

OUTSTANDING! ★



PHOTO: FRIEDRÜN REINHOLD

ANTHONY HYMAN

The Körber Prize for European Science 2022 goes to Anthony Hyman, Director at the Max Planck Institute of Molecular Cell Biology and Genetics. The British cell biologist and his team discovered short-lived, droplet-like condensates of proteins in cells. The impaired degradation of these condensates can result in diseases such as ALS or Alzheimer's, and researching them thus opens up new therapeutic approaches. The Körber Prize, which is endowed with one million euros, is one of the world's most highly endowed research prizes and supports the winners in the continuation of their work.

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NEW PHASE IN THE FUSION EXPERIMENT

The Wendelstein 7-X fusion facility in Greifswald, which belongs to the Max Planck Institute for Plasma Physics, has been further expanded after the first two experimentation phases. This upgrade makes it possible to generate plasma pulses in the facility for up to 30 minutes at higher heating power, thus demonstrating the ability to operate continuously. This marks the final completion of Wendelstein 7-X, adding a water-cooled inner lining and the new centerpiece, a water-cooled divertor. Divertors remove impurities from the plasma and will be used to remove heat for power generation in a fusion power plant that

will be created in the future. A trial run with the new technology began in September, and the scientific experimentation phase is scheduled to begin in November. Federal Minister of Education and Research Bettina Stark-Watzinger and Bettina Martin, Minister of Science in Mecklenburg-Vorpommern, visited the facility in August to mark the completion of the expansion work. "Wendelstein 7-X is an important step on the path to creating a commercial fusion power plant," Stark-Watzinger said. "Should the transfer to application-readiness be successful, it would be a momentous innovation."

www.mpg.de/mpr-2022-033



PHOTO: MAGNUS SCHULT

Grand visit: State Minister for Science Bettina Martin, Max Planck Director Sibylle Günter, and Federal Minister of Education and Research Bettina Stark-Watzinger (from left) in front of the Wendelstein 7-X fusion facility in Greifswald.

START-UP PRIZE FOR AVATAR COMPANY

Presented by the Stifterverband für die Deutsche Wissenschaft [Donor's Association for the Promotion of German Science and Humanities], this year's Max Planck Start-up Prize goes to the start-up Meshcapade from Cyber Valley in the Stuttgart-Tübingen region. The company is expanding on techniques developed at the Max Planck Institute for Intelligent Systems relating to three-dimensional body modeling. The aim is to use images, sensor-based de-

vices, body measurements, and similar data to create realistic human figures in an easily accessible 3D format. The resulting avatars have facial expressions, can perform realistic movements, and are compatible with all popular 3D visualization programs. The technology can be used in the fashion, gaming, and film industries. However, it also holds enormous potential for medicine and healthcare, because it enables the creation of lifelike, 3D recreations of real

people. Michael Black, Director at the Max Planck Institute for Intelligent Systems, co-founded Meshcapade in 2018 with his collaborators Naureen Mahmood and Talha Zaman. Max Planck President Martin Stratmann views the start-up's award as a positive signal for Cyber Valley: "It is my hope that the award will help motivate other researchers who are willing to spin off, so that Cyber Valley can develop into a 'Start-up Valley'" www.mpg.de/18471930

Hydroxyl radicals OH are formed on human skin and react with organic substances in the air. The reactivity (indicated per second) that takes place directly on human skin is particularly high.

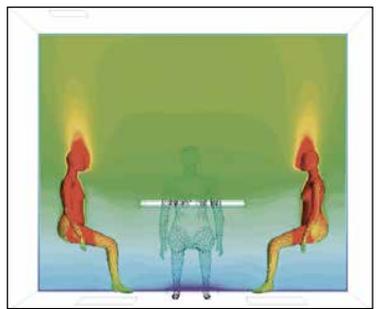
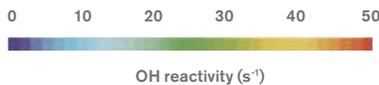


IMAGE: UC IRVINE



RADICALS IN THE AURA

Humans influence the chemistry in indoor spaces in previously unknown ways. As a team led by researchers at the Max Planck Institute for Chemistry has discovered, ozone that enters buildings along with the outside air reacts with fats, especially squalene, on human skin to form hydroxyl radicals. These molecules create an oxidative field around each person, as they alter or even degrade organic substances in the air. This means that, on the one hand, hydroxyl radicals rid the air of potentially harmful substances. On the other, however, they can also produce substances that are potentially harmful to health. Consequently, the full impact of the human radical aura on health must be clarified in further studies.

www.mpg.de/19157061



PHOTO: LADY FERN PHOTOS/UNSPLASH

Even a one-hour walk in nature can reduce brain activity associated with stress.

