

75TH ANNUAL ASSEMBLY IN BERLIN

At this year's Plenary Assembly, the focus was on the issue of climate change. It is one of the most urgent global problems, with enormous geopolitical implications. Among the speakers were Filippo Grandi, the United Nations High Commissioner for Refugees, Anne Peters, Director at the Max Planck Institute for Comparative Public Law and International Law, and Axel Ockenfels, Director at the Max Planck Institute for Research on Collective Goods. They discussed international legal issues and economic challenges in the context of climate change and cli-

mate-induced migration. The Foreign Office was represented by Marcus Hicken, Director of Energy Diplomacy, Climate and Security. In his speech preceding the discussion, Patrick Cramer emphasized that international climate protection remains the great challenge for the future, and that it is therefore crucial that the European Green Deal is rigorously implemented after the EU election. Of the Max Planck Society, he said: "Our greatest contribution to tackling climate change is our research."

www.mpg.de/22059937

MERGER FOR THE HEART

Up to a billion euros, provided specific milestones are achieved – that's how much Europe's most valuable publicly traded company, the Danish pharmaceutical company Novo Nordisk, paid for the acquisition of Cardior Pharmaceuticals. Cardior develops therapies that prevent, repair, and reverse heart disease with the help of RNA (ribonucleic acid). The agreement covers Cardior's main product candidate CDR132L, which is based on findings from research conducted by the Hannover Medical School in cooperation with, among others, the Max Planck Institute for Multidisciplinary Sciences in Göttingen. The drug is currently in phase 2 of clinical trials for the treatment of heart failure. The acquisition was concluded on May 2, 2024.

www.mpg.de/21735306



Moderators Helene Bubrowski, Filippo Grandi, Anne Peters, Marcus Hicken, and Axel Ockenfels (from left) discuss climate change and migration.



PHOTO: DAVID AUSSERHOFER/MPG

OUTSTANDING! ★

CLAIRE DONNELLY

A researcher from the Max Planck Institute for Chemical Physics of Solids and the Dresden University of Technology, Donnelly received a Heinz Maier-Leibnitz Prize, which is awarded with 200,000 euros in prize money. She discovered a method for examining the magnetic properties of materials at a high spatial and temporal resolution. Over the next three years, she will use the prize money to study how nanomaterials with specific magnetic properties can be manufactured.



PHOTO: PHUONG DAO

EUGENE KIM

A researcher at the Max Planck Institute of Biophysics in Frankfurt am Main, Kim was another recipient of a Heinz Maier-Leibnitz Prize. She studies how chromosomes are organized and packaged with the help of condensin protein complexes. Kim discovered, for example, how several of these condensins work together without colliding and damaging each other when they form the structure of chromosomes. Her research also involves the development and use of new imaging techniques.



PHOTO: MPI OF BIOPHYSICS

COMMITTED TO UKRAINE

The Ukraine Recovery Conference took place in Berlin on June 11 and 12, 2024. Its goal was to mobilize further international support for the reconstruction of Ukraine. The Alliance of Science Organizations had developed an action plan prior to the conference. It sketches out measures and priorities in the short, medium, and long term for the reconstruction of Ukrainian science and higher education. Patrick Cramer, who currently serves as spokesman for the Alliance, argued for consistent and complementary support from the scientific community, politicians, and various sponsors. “A robust educational, research, and development sector is of fundamental importance for the sovereignty of Ukraine with regard to both science and security policy, as well as for its integration into the European Union and for its reconstruction at the end of the war,” said the President of the MPG. Since Russia began its war of aggression against Ukraine in violation of international law, the Alliance has stepped up its cooperation with research facilities and higher education institutions in Ukraine, while also providing funding and resources to support scientists and students alike.

