

## Welcome to the June 2023 issue

SCIENCE NEWS *Monthly* is produced by the Science Department, St Benedict's Catholic Secondary School, Bury St Edmunds, Suffolk, UK.

# **ARCHAEOLOGY** - Scientists find oldest known evidence of humans in Europe using fires to cook

Prehistoric humans in Europe might have been sitting round campfires built to toast snacks as early as 250,000 years ago – 50,000 years earlier than originally thought, researchers have suggested.

Human species have a long association with fire, with some sites suggesting its controlled use dates back more than 700,000 years in Africa and the Middle East and at least 400,000 years in Europe. Now experts say they have found the earliest evidence in Europe for fires that could have been made for hanging out and heating food.



*"This is the oldest evidence of human-controlled fire meant for cooking and social interaction,"* said Dr Clayton Magill, an assistant professor at Heriot-Watt University and an author of the study.

Using forensic chemical methods to identify molecules of incomplete burning, the research team at Heriot-Watt's School of Energy, Geoscience, Infrastructure and Society detected fire at Valdocarros II, an archaeological site near Madrid in Spain. Dr. Magill said, *"We have found definitive evidence of things being burnt and those remains are organized into a pattern, suggesting it's humans who are making and controlling the fire. Either they were using the fire to cook or to defend themselves. The spatial patterning in the fire tells us that they were encircling something, like a home or sleeping area, a living room or kitchen, or an enclosure for animals." The chemical profiles of the charred remains also suggest our human ancestors chose certain types of firewood for its burning properties, such as heat and lack of smoke.* 

"This is important because our species is defined by our use of fire," Dr. Magill said. "Being able to cook food to feed our big brains is one of the things that made us so successful in an evolutionary sense. Fire also brings protection and fosters communication and family connection. And we now have definitive, incontrovertible evidence that humans were starting and stopping fires in Europe about 50,000 years earlier than we suspected."

The scientists, using chemical analysis, determined that the temperature of the fires would have been between 280 and 350 degrees Celsius, which is considered the "sweetspot" for open air cooking. The first barbecues were used 250,000 years ago – just fancy that!

Globally, the oldest clear evidence of human-controlled fire is in East Africa about 1.5 million years ago and in Israel about 790,000 years ago. In Europe, countries including Hungary, France and Germany have been linked with previous evidence of fire.

In the next phase of the project, the research team will study stone tools found near fire hearths to identify whether these were used in particular ways around the making and controlling of fire—for example, to cut meat or pulverize plants. *"We want to understand whether the selective or specialized use of tools is something that should go at least theoretically hand-in-hand with fire control,"* said Dr. Magill, who is also Assistant Professor in Geoenergy at the Lyell Centre for Earth and Marine Sciences, one of Heriot-Watt's Global Research Institutes.

https://phys.org/news/2023-05-humans-years-europe.html

## HUMAN GENETICS - Baby born from three people's DNA in UK first

It is a fundamental of genetics that we get half of our DNA from one parent and the other half of our DNA from the second parent. Now, incredible as it may sound, a baby has been born using DNA from <u>3</u> people using a revolutionary new IVF technique.

Most of the baby's DNA comes from their two parents and around 0.1% from a third, donor woman. The pioneering technique is an attempt to prevent children being born with devastating mitochondrial diseases. In nearly every cell in the body, mitochondria are responsible for producing energy, in the form of the chemical ATP, that cells need in order to function. When a person has Mitochondrial Disease, the mitochondria in the cells are not producing enough energy. Sometimes they are not very efficient or they do not work at all. There is huge variety in the symptoms and severity of Mitochondrial Disease. It depends on how many cells are affected and where they are in the body. The parts of the body commonly affected are those that have the highest energy demands, such as brain, muscle, liver, heart and kidney. When these systems are effected Mitochondrial Disease is usually progressive. Mitochondrial diseases are incurable and can be fatal within days or even hours of birth. Some families have lost multiple children and this technique is seen as the only option for them to have a healthy child of their own.

