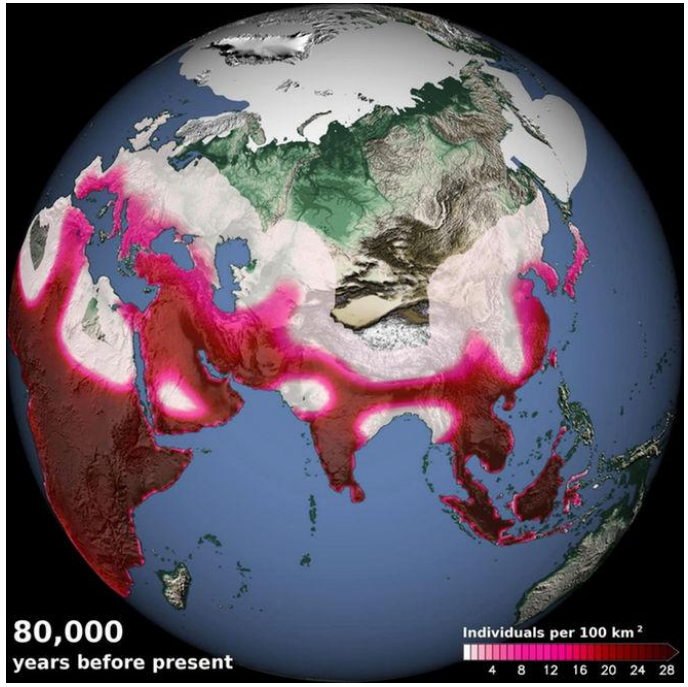
**By Charles Q. Choi, Live Science Contributor**

Modern humans first appeared in Africa about 150,000 to 200,000 years ago. It remains a mystery as to why it then took many millennia for people to disperse across the globe. Recent archaeological and genetic findings suggest that migrations of modern humans out of Africa began at least 100,000 years ago, but most humans outside of Africa most likely descended from groups who left the continent more recently — between 40,000 and 70,000 years ago.

Previous research suggested that shifts in climate might help explain why modern human migrations out of Africa happened when they did. For instance, about every 21,000 years, Earth experiences slight changes to its orbit and tilt. These series of wobbles, known as Milankovitch cycles, alter how much sunlight hits different parts of the planet, which in turn influences rainfall levels and the number of people any given region can support.

Now scientists have developed a new computer simulation of Earth to pinpoint how these changes in orbit and solar radiation levels might have affected rainfall, temperature, sea levels, glacial ice, vegetation, carbon dioxide levels and global modern human migration patterns over the past 125,000 years. The researchers noted that this model's predictions agree well with previous findings regarding ancient climates.

The model suggests that modern humans dispersed from Africa in multiple waves across the Arabian Peninsula and the area known as the Levant, the eastern Mediterranean region that includes Israel and Syria. These results closely align with previous estimates garnered from archaeological and fossil data of when modern humans arrived in areas such as the Middle East, Europe, Asia, Australia and the Americas.




***A computer model simulated human density 80,000 years ago, showing the arrival of humans in eastern China and southern Europe as well as migrations out of Africa along vegetated paths in Sinai and the Arabian Peninsula.*** **Tobias Friedrich**

"Earth's wobble with a periodicity of 21,000 years played a huge role in our dispersal across the planet and most likely also in our evolution and adaptation," said study lead author Axel Timmermann, a climate researcher at the University of Hawaii at Manoa. "If the climate had been constant over the past 125,000 years, we would have evolved in a very different way."

Specifically, the researchers found that intensified rainfall in northern Africa, the Arabian Peninsula and the Levant would have generated habitable green corridors for modern humans to migrate through the Sahara and Arabian deserts. These corridors would have been open

during four distinct times — about 106,000 to 94,000 years ago; 89,000 to 73,000 years ago; 59,000 to 47,000 years ago; and 45,000 to 29,000 years ago — "enabling *Homo sapiens* to leave northeastern Africa and embark onto their grand journey into Eurasia, Australia and the Americas," Timmermann told Live Science.

The model suggests these migrations were not one-way in nature away from Africa, "as is often portrayed in schematics," Timmermann said. "A green migration corridor between Africa and the eastern Mediterranean meant that Africans were migrating into Eurasia, and Eurasians were moving into Africa. The backflow of *Homo sapiens* into certain regions and the corresponding backflow of genes may be crucial for understanding who we are, why we are, where we are."

The model also suggests that modern humans should have arrived nearly simultaneously in southern China and Europe about 80,000 to 90,000 years ago. However, the oldest-known modern human fossils in southern China predate the oldest-discovered modern human fossils in Europe by about 35,000 to 40,000 years. The researchers proposed that the slow entry of modern humans into Europe might have been due to Neanderthals there.

In the future, "I am planning to include Neanderthals in our computer model" and account for factors such as interbreeding, cultural exchange and competition over food, Timmermann said.

Timmermann and his colleague Tobias Friedrich at the University of Hawaii at Manoa detailed their findings in the Sept. 22 issue of the journal Nature.

***http://bit.ly/2cu4lWu***

## 1,700-Year-Old Dead Sea Scroll 'Virtually Unwrapped,' Revealing Text

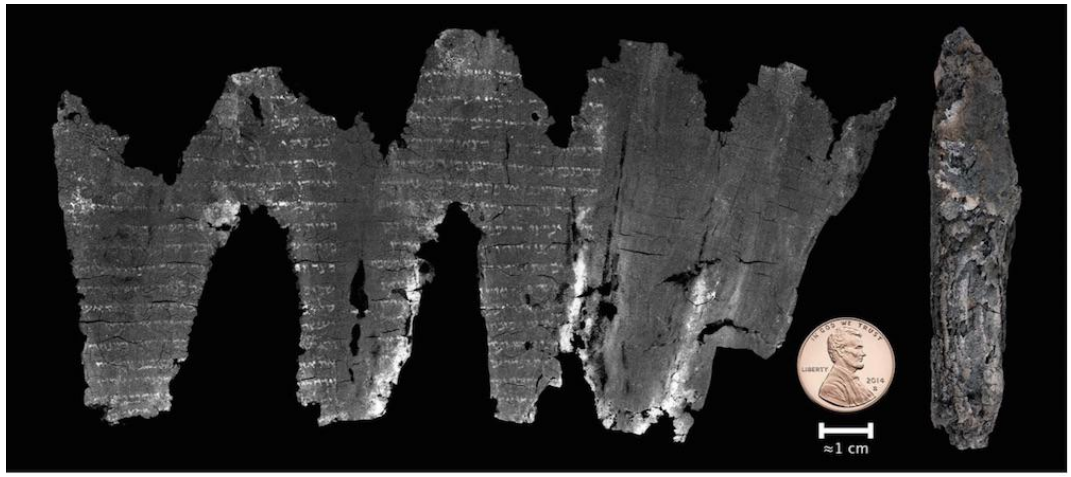
***The En-Gedi scroll, a text that includes part of the Book of Leviticus in the Hebrew Bible that was ravaged by fire about 1,400 years ago, is now readable, thanks to a complex digital analysis called "virtual unwrapping."***

**By Laura Geggel, Senior Writer | September 21, 2016 02:28pm ET**

Rather than physically unfurl the scroll, which would have destroyed the crumbling artifact, experts digitally scanned the document, and then virtually flattened the scanned results, allowing scholars to read its ancient text.

"We're reading a real scroll," lead study author Brent Seales, professor and chairman in the department of computer science at the University of Kentucky, said in a news conference yesterday (Sept. 20). "It hasn't been read for millennia. Many thought it was probably impossible to read."

The charred scroll from En-Gedi (right) that experts digitally unfurled (left).




***The charred scroll from En-Gedi (right) that experts digitally unfurled (left). From Seales et al., Sci. Adv. 2:e1601247 (2016). Distributed under a Creative Commons Attribution Non Commercial License 4.0 (CC BY-NC).***

Archaeologists found the scroll in 1970 in En-Gedi, where an ancient Jewish community thrived from about the late 700s B.C. until about A.D. 600, when a fire destroyed the site, the researchers said. Excavations of the synagogue's Holy Ark, a chest or cupboard that holds the Torah scrolls, revealed charred scrolls of parchment, or animal skin. But each scroll was "completely burned and crushed, had turned into chunks of charcoal that continued to disintegrate every time they were touched," the researchers wrote in the study.