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PHOTO: RENÉ VOLFIK

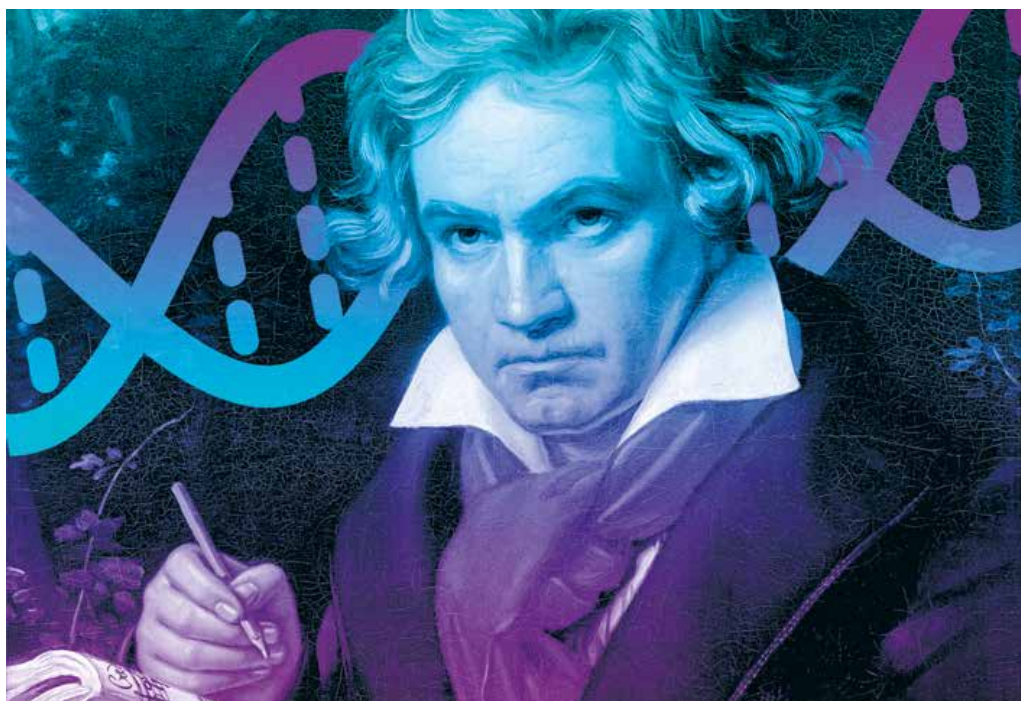
Patrick Peter Fabian, Helena Reichlová, and Barbora Špačková (from left), who will head the Czech Dioscuri Centers, with Patrick Cramer at the opening of the Centers.

THREE DIOSCURI CENTERS IN THE CZECH REPUBLIC

To offset the performance gap between Western and Eastern Europe, the Max Planck Society developed the Dioscuri Program, which promotes outstanding researchers. Launched in 2019 in Poland, which now has eight Dioscuri Centers, the program is currently being implemented in a second country, the Czech Republic. Three innovative research centers are forming with financing from the Czech Ministry of Education, Youth and Sports in cooperation with the German Federal Ministry of Education and Research. They are based at the Czech Academy of Sciences and its Institute of Physics, as well as at Masaryk University. “The European research area offers in-

credible opportunities for transnational cooperation. Close collaboration is needed across the entire EU if we are to advance European science as a whole,” said Patrick Cramer at the opening in May of 2024. The freedom and opportunities offered by the EU have benefited the scientific careers of many, including Helena Reichlová, Barbora Špačková, and Peter Fabian, who took advantage of mobility opportunities to conduct research in France, Germany, and Sweden. The two physicists and the developmental biologist were chosen from a pool of 30 applicants in Dioscuri’s first call for applications.

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If genes have anything to say about musicality, Beethoven was no more predisposed than the average person – which goes to show how little genes reveal about individual abilities.

GENES AND GENIUS

10 Genetically speaking, Ludwig van Beethoven was apparently not especially predisposed to music. Such was the conclusion reached by a team led by the Max Planck Institute for Empirical Aesthetics in Frankfurt am Main and the Max Planck Institute for Psycholinguistics in the Dutch city of Nijmegen. The researchers examined DNA from the composer's hair. Using genetic analysis, they calculated a "polygenic score" for beat synchronization, which is the ability to clap rhythmically, a skill closely related to musicality. Earlier studies have shown that, on average, around 42 percent of musicality is inherited. Beethoven's polygenic score did not stand out prominently, however,

when compared to large population samples from the Karolinska Institute in Sweden and Vanderbilt University in the U.S. Nevertheless, the unremarkable polygenic score says nothing about Beethoven's musical creativity and compositional skills. The authors of the study view this as proof of the limited significance of genetic analysis. When conducted on large random samples, research into genetic influences can admittedly yield insights into how and why musical skills and musical behavior vary from person to person. However, an individual's abilities or behavior cannot be reliably predicted based on genetic analysis.

