

NEW PRESIDENT CHOSEN FOR THE MAX PLANCK SOCIETY

PHOTO: MPI FOR MULTIDISCIPLINARY SCIENCES



President-elect: Patrick Cramer will head the Max Planck Society starting in June 2023.

In June, the Senate of the Max Planck Society selected Patrick Cramer as the future MPG President for the term 2023 to 2029. The 53-year-old chemist and molecular biologist is Managing Director at the Max Planck Institute for Multidisciplinary Sciences in Göttingen. He will take over his new position in June 2023 from Martin Stratmann, who has headed

the Max Planck Society for eight years. Patrick Cramer has been a Scientific Member of the Max Planck Society since 2014. Previously, he had held a professorship in biochemistry at the Ludwig-Maximilians-Universität in Munich for thirteen years. During this time, he served as Director of the Munich Gene Center and Dean of the Faculty of Chemistry and Pharmacy, among other positions. Cramer earned his doctorate at the European Molecular Biology Laboratory (EMBL) in Grenoble, France. From 1999 to 2001, he conducted research at Stanford University in the U.S. with Roger Kornberg, who was later awarded the Nobel Prize. Cramer enjoys great acclaim as a scientist and has won a number of scientific awards, including the Gottfried Wilhelm Leibniz Prize in 2006, the Ernst Jung Prize in Medicine in 2009, and the Louis Jeantet Prize in Medicine in 2021. Patrick Cramer is active in several national and international committees. His experience in science policy includes his chairmanship of the Council of the European Molecular Biology Laboratory.

www.mpg.de/18845304



Stand with Ukraine: the Max Planck Society supports staff from the war-torn country.

PHOTO: EDOARDO CERIANI / UNSPLASH

AID PACKAGE FOR UKRAINE

Looking to support Ukrainian scientists, the Max Planck Society has set up a special fund for an initial sum of one million euros. The goal of the fund is to finance follow-up contracts for temporarily employed Ukrainian staff at the Max Planck Institutes as well as to establish scholarships to accommodate further refugee guest researchers and early career researchers from Ukraine. Institutes can apply for these funds as needed. A number of Max Planck Institutes have already expanded their guest program with their own funds and are offering additional fellowships for the coming months. In addition, the Max Planck Society has established contact with the Ukrainian Academy of Sciences in order to support research in Ukraine in the medium and long term. One possibility would be to set up partner groups in Germany for former Ukrainian postdocs.

www.mpg.de/18477267

DISTINGUISHED ★

FRANK EISENHAUER

Frank Eisenhauer of the Max Planck Institute for Extraterrestrial Physics has been awarded the Gruber Cosmology Prize for developing instruments that have gathered evidence for the existence of a black hole at the center of our Milky Way. In the Gravity Experiment in 2018, researchers observed various phenomena near Sagittarius A*, a supermassive and invisible object at the center of our Milky Way. With the help of Frank Eisenhauer's technical innovations, the Gravity team found that the motions of stars and gas near the galactic center were consistent with theoretical predictions of a black hole.



PHOTO: ESO / M. ZAMANI

PHOTO: THOMAS BRÜCKNER/API FOR THE SCIENCE OF HUMAN HISTORY



GEOANTHROPOLOGY COMES TO JENA

To reflect its scientific reorientation, the Max Planck Institute for the Science of Human History in Jena is changing its name to the Max Planck Institute for Geoanthropology. The Senate of the Max Planck Society decided on this name change in June. The scientific concept was largely developed by Jürgen Renn, Director at the Max Planck Institute for the History of Science in Berlin. He will also advance the concept's implementation as Director at the Institute. It will be the site of future research into the interrelationships between the geosphere and man-made systems. The Institute combines research areas

from all three scientific sections of the Max Planck Society. One central subject, for example, is human-ecosystem dynamics, bringing together data and expertise from climate research, biodiversity research, and the social sciences. Examples of inter- and transdisciplinary research projects include the study of urbanization, world nutrition, and global flows of materials, energy, and information. The core questions range from the deep past to the distant future and include the question of how humanity has driven the emergence of the Anthropocene and in what ways it can still positively influence its course. www.mpg.de/18857834