The En-Gedi scroll is different than the original Dead Sea Scrolls, which a young shepherd discovered in caves near Qumran in the Judean Desert in 1947. However, Dead Sea Scroll has become an umbrella term for many ancient scrolls found in the area, and some researchers also call the En-Gedi artifact a Dead Sea Scroll.

The scorched En-Gedi scroll fragments sat in storage for more than 40 years until experts decided to give them another look, and try the newly developed "virtual unwrapping" method for the first time on the scroll.

The virtual journey began in Israel, where experts digitally scanned the rolled-up scroll with X-ray-based micro-computed tomography (micro-CT). At this point, they weren't sure whether the scroll had text within it, said study co-author Pnina Shor, curator and head of the Dead Sea Scrolls Projects at the Israel Antiquities Authority. So, they increased the spatial resolution of the scan, allowing them to capture whether or not each layer had detectable ink.

Their exhaustive attention to detail paid off: There was ink, and it likely contained metal, such as iron or lead, because it showed up on the micro-CT scan as a dense material, the researchers said.

However, the text was illegible. So Shor and her colleagues in Israel sent the digital scans to Seales in Kentucky so he and his team could try the new "virtual unwrapping" technique.

"It was certainly a shot in the dark," Shor said.

**Virtual unwrapping**

This new method marks the first time that experts have virtually unrolled and noninvasively studied a severely damaged scroll with ink text, Seales said. The unwrapping took time and involved three steps: segmentation, texturing and flattening, he said. With segmentation, they identified each segment, or layer, within the digital scroll, which had five complete revolutions of parchment in the scroll. Then, they created a virtual geometric mesh for each layer made of tiny, digital triangles. They were able to manipulate this mesh, which helped them "texture" the document, or make the text more visible.

"This is where we see letters and words for the first time on the recreated page," the researchers wrote in the study.

Finally, they digitally flattened the scroll, and merged the different layers together into one, flat 2D image that could easily be read.

**Book of Leviticus**

The scroll holds the beginning of the Book of Leviticus, the third of the five books of Moses (known as the Pentateuch) that make up the Hebrew Bible, biblical scholars said. In fact, the En-Gedi scroll contains the earliest copy of a Pentateuchal book ever found in a Holy Ark, the researchers said.

The virtual unwrapping revealed two distinct columns of text that include, in total, 35 lines of Hebrew. Each line has 33 to 34 letters. However, there are only consonants, no vowels. This indicates that the text was written before the ninth century A.D., when Hebrew symbols for vowels were invented, said study co-author Emanuel Tov, a professor emeritus in the department of Bible at Hebrew University of Jerusalem.

Radiocarbon dating places the scroll in the third or fourth century A.D., but studies based on historical handwriting place it at either the first or second century A.D., the researchers said. Regardless, the data suggest that it was written within the first few centuries of the Common Era, they said. These dates make the En-Gedi scroll slightly younger than the original Dead Sea Scrolls, which were written between about 200 B.C. and A.D. 70.

"Hence, the En-Gedi scroll provides an important extension to the evidence of the Dead Sea Scrolls and offers a glimpse into the earliest stages of almost 800 years of near silence in the history of the biblical text," the researchers wrote in the study.

Moreover, the En-Gedi text is "completely identical" to the text and paragraph breaks found in medieval Hebrew Bibles, which are known as the Masoretic text, a text that is still used today. In antiquity until the first century B.C., there were an "endless number of textual forms" of the Masoretic text, earning them the name "proto-Masoretic," Tov

said. But the En-Gedi finding suggests that the standard Masoretic text coalesced relatively early, he said. "This is quite amazing for us," Tov said. "That in 2,000 years, this text has not changed." The study was published online today (Sept. 21) in the journal Science Advances.

***http://bit.ly/2d0Vqsq***

## Iceman Killed After Sneak Attack From Behind

***The murder of Ötzi the Iceman was likely committed at the end of a harsh personal conflict, researchers at a three-day mummy congress in Bolzano, north Italy, concluded.***

**By Rossella Lorenzi, Discovery News**

Launched to celebrate the 25th anniversary of the Iceman's discovery in the Ötztal Alps in South Tyrol, the meeting presented new insights on the 5,300-year-old mummy, including a profile carried out with latest criminological methods.

According to this analysis, Ötzi did not flee up the mountain to escape his enemies. On the contrary, he was just resting and taken by surprise by his attacker(s) who shot the arrow from behind and at a distance.

The theory is the latest of a series of speculations over Ötzi's death. No corpse has been more thoroughly investigated.

"In terms of his significance for science, Ötzi is not simply an isolated mummy discovery. He could be seen as a typical European from earlier times and is precious for this reason alone," Albert Zink, director at the EURAC Institute for Mummies and the Iceman in Bolzano, said.

Scientists have learned a lot about Ötzi in the past 25 years. Among many things, they discovered that he had brown eyes, was about 5 foot, 3 inches tall and weighed 110 pounds.

He died at around 45, was arthritic, lactose intolerant, suffered from atherosclerosis and had cavities, worn teeth and periodontal diseases. He was also infected with Helicobacter pylori, the pathogen that gives people gastritis and stomach ulcers. Genetic tests revealed he belonged to the European haplogroup K and was probably infertile.

"What concerns us most these days is to know who the Iceman was, what role he played in society and what happened to him in the last days of his life," said Angelika Fleckinger, director of the South Tyrol Museum of Archaeology where the mummy is housed in refrigerated cell with an observation window.

To help solve the coldest of cold cases, Fleckinger asked chief inspector Alexander Horn, at the Criminal Investigation Department in Muinch, Germany, to probe the "Ötzi Murder Case" using behavioral investigative analysis.

Horn began his inquire by examining the crime scene as it appeared on Sept. 19, 1991 when a human corpse was found near a melting glacier in the Ötztal Alps. The corpse was lying with the chest against a flat rock. Only the back of the head, the bare shoulders and part of the back emerged from the ice and meltwater.

He reconstructed the crime scene with the objects that were found in the vicinity and added to his analysis the data from the forensic medical examinations. "I actually had more information with Ötzi than in certain modern crime cases," Horn said.

The results of his investigation were that Ötzi did not feel threatened shortly before his murder. "He wasn't escaping, but resting. He had placed down his gear and enjoyed a hearty meal," Horn said.

Indeed, previous research established that Otzi had eaten Alpine ibex — a wild goat — just 30 minutes to 2 hours before his death.

"When you run away, you do not just sit and stop to eat a big meal," Horn told Discovery News.

He noted however that a few days prior to the murder, the Iceman had incurred an injury to his right hand. "The wound was the result of a defensive action during the course of a physical altercation. Since no other injuries could be found, we believe he came out as a winner from that hostile encounter," Horn said. Such conflict could explain the surprise attack a few days later. Anger might have mounted after the unsuccessful hand-to-hand fight in Ötzi's counterpart and a new attack was planned — by surprise this time.

According to Horn, the arrow shot appears to have been launched from a great distance in an act of treachery, taking Ötzi by surprise.