www.mpg.de/21817081

A SAFER WAY TO DYE

In the future, dyes and other chemical products will be much safer to manufacture. An intermediate step in the prevailing method for synthesizing these substances for over 100 years causes an accumulation of explosive aryl diazonium salts, which in the past has often led to chemical accidents. Chemists at the Max-Planck-Institut für Kohlenforschung have now discovered a reaction pathway in which the explosive salts react immediately and do not accumulate. It was while working on another project that the team from Müllheim accidentally discovered that aryl diazonium salts form and are immediately disarmed, so to speak, in the new synthesis process. There was nothing in the textbooks to indicate this would happen. As source materials, the new synthesis pathway requires only inexpensive chemicals that are already used in large quantities in the production of fertilizers and fuels. The new method will make the manufacture of dyes not only safer, but cheaper as well.

www.mpg.de/21879939

WEAK CENTER

In 2022, an international research team that included researchers from the Max Planck Society published the first image of the black hole Sagittarius A* in the center of the Milky Way. New observations with the Event Horizon Telescope reveal this black hole to have strong magnetic fields spiraling out from its rim – much like the mass monster in the center of Galaxy M87 was observed to have. These magnetic fields might point to a matter jet that hurled massive quantities of matter into space a few million years ago. Today, the jet is too weak for that. It is, to quote the specialists, “frustrated.” Po-

larized radio light, which is difficult to measure, reveals these magnetic fields and makes it possible to map their structure. The discovery yields insights into the complex environment of Sagittarius A*, where gravitation, magnetism, and spacetime curvature collide. From Earth, the luminous environment of the black hole 27,000 light years away only looks about the size of a donut. To take pictures of it would require a telescope as big as Earth. The Event Horizon Telescope meets this requirement. It consists of eight radio observatories distributed across the globe.

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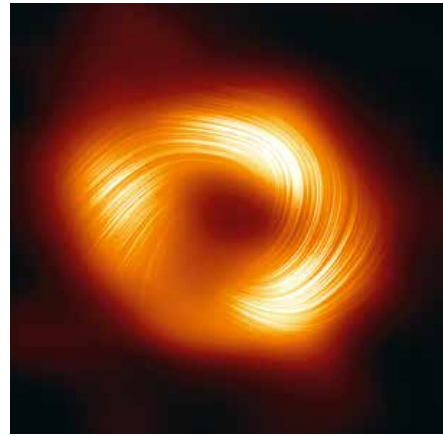


IMAGE: THE EHT COLLABORATION

Photo by the Event Horizon Telescope of the luminous environments of the black hole Sagittarius A* at the center of the Milky Way. The lines follow the direction of polarization of radio waves caused by a spiral-shaped magnetic field unwinding from the image plane.



PHOTO: SUTEISHI/ISTOCK

Dancers are more open and agreeable than other people – especially if they swing dance.

RHYTHM VS. NEUROSIS

Those who dance are less neurotic than those who don't. The proof is in a study led by the Max Planck Institute for Empirical Aesthetics in Frankfurt am Main. Researchers analyzed data from more than 5,400 people from Sweden and 574 people from Germany. They examined the Big Five Personality Traits, which are often used in psychology: openness, conscientiousness, extroversion, agreeableness, and neuroti-

cism. And they found that amateur and professional dancers alike are more open and agreeable than non-dancers. What's more, the level of agreeableness depended on the type of dance, with swing dancers registering as even less neurotic than people who do Latin and ballroom dancing. However, the findings are still to be confirmed using larger data samples.