However, there is now some hope with the trialling of the new technique, known as **Mitochondrial Replacement Therapy**. It works on the principle of replacing a women's abnormal mitochondrial DNA (mt-DNA) with the donor's healthy one, which means that technically the resulting children inherit DNA from their two parents and a smidge from the donor as well. This is a permanent change that would be passed down through the generations. It must be stressed that this does not mean that the baby will have 3 parents – just two parents as usual, but with the help of a mitochondrial donor too.



The technique was pioneered in Newcastle at the Newcastle Fertility Centre and laws were introduced to allow the creation

of such babies in the UK in 2015. Work in this area is closely regulated by the Human Fertilisation and Embryology Authority (the HFEA). Prof Robin Lovell-Badge, from the Francis Crick Research Institute, said: "It will be interesting to know how well the mitochondrial replacement therapy technique worked at a practical level, whether the babies are free of mitochondrial disease, and whether there is any risk of them developing problems later in life."

https://www.bbc.co.uk/news/science-environment-65538866

### **ENVIRONMENT - Forget Cars, Green Hydrogen Will Supercharge Crops**

Hydrogen has long been touted as a "fuel of the future" for motor vehicles and renewable generation projects are set to make this future fuel widely available. But this lightest element of them all could turn out to be more versatile than we thought.

In the dry, red dust of Western Australia's vast Pilbara region, something green is growing. In October 2022, construction began on a massive solar photovoltaic and battery installation, around 40 soccer fields in



size, that will soon power a 10-megawatt electrolyser—a machine that uses electricity to convert water into hydrogen. But that hydrogen isn't going to fuel cars or trucks or buses: It's going to grow crops.

The production of ammonia for fertilizer contributes around 0.8 percent of global greenhouse gas emissions. Currently, the industry is a major consumer of hydrogen, which is produced from natural gas or coal and generates significant carbon emissions. Green hydrogen, on the other hand, uses electricity from renewable sources to split water into hydrogen and oxygen using a process called electrolysis, which means the process generates zero carbon emissions. That is an exciting prospect for Yara, a global company which is the largest ammonia producer in the world. The Yuri Project—a joint venture between global fertilizer giant Yara, utilities company Engie, and investment and trading company Mitsui & Co.—is producing green hydrogen that's combined with nitrogen to create ammonia for fertilizer production.

But perhaps hydrogen's greatest potential lies in its ability to store energy for rainy days. While fossil fuels are stores of energy from prehistoric sunlight, hydrogen can be used to store the solar energy of the previous 12 hours. Once an electricity grid gets to a critical mass of renewable inputs from sources such as wind and solar, something has to step in to stabilise and smooth out the peaks and troughs of supply and demand. You cannot do that with batteries, but you can do it with hydrogen.

## **ECOSYSTEMS - How wildfires actually keep ecosystems healthy**

There's no denying the destructive power of wildfires. Lightning, campfires, power lines or other sources may spark these infernos. They mainly ravage natural areas, such as forests and grasslands. But when they encroach on populated places, wildfires can endanger human lives and property. Still, wildfires have always been a part of some forest and prairie ecosystems and regular burns can be vital for keeping those ecosystems healthy.

For one thing, wildfires can get rid of pests. The animals native to an area often know how to escape a wildfire by fleeing or hiding underground, but



invasive species may not, so those trespassers get wiped out. Fires can prevent trees from overcrowding each other which allows smaller plants and animals that need a lot of sunlight to thrive below. Plus, wildfires burn up a lot of leaf litter, pine needles and other dead matter on the ground. This clears out junk that may stifle new plant growth and releases nutrients back into the soil. Importantly, it also prevents the buildup of dead matter that catches fire easily. If the ground is covered with too much highly flammable stuff, that can fuel more extreme, more dangerous wildfires.

There are also species that have evolved to depend on regular wildfires. The seed pods of *Banksia* trees in Australia, for instance, only release their seeds in the heat of a wildfire. These trees need fires if they are to produce more trees. And birds such as the black-backed woodpecker prefer to live in recently burned areas, because freshly scorched trees may offer easy access to a feast of insects.