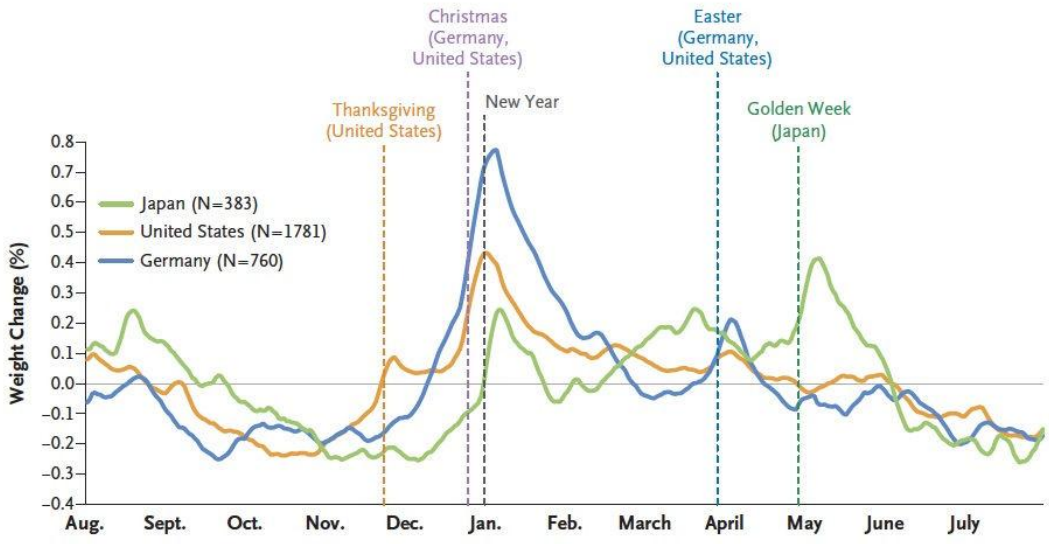
All his objects, including the valuable copper axe, remained at the crime scene —a fact that made Horn rule out theft as the reason of the killing. "A personal conflict is more likely. We are talking of a behavioral pattern that is also prevalent today in most murder cases. It starts with little things and it grows to the extreme," Horn said.

***http://bit.ly/2cw6Z2P***

## A Look at Holiday Weight Gain in 3 Countries

***Holiday weight gain isn't unique to the United States: A new analysis finds that people in Germany and Japan also pack on pounds during festive seasons.***

**By Sara G. Miller, Staff Writer | September 21, 2016 05:00pm ET**




***This image shows how people's average weights in three countries — Japan, the United States and Germany — changed over a one-year period.*** **The New England Journal of Medicine © 2016**

But unlike Americans, who gain a lot of weight during Thanksgiving, people in other countries put on pounds at other "celebratory" times of the year, according to the study.

In the study, which was published today (Sept. 21) in the New England Journal of Medicine, the researchers gave wireless digital scales to nearly 3,000 participants in Germany, Japan and the United States.

Over 12 months starting on Aug. 1, 2012, the people in the study weighed themselves each day. At the end of the study period, the researchers used the scale data to calculate how each participant's weight changed over the course of the year, compared to their starting weights.

People in all three countries gained weight, on average, around Christmas, according to the study. Specifically, people's weight went up in the 10 days after Christmas compared to the 10 days before Christmas, the researchers found.

People's average weights also increased around national holidays in their countries. In Japan, for example, there was an increase in weight during a holiday period called Golden Week, which takes place around the beginning of May.

In addition, Germans saw a sharp uptick in weight around Easter, and Americans around Thanksgiving, the researchers found.

But the largest gains were over the Christmas-New Year holiday season, according to the study. During this time, the Germans in the study gained an average of 1.8 lbs. (0.8 kilograms); the Americans gained an average of 1.3 lbs. (0.6 kg); and the Japanese gained an average of 1.1 lbs. (0.5 kg).

The investigators, led by Elina Helander, a personal health informatics researcher at Tampere University of Technology in Finland, noted that shortly after the holidays, people shed about half of their holiday weight gain; however, the other half appears to remain until the summer or beyond.

To help people avoid gaining weight during this time of year, one approach is to advise patients to have better self-control over the holidays, the researchers wrote. "The less one gains, the less one then has to worry about trying to lose it," they wrote.

http://n.pr/2djATUE

# Breaking Taboo, Swedish Scientist Seeks To Edit DNA Of Healthy Human Embryos

***Easy and precise editing of DNA is making possible experiments with human embryos that raise a host of ethical questions.***

**Rob Stein/NPR**

Download

A scientist in Sweden has started trying to edit the DNA in healthy human embryos, NPR has learned. The step by the developmental biologist Fredrik Lanner makes him the first researcher known to attempt to modify the genes of healthy human embryos. That has long been considered taboo because of safety and ethical concerns.

Lanner is attempting to edit genes in human embryos to learn more about how the genes regulate early embryonic development. He hopes the work could lead to new ways to treat infertility and prevent miscarriages. He also hopes to help scientists learn more about embryonic stem cells so they can someday use them to treat many diseases.

The fear is that Lanner's work could open the door to others attempting to use genetically modified embryos to make babies.

Making changes to the DNA in human embryos could accidentally introduce an error into the human gene pool, inadvertently creating a new disease that would be passed down for generations, critics say.

Some also worry the experiments could open the door to so-called designer babies that would let parents pick and choose the traits of their children.

Lanner, however, says he is initially planning only to study the modified embryos for the first seven days of their growth and would never let them develop past 14 days. The potential benefits could be enormous, he argues.

"Having children is one of the major drives for a lot of people," Lanner says. "For people who do struggle with this, it can tend to become an extremely important part of your life."

Lanner also hopes to learn things that could help scientists who are trying to turn stem cells from human embryos into new treatments for diseases.

"If we can understand how these early cells are regulated in the actual embryo, this knowledge will help us in the future to treat patients with diabetes, or Parkinson, or different types of blindness and other diseases," he says. "That's another exciting area of research."

Fredrik Lanner (right) of the Karolinska Institute in Stockholm and his student Alvaro Plaza Reyes examine a magnified image of an human embryo that they used to attempt to create genetically modified healthy human embryos.

NPR recently got exclusive access to Lanner's labs at the Karolinska Institute in Stockholm to watch some of his early efforts.

During the visit, Lanner and a graduate student carefully thawed five embryos donated by couples who had gone through in vitro fertilization at the Karolinska University Hospital to try to have children.

One of the embryos didn't survive the freezing and thawing process. The researchers gingerly placed each of the remaining 2-day-old embryos into a dish on a special microscope.

"You need to be stable on your fingers and hands while doing this," Lanner said, quipping, "You don't want to be dropping the embryos while taking them out."

With Lanner looking on, the student injected one of each embryo's four cells with a genetic engineering tool known as CRISPR-Cas9 while holding the embryo in place with a thin glass rod.

The gene-editing tool comprises two molecules that can zero in on individual genes and make very precise changes to the DNA. It lets scientists modify DNA much more easily and precisely than ever before. Lanner calls the technique a "game changer."

"It's not just quicker or cheaper," Lanner says. "This actually opens the door to start to look at this for the first time, because we could not do this at all previously in the human embryo. The technology was

just not efficient enough to try to look at individual gene function as the embryo develops."

Lanner is planning to methodically knock out a series of genes that he has identified through previous work as being crucial to normal embryonic development. He hopes that will help him learn more about what the genes do and which ones cause infertility.

He declined to specify which genes he's targeting until the work is reviewed and published.

During the visit by NPR, one of the embryos got severely damaged when the injection needle got clogged. But the researchers successfully injected the remaining three embryos and placed them in an incubator to continue developing. One embryo divided again immediately after being injected, showing that it could still grow.

Two of the embryos survived in good enough shape to be analyzed later, Lanner explained in an email afterward.

Lanner has now done this on at least a dozen embryos, but is still studying his results and refining his techniques. He remains unsure how well the editing is working so far. However, he's confident he'll be able to modify individual genes in the embryos to determine their function.

"It will be very exciting. We're fortunate to be in this position," Lanner says. "This is a privilege to be in this position."

But just the act of attempting to edit the DNA in healthy human embryos is extremely controversial. Chinese scientists triggered an international uproar earlier last year when they tried to edit the DNA of human embryos even though they used only defective embryos that had no hope of developing.

Experiments like these intensified calls for a moratorium on such research, and the National Academies of Sciences, Engineering and Medicine launched the Human Gene-Editing Initiative to sort through the complex scientific and ethical issues they raise.

Organizers of an international summit convened in Washington, D.C., last year as part of that process concluded that it was far too early to try to create a baby from embryos that had their genes edited.

But the organizers said basic research like Lanner's could be acceptable. A final report from the gene-editing initiative is expected late this year or early next.

Still, not everyone agreed with the summit organizers' assessment. Some people have moral objections to doing any research on human embryos because they consider a human embryo to have the moral standing of a person.

