Off the BENCH

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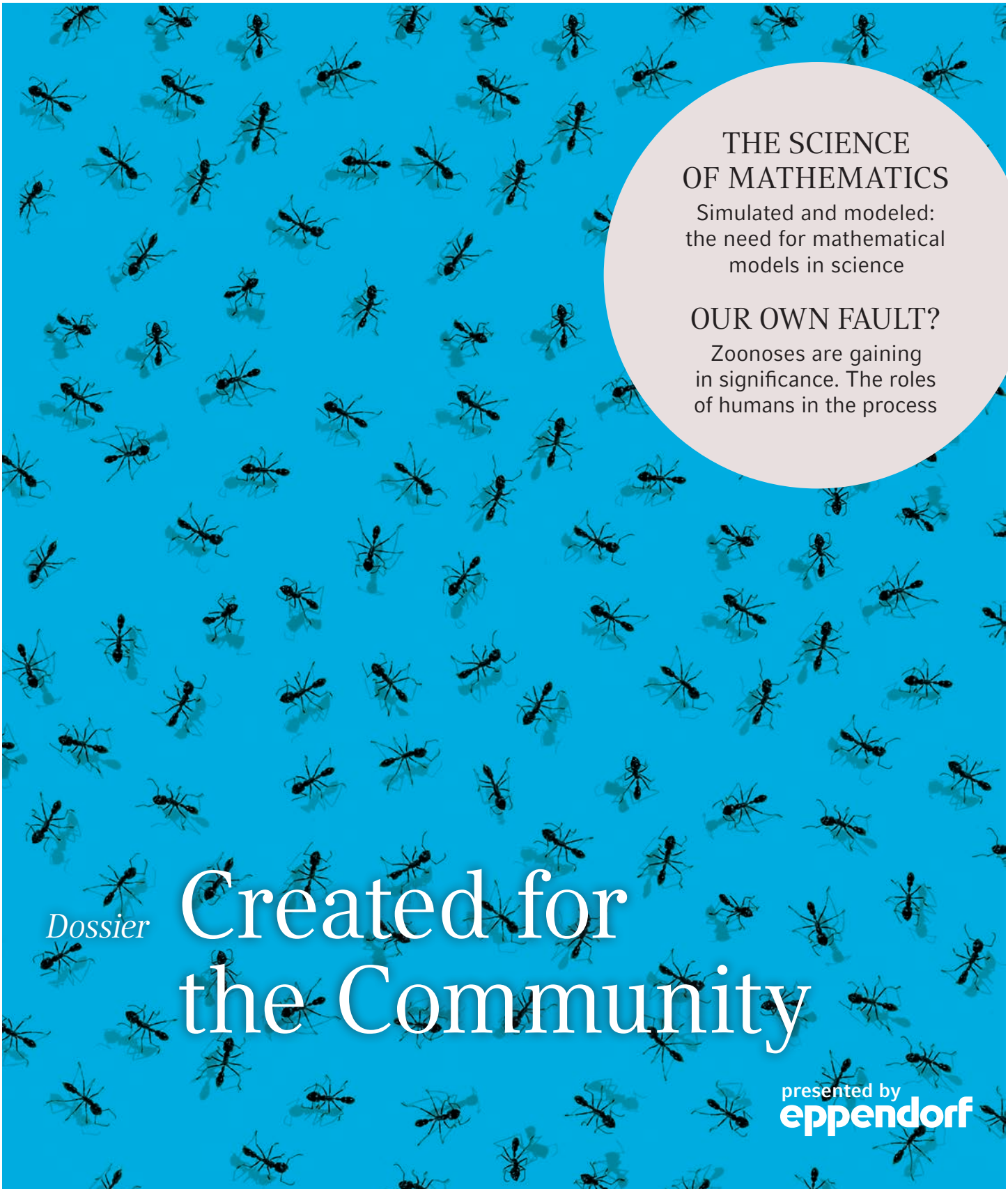
The Eppendorf – LifeScienceStyle Magazine



THE SCIENCE OF MATHEMATICS

Simulated and modeled: the need for mathematical models in science

OUR OWN FAULT?

Zoonoses are gaining in significance. The roles of humans in the process

Dossier

Created for the Community

presented by eppendorf

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INSPIRING SCIENCE

DOSSIER

INSIDE EPPENDORF

BRIGHT MINDS

EXPLORING LIFE

ISSN 2625-1116

Dear Reader,

Were you among those who held the first issue of "Off the Bench" in your hands back in 2016 – and therefore belong to our group of original readers? That first edition comprised 28 pages; it was published in English, and it featured malaria researcher Tim Gilberger on its cover. Now, in the early summer of 2021, we are launching the 10th issue of "Off the Bench", reporting once again on exciting topics from the vast field of the life sciences. Since 2018, the magazine has also been published in the German language – and it now comprises 52 pages. We are delighted with the continued growth of our publication.