As a result, fire experts may start "prescribed burns" in certain places. Professionals set these fires only in areas and under weather conditions where they are sure they can control the flames. Prescribed burns are meant to provide the benefits of natural, low-intensity fires. That includes preventing more extreme fires that could endanger people. So, ironically, one important way to protect against fires is experts setting them!

https://www.snexplores.org/article/lets-learn-about-how-wildfires-keep-ecosystems-healthy

#### **MICROBIOLOGY - Microbes discovered that can digest plastics at low temperatures**

Many microorganisms that can digest plastics have already been found, but they can usually only work at temperatures above 30C (86F). This means that using them in industrial practice is prohibitively expensive because of the heating required. It also means using them is not carbon neutral. Scientists from the Swiss Federal Institute WSL have now found microbes that can do this at 15C, which could lead to a breakthrough in microbial recycling. Their findings have been published in the journal *Frontiers in Microbiology*.

Microbes that can digest plastics at low temperatures have been discovered by scientists in the Alps and the Arctic. Dr Joel Rüthi from WSL and colleagues



sampled 19 strains of bacteria and 15 of fungi growing on free-lying or intentionally buried plastic kept in the ground for one year in Greenland, Svalbard and Switzerland. They let the microbes grow as single-strain cultures in the laboratory in darkness at 15C and tested them to see if they could digest different types of plastic.

The results showed that the bacterial strains belonged to 13 genera in the phyla *actinobacteria* and *proteobacteria*, and the fungi to 10 genera in the phyla *ascomycota* and *mucoromycota*. The plastics tested included non-biodegradable polyethylene (PE) and the biodegradable polyester-polyurethane (PUR) as well as two commercially available biodegradable mixtures of polybutylene adipate terephthalate (PBAT) and polylactic acid (PLA).

None of the strains were able to digest PE, even after 126 days of incubation on these plastics. But 19 strains (56%), including 11 fungi and eight bacteria, were able to digest PUR at 15C, while 14 fungi and three bacteria were able to digest the plastic mixtures of PBAT and PLA. While plastics have only been in wide use since the 1950s, microbes can degrade polymers because they resemble some structures found in plant cells.

Rüthi said: "Here we show that novel microbial taxa obtained from the 'plastisphere' of alpine and arctic soils were able to break down biodegradable plastics at 15C. These organisms could help to reduce the costs and environmental burden of an enzymatic recycling process for plastic."

https://www.theguardian.com/science/2023/may/10/microbes-digest-plastics-low-temperatures-recycling

## **GENETICS - Updated DNA map better reflects human diversity**

The original human genome, published 20 years ago, is mostly from one person, and does not represent human diversity. Scientists have now produced an updated map of all human DNA which could help to transform medical research. The latest version dubbed the **pangenome** - is made up of data from 47 people from Africa, Asia, the Americas and Europe.

According to Dr Eric Green, who is director for the National Human Genome Research Institute in Bethesda Maryland, the research, which has been published in the journal *Nature*, has the potential to transform medical research. *"This represents a* 



tremendous scientific achievement. A pangenome that better reflects the diversity of the human population will enable scientists to better understand how genetic variation influences health and disease and moves us to a future in which genomic medicine benefits everyone".

The pangenome consists of 47 separate DNA maps of the people from different ancestries, which can also be combined and compared with new software tools to find important genetic differences. The aim is to develop more effective treatments for more people, but genetic scientists are aware that the research has the potential to be misused.

Prof Muzlifah Haniffa, of the Sanger Institute in Newcastle, who was not part of the research team, said that the science should not be misinterpreted, "Genetic information about diversity should be used responsibly and not to provide evidence of differences in race, which is a social construct. We have to understand what it shows and, importantly, what it doesn't show. We have to make sure that taking information very superficially to establish false racial characteristics does not happen".