And editing the DNA in embryos is controversial even among people who think human embryonic research is acceptable. That's the position of Marcy Darnovsky, who heads the Center for Genetics & Society, a watchdog group based in California that supports human embryonic research.

"The production of genetically modified human embryos is actually quite dangerous," Darnovsky says. "It's a step toward attempts to produce genetically modified human beings. This would be reason for grave concern."

One fear is that scientists could make some kind of mistake, accidentally creating new diseases that would be passed down for generations. "When you're editing the genes of human embryos, that means you're changing the genes of every cell in the bodies of every offspring, every future generation of that human being," Darnovsky says. "So these are permanent and probably irreversible changes that we just don't know what they would mean."

But even if it's safe, Darnovsky and others still worry about what designer babies would do to society.

"If we're going to be producing genetically modified babies, we are all too likely to find ourselves in a world where those babies are perceived to be biologically superior. And then we're in a world of genetic haves and have-nots," Darnovsky says. "That could lead to all sorts of social disasters. It's not a world I want to live in."

Lanner says he has no interest in ever doing anything like that. In fact, at the moment it would be illegal in Sweden. And, Lanner says, much more research would be needed to make sure it would be safe before anyone tries to use a genetically modified embryo to make a baby to prevent diseases.

"It's not a technology that should be taken lightly," he says. "So I really, of course, stand against any sort of thoughts that one should use this to design designer babies or enhance for aesthetic purposes."

But Lanner argues that basic research is necessary and morally acceptable, and banning it would be counterproductive.

"I think it's wise to be allowed to do fundamental research so we can gain more information about this technology and potentially use it in the future," he says.

Lanner plans to continue attempting to edit the DNA in healthy human embryos until he develops efficient editing techniques that will allow him to study the genes involved in early embryonic development. Scientists in Britain are planning to start similar experiments later this year.

Research using human embryos is legal in the U.S., but not with the support of federal funds. U.S. labs that are known to be active in human embryo research have not announced any plans to proceed with gene-editing experiments.

***http://bit.ly/2cCWokX***

## Biological 'dark matter' molecule plays surprise role in heart failure

***Scientists at UCLA have identified a molecule that appears to play a key role in the development of heart failure.***

**Jim Schnabel**

The scientists found that blocking the molecule, known as chaer, in animal studies prevented the animals from developing heart failure.

Although the research is still at an early stage, future drugs that target chaer or related signaling pathways may hold promise for treating or preventing heart failure, a condition that afflicts about 5.7 million people and is a contributing cause to roughly one in nine deaths in the United States. The results of the study were published in the journal Nature Medicine.

Chaer is not a protein; it is made of RNA, DNA's simpler cousin, and belongs to a category of RNA molecules called long non-coding RNA, or lncRNA. It's called "non-coding" because the molecules don't encode and get translated into proteins, as do other RNAs. Non-coding RNAs have been considered part of the "dark matter" of biology because they are abundant and diverse in cells, and the DNA that encodes them accounts for most of plant and animal genomes, yet their roles have been largely unexplored.

"The observation that a single lncRNA molecule can activate a broad set of heart-failure related genes was a big surprise," said Yibin Wang, the study's senior author and a professor in the departments of anesthesiology, physiology and medicine at the David Geffen School of Medicine at UCLA. "The findings provide us a better understanding of the molecular processes of heart failure, which we hope eventually to target with effective therapies."

With heart failure, the muscle tissue progressively thickens and stiffens, impairing the heart's ability to pump blood. Damage to the heart that occurs from coronary heart disease, heart attacks, chronic high blood pressure or diabetes can increase one's risk of heart failure. Current therapies can slow the disease in its early stages but often become less effective as the disease progresses.

Scientists know that the normal, healthy pattern of gene activity goes awry in cardiac cells during heart failure. But the details of how high blood pressure and other heart stresses lead to this broad change in gene expression have been elusive.

In recent years, researchers have begun to investigate the possible roles of non-coding RNAs in this process. For their study, Wang and colleagues focused on chaer, which they had found in an earlier study to be present at unusually high levels in mouse heart cells at the outset of heart failure induced by high blood pressure.

When the researchers eliminated chaer in mice that were similarly induced by high blood pressure, they observed that the animals were essentially protected from heart failure, having little of the usual heart overgrowth (hypertrophy), scar-like remodeling of tissue (fibrosis), and loss of cardiac function. The knockout of chaer also blocked the usual heart failure-related pattern of gene activity in the mice's heart muscle cells. Experiments in human heart cell-based models of heart failure yielded similar results.

The researchers determined that chaer levels spike in heart cells after a jump in blood pressure, and trigger a cascade of heart failure events by binding to a large protein complex called PRC2. Normally, PRC2 works as an "epigenetic" regulator, switching off various genes across the genome. In heart cells, these PRC2-suppressed genes include those responsible for driving cardiac hypertrophy and other aspects of heart failure. Chaer interferes with this function of PRC2, essentially taking the brakes off heart failure-driving genes.

"For heart failure to develop, it has to get past this epigenetic 'checkpoint,'" Wang said. "That's an entirely new idea in the field, and we think it presents opportunities for developing future therapies."

In principle, a drug that blocks or reduces chaer production in the heart, and thereby restores PRC2's healthy function, could prevent or delay the development of heart failure in people who have high blood pressure or are otherwise at risk of the condition.

To that end, Wang and colleagues hope to find molecules that could be turned into chaer-blocking drugs. They also have begun to explore other signaling pathways that need to be present for chaer to produce its heart failure-inducing activity, and are already testing compounds that inhibit those signals.

*Zhihua Wang, Xiao-Jing Zhang, Yan-Xiao Ji, Peng Zhang, Ke-Qiong Deng, Jun Gong, Shuxun Ren, Xinghua Wang, Iris Chen, He Wang, Chen Gao, Tomohiro Yokota, Yen Sin Ang, Shen Li, Ashley Cass, Thomas M Vondriska, Guangping Li, Arjun Deb, Deepak Srivastava, Huang-Tian Yang, Xinshu Xiao, Hongliang Li, Yibin Wang. The long noncoding RNA Chaer defines an epigenetic checkpoint in cardiac hypertrophy. Nature Medicine, 2016; DOI: 10.1038/nm.4179*

***http://bit.ly/2d8VwnP***

## Is it okay for a doctor to attend a patient's funeral?

***New research at the University of Adelaide has shed light on how many doctors are attending the funerals of their patients and the reasons behind their choice.***

The researchers say more needs to be done within the medical profession to openly discuss the issue.

In a study published online ahead of print in the journal Death Studies, researchers from the University's School of Psychology and School of Medicine report on the practices and attitudes towards funeral attendance of more than 430 Australian doctors.

The publication is part of a nationwide survey of more than 1000 health professionals.

"Our survey was aimed at better understanding what motivates health professionals to attend their patients' funerals, what barriers they may experience in attending, and their attitudes towards the issue of funeral attendance," says Dr Sofia Zambrano, who conducted this work as a follow up to her PhD in the School of Medicine at the University of Adelaide.

The survey found that 57% of the doctors surveyed had attended at least one funeral of a patient -- but the number varied greatly depending on which medical specialisation they had pursued.

For example: 71% of general practitioners had attended a patient's funeral; 67% of oncologists; 67% of psychiatrists; 63% of palliative medicine specialists; 52% of surgeons and 22% of intensive care specialists.

"The death of a patient can be a very emotional and isolating experience for physicians, and some may regard it as the ultimate failure of their professional care," says Associate Professor Greg Crawford, study co-author and Associate Professor of Palliative Medicine in the University's School of Medicine.

He says the benefits of attendance may be twofold: "Funeral attendance seems to be a practice that may help physicians deal with

their emotions after a patient dies, and in turn it can also be of comfort for the patient's family.

"However, there are differing views within medicine about whether or not it's acceptable to attend a patient's funeral, with some doctors seeing it as 'unprofessional', and others feeling that their colleagues would disapprove of them attending, which in fact were factors associated to non-attendance to funerals in our study," Associate Professor Crawford says.