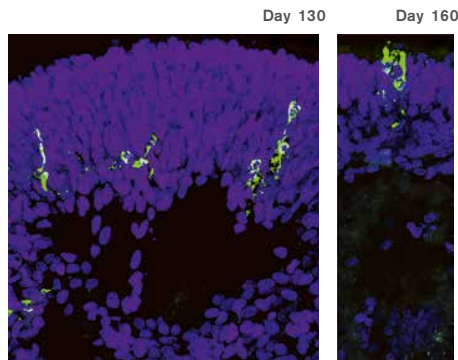
Reoriented: at the Max Planck Institute for the Science of Human History, the focus in the future will be on geoanthropology.

PARTNERING WITH AMAZON AND GOOGLE

At the end of May, Amazon and the Max Planck Society agreed on scientific collaboration. The goal of the joint Science Hub is to advance research into artificial intelligence, particularly in issues of causality, computer vision, and machine learning. Amazon is already providing nearly 700,000 euros in the first year to support the financing and implementation of research projects as well as the education and training of talented doctoral students. In addition, researchers from the Max Planck Society are being given the opportunity to work at Amazon part time, thereby gaining deeper insights into application-related research issues. The cooperation is planned for an initial period of five years. The Max Planck Institute for Informatics in Saarbrücken and Google have another partnership, and are now expanding their collaboration. In early June, they jointly founded the Saarbrücken Research Center for Visual Computing, Interaction, and Artificial Intelligence (VIA). The center will conduct basic research in frontier areas of computer graphics, computer vision, and human-machine interaction at the intersection of artificial intelligence and machine learning. The VIA will be headed by Christian Theobalt, Director at the Max Planck Institute for Informatics.

www.mpg.de/18709497

IMAGE: MPI FOR MOLECULAR BIOMEDICINE/ YOTAM MENCHIN-LASOWSKI



Using immunofluorescence (green), the researchers detected SARS-CoV-2-infected cells in the retinal organoid.

THERE IS MORE TO SARS-COV-2 THAN MEETS THE EYE

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SARS-CoV-2 is a multi-organ virus that affects various tissues of the human body. Autopsies of patients who died from Covid-19 have detected the virus in the retina. In addition, visual disturbances occasionally occur during or following infection with the coronavirus. However, it was unclear which retinal structures were affected and whether the damage might only be an indirect consequence of the virus. In an attempt to clarify this question, researchers at the Max Planck Institute for Molecular Biomedicine and the Westfälische Wilhelms-Universität Münster have studied the effects of Sars-CoV-2 infection on the retina in laboratory experiments. As a model, they used retinal organoids that can be grown from reprogrammed human stem cells. In the experiments, researchers showed that SARS-CoV-2 actually infected these organoids and replicated in them. The virus primarily affected retinal ganglion cells, but light sensory cells were affected as well. Retinal pathologies should therefore be monitored more closely as a possible consequence of “Long Covid”.

www.mpg.de/18453648

ON A COLLISION COURSE

Wind and solar energy are crucial in the fight against the climate crisis, but birds and other flying animals risk death from collisions with wind turbine blades. Wind farm operators could limit the impact of turbines on wildlife by considering the collision risk to birds early in the planning process. Researchers at the Max Planck Institute of Animal Behavior in Constance, Germany, and the University of East Anglia in England have now presented the necessary data. The team has identified hotspots in Europe where birds are particularly at risk from wind turbines and power lines: the western Mediterranean coast of France, southern Spain, the

Moroccan coast and the Strait of Gibraltar, eastern Romania, the Sinai Peninsula, and the Baltic coast of Germany. The authors say that the construction of new wind turbines and transmission power lines in these high-sensitivity areas should be minimized. In another study, black kites equipped with GPS transmitters were observed approaching wind turbines. The data showed that the birds do not fly directly up to the wind turbines but avoid the rotors once they are within one kilometer. This means that at least some of the birds recognize the danger and keep an appropriate safe distance.

www.mpg.de/18544955

Griffon vultures near wind turbines in southern Spain. In the Gibraltar region alone, more than a hundred of these birds die each year as well as dozens of short-toed eagles and kestrels.