In the same way that Eppendorf continues to support global laboratories in their battle against the COVID-19 pandemic with its products, the virus is once again represented in the topics of this current issue. One reader from the Netherlands, however, wrote to us: "It is good to read articles from time to time that have nothing to do with COVID. I have subscribed to 'Off the Bench', and I hope it will not be all about the pandemic."

Indeed, we gather our topics from the vast realm of science with plenty of foresight and care. We introduce the extremely talented researcher Neri Oxman who allows silkworms to spin environmentally friendly material for the building industry. Mathematics professor Gerta Köster illustrates why science cannot function without modeling and simulation. And Claudia Kessler supports female specialists within the aerospace industry with all her might.

You can see that we are invested in increasing the visibility of women in science. Supporting women is a matter of the heart to UNESCO as well as to UN Women who in 2015 originated the annual "International Day of Women and Girls in Science". It is a topic which we would like to pursue in more depth in the coming issue of "Off the Bench".

We hope you will enjoy the read

Eva van Pelt
Co-CEO

PS: You would like to experience "Off the Bench" in digital format? Simply visit our website!

www.eppendorf.com/otb

Create Knowledge

First "Kid of the Year" by US magazine "Time"
The US-American young scientist Gitanjali Rao

A Teenager in the Fast Lane

Since 1927, "Time Magazine" has been honoring the "Person of the Year" – starting with Charles Lindbergh who was chosen for his solo flight across the Atlantic. In 2020, almost 100 years later, Gitanjali Rao made it to the cover of the magazine – as the first "Kid of the Year".

Among other issues, the only-15-year-old science prodigy tackles the problem of drinking water contamination. To this end, the teenager is currently in the process of developing an instrument that is capable of detecting contaminating substances. Poor countries, in particular, are meant to benefit from the device. In addition, the American from Colorado developed the app "Kindly". This app, which relies on artificial intelligence, recognizes bullying in social media networks.

"All we have to do is tackle the one issue that we care about and solve it – however small it may be. Everything makes a difference", said Gitanjali Rao in an interview with Angelina Jolie on the occasion of her "Time Magazine" honor. Rao aims to be a role model and ignite other children's enthusiasm for science. Her recipe for success: "Observe, brainstorm, research, develop, share."

A Question of Genetics

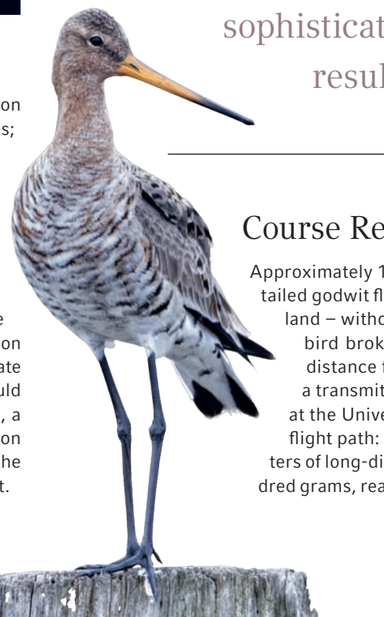
Whether, and to what degree, we are mathematically gifted, is at least partially a matter of genetics. In a study involving children, researchers at the Max Planck Institute for Cognitive Neuroscience in Leipzig discovered the ROBO1 gene. It influences the volumes of those regions of the brain that are considered to be the centers for the processing of numbers. In those children who carried the ROBO1 gene, a larger volume was ascribed to the right parietal cortex, and these children scored higher on mathematical tests. The researchers concluded that one fifth of mathematical abilities could be explained by differences in brain volume – but not to worry: the remainder is determined by the support and encouragement from parents and schools.

Wound-up World

Earth rotates ever faster. The year 2021 is on track to become the shortest year in decades; the average length of a day could decrease by approximately 0.05 milliseconds. According to the International Earth Rotation and Reference Systems Service (IERS), the hitherto shortest time period measured for one day was undercut during 28 days in 2020. Exact reasons for this trend, which has been observed since 2016, have not yet been identified. In addition to geodynamic processes, an indirect climate effect, possibly caused by melting ice, could play a role. If this trend were to continue, a negative leap second would be required on New Year's Eve in order to make up for the accelerated rotation. This would be a first.

1 Dollar

Is to be the price of a novel test developed by researchers from Nigeria, Sierra Leone and the US for the purpose of fighting Ebola and the Lassa virus. These infectious diseases continue to be a major problem in Africa. The test is quick, accurate and cheap, and it can be applied without the need for sophisticated equipment. Test results are read via app.



Course Record!