The study also found that female doctors were more likely to attend a patient's funeral than their male counterparts, were more open to crying and expressing grief at the funeral, and they actively discussed attending patients' funerals with their colleagues and families.

Those who were least likely to attend were young male doctors with fewer years of medical experience.

Dr Zambrano says that because the decision is a personal one, the paper's authors have refrained from advocating attendance or non-attendance at funerals.

"We aim to contribute to a more open discussion about this poorly researched topic, and to provide a clearer picture of actual practices and attitudes of a large sample of physicians and other health professionals," she says.

"The role of peer perception and the hesitation of doctors to discuss funeral attendance and death more broadly with colleagues are important issues to consider. The medical community should ask itself whether funeral attendance needs to -- and can -- be addressed more openly, whether death and dying should be discussed more candidly among health professionals, and what effects these discussions may have on job satisfaction and on the mental health of medical practitioners."

*Sofia C. Zambrano, Anna Chur-Hansen, Gregory B. Crawford. Attending Patient Funerals: Practices and Attitudes of Australian Medical Practitioners. Death Studies, 2016; DOI: 10.1080/07481187.2016.1214631*

***http://bit.ly/2cu976s***

## Culex mosquitoes do not transmit Zika virus, study finds

***A Biosecurity Research Institute study has found important results in the fight against Zika virus: Culex mosquitoes do not appear to transmit Zika virus.***

Researchers at Kansas State University's Biosecurity Research Institute studied Culex species mosquitoes from across the country, including Vero Beach in Florida, which is near Miami-Dade County where mosquitoes are spreading Zika virus.

The research, "Culex species mosquitoes and Zika virus," appears in the journal Vector-Borne and Zoonotic Diseases and involves researchers from Rutgers University, the University of Florida and the U.S. Department of Agriculture.

The findings are important for controlling Zika virus in Florida and preventing its spread to other parts of the country, said Dana Vanlandingham, lead author and assistant professor of virology in the College of Veterinary Medicine.

"It's very important to know that Culex mosquitoes are not able to transmit Zika," Vanlandingham said. "It enables people to target their control strategies so that they aren't wasting time and effort on a mosquito that isn't transmitting Zika virus."

It is the first Zika virus research publication from the Biosecurity Research Institute. Before this study, Culex mosquitoes' role in Zika virus was unclear. By studying Culex mosquitoes over a period of time, the researchers found that Zika virus did not multiply and instead disappeared in the species.

"This is great news," said Stephen Higgs, co-author and director of the Biosecurity Research Institute. "We can check this particular group of mosquitoes off the list here in the U.S. and focus efforts of control on the mosquitoes that we know can infect, like Aedes aegypti and Aedes albopictus."

The Centers for Disease Control and Prevention has identified Aedes aegypti, or yellow fever mosquito, and Aedes albopictus, or Asian

tiger mosquito, as two species that transmit Zika virus. Both mosquitoes are widely distributed in the U.S. and are present in Kansas.

Culex mosquitoes are brown mosquitoes, while Aedes aegypti are black and Aedes albopictus are black and white. Culex mosquitoes transmit West Nile virus and Japanese encephalitis and live outside. Aedes aegypti and Aedes albopictus can live in and around houses in plant trays, spare containers or gutters.

"We need to know which mosquitoes to target and which mosquitoes not to target because mosquitoes live in different environments," said Vanlandingham, whose research focuses on zoonotic viruses -- such as Japanese encephalitis and chikungunya. "Some mosquitoes are found outside and some are more in people's homes. You need to know this in order to target your efforts."

Both Vanlandingham and Higgs emphasize the importance of personal responsibility in stopping the spread of Zika virus. Homeowners can get rid of small pools of water where mosquitoes breed and should use mosquito repellent as personal protection.

While a startup fund from the university's College of Veterinary Medicine provided funding for this Biosecurity Research Institute study, there is still a need for additional national funding to support research that stops Zika virus, said Higgs, who also has studied chikungunya, a mosquito-borne virus that has a similar transmission cycle to that of Zika virus.

"We thought that this research is so important with what is going on that we were able to use startup funding," Higgs said. "This research is basic research because we don't know some of the most fundamental information about mosquitoes. Applied research -- such as vaccines and diagnostics -- are obviously very important, but there is a need for funding basic research as well."

*Yan-Jang S. Huang, Victoria B. Ayers, Amy C. Lyons, Isik Unlu, Barry W. Alto, Lee W. Cohnstaedt, Stephen Higgs, Dana L. Vanlandingham. CulexSpecies Mosquitoes and Zika Virus. Vector-Borne and Zoonotic Diseases, 2016; DOI: 10.1089/vbz.2016.2058*

***http://bit.ly/2d8YbOo***

## Drinking Beer May Help You Read Certain Emotions

***Alcohol is known to impair people's judgment, but downing a beer may actually enhance one ability: A small new study suggests that imbibing may improve people's ability to recognize certain emotions, like happiness.***

**By Agata Blaszczak-Boxe**

Though "many people drink beer and know its effects through personal experience, there is surprisingly little scientific data on its effects on the processing of emotional social information," study co-author Matthias Liechti, a professor of psychopharmacology at the University of Basel in Switzerland, said in a statement.

In the study, 60 people ages 18 to 50 drank either regular beer that contained alcohol or nonalcoholic beer, over the course of 15 minutes. The people in the study drank about 17 ounces (500 milliliters) of beer, on average. For the people in the group that was given regular beer, that amount of beer that was meant to make them drunk enough to potentially alter their ability to recognize emotions but not too drunk to perform tasks in the study.

The participants were unaware of whether they were drinking beer with alcohol or nonalcoholic beer, according to the researchers. About 30 minutes after the people drank the beer and began experiencing its effects, the researchers started their experiments. In one of them, the researchers showed the participants pictures of faces representing the six basic emotions — fear, sadness, disgust, happiness, anger and surprise — and asked them to identify which emotion each face represented.

It turned out that the people who were given regular beer were better at recognizing the faces that expressed happiness, compared with those who drank nonalcoholic beer, according to the findings, presented Sept. 19 at the annual meeting of the European College of Neuropsychopharmacology (ECNP) in Vienna and published in the journal Psychopharmacology. "We found that drinking a glass of beer

helps people see happy faces faster and enhances concern for positive emotional situations," Liechti said.

However, there were no other differences in how fast the people in the two groups recognized other emotions, according to the study. In other experiments conducted in the study, the researchers found that people who drank alcoholic beer expressed a greater desire to spend time in the company of other people than those who drank the nonalcoholic variety. This effect was more pronounced in women than in men.

Participants who imbibed the alcoholic beer were also more interested in viewing sexually explicit images compared with the people who drank the nonalcoholic beer, and that effect was also more pronounced in women than in men, the researchers found.

The effects may have been more pronounced in women because consuming the same dose of alcohol may lead to different blood concentrations of alcohol in men and women, and thus may affect them differently, Wim van den Brink, a professor of psychiatry and addiction at the University of Amsterdam who was not involved in the study, said in a statement.

However, the authors of the new study noted that it had certain limitations. For example, the researchers used relatively low doses of alcohol in the study, which means that the findings may not apply to people who drink more alcohol than the doses used in the study.

***http://bit.ly/2cD2Mca***

## Can sheer willpower keep patients alive in their dying hours?

***Clinicians routinely see cases in which people who are nearing life's end seem to will themselves to hold on until a certain point, then "let go."***

**Bob Tedeschi**

Marjorie Severance had lived 91 years, five months, and two weeks when, if you believe such things, she decided she could let herself die.

She had completed all of her funeral and memorial service plans. Her finances were set. "Nana," as she was known to her many grandchildren and great-grandchildren, spent the last weeks of her life sprucing up her jewelry collection and choosing beneficiaries.

Her granddaughter, Jan Schultz, who was helping with the jewelry, was dragging her feet getting the two last rings fixed. "I had a feeling that as soon as this was done, she'd be done," Schultz recalled.

When a great-grandson visited her for supper at her assisted-living facility in Madison, Wis., earlier this month, Nana ushered him out early. The family laughed about it, but the next day she barely woke.