PHOTO: ALEJANDRO ONRUBIA

ALARM SYSTEM AGAINST HARDWARE ATTACKS

HOT BREATH

Sexual arousal not only causes more blood flow to the genitals, but also an increased pulse and dilated pupils. But arousal can also be detected in breath, as a study by an international team involving researchers from the Max Planck Institute for Chemistry has now shown. According to the study, a characteristic signature of volatile molecules is found in the breath of sexually aroused people. The test subjects exhaled less isoprene and carbon dioxide, while the concentration of metabolites that can be assigned to certain neurotransmitters, such as the happiness hormone dopamine, increased. The researchers made this discovery when they showed twelve men and twelve women different film clips, including an erotic film, at the Research Laboratory on Human Sexuality, or Sex-Lab for short, at the University of Porto. While the test subjects watched, the researchers measured their sexual arousal by determining the temperature of their genitals and analyzed their breath for more than one hundred volatile organic compounds. The researchers hope their discovery will help better diagnose sexual dysfunction in the future.

www.mpg.de/18577820

Radio waves could protect computers, as well as card readers, against attacks on their hardware. As a research team from the Max Planck Institute for Security and Privacy and the Ruhr University in Bochum has shown, the signal from one antenna in a device generates a characteristic electromagnetic pattern that is received by a second antenna. If an attacker taps the device with a wire or needle, for example, the radio wave pattern changes and blows the whistle on the tampering. Until now, only individual, particularly

important components have been wrapped in a wired film that emits an electrical signal in the event of damage. How well the new radio wave alarm system responds depends on the thickness of the object that is inserted into a device and also on the location and depth of penetration. The technology reliably detected a needle 0.3 millimeters thick, for example, when it was pushed one centimeter deep into a computer case.

www.mpg.de/18787930

Radio monitoring: two antennas (pink) for electromagnetic signals can detect hardware attacks on a circuit board.

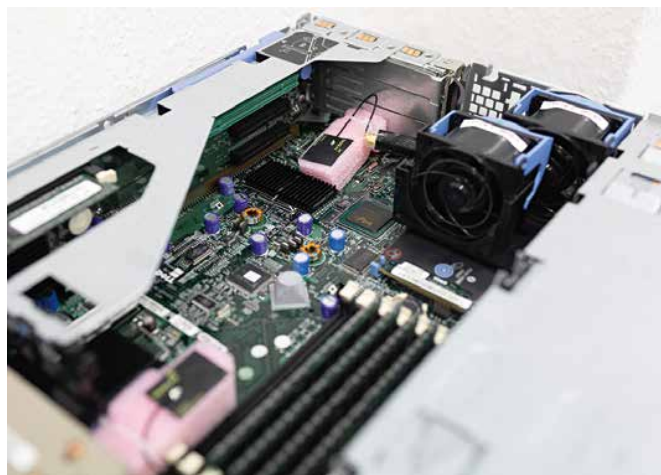


PHOTO: MICHAEL SCHWETTMANN

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HARD LIFE

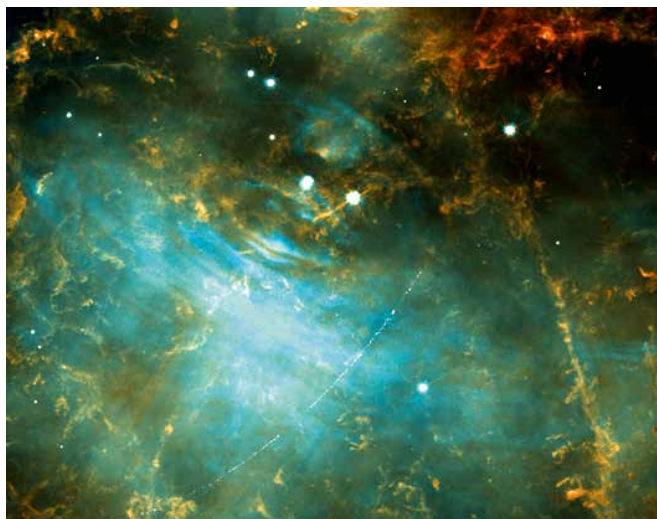
Living in arid regions is hard – often literally. This is because in a quarter of the world's areas where plants grow sparsely, bacteria, fungi, mosses, lichens, and algae form biological crusts. These stable layers cover about 12 percent of the world's land surface, but they are projected to decrease by 25 to 40 percent by 2070 due to climate change and shifts in land use. A team from the Max Planck Institute for Chemistry has now investigated the importance of biocrusts for the climate and ecosystems and what their partial loss would mean. According to the study, biocrusts currently stabilize soils against erosion and reduce dust emissions in drylands by about 60 percent. Their decline is likely to raise more dust in the future,