Approximately 12,200 kilometers – last September, a bar-tailed godwit flew this distance, from Alaska to New Zealand – without a break, in a little over nine days. The bird broke the record of the longest consecutive distance flown by 700 kilometers. The bird carried a transmitter on its back which allowed researchers at the University of Groningen to accurately track its flight path: during their marathon flights, these masters of long-distance travel, which weigh only a few hundred grams, reach a speed of up to 90 kilometers per hour.

Understanding Our Cosmos

Curiosity about our universe is as boundless as the universe itself. Space explorers study it with probes, satellites and telescopes – continually revealing new knowledge and spectacular images.

Eye in the Sky

What we cannot capture with the naked eye is "observed" more accurately by the space telescope "**Hubble**", developed through collaboration between NASA and ESA. Since 1990, it has been orbiting Earth at an altitude of 500 kilometers and a speed of eight kilometers per second, in only 97 minutes, delivering new knowledge about galaxies, the expansion of the universe, or even the mass of the Milky Way. In 2021, it will be replaced by the James Webb space telescope. The successor performs its measurements using infrared rays and, thanks to its enormous main mirror measuring 25 square kilometer in size, it can collect up to ten times more light. Equipped with instruments such as an infrared camera, spectrograph and a sensor, the James Webb space telescope is capable of performing even more precise measurements than the legendary Hubble. With the help of the telescope which will be placed roughly 1.5 million kilometers from Earth, scientists aim to study the early existence of the universe, among other topics.

Hot Encounters

What do we know about our Sun? It continues to be a scientific enigma, similar to the depths of our oceans. In the summer of 2020, however, the space mission "**Solar Orbiter**", on behalf of the European Space Agency (ESA), was able to collect images of hitherto unknown regions of the Sun, mere months after its launch. Even though it appeared that the space probe had come extremely close to the star, it had still kept a safe distance of 77 million kilometers – approximately half the distance between the Sun and Earth. The new images are meant to provide insight into how the magnetic field of the dwarf star functions and how solar winds are initiated. Researchers are hopeful that the images will allow predictions about future solar activity. Over the next two years, the orbiter will explore even closer to the Sun, at a distance of 42 million kilometers.

Unexpected Capabilities

It was only recently that researchers at the NASA Goddard Space Flight Center learned about the secret talents of their satellite "**ICESat2**": with the help of its instrument "Atlas", it is capable of scanning coral reefs 40 meters below the ocean surface. This came as a surprise as this satellite, orbiting at 470 kilometers above Earth, is mainly employed for the observation of climate change. The scan of a coral reef was first discovered in images of the Bikini Atoll in the western Pacific Ocean. The satellite scanned not only the atoll, but also the giant deep reef system. The field of oceanography considers this discovery a major success since the study of coral reefs which are situated at greater depths is extremely difficult. The researchers assume that, based on the ATLAS laser,the structures, as well as the changes of coral reefs, may be understood to an even greater extent.

Back to the Future

"The first images that our telescope sent us showed the true beauty of the hidden universe", said Peter Predehl of the Max Planck Institute for Extraterrestrial Physics (MPE) on the occasion of the first publication of photographs taken in late 2019 by the X-ray telescope with the melodious name of "**eROSITA**". Every six months, it screens the entire sky and transmits data for the purpose of constructing maps of the sky which depict the universe and its evolution. The astronomers operate on the premise that with the help of "eROSITA" they will find approximately 100,000 galaxy clusters as well as several million active black holes in the centers of these galaxies. Since light from far away galaxies travels for a long time, the telescope can look back in time up to six billion years.

In Harmony with Nature

New building materials may open up a future in which buildings and their environments can interact with one another. Whether organic or inorganic – materials will no longer be able to be assigned to distinct categories.

View through an opening of the "Silk Pavilion II"
The silk worms work live on the structure

The building industry is considered to be one of the most resource-intensive sectors overall. Globally, it consumes roughly 36 percent of all available energy, and is responsible for 40 percent of all CO_2 emissions. Innovations can contribute significantly – to the buildings themselves as well as in entirely new ways to the economy, to life and to the work which are all directly connected to these buildings. The central question: how can we meet the challenges of dwindling resources in times of a growing world population, climate change and a decline in biodiversity? Changes are necessary – we need to move away from fossil fuel-based resources and instead move towards sustainable, bio-based building strategies. New connections between the economy, technology and art offer reasons for hope.

The environment as a role model

American-Israeli professor Neri Oxman, for example, combines technology and biology in the Media Lab at the Massachusetts Institute of Technology (MIT). Together with an interdisciplinary team, she researches novel combination options for computer designs, digital manufacturing and materials science. Her goals: designs that comply with the principles of ecological sustainability to the maximum extent possible. For this purpose, she observes natural systems and processes in detail, allowing her to draw conclusions which will inform the development of new materials and styles. In 2020, the Museum of Modern Art (MoMA) in New York dedicated an entire exhibit to Oxman's idea of "Material Ecology". In a MoMA YouTube post on the occasion of the opening of the exhibit, Oxman explains the term as a "unique combination of research approach and designer philosophy, intended to bring the designed objects and their environment as closely together as possible."