Schultz called Nana's son in Texas and told him to get there fast. Then she told her grandmother that her son was on his way and would arrive the following day. Nana's eyes stayed closed; she was alive but largely unresponsive.

The next day, her son arrived. She opened her eyes for him. And then, not long after, in the solitude of her room, Marjorie Severance passed away. The question of whether Severance somehow prolonged her life will forever remain a mystery. But it is hardly a mystery that stands on its own.

Hospice and palliative care clinicians routinely see cases in which people who are nearing life's end seem to will themselves to hold on until a certain point, after which time they let go.

And while some people hold on long enough to see a loved one, others seem to do the opposite, clinging to life until they are left alone.

Dr. Toby Campbell, an oncologist and palliative care specialist at the University of Wisconsin, Madison, said patients tend not to have a lot of control at the very end of their lives. But that doesn't mean they don't have any. "People in end-of-life care wouldn't bat an eye if you asked if they think people can, to a certain degree, control those final moments," Campbell said. "We'd all say, ‘Well, yeah. Sure.' But it's inexplicable."

If these well-timed deaths are anything but coincidental, medical scientists appear unlikely to be able to provide an explanation anytime soon. A body of scientific literature called "the will to live near death"

explores questions at the fringe of this topic, but the research focuses more squarely on how one's will to live might affect life expectancy.

When it comes to extending one's life by hours, seemingly through sheer will, Campbell believes the dying "probably have some kind of hormonal stimulus that's just a driver to keep them going. Then, when whatever event they were waiting for happens, the stimulus goes away, and there must be some kind of relaxing into it that then allows them to die."

In one memorable experience, Campbell recalled three sisters who had gathered in the hospital room of their elderly mother after she'd suffered a stroke. One sister lived nearby and the others joined from out of town, holding vigil for several days.

The mother was unresponsive, and though her prognosis was grim, she wasn't actively dying. "They were having really a lovely time bonding together, but then life was kind of moving on and in truth they were ready for mom to die," Campbell said.

One morning, he told them that their mother might actually want to die - but not with them present. Some people deem the dying process too personal to share, while others don't want to expose family members to the trauma of watching them go.

The sisters, Campbell said, " immediately grabbed onto the idea, and right then, they said, ‘Mom, we're going out for breakfast. We'll be gone for two or three hours, and then we're going to come back and see you. So if you need to be alone to do this, now's a good time.'"

Campbell left the room. The sisters left soon after. Their mother died while they were gone. "They were sad, of course," he said. "But they felt like they had done right by her."

Jan Schultz felt that way too. Her grandmother had worked her way from bank teller to vice president over a 40-year career in finance. She was a proud matriarch, both loving and deeply beloved. Schultz said it would have been out of character for Nana to die before her son arrived, and it would have been equally out of character for her to burden him or anyone else with the sight of her death.

So in retrospect, it was little surprise that when Nana's son arrived, her condition noticeably changed. "I could almost see a sense of calmness over her when he arrived," Schultz said.

Nana opened her eyes for him. She heard him leave. And then, after he was gone, her heart went quiet.

***http://bit.ly/2drihCE***

## Caspian terns discovered nesting 1,000 miles farther to the north than ever recorded in Alaska

***Discovery of Caspian terns breeding above the Arctic Circle in the Chukchi Sea is nearly 1,000 miles farther north than previously recorded***

WCS reported today that in the late summer of 2016, a WCS field team led by Dr. Trevor Haynes monitored Caspian tern chicks through to fledging in Cape Krusenstern National Monument in Alaska. This discovery of Caspian terns breeding above the Arctic Circle in the Chukchi Sea is nearly 1,000 miles farther north than previously recorded -- a strikingly large jump in the range of nesting for this (or any) species.

Rapid range expansions in the Arctic are largely being driven by climate change. The arrival of Caspian terns is just one of a suite of profound alterations to the rhythms of this environment being reported by scientists and local residents. There is now less summer sea ice, and a longer snow and ice-free season -- simply put, summer conditions now last longer. Therefore, more temperate species can, where possible, opportunistically move north.

Species such as fin and humpback whales are now spending more time in the Arctic, and boreal species such as the red fox and brown bear now interact more routinely with their arctic counterparts -- the arctic fox and polar bear.

"The challenge for scientists is to help understand the repercussions of these changes- for example, we've seen red foxes take over areas previously used by arctic foxes. We don't know what the repercussions of new colonies of Caspian terns will be on the current

resident species, particularly if they gain more of a foot hold and expand their numbers," says Dr. Martin Robards. Elsewhere there have been critical concerns about predation by Caspian terns on local fish stocks, such as in the Columbia River.

Caspian terns are the largest and most majestic of all tern species and are avid full-body divers for fish. They occur on all continents except Antarctica. Unlike many other species of wildlife, Caspian tern populations appear to have increased in recent years. They were first noted in Alaska in 1981 and were thought to be breeding in Southeast Alaska by 1989. They have gone from being rare occurrences to breeding annually, but only at a handful of locations, and no farther north than Neragon Island in the southern Bering Sea, a thousand miles to the south.

"What we saw this season for Caspian terns is another example of the fragility of the Arctic system," said Peter Zahler, WCS Regional Director. "New patterns are starting to take hold in an environment that is dynamic and reinventing itself in the context of a new warmer climate. However, the arrivals of new species are mirrored by the challenges for existing ones adapting to new conditions such as walrus and polar bear. Adaptation of wildlife and people to new conditions in the Arctic represents one of the most significant challenges for conservationists and local communities, not just in the future but right now. Long-term monitoring efforts that supported this discovery are vital as we continue to monitor changes in the Arctic and develop tools to support adaptation planning for both wildlife and people."

*Materials provided by Wildlife Conservation Society.*

*www.sciencedaily.com/releases/2016/09/160923083804.htm.*

***http://bit.ly/2dtIraI***

## Vitamin B levels during pregnancy linked to eczema risk in child

***Infants whose mothers had a higher level of a particular type of vitamin B during pregnancy have a lower risk of eczema at age 12 months, new Southampton research has shown.***

The study from the Medical Research Council Lifecourse Epidemiology Unit, University of Southampton, is the first to link maternal serum levels of nicotinamide, a naturally occurring vitamin, and related metabolites to the risk of atopic eczema in the child.

The researchers believe the findings support the concept that eczema partly originates as a baby develops in the womb and could reveal ways of reducing the risk of the skin condition.

Dr Sarah El-Heis, the study's lead researcher from the University of Southampton, comments: "Nicotinamide cream has been used in the treatment of eczema but the link between the mother's levels of nicotinamide during pregnancy and the offspring's risk of atopic eczema has not been previously studied.. The findings point to potentially modifiable influences on this common and distressing condition."

Nicotinamide is a form of vitamin B3. Its level is maintained through intake of foods such as fish, meat, chicken, mushrooms, nuts and coffee as well as tryptophan, an amino acid found in most proteins. Nicotinamide and related nutrients are important for the body's immune responses and energy metabolism.

The research, published in Clinical and Experimental Allergy, assessed the amount of nicotinamide and related tryptophan metabolites during pregnancy in 497 women that took part in the Southampton Women's Survey. The rates of eczema in their children at ages 6 and 12 months was studied.

Results showed that offspring of mothers with higher levels of nicotinamide had a 30 per cent lower chance of developing atopic eczema at 12 months. There was an even stronger association with higher levels of anthranilic acid, a tryptophan metabolite.

Nicotinamide can improve the overall structure, moisture and elasticity of skin and therefore could potentially alter the disease processes associated with eczema, the researchers say. The study showed a gradual association between higher maternal nicotinamide and anthranilic acid levels and a lower risk of atopic eczema,

suggesting that the development of eczema is not simply prevented by the presence of these nutrients.

Professor Keith Godfrey, Director of the NIHR Southampton Biomedical Research Centre in Nutrition, added: "More research is needed to investigate this interesting association, but the findings are further evidence of the potential benefits of eating a healthy balanced diet during pregnancy."