www.mpg.de/22051204

LED BY CULTURAL PREFERENCES

What are pull factors for migration? Researchers from the Max Planck Institute for Demographic Research have studied Facebook data to investigate the influence of cultural similarity on migration flows. They found that cultural similarity plays an important role in the choice of target country as shared language and history. The researchers also showed that migration flows and culinary preferences are correlated. On Facebook, for example, Brazilians show far more interest in American food than Americans do in Brazilian food. Cultural aspects of daily life react sensitively to changes in the environment and can provide indicators for modeling and predicting migration.

www.mpg.de/21742745

JUST LIKE THEIR PARENTS

In times of climate change, scientists hope to meet the nutritional requirements of a growing world population by cultivating new, more resistant, and fruitful crop plants. Among them are hybrid plants, which descend from two different parent lines with beneficial characteristics. Hybrid plants lose their efficacy in later generations, however, because advantageous combinations of genes are lost when genetic material is restructured during gamete formation. As a result, hybrid seeds have to be made from scratch again and again. Researchers from the Max Planck Institute for Plant Breeding Research have now developed a method using tomatoes in which the gametes form not in the usual way through a special type of cell division called meiosis, but through simple division, or mitosis. The genetic material is no longer restructured, and the resulting gametes are genetically identical. All the beneficial properties of both hybrid parents are therefore united in the new plant. The technique can presumably be used on potato plants and other cultivated plants.

www.mpg.de/21914270

ORANGUTAN HEALS ITSELF

12 Researchers have observed an orangutan treating an open wound in its face with sap. The animal was presumably wounded in the face during a fight with one of its own kind, after which it tore leaves from a liana, chewed them, and applied the sap to the wound several times. Finally, it covered the wound completely with chewed leaves. The leaves contain antibacterial and anti-inflammatory substances. They are used in traditional medicine to treat a variety of illnesses due to their ability to reduce pain and lower temperatures. However,

it is not yet clear whether the orangutan “discovered” this type of wound treatment itself, for example when this wound or a previous one came into contact with the painkilling sap accidentally during a meal. It may also have seen one of its kind treating a wound. In any case, the behavior has never been observed in any other orangutan. Apes are known to take plants and rub them on their skin to alleviate pain caused by parasite infections, and chimpanzees in Gabon even treat wounds with insects.

www.mpg.de/21886982



PHOTO: ARMAS FITRA & TNGI & KLHK & MPI & UNAS & YEL

Wounded orangutan in Sumatra. Two days after this photo was taken, the animal applied sap from a liana plant to the wound and then covered it with chewed leaves.

CLOUDS OF MOLTEN SALT

The climate on exoplanet Wasp-43b is inconceivable by terrestrial standards. Researchers from the Max Planck Institute for Astronomy and their colleagues have drawn a temperature map of the hot gas giant with the help of data from the James Webb Space Telescope. The nearby mother star heats one side of the planet to 1250 degrees Celsius, while the other lies in eternal night, making it a mere 600 degrees. The extreme temperature difference raises violent winds that blow hot gas to the dark side at speeds of up to 9,000 kilometers per hour. The temperatures there are low enough that the gas must condense and form a thick layer of clouds. But the clouds in question are not just made of water like on Earth; these clouds contain molten salts and other minerals, which the James Webb Telescope has detected in the atmosphere of Wasp-43b in the form of spectroscopic fingerprints. At a dis-



IMAGE: T. MÜLLER (MPIA/HDA)

tance of 280 light years, the exoplanet is too far from Earth to allow its appearance to be studied in detail. Instead, the team has detected various molecules in the spectra of light that has passed through the exoplanet's atmosphere on the way to Earth.

www.mpg.de/21875918

This is how the gas giant Wasp-43b might look as it orbits its mother star closely. Because the star always illuminates the same side of the planet, the climate on Wasp-43b is assumed to be extreme.

Cells damaged by UV light form droplets in their cellular fluid with the protein DHX9 (green), where they sort and collect damaged RNA molecules.