Silkworm colleagues

The results of a possible interaction and collaboration between humans and their environment are groundbreaking. Like a supernatural being, the several meter high, fine white fabric, which had previously been on display at the MoMA, oscillates from the ceiling. For the project "Silk Pavilion II", Oxman left construction management to 17,532 silkworms. "We had observed that silkworms will spin their cocoons in a flat shape if they are unable to find tree branches by which to orient themselves", explained Oxman in the streamed Q&A format. With the help of a metal scaffold, she merely provided the framework – the remainder of the work was carried out by self-motivated larvae. The thus constructed building made from silk fibers is breathable and extremely robust, as well as tearproof and long-lived, despite its delicate appearance.

For Oxman, the project also illuminates different dimensions: "Our relationships with other species are just as much a topic as our love for silk. We should ask ourselves the basic question of whether designers must always determine form", says Oxman in her MoMA interview. In this context, she compares her role to the collaboration with an orchestra: "We begin as composers, and then we become conductors." Additional advantages: for the construction of the pavilion, not a single larva needed to be scalded or otherwise killed, as is common practice in traditional silk production.

Buildings out of a 3D printer

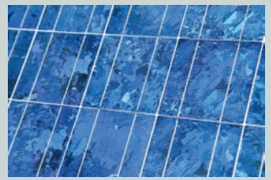
Oxman also experiments with 3D printers that she developed herself. In 2017, using a digital construction platform and ▶

Put in the right light
Neri Oxman's installation at MoMA In 2020

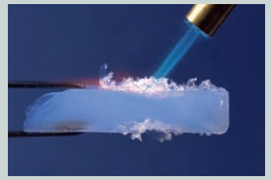
Masterpiece
A *Bombyx mori* silkworm lays silk fibers on a digitally produced scaffold structure

MORE SUSTAINABILITY

Bacteria as concrete
A Dutch marine biologist invented a bio-concrete with self-healing properties. Bacteria that normally live in alkaline lakes can survive up to 200 years in concrete – without oxygen or nutrients. In case of damage and the resulting contact with water, the bacteria "awaken", utilizing calcium lactate as a source of nutrition. The ensuing waste product, limestone, then seals the cracks.



Windows as energy generators
Transparent solar cells have been a topic of conversation for a number of years. Until now, they had a color cast and were not particularly efficient when compared with traditional solar cells. South Korean researchers have now developed color-neutral, transparent solar cells made from silicon circuit boards which are also flexible. This opens up new possibilities for application – for example, as windows.



Astronomical insulation
Aerogels are highly porous solid bodies consisting of amorphous silicon dioxide. 90 percent of their volume is made up of tiny air-filled pores which ensure that energy-conductivity, which depends on the movements of air molecules, is extremely diminished – the perfect insulator. Originally developed by the US Space Agency NASA for the Space Shuttle, they are now also used in the construction sector.

an automated building system that analyzes environmental data which thus guides production, she and her team succeeded in building – i.e., printing – an open cupola 14.6 meters in diameter and 3.7 meters high in roughly 13.5 hours. A laser-equipped robot arm controlled the material-foam nozzle. Empty spaces between the walls, which were built in layers, were filled with cement. The team had previously tested a number of different fast-curing polyurethane foams.

"Aquahoja" – this is what Oxman calls the resin-bound cellulose fibers and polymer variants she developed as alternatives to traditional plastic. These compounds, which consist of organic, water-based materials, degrade over time and may therefore be utilized in a continuous cycle.

Accepting change

Oxman and her team understand change as a natural process that humans should not resist. After all, most natural units such as glaciers, plankton or dandelions adapt to and co-evolve with new conditions.

"Humans do not behave in this way; most resist change and stand in its way. By doing so, they create consequences for all species", clarified MoMa curator Paula Antonelli in her contribution on YouTube. Oxman: "Nature does it best". Why not copy as much as possible from it? ■

Interview

At HafenCity University Hamburg, Professor Antje Stokman combines architecture, ecology, technology and urban planning.

You are currently collaborating with 35 international cities and institutions on a five-year EU project with the name "CLEVER Cities". What is it that makes a city and its buildings clever?

Antje Stokman: In this case, it means utilizing the materials and mechanisms of nature and working with nature instead of against it with concrete and technology. Real estate and cities can be planned from the ground up in such a way that they will provide ecosystem-services; in other words, they will not only use their environment but that they will also be of service to it. A façade, for example, can be constructed so that plants will be able to contribute significantly to the shading and cooling of the building without consuming energy or