*S. El-Heis, S. R. Crozier, S. M. Robinson, N. C. Harvey, C. Cooper, H. M. Inskip, K. M. Godfrey. Higher maternal serum concentrations of nicotinamide and related metabolites in late pregnancy are associated with a lower risk of offspring atopic eczema at age 12 months. Clinical & Experimental Allergy, 2016; DOI: 10.1111/cea.12782*

***http://nyti.ms/2djXFQZ***

# An Expert on Chinese Medicine, but No New Age Healer

***German academic's rise from relative obscurity to a position as the West's leading authority on ancient Chinese healing practices***

**By IAN JOHNSON SEPT. 23, 2016**

BERLIN — One day in 1971, the doorbell rang at Paul U. Unschuld's apartment in Munich. He opened the door to find a young man, who laconically said in English: "Hi, I am James Quinn, C.I.A. Tell me about the military usage of acupuncture."

So began the German academic's rise from relative obscurity to his position as the West's leading authority on ancient Chinese healing practices. One of the first Western scholars to tackle Chinese medicine in a systematic and serious way, Dr. Unschuld has seen his subject more as a way to interpret Chinese civilization than as a New Age answer to modern medicine.

Respected and sometimes resented for his scrupulousness in translating Chinese medical texts, Dr. Unschuld, a tall man of regal bearing, harks back to an era of scholarship, when people who engaged with China were called Sinologists — those who studied broad swaths of the Chinese world that reflected their wide-ranging interests.

For Dr. Unschuld, that has included amassing a collection of statues of medical deities that is planned to be a centerpiece of Berlin's Humboldt Forum, a new museum under construction that will showcase non-European cultures.

Dr. Unschuld has also collected 1,100 antique manuscripts that could give clues to how medicine was practiced at China's grass-roots level. The manuscripts contain more than 40,000 prescriptions that are being examined for promising ingredients, with some of the remedies for epilepsy already being studied by a Chinese-German start-up.

In his spare time, Dr. Unschuld has led German government delegations to China, and has written books on how medicine helps to explain China's rise to global prominence.

"If there are two words I'd associate with Unschuld, it's rigor and exactitude," said Phil Garrison, a teacher at the Pacific College of Oriental Medicine in San Diego and at the Finger Lakes School of Acupuncture and Oriental Medicine in Seneca Falls, N.Y. "But these qualities are a double-edged sword."

That is because Dr. Unschuld, who is as blunt as he is outspoken, stands at the center of a long and contentious debate in the West over Chinese medicine. For many, it is the ur-alternative to what they see as the industrialized and chemicalized medicine that dominates in the West. For others, it is little more than charlatanism, with its successes attributed to the placebo effect and the odd folk remedy.

Dr. Unschuld is a challenge to both ways of thinking. He has just finished a 28-year English translation of the three principal parts of the foundational work of Chinese medicine: the Huangdi Neijing, or Yellow Emperor's Inner Classic, published by the University of California Press. But unlike many of the textbooks used in Chinese medicine schools in the West, Dr. Unschuld's works are monuments to the art of serious translation; he avoids New Age jargon like "energy" or familiar Western medical terms like "pathogens," seeing both as unfair to the ancient writers and their worldviews.

But this reflects a deep respect for the ancient authors the detractors of Chinese medicine sometimes lack. Dr. Unschuld hunts down obscure terms and devises consistent terminologies that are sometimes not

easy to read, but are faithful to the original text. Almost universally, his translations are regarded as trailblazing — making available, for the first time in a Western language, the complete foundational works of Chinese medicine from up to 2,000 years ago.

"There exist any number of critical editions of the works of Hippocrates or Galen" from ancient Greece, said Don Harper, a professor at the University of Chicago, who studies ancient Chinese religious and medical texts. "Paul is the first to provide anything comparable to the Chinese corpus."

But for many Western practitioners of Chinese medicine, Dr. Unschuld is an uncompromising guide to the Chinese classics. His books sell well, but many Westerners prefer more accessible translations that use more familiar terms.

"People were very threatened by what he said," said Z'ev Rosenberg, an author, and a practitioner and teacher of Chinese medicine. "He said you need access to the sources and the terminology."

And then there is the issue of efficacy. With his extremely dry humor, Dr. Unschuld likens Chinese medicine to the herbal formulas of the medieval Christian mystic Hildegard von Bingen. If people want to try it, they should be free to do so, he said, but not at taxpayer expense. As for himself, Dr. Unschuld says he has never tried Chinese medicine.

At his office in Berlin's famous Charité hospital — where many pioneers of modern medicine got their start — Dr. Unschuld told a story about how, several years ago, he suffered a bilateral lung embolism. Pointing out the window to the hospital's main tower, he said he was saved by modern medicine.

"Excuse me, but acupuncture and herbs can't help you there," he said, with a laugh. "But there are some health problems where these therapies may be beneficial, and, hence, I'm not against it when someone uses it."

At times, Dr. Unschuld almost seems perplexed that his field of study actually became an alternative source of medical treatment. He said Chinese medicine's popularity in the West can trace its roots to the Cold War, to 1971 to be exact. That is when James Reston, a columnist for The New York Times, reported about how he was treated in China for a burst appendix, in part with acupuncture and mugwort.

This was during the Kissinger-Nixon rapprochement with China, and the start of China's decades-long reopening to the outside world. Chinese medicine became part of the country's allure. Soon came the visit to Dr. Unschuld from Mr. Quinn, the C.I.A. agent; the opening of Chinese medical schools in the West; and a flood of books and translations about the exotic-sounding healing arts from the Orient.

Dr. Unschuld's interest in medicine was not entirely unique in his family. His great-grandfather had treated the king of Belgium and other European nobility. Dr. Unschuld says he grew up in a household filled with vases and other chinoiserie donated by grateful patients. His father had been a pharmacist who collected pharmaceutical artifacts and pharmacopoeias of past centuries.

Initially, Dr. Unschuld earned a degree in pharmacy in Munich along with his wife, Ulrike. But he had also been fascinated with foreign languages and had completed a parallel track in Chinese studies. In 1969, before what he assumed would be a career in the pharmaceutical industry, the couple went to Taiwan for a year to improve their Chinese language skills.

Instead, Dr. Unschuld spent the year interviewing medical practitioners. The resulting Ph.D. thesis started his career as an expert on Chinese medicine, and for 20 years he headed the Institute for the History of Medicine at Munich's Ludwig Maximilian University.

His purely academic approach, however, makes him a difficult figure for China to embrace. While widely respected for his knowledge and translations, he has done little to advance the government's agenda of promoting Chinese medicine as soft power. Echoing other critics, he describes China's translations of the classics as "complete swindles," saying they are done with little care and only a political goal in mind.

For Dr. Unschuld, Chinese medicine is far more interesting as an allegory for China's mental state. His most famous book is a history of Chinese medical ideas, in which he sees classic figures, such as the Yellow Emperor, as a reflection of the Chinese people's deep-seated pragmatism. At a time when demons and ghosts were blamed for illness, these Chinese works from 2,000 years ago ascribed it to behavior or disease that could be corrected or cured.

"It is a metaphor for enlightenment," he says.

Especially striking, Dr. Unschuld says, is that the Chinese approach puts responsibility on the individual, as reflected in the statement "wo ming zai wo, bu zai tian" — "my fate lies with me, not with heaven." This mentality was reflected on a national level in the 19th and 20th centuries, when China was being attacked by outsiders. The Chinese largely blamed themselves and sought concrete answers by studying foreign ideas, industrializing and building a modern economy.

In China, Dr. Unschuld said, "Medicine and politics are similar: You don't blame others, you blame yourself." He added, "You ask: 'What did I do wrong? What made me vulnerable? What can I do against it?' This is why China has risen."

***http://bit.ly/2d9Xwdk***

## Oxygen levels were key to early animal evolution, strongest evidence now shows

***It has long puzzled scientists why, after 3 billion years of nothing more complex than algae, complex animals suddenly started to appear on Earth.***

Now, a team of researchers has put forward some of the strongest evidence yet to support the hypothesis that high levels of oxygen in the oceans were crucial for the emergence of skeletal animals 550 million years ago.

The new study is the first to distinguish between bodies of water with low and high levels of oxygen. It shows that poorly oxygenated waters did not support the complex life that evolved immediately prior to the Cambrian period, suggesting the presence of oxygen was a key factor in the appearance of these animals.