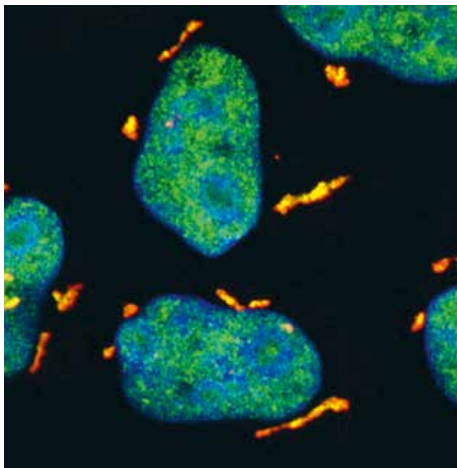


IMAGE: MPI OF IMMUNOBIOLOGY AND EPIGENETICS

SUN PROTECTION FOR CELLS

When cells divide, DNA and other molecules are passed on to the daughter cells. However, the latter may contain mutations or be damaged in other ways, for example, when a cell was exposed to strong sunlight. UV radiation damages not only DNA, but also RNA molecules, which form during DNA transcription. Among other things, the RNA contains genetic information on the site where proteins are formed. Researchers from the Max Planck Institute of Immunobiology and Epigenetics have recently discovered a cellular protective shield that cells use to protect against the negative consequences of damaged RNA. They irradiated cells with UV light and found that droplets of a pro-

tein called DHX9 appeared in the cellular fluid. Analysis of the droplets confirmed them to be full of damaged RNA molecules. Apparently, cells are capable of sorting RNA that was damaged by UV light and gathering it in these droplets of DHX9. Experiments by the researchers show that irradiated cells die faster when they are unable to form the droplets. The researchers also observed that droplets do not form in the mother cell damaged by UV light. To the contrary, DHX9 first emerged in both daughter cells. Cells therefore pass down sun protection during cellular division. These findings could lead to new methods for treating sunburns and cancer.

www.mpg.de/21712407

CELTIC DYNASTIES

The Celts laid high-status individuals to rest in burial mounds. Many of these monuments have survived, and some are massive. To this day, however, it remains a mystery who was buried in them. Researchers at the Max Planck Institute for Evolutionary Anthropology have now reconstructed genetic material from over 30 people from various burial mounds in Baden-Württemberg. Their analysis shows that the individuals were related to each other. For example, the people who were buried in the mounds known as princely tombs in Eberdingen-Hochdorf and Asperg-Grafenbühl must have been uncle and nephew; the sister of the prince in Hochdorf was the mother of the prince in Asperg. Other people buried in the two mounds and in the mound erected in Magdalenenberg a century prior were also related. The findings show that political power was inherited by succeeding generations among the Celts, and that consequently they must have had dynasties.

www.mpg.de/21995036



Reconstruction of the central tomb of the Eberdingen-Hochdorf burial mound in Baden-Württemberg.

IMAGE: LANDESMUSEUM WÜRTEMBERG, FABERCOURTIAL; THOMAS HOPPE (SCIENTIFIC RECREATION)

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Through conversations with partners, Dyad programs promote a positive world view, which helps alleviate depression.

PHOTO: COETZEE/PEOPLEIMAGES.COM/ADOBE STOCK

PAIRING UP AGAINST LONELINESS

In Germany, the number of people who feel alone, anxious, or depressed has increased, especially since the Covid-19 pandemic. In a large-scale study of psychological health, researchers from the Social Neuroscience Lab of the Max Planck Society polled thousands of Berlin citizens during the pandemic. The results show that loneliness, stress, depression, and anxiety increased with each lockdown. In the second phase, re-

searchers offered online training programs. The team compared the effectiveness of all the mindfulness programs with the effect of what are termed Dyad programs, in which two people converse. They take turns discussing certain topics, while the other person simply listens without judging. The new findings show that daily engagement in Dyads can increase resilience, compassion, and empathy, and deepen social relationships.