Dr Zamin Iqbal, a senior researcher at EMBL's European Bioinformatics Institute near Cambridge, believes that a more representative genome will lead to better treatments for more people. "Expanding the range of populations present in the human reference genome will reduce a long-standing implicit bias in studies of human genetics. Humans are diverse, and it's important that our analytical methods incorporate that."

https://www.bbc.co.uk/news/science-environment-65539594

#### **ARCHAEOLOGY - Scotland's "Stone of Destiny" Studied**

It is timely that at the time of the coronation of King Charles III, some new research has been published regarding the coronation's **"Stone of Destiny"**. The 350-pound piece of sandstone was used as a seat for Scotland's monarchs during coronation ceremonies until the invasion of Scotland by Edward I in the late thirteenth century. He took the Stone to England's Westminster Abbey and fitted it into a wooden chair known as the Coronation Chair. In 1996, the stone was officially returned to Scotland and is only ever removed for a coronation in London.



Seen as a sacred object, its earliest origins are unknown. Innovative methods have now revealed new information, including previously unrecorded markings and further evidence of the Stone's provenance. A new digital 3D model of the Stone has been created, allowing the Stone to be viewed from different perspectives in higher detail than ever before. This has revealed previously unrecorded markings on the Stone's surface, which have the appearance of Roman numerals. The digital imaging has also improved visibility of the geological features of the Stone, such as cross-bedding, which is indicative of the geological conditions in which the sandstone was formed and which is characteristic of sandstone of the Scone Sandstone Formation. The many tooling marks evident from original working of the stone and areas of wear and tear can now also be seen more clearly, as well as further details of a 1951 repair.

The new examination has also provided further evidence for the Stone's origins, while also unearthing more of its post-quarrying history. X-ray fluorescence (XRF) analysis was undertaken to determine the elemental composition of the Stone, leading to the discovery of traces of copper alloy on the top surface of the Stone that coincide with a dark stain near its centre. This suggests a bronze or brass object has been in contact with or placed on the Stone at some time in its history.

## ASTRONOMY - Astronomers reveal the largest cosmic explosion ever seen

A team of astronomers led by the University of Southampton have uncovered the largest cosmic explosion ever witnessed. The explosion is more than ten times brighter than any known supernova (exploding star) and three times brighter than the brightest tidal disruption event, where a star falls into a supermassive black hole. The findings of the research have been published in *Monthly Notices of the Royal Astronomical Society*.

The explosion, known as **AT2021lwx**, has currently lasted over three years, compared to most supernovae which are only visibly bright for a few months. It took place nearly 8 billion light years away, when the



universe was around 6 billion years old, and is still being detected by a network of telescopes. The researchers believe that the explosion is a result of a vast cloud of gas, possibly thousands of times larger than our sun, that has been violently disrupted by a supermassive black hole. Fragments of the cloud would be swallowed up, sending shockwaves through its remnants, as well as into a large dusty 'doughnut' surrounding the black hole. Such events are very rare and nothing on this scale has been witnessed before.

Last year, astronomers witnessed the brightest explosion on record - a gamma-ray burst known as GRB 221009A. While this was brighter than AT2021lwx, it lasted for just a fraction of the time, meaning the overall energy released by the AT2021lwx explosion is far greater. AT2021lwx was first detected in 2020 by the Zwicky Transient Facility in California, and subsequently picked up by the Asteroid Terrestrial-impact Last Alert System (ATLAS) based in Hawaii. These facilities survey the night sky to detect transient objects that rapidly change in brightness indicating cosmic events such as supernovae, as well as finding asteroids and comets.

There are different theories as to what could have caused such an explosion, but the Southampton-led team believe the most feasible explanation is an extremely large cloud of gas (mostly hydrogen) or dust that has come off course from its orbit around the black hole and been sent flying in. The team are now setting out to collect more data on the explosion - measuring different wavelengths, including X-rays which could reveal the object's surface and temperature, and what underlying processes are taking place. They will also carry out upgraded computational simulations to test if these match their theory of what caused the explosion.

#### Astronomers Reveal The Largest Cosmic Explosion Ever Seen | University of Southampton

#### **RECYCLING TECHNOLOGY - Recycling rare-earth elements is hard — but worth it**

Our modern lives depend on metals known as rare earths. Unfortunately, these elements are so widely used and popular that someday soon we may not have enough of them to meet society's needs. This means that it is essential that we recover and recycle as much as we can – but this is no easy task.