The research, based on fieldwork carried out in the Nama Group in Namibia, is published in the journal Nature Communications.

Lead author Dr Rosalie Tostevin completed the study analyses as part of her PhD with UCL Earth Sciences, and is now in the Department of Earth Sciences at Oxford University. She said: 'The question of why it took so long for complex animal life to appear on Earth has puzzled scientists for a long time. One argument has been that evolution simply doesn't happen very quickly, but another popular hypothesis suggests that a rise in the level of oxygen in the oceans gave simple life-forms the fuel they needed to evolve skeletons, mobility and other typical features of modern animals.

'Although there is geochemical evidence for a rise in oxygen in the oceans around the time of the appearance of more complex animals, it has been really difficult to prove a causal link. By teasing apart waters with high and low levels of oxygen, and demonstrating that early skeletal animals were restricted to well-oxygenated waters, we have provided strong evidence that the availability of oxygen was a key requirement for the development of these animals. However, these well-oxygenated environments may have been in short supply, limiting habitat space in the ocean for the earliest animals.'

The team, which included other geochemists, palaeoecologists and geologists from UCL and the universities of Edinburgh, Leeds and Cambridge, as well as the Geological Survey of Namibia, analysed the chemical elemental composition of rock samples from the ancient seafloor in the Nama Group - a group of extremely well-preserved rocks in Namibia that are abundant with fossils of early Cloudina, Namacalathus and Namapoikia animals.

The researchers found that levels of elements such as cerium and iron detected in the rocks showed that low-oxygen conditions occurred between well-oxygenated surface waters and fully 'anoxic' deep waters. Although abundant in well-oxygenated environments, early

skeletal animals did not occupy oxygen-impoverished regions of the shelf, demonstrating that oxygen availability (probably >10 micromolar) was a key requirement for the development of early animal-based ecosystems.

Professor Graham Shields-Zhou (UCL Earth Sciences), one of the co-authors and Dr Tostevin's PhD supervisor, said: 'We honed in on the last 10 million years of the Proterozoic Eon as the interval of Earth's history when today's major animal groups first grew shells and churned up the sediment, and found that oxygen levels were important to the relationship between environmental conditions and the early development of animals.'

*R. Tostevin, R. A. Wood, G. A. Shields, S. W. Poulton, R. Guilbaud, F. Bowyer, A. M. Penny, T. He, A. Curtis, K. H. Hoffmann, M. O. Clarkson. Low-oxygen waters limited habitable space for early animals. Nature Communications, 2016; 7: 12818 DOI: 10.1038/ncomms12818*

***http://bit.ly/2drklLa***

## NASA to Announce 'Surprising' Europa Discovery Monday

***NASA will announce new findings about Jupiter's ocean-harboring moon Europa during a news conference at 2 p.m. EDT (1800 GMT) on Monday (Sept. 26).***

**By Mike Wall, Space.com Senior Writer | September 23, 2016**

"Astronomers will present results from a unique Europa observing campaign that resulted in surprising evidence of activity that may be related to the presence of a subsurface ocean on Europa," NASA officials wrote in a media advisory Tuesday (Sept. 20).

The new information comes courtesy of NASA's Hubble Space Telescope, agency officials said. You can follow the news conference live here at Space.com, courtesy of NASA.

The participants in Monday's briefing are:

***Paul Hertz, director of the Astrophysics Division at NASA Headquarters in Washington.***

***William Sparks, astronomer with the Space Telescope Science Institute in Baltimore.***

***Britney Schmidt, assistant professor at the School of Earth and Atmospheric Sciences at Georgia Institute of Technology in Atlanta.***

***Jennifer Wiseman, senior Hubble project scientist at NASA's Goddard Space Flight Center in Greenbelt, Maryland.***

Astrobiologists regard Europa as one of the solar system's best bets to host alien life. The 1,900-mile-wide (3,100 kilometers) moon harbors a huge ocean of liquid water beneath its icy shell; furthermore, astronomers think this ocean is in contact with Europa's rocky mantle, making possible all sorts of interesting chemical reactions.

Tuesday's media advisory offered no further details about what the researchers will announce on Monday, but the involvement of Hubble raises the possibility that Europa's elusive plumes may finally have been spotted again.

In December 2012, Hubble detected what appeared to be plumes of water vapor extending about 120 miles (200 km) into space from Europa's south pole. This news, which was made public in late 2013, caused a great deal of excitement in the astrobiology community, because it suggested that a robotic probe may be able to sample Europa's ocean without landing on the moon's surface.

The detection team has been eyeing Europa with Hubble extensively since that initial observation, but to date they have not been able to confirm the existence of the plume

***http://bit.ly/2dhALZQ***

## Acidity in atmosphere minimized to preindustrial levels

***New research shows that human pollution of the atmosphere with acid is now almost back to the level that it was before the pollution started with industrialisation in the 1930s.***

The results come from studies of the Greenland ice sheet and are published in the scientific journal, Environmental Science and Technology.

The Greenland ice sheet is a unique archive of the climate and atmospheric composition far back in time. The ice sheet is made up of snow that falls and never melts, but rather remains year after year and is gradually compressed into ice. By drilling ice cores down through

the kilometre-thick ice sheet, the researchers can analyse every single annual layer, which can tell us about past climate change and concentration of greenhouse gases and pollutants in the atmosphere.

Acid in the atmosphere can come from large volcanic eruptions and humanmade emissions from industry. You can measure acidity in the ice by simply passing an instrument that can measure conductivity over the ice core. If there is a high level of acidity, the measurement turns out and it works great for measuring the climate of the past all the way back to the last interglacial period 125,000 years ago. But if you want to measure atmospheric acidity for the last 100 years, it is more difficult as the annual layers are located in the uppermost 60 metres and there the ice is more porous as it has not yet been compressed into hard ice.

**Measures pollution from year to year**

But the last 100 years are interesting for climate researchers as it is the period where we have had massive pollution of the atmosphere from industrialisation, vehicle use and people's energy consuming lifestyles.

"We have therefore developed a new method that can directly measure the acidity of the ice using a spectrometer. We have an ice rod that is cut along the length of the ice core. This ice core rod is slowly melted and the meltwater runs into a laboratory where they take a lot of chemical measurements. With our new method you can also measure the acidity, that is to say, we measure the pH value and this is seen when the water changes colour after the addition of a pH dye. We can directly see the fluctuations from year to year," explains Helle Astrid Kjær, postdoc in the Centre for Ice and Climate at the Niels Bohr Institute, University of Copenhagen.

For many years, there has been a quest to solve the problem of measuring acidity in the porous annual layers of the ice and now scientists from the Niels Bohr Institute have succeeded. The method is a Continuous Flow Analyses or CFA method and it was originally invented in Switzerland, but Helle Astrid Kjær has spearheaded the further development of the system so it can also measure acid.

Distinguishes between natural and humanmade sources

In addition to being able to measure the pH value more accurately using the new method, the CFA system can also distinguish whether the emissions come from volcanic eruptions, large forest fires or industry. The researchers can therefore filter out both volcanic eruptions and forest fires in the assessment of industrial pollution and the new results are revolutionary.

"We can see that the acid pollution in the atmosphere from industry has fallen dramatically since humanmade acid pollution took off in the 1930s and peaked in the 1960s and 70s. In the 1970s, both Europe and the United States adopted the 'The clean air act amendments', which required filters in factories, thus reducing acid emissions and this is what we can now see the results of. The pollution of acid in the atmosphere is now almost down to the level it was before the pollution really took off in the 1930s, explains Helle Astrid Kjær.

The new pH method has already been used on ice cores from Greenland and Antarctica by research teams from New Zealand, the United States and Denmark.

*Helle Astrid Kjær, Paul Vallelonga, Anders Svensson, Magnus Elleskov L. Kristensen, Catalin Tibuleac, Mai Winstrup, Sepp Kipfstuhl. An Optical Dye Method for Continuous Determination of Acidity in Ice Cores. Environmental Science & Technology, 2016; DOI: 10.1021/acs.est.6b00026*