cooling the climate, because dust in the atmosphere reflects sunlight. The additional dust will slow global warming by about half as much as human-made dust emissions, which come mainly from burning fossil fuels and biomass. In addition, the stirred-up dust transports nutrients. These nutrients are lacking in the areas from where they are blown and act as fertilizer where they land. According to the researchers, this can also lead to the displacement of the original vegetation. In addition, microorganisms travel with the dust and colonize new habitats in this way. This can also spread pathogens that harm plants, animals, or humans.

www.mpg.de/18648634

12%

of the world's land surface is covered by biological crusts.



Cosmic motion profile: in this Hubble photo taken on December 5, 2005, asteroid 2001 SE101 is passing in front of the Crab Nebula

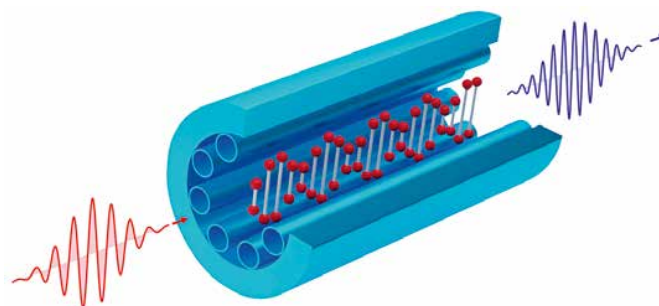
ASTEROIDS FROM THE HUBBLE ARCHIVE

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Using a sophisticated combination of human and artificial intelligence, researchers led by the Max Planck Institute for Extraterrestrial Physics have sifted through the archive data that most observations with the Hubble Space Telescope automatically filter out as noise or interference. In their cosmic detective work, some 11,500 volunteers searched the images for traces of asteroids, which appeared as more or less short streaks due to the typical exposure times of half an hour. In the process, they managed 1488 hits. The scientists used these layman classifications to train an automated machine learning algorithm to search for additional asteroid trails in the remaining archive data. This resulted in 900 additional discoveries. After the cleanup, a total of 1701 trails remained. Of these, a third could be identified as objects listed in the Minor Planet Center – the largest database of solar system objects. The majority, 1031 trails, come from small celestial bodies that were apparently unknown until now.

www.mpg.de/18603162

Hydrogen molecules (red) placed in collective vibration in a photonic crystal fiber change the frequency and thus the color of a photon (red and blue waves). The entanglement with a second photon is preserved.



PLAY OF COLORS WITH PHOTONS

Quantum information could enable more secure communication and speed up some computer calculations. But before it can fulfill these promises, physics must come to terms with one of its drawbacks: many quantum states are extremely delicate, especially the entangled states where two or more particles behave as one. Entanglement is a central element of both quantum cryptography and quantum computing. Now, a team from the Max Planck Institute for the Science of Light has found a way to dramatically change the color of a photon from two entangled light particles without destroying the entanglement. This is a prerequisite for optical devices operating at different frequencies to exchange photons in a quantum internet, for example. To

achieve the drastic frequency jump, the researchers inject hydrogen gas into the hollow core of a photonic crystal fiber – that is, a glass fiber in which fine channels are arranged regularly in parallel to the core and which conducts light in a particularly loss-free manner. Using a method called stimulated Raman scattering, the researchers excite the molecules of hydrogen gas to vibrate collectively. Now, when the photon of an entangled pair passes the molecules oscillating in time, it absorbs energy from them. By choosing the color of the entangled photons, the gas, and the pressure in the fiber, researchers can very efficiently control the color that the photon will take over a broad spectrum.