Because of their special properties, these 17 metals have become crucial to high-performing computer screens, cell phones and other electronics. Compact fluorescent lamps use them. So do medical-imaging machines, lasers, high-



power magnets, fibre optics and pigments. They're even in rechargeable electric car batteries. These elements are also a gateway to a climate-friendly low- or zero-carbon future.

In 2021, the world mined 280,000 metric tons of rare earths. That's roughly 32 times as much as in the mid-1950s. By 2040, experts estimate we'll need up to seven times as much as we use today. There are no good substitutes for most of the jobs that rare earths do, so satisfying our appetite for these metals won't be easy. They are not found in rich deposits, so miners must excavate huge amounts of ore to get them. Then companies must use a mix of physical and chemical processes to concentrate the metals and separate them out. Those processes use lots of energy and they're also dirty and use toxic chemicals.

Rare-earth recycling tends to use hazardous chemicals. It also uses a lot of energy. And that effort may only recover a tiny amount of metal. A computer's hard-disk drive, for instance, might contain just a few grams (less than an ounce) of rare-earth metals. Some products might have just a thousandth as much. But scientists are trying to develop better recycling approaches to reduce the need for mining more of these metals.

One approach recruits microbes. *Gluconobacter* bacteria naturally produce organic acids. These acids can pull rare earths — such as lanthanum and cerium — from used catalysts or from the glowing phosphors that make fluorescent lights glow. The bacterial acids are less harmful to the environment than other metal-leaching acids. Other bacteria can also help extract rare earths. A few years ago, researchers discovered that some microbes produce a protein that can grab onto rare earths. This protein can separate rare earths from each other. Such systems might avoid the need for many toxic solvents. And the waste left from this process will biodegrade.

## WILDLIFE PHYSICS - How Do Flapping Wings Work in Water?

The ancient ancestors of penguins gained their ability to swim at the expense of flight, engineers have found. They mathematically compared the swimming efficiency of penguins to the movements and propulsion of birds like puffins and guillemots that haven't lost their ability to fly but can still swim for brief periods while foraging underwater.

"It's kind of an engineering method to look at species as highly sophisticated engines," said Peter Dabnichki, a professor of mechanical engineering at the Royal Melbourne Institute of Technology in Australia. "Basically we tried to understand how flapping wings work in the water." In a study published recently in the Journal of Avian Biology, Dabnichki and his colleagues used mathematical models for how an object generates drag and for how it propels itself. Since drag and propulsion work against each other, combining the numbers can reveal how well something swims.



All birds are naturally fairly buoyant – they need superior swimming abilities to overcome this buoyancy and propel themselves downward. So it takes a good swimmer to dive more deeply. The researchers applied their calculations to the species known as the Little Penguin. These birds are thought to be the type of penguin with the deepest diving distance, able to descend to about 65 metres. The researchers then ran their calculations on species of *alcids*, a family of birds that includes puffins and guillemots, which can both fly and swim.

The little penguins, they found, sat in between some of the *alcids*, diving deeper than horned puffins but not as far as Brünnich's guillemot – the best diver among *alcids*. What is the coolest thing is that we are talking about adapting the flight stroke, which is used in air, to a medium (water) that is 800 times denser than air. Dabnichki said that long, fragile wings aren't as efficient while flapping in the water. The wings of penguins are broader and more finlike. Most of the alcids that swim well don't even extend their wings fully while propelling themselves under the surface. Penguins' ability to swim is still underappreciated in birds, especially compared to the changes that allowed the ancestors of whales to evolve back to a fully aquatic lifestyle

https://www.insidescience.org/news/how-do-flapping-wings-work-water-penguins-and-puffins-show-way

### PALAEONTOLOGY - Boy finds 200-million-year-old ammonite on Welsh beach

A nine-year-old fossil hunter had the find of his life when he stumbled on a 200-millionyear-old ammonite. Eli was out on Sunday with his family at Llantwit Major beach in Vale of Glamorgan when he spotted the preserved mollusc in a cliff face. Experts said its size - about 1ft (0.3m) across - and quality made it unusual for the area.