While both mindfulness exercises and Dyad programs mitigate psychological problems, only the latter reduce loneliness, depression, anxiety, and a negative attitude towards life. The researchers plan to continue developing the Dyad programs so that they can be implemented on a large scale in areas of society where burn-out rates and stress are a daily struggle, such as healthcare and education.

www.mpg.de/21926353

SWIMMING IN SYNC

When two fish swim together, they synchronize their movements. That was the conclusion drawn from movement analyses by researchers from the Max Planck Institute of Animal Behavior. The studies have shown that fish make swimming movements alternately rather than simultaneously. However, they only do it when both are paying attention to the other's movements. Computer models and experiments with virtual fish have shown that reciprocity has a significant influence on the swimming behavior of fish. Furthermore, fish that alternate their movements in sync possess stronger social bonds with each other. Reciprocity plays a central role in

most paired activities for humans as well, whether dance, sports, or conversation. By contrast, other species synchronize even when a partner doesn't react to its companion. Fireflies, for example, will synchronize their glow with a blinking artificial light source.

www.mpg.de/21966809



PHOTO: CHRISTIAN ZIEGLER/MPI OF ANIMAL BEHAVIOR

A school of Zebra fish.

NERVE CELLS AGAINST APPETITE

An impending exam, a sea voyage, spoiled food – all of these can lead to nausea. And when someone feels bad, they generally have no appetite. Why is that? Researchers from the Max Planck Institute for Biological Intelligence have identified a circuit in the brains of mice that prevents them from eating when they feel nauseous. A group of nerve cells in the amygdala, a brain region that deals with emotions connected with eating, plays a key role here. When the organism experiences nausea, the nerve cells are activated and transmit appetite-suppressing signals. When researchers activated the cells artificially,

even hungry mice stopped eating. Conversely, activating the cells caused the mice to eat even when nauseated. The newly discovered cells send their suppressive signals to several areas, including a region of the brain where information about the state of the body comes together. The cells differ from another group of nerve cells that suppress the appetite when the mouse is full. These exert control almost exclusively over neighboring nerve cells. In conclusion, the findings show that there are different forms of appetite loss, for which different brain circuits are responsible.

www.mpg.de/21757561

IRON PROTECTION FOR TEETH

Human tooth enamel could potentially be hardened with iron-rich material to protect it from acid attacks. Iron has long been known to strengthen the tooth enamel of rodents incisors, but researchers previously believed that iron also gave these animals' teeth their orange-brown color. So this layer of the incisors is currently called pigmented enamel. Now, however, a team from the Max Planck Institute

for Solid State Research has discovered that iron-rich material does not cause teeth to color. Using electron microscopy, among other techniques, the researchers analyzed the structure of the enamel of beavers, coypus, squirrels, along with some other rodents down to the nanostructure. In doing so they found that ferrihydrite-like material was embedded between the elongated hydroxyapatite crystals, the main component of

enamel. This layer is whitish in color. The Max Planck team therefore suggests to rename it as iron-rich enamel. Only a very thin layer on the surface of the incisors, consisting of inorganic nanoparticles and organic component, gives the typical orange-brown color. The researchers are now investigating how iron-rich material can be incorporated into human tooth enamel and how it changes its properties. www.mpg.de/22034748

Strengthened by iron, but not colored: the lower incisors of nutria (coypu, left) and beaver.



PHOTO: ADAPTED FROM ACS NANO 2024

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PHOTO: CZECH UNIVERSITY OF LIFE SCIENCES/JAN SOBOTNIK

Digestive help: termites (*Porotermes adamsoni*) that thrive exclusively on wood with the help of symbiotic microorganisms in their guts.

FROM BENEFICIAL TO HARMFUL

Microorganisms in the gut aid digestion in both ruminants and humans. Termites, for example, could not process wood without them, so their guts are packed with single-celled flagellates. These, in turn, are inhabited by bacteria that live in or on the flagellates and provide them with nutrients from the termite gut. Researchers at the Max Planck Institute for Terrestrial Microbiology have studied a group of bacteria called Endomicrobia to understand how the partnership between flagellates and their symbionts has evolved. Genetic comparisons between symbiotic and free-living Endomicrobia bacteria

have shown that the symbiotic forms have lost many genes over time, and this loss has been compensated for with the acquisition of genes from other gut bacteria. As a result, some bacteria have completely lost the ability to break down carbohydrates and can now only use molecules that are more energy-rich than carbohydrates, which is typical of parasitic organisms. It is possible that the originally mutually beneficial relationship between bacteria and flagellates is in evolutionary decline, and that some bacterial strains have evolved from beneficial to parasitic.

www.mpg.de/21900902