HEADING TO THE COUNTRY TO NURTURE THE BRAIN

Living in a city is a known risk factor when it comes to developing mental disorders. The amygdala, a central brain region involved in stress processing, has been shown to be less active in people living in rural areas than in city dwellers. Until now, it was unclear whether the rural environment causes this effect or whether people who choose to live in the countryside are simply wired differently to those in the city. To uncover the causal relationship, scientists at the Max Planck Institute for Human

Development used functional magnetic resonance imaging to examine 63 healthy subjects before and after a one-hour walk. One group of the subjects walked in the Grunewald Forest, the other on a commercial street in Berlin. The results did indeed show that activity in the amygdala had decreased after walking in nature. This suggests that even spending as little as 60 minutes in nature has positive effects on the regions of the brain that are related to stress.

www.mpg.de/19168412



It is difficult for humans to survive in the tropical rainforest. Nevertheless, researchers are increasingly finding evidence of prehistoric settlements in such environments

EXPANSION THROUGH THE RAINFOREST

10 The Bantu expansion – a gigantic series of migrations by Bantu-speaking people – permanently changed numerous sub-Saharan African regions in terms of language and culture. The current ancestors of the Bantu-speaking people lived and farmed in an area near the border between Nigeria and Cameroon 5000 to 6000 years ago. Until now, the assumption had been that it was almost impossible for these people to spread their settlement area through the Central African rainforest. It was thought that migration was only made possible by a savannah cor-

ridor that formed around 2500 years ago. Based on linguistic data and with the help of novel computer-assisted methods, a team from the Max Planck Institute for Evolutionary Anthropology has now calculated that the southward spread must have taken place around 4000 years ago – long before the corridor through the rainforest had opened up. These results corroborate other recent findings that humans have been able to adapt surprisingly well to living conditions in tropical forests throughout their history.

www.mpg.de/19012651

SPYING WITH KINDERGARTEN APPS

Apps designed to support kindergartens sometimes exhibit serious data protection and security flaws. This was the result of an analysis by a team featuring researchers from the Max Planck Institute for Security and Privacy in Bochum. Kindergarten apps are designed to make everyday life in kindergartens easier. Parents can use them, for example, to view reports on their child's development or communicate with kindergarten staff. The researchers examined 42 of these apps from Europe and the USA with regard to security and data protection. They found that several apps tapped users' personal data without their consent and shared it with third-party providers. In some apps, researchers were also able to access children's private photos. However, refraining from the use of these kindergarten apps is no better, the researchers say, because parents and kindergarten staff would then use messenger services that have other serious privacy issues. Instead, specialists should create guidelines and checklists for kindergarten apps, which government agencies, for example, could use to make recommendations for associations that support kindergartens. www.mpi-sp.org/43309

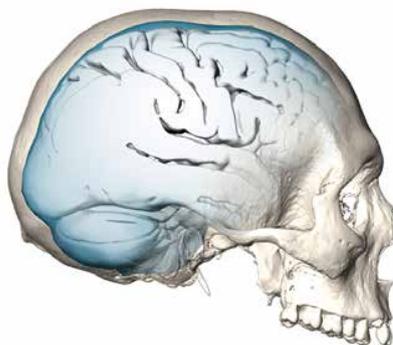
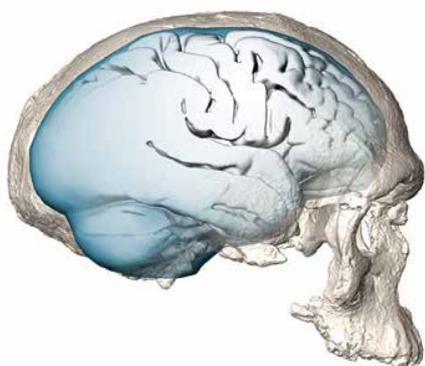
A NOSE FOR FAKE PERFUME