The rocks that form Llantwit Major's beach and cliffs are from the Jurassic period and are about 200 million years old. The rock is made up of a mix of limestone and mudstone, called a blue lias formation. Swansea University's physical geography



lecturer Dr Nick Felstead said: "The fossil Eli found is an ammonite, which was a type of mollusc closely related to octopuses, squid and cuttlefish, which is a rare find at Llantwit Major. We can see that the inner chambers that would have been used for buoyancy of the ammonite have been infilled with quartz during fossilisation, which is even rarer, and makes this one especially pretty."

The Swansea schoolboy said: "I was just sitting here and looked up and thought 'Oh my God, that's big!"" Eli has a collection of smaller fossils he keeps at home. They are dotted around the lounge, kitchen, stairs and his bedroom. He said: "They're just interesting and I like their shape and the texture. It's just cool."

Eli's dad, Glenn Morris, said he and his son often went fossil hunting. "We're always on the coast somewhere, usually down Gower way, but this was our first time here, so it was beginner's luck really," he said. "I was a bit of a nerd growing up and liked dinosaurs and rocks and the same things he's into to be honest and I think I've passed it onto him."

Despite his gift for finding prehistoric preservations Eli does not want to be a palaeontologist when he gets older. *"I want to be a footballer,"* he said.

https://www.bbc.co.uk/news/uk-wales-65116503

# QUANTUM BIOLOGY - Quantum physics proposes a new way to study biology—the results could revolutionize our understanding of how life works

Research in quantum physics is usually geared toward technology. However, and somewhat surprisingly, there is increasing evidence that nature—an engineer with billions of years of practice—has learned how to use quantum mechanics to function optimally. If this is indeed true, it means that our understanding of biology is radically incomplete. It also means that we could possibly control physiological processes by using the quantum properties of biological matter.

In general, quantum effects only manifest at very small length and mass scales at the atomic or sub-atomic level, or when temperatures approach absolute zero. This is because quantum objects like atoms and molecules lose their "quantumness" when they uncontrollably interact with each other and their environment. In a complicated, noisy biological system, it is thus expected that most quantum



effects will rapidly disappear, washed out in what the physicist Erwin Schrödinger called the "warm, wet environment of the cell." To most physicists, the fact that the living world operates at elevated temperatures and in complex environments implies that biology can be adequately and fully described by classical physics.

Chemists, however, have for a long time begged to differ. Research on basic chemical reactions at room temperature unambiguously shows that processes occurring within biomolecules like proteins and genetic material are the result of quantum effects. Importantly, such nanoscopic, short-lived quantum effects are consistent with driving some macroscopic physiological processes that biologists have measured in living cells and organisms. Research suggests that quantum effects influence biological functions, including regulating enzyme activity, sensing magnetic fields, cell metabolism, photosynthesis, sense of smell and electron transport in biomolecules.

The existence of quantum biology as a discipline implies that traditional understanding of life processes is incomplete. Further research will lead to new insights into the age-old question of what life is, how it can be controlled and how to learn with nature to build better quantum technologies.

#### https://phys.org/news/2023-05-quantum-physics-biologythe-results-revolutionize.html

#### CAT SCIENCE - How to tell if your cats are having fun — or if the fur is flying!

Regular readers will know that the editor has a liking for cats. They are at the same time enchanting and infuriating. Often their behaviour defies logic and appears inexplicable. Cat specialists have had a look at how specific behaviours in cats could signal if they are friends or frenemies!

Two cats together may chase and hiss at each other. They might yowl and puff up their tails. They could pounce or even wrestle. Are the cats play-fighting — or fighting *fur* real? Pouncing and wrestling might be friendly play. But chasing or yowling could be tell-*tail* signs that the cats aren't getting along, a new study shows. The results could help cat owners figure out if their pate are playmated, or if they stream



help cat owners figure out if their pets are playmates, or if they stress each other out.

Sometimes cat owners miss the signs of a tense relationship. Humans might think their pets are just playing when in fact they don't get along at all. Living with another cat they don't like can make some animals ill and stressed. Other times, owners rehome their cats because they assumed their pets were fighting — when their cats were really best friends.