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PHOTO: SHUTTERSTOCK

Not so negative anymore: if we actively suppress a memory and then recall it again, the images appear less vividly than before.

BEST FORGOTTEN

Many people have negative experiences in their lives that they would prefer not to be reminded of. Nevertheless, there are always moments when memories come up unintentionally – often triggered by objects that are otherwise quite harmless: a rubber boot reminds you of a flood, a sneaker reminds you of a car accident, a teddy bear reminds you of an injured child. However, earlier studies had concluded that if a person actively pushes the emerging images out of their consciousness, the associated scenes are more difficult to recall later. They are forgotten. Until now, however, it was

unclear what happens to the memory as a result or how the process is reflected in the brain. Researchers at the Max Planck Institute for Human Cognitive and Brain Sciences have pursued these questions in a study. They found that suppressing a memory reduces the neuronal reactivation of scene information both globally throughout the brain and locally in the parahippocampal cortex, which plays an important role in memory. By controlling one's thoughts, it is apparently indeed possible to permanently weaken one's memories.

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WEAKER DEFENSE IN OLD AGE

The immune system must constantly respond to and memorize attacks from new pathogens in order to protect against the next infection. This is accomplished with the help of B cells that build up a store of information and produce a large number of antibodies that directly recognize the pathogens. As we age, however, the immune system works progressively worse – a process that we also find in fish. A research team from the Max Planck Institute for Biology of Aging in Cologne has found that older killifish have different types as well as a lower diversity of antibodies in their blood than young ones. This could contribute to a general deterioration of immune defenses.

www.mpg.de/18474159/0325



MISCONCEPTIONS LOWER VACCINATION RATES

Raising vaccination readiness in the fight against Covid: the study by an international team, including the Max Planck Institute for Tax Law and Public Finance shows how this could be achieved. In January 2021, the researchers surveyed several thousand physicians about their attitudes toward vaccination against Covid. About 90 percent said they trust vaccination and plan to get vaccinated themselves. This proportion was vastly underestimated by the general population: in surveys, about 50 percent of lay people assumed that, at most, half of the medical profession was positive

about vaccination. Those who were then told the actual numbers not only changed their perception of the doctors' opinion but also increased their willingness to be vaccinated themselves: education lowered the number of unvaccinated by 15 to 20 percent. One reason for the distorted perception among the population, according to the researchers, is that minority opinions are given disproportionate weight in the media. For this reason, in debates on controversial topics, it should always be communicated how widespread individual views are.

www.mpg.de/18755942/0601

A matter of trust: those who believe that the medical profession trusts Covid vaccination are more likely to get vaccinated themselves than those who assume that there are many vaccination skeptics among physicians.

BONES BUILT LIKE PRESTRESSED CONCRETE

What engineers discovered only about 100 years ago has been used by nature for as long as vertebrates have existed. Just as steel wires under strain increase the fracture resistance of prestressed concrete, bones also become particularly hard and strong when their collagen fibers are prestressed by embedded mineral nanoparticles and they transfer this stress to the particles. A team from the Max Planck Institute of Colloids and Interfaces has observed that it is not only hydroxyapatite (which

forms the mineral component of bone) that creates a prestress in collagen fibers but other minerals with different crystal structures as well. In addition, the researchers have for the first time followed live, so to speak, how the stress builds up in the collagen and mineral particles when they precipitate within the protein fibers. The findings could be used to develop collagen-based hybrid materials for medical applications, among other things.

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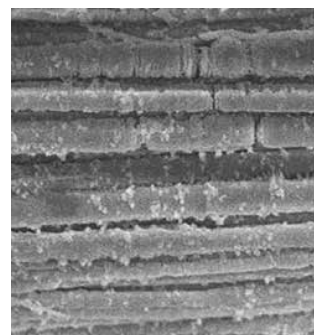


IMAGE: MPI OF COLLOIDS AND INTERFACES

Toughened by mineral particles: scanning electron microscopy shows that nanocrystals of strontium carbonate have become embedded within the collagen fibers of a tendon.