In the future, a new technique will be used to unmask counterfeit perfumes or identify diseased plants. Researchers at the Max Planck Institute for Chemistry in Mainz and the Johannes Gutenberg University Mainz have developed a method for determining the chiral signature of volatile organic substances very precisely. "Chiral" is derived from the Greek word for hand and means that a

substance – like hands – exists in two mirror-image versions. The chiral signature can be used to determine the ratio in which a plant's perfume or transpiration contains the two variants. Many biomolecules are chiral, although the two variants of many chiral substances have very different biological effects, for example on the sense of smell. In addition, some biomolecules only naturally occur in one

variant, meaning counterfeit perfumes containing synthetic rather than natural components can be recognized by their signature. To achieve this, the Mainz researchers measure the direction in which their samples' components rotate the plane of polarization – the only physical property that differs between the two variants of chiral compounds.

www.mpg.de/18855876



Skull and brain of a Neanderthal (left) and a modern human (right).

MORE BRAIN

The extinct Neanderthal had a brain similar in size to modern humans, but possibly with fewer neurons in a region important for higher cognitive abilities. According to an international team of researchers at the Max Planck Institute of Molecular Cell Biology and Genetics in Dresden, there is a particularly abundant protein variant in the frontal lobe of our cerebral cortex that enables the production of more neuronal precursors. Referred to as *TKTL1*, the protein is produced primarily in basal radial glial cells in the human fetus; these produce the majority of neurons in this part of the brain. The protein allows more lipid molecules to form for the cell membrane of these progenitor cells. Only a single amino acid differs between the protein variants in modern humans and Neanderthals – but this tiny difference may have improved the mental faculties of modern humans. www.mpg.de/mpr-2022-031

BATTLE OF THE TRASH CANS

In South Sydney, a dispute about trash has erupted: residents want to keep their neighborhood free of it, yellow-crested cockatoos want to eat it. The birds have learned to flip open the lids of trash cans to get to the contents. As soon as one cockatoo has opened a trash can, others come along and try to join in the feast. In the process, the birds generously distribute the trash all over the neighborhood. Researchers at the Max Planck Institute of Animal Behavior in Constance have observed that humans and animals adapt their behavior to each other. Residents try

to keep the birds away from the contents of the trash cans in different ways: for example, they block the hinges of the lids or weigh down the covers with stones. So far, however, the birds are managing to consistently outwit the humans. For example, they simply grab the stones with their beaks and push them off the cans with all their might. There is no way to predict who will win the race to control the trash cans. However, the first locks to keep cockatoos out are already available for purchase in Sydney. www.mpg.de/19174958

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Clever bird: a yellow-crested cockatoo maneuvers a rock off a trash can.

PHOTO: MPI FOR ANIMAL BEHAVIOR / CHRISTIAN ZIEGLER



A death's-head hawk moth is fitted with a tiny transmitter. The device weighs less than 15 percent of its body weight – less than what an adult moth eats in a night.

THE LONG JOURNEY OF THE HAWK MOTHS

Like migratory birds, many insects commute between breeding and wintering grounds during the year, covering enormous distances in the process. A study by the Max Planck Institute for Animal Behavior has found that death's-head hawkmoths – large, nocturnal moths – can maintain perfectly straight flight paths when migrating, even in unfavorable wind conditions. Researchers from the Institute used an airplane to track 14 death's-head hawkmoths equipped with radio transmitters. The moths traveled from Constance over distances of up to 80 kilometers in the direction of the Alps – the longest ever continuously observed distance of on an insect in the wild. The moths fly high in a tailwind and are carried by the current. In strong headwinds or crosswinds, however, they fly low and increase their speed to stay on course. Death's-head hawkmoths fly up to 4000 kilometers from Europe to Africa every year over several generations. Each individual travels only part of the way and reproduces at the end of its journey, allowing the next generation to continue the migration.