Researchers watched about 100 cat videos. Each video had a different pair of cats interacting. After viewing around one-third of the videos, they noted six main types of behaviours. These included wrestling, chasing, making noises and staying still. They then watched all of the videos and tallied how often and how long each cat showed one of the six behaviours.

The team was able to pinpoint three types of interactions between cats: playful, aggressive and in-between. Quiet wrestling suggested playtime. Chasing and sounds like growling, hissing or yowling implied aggressive encounters. The in-between behaviours could be a little playful and a little aggressive. They also often included one cat moving toward the other. It might pounce on or groom its fellow feline. These actions could hint that one cat wants to keep playing while the other doesn't. The more playful cat gently nudges to see if its partner wants to continue,

## **WEIRD GENETICS - Nose shape gene inherited from Neanderthals**

Neanderthals (*Homo neanderthalensis*) were an extinct species of humans who lived on Earth until about 40,000 years ago. They had some physical traits that were similar to modern humans, such as walking upright, having hands and feet, and having a big brain2. However, they also had some distinct features, such as a larger skull, a huge nose, angled cheek bones, shorter and stockier body, and powerful teeth and jaws. Interestingly, only 0.12 percent of their DNA is different to modern humans (*Homo sapiens*).

It is this last fact that has been the subject of some controversy – for example, when our earliest ancestors first encountered the Neanderthals in Europe, did the two interact in any way? Did they remain separate? Did they fight? Or did they interbreed? Research in recent years has shown that there was more interaction of a social kind than had been originally thought. There is even strong evidence that rather than being two separate species, *Homo neanderthalensis* and *Homo sapiens* were actually one. Recent genetic research indicates that the two interbred with each other when they met outside Africa about 55,000 years ago. As a result, everyone today whose ancestors lived outside Africa at that time



has inherited a small but significant amount of Neanderthal DNA, which makes up about 2% of our genomes.

A new study by University College London, published in the journal *Communications Biology*, shows that humans inherited genetic material from Neanderthals that affects the shape of our noses. The study finds that a particular gene, which leads to a taller nose (from top to bottom), may have been the product of natural selection as ancient humans adapted to colder climates after leaving Africa.



The researchers newly identified 33 genome regions associated with face shape, 26 of which they were able to replicate in comparisons with data from other ethnicities using participants in east Asia, Europe, or Africa. In one genome region in particular, called ATF3, the researchers found that many people in their study with Native American ancestry (as well as others with east Asian ancestry from another cohort) had genetic material in this gene that was inherited from the Neanderthals, contributing to increased nasal height. They also found that this gene region has signs of natural selection, suggesting that it conferred an advantage for those carrying the genetic material.

First author Dr Qing Li said: "It has long been speculated that the shape of our noses is determined by natural selection; as our noses can help us to regulate the temperature and humidity of

the air we breathe in, different shaped noses may be better suited to different climates that our ancestors lived in. The gene we have identified here may have been inherited from Neanderthals to help humans adapt to colder climates as our ancestors moved out of Africa."

The finding is the second discovery of DNA from archaic humans, distinct from Homo sapiens, affecting our face shape. The same team discovered in a 2021 paper that a gene influencing lip shape was inherited from the ancient Denisovans.

https://www.sciencedaily.com/releases/2023/05/230508104930.htm

## WORD(S) OF THE MONTH: VIRUS (noun, "VY-rus")

A virus is a non-living, microscopic particle that infects living things. Viruses cause infections by inserting their own genetic material into living cells. This causes the cell to follow the instructions spelled out in the virus' DNA or RNA, instead of its own. As a result, the cell creates more viruses. Viruses infect every form of life on Earth. Even bacteria suffer from viral infections. Examples of viral diseases in humans include measles, the flu, COVID-19 and the common cold.

Some scientists say viruses are not living, because they cannot reproduce on their own. But viruses do have some of the traits of living things. For example, virus species can change over time, or evolve. This can happen if there is a spontaneous mutation, or change, in the virus' DNA or RNA. This is why you need a flu shot every year. Over time, flu viruses swap DNA, evolving into different strains. And last year's flu shot might not protect against the strain making the rounds this year.