A TOOTH FOR A TOOTH

Who eats whom often depends on body size. Potential prey can therefore escape their predators in the long term by growing larger in the course of evolution – a path that whales, for example, may have taken as protection against killer whales and great white sharks. As an international research team led by the Max Planck Institute for Evolutionary Anthropology in Leipzig has now shown, however, size does not always offer an advantage in the food chain. The researchers used zinc isotope analysis to compare the diet of the great white shark with that of the megalodon (*Otodus megalodon*). This megalodon shark lived 23 to 3.6 million years ago and reached a length of up to twenty meters. According to the findings, the positions of the megalodon and the much smaller great white shark (six meters long) in the food chain overlapped. This means that when the first great white sharks emerged about five million years ago, both species must have frequently hunted the same prey – even though the megalodon was more than three times larger. The findings support the theory that the great white shark competed with the megalodon for food and thus may have contributed to the giant toothed shark's extinction.

www.mpg.de/18712873/0527



PHOTO: LIRAN SAMUNI, TAI CHIMPANZEE PROJECT

Communication in chimpanzees: the researchers identified hundreds of different vocal sequences that follow each other according to certain rules.

PLEASE USE COMPLETE SENTENCES

The gift of combining words according to rules is considered a unique feature of human language. Researchers at the Max Planck Institutes for Evolutionary Anthropology and Human Cognitive and Brain Sciences have now found clues as to where this extraordinary ability comes from. They studied the vocal communication of great apes and recorded thousands of vocalizations of chimpanzees living in the wild in Tai National Park in the Ivory Coast. As it turns out, the animals produce hundreds of different vocal sequences containing up to ten different call types. The order of calls in these sequences follows certain rules. This shows that vocal communication among chimpanzees is far more complex and structured than previously thought. The researchers will now investigate whether there are similarities to human language structures and whether chimpanzees use these sequences to increase the range of topics, they can communicate about.

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Clear difference: tooth of an extinct giant toothed shark Megalodon (left) and a great white shark (right). The composition of different zinc isotopes in the enamel crown of the teeth tells researchers what the animals fed on.

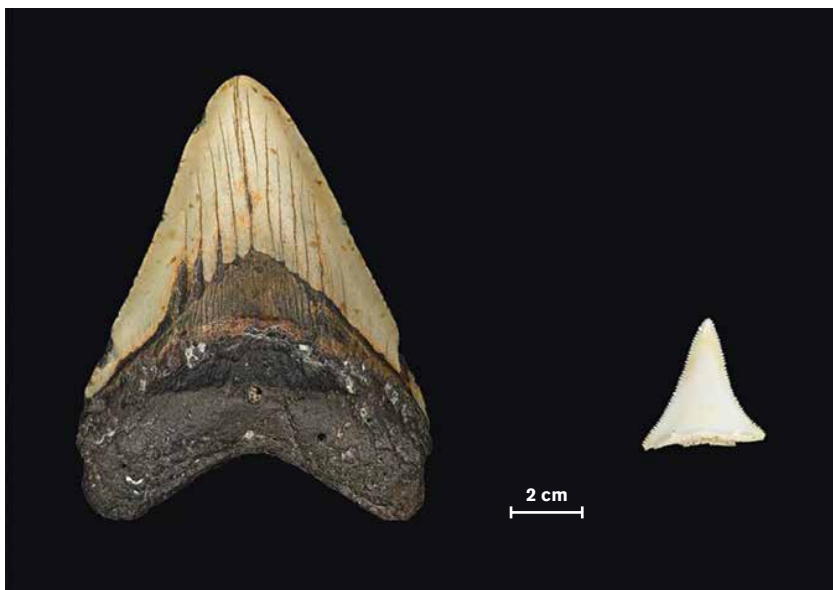


IMAGE: MPI FOR EVOLUTIONARY ANTHROPOLOGY