www.mpg.de/19067141

WARM PERIODS PROVIDE OXYGEN

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When oxygen is scarce, life is hardly possible. This is true of mountainous regions above 7000 meters as well as waters with a low oxygen content, for example in tropical regions on the west coast of America. Oxygen-deficient ocean regions, where practically only specialized microbes or jellyfish survive, have expanded over the past 50 years. Until now, geoscientists have attributed this development to global warming, which, among other things, causes seawater to absorb less oxygen. However, in the medium or long term, it could be natural climate change that causes the low-oxygen zones in the oceans to shrink. This is exactly what happened in two previous warm phases of the Earth's modern era, about 16 and 50 million years ago, as an international team led by researchers from the Max Planck Institute for Chemistry discovered using sediment cores from tropical ocean regions. This could be due to various mechanisms in which altered mixing of deep and near-surface ocean layers plays a role. The mixing could occur locally, where it has a short-term effect, or in the Antarctic Ocean, which has long-term consequences. Therefore, the length of the period in which human-induced global warming may cause the oxygen-deficient ocean regions to shrink is still unclear. www.mpg.de/19158609

Areas with low oxygen content (red), indicated in micromoles per kilogram, are found along the west coast of America, in the Bay of Bengal and in the Arabian Sea.

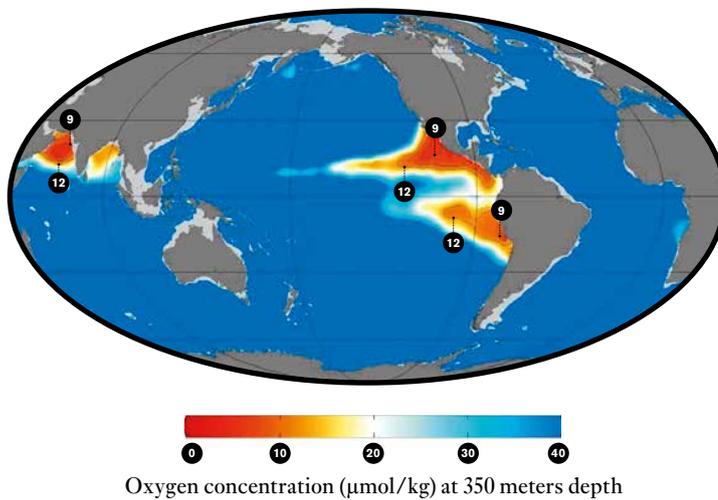


IMAGE: A. AUDERSET / MPI FOR CHEMISTRY



The Baltic Sea isopod (*Idotea balthica*) on the red alga *Gracilaria gracilis*.

PHOTO: WILFRIED THOMAS, STATION BIOLOGIQUE DE ROSCOFF (SBR)

BEES OF THE SEA

On land, bees, hummingbirds, and even bats and lizards perform important services in plant fertilization. An international team, including researchers from the Max Planck Institute for Biology in Tübingen, has now discovered that animals also act as pollinators in the sea. The Baltic Sea isopod hides in the tufts of a red algae and feeds on microalgae growing there. The isopod shows its appreciation for this: when it feeds on a male alga, the sperm growing on the alga's leaf surface sticks to its body. Upon contact

with a female alga, the sperm attach to and pollinate the female reproductive organs as the isopods pass by. The red algae need the help of this ant-sized crustacean, because their sperm cells cannot move independently. Without the isopods, therefore, it would only be favorable water currents and local proximity that determine whether the male and female algae could reproduce. The researchers now want to find out whether other algae species are pollinated in a similar way.

www.mpg.de/19006751

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There have been 278 different molecules discovered in space to date.

DISINFECTANT IN SPACE

For half a century, researchers have been using radio telescopes to search for molecules in the universe. Up until now, the fingerprints of 276 different substances have been found in the spectra. But the data base has grown again: using the Alma antenna array, a team led by the Max Planck Institute for Radio Astronomy discovered the alcohol propanol and its isomer isopropanol – a chemical compound with the same molecu-

lar formula but different structure – in a gas cloud called Sagittarius B2. This is a substance that many of us have literally held in our hands before: among other things, it is used to disinfect skin or surfaces. The observation was made as part of a long-term study in which the chemical composition of the molecular cloud is being surveyed using high angular resolution. Sagittarius B2 is located near the galactic center and resembles

a cosmic delivery room where stars are born. Propanol is the largest alcohol molecule discovered in interstellar space to date. The size didn't make the search any easier, however, because it emits many spectral lines at different frequencies. And in a source like Sagittarius B2, there are so many molecules that their spectra overlap, making it difficult to identify the individual fingerprints.

www.mpg.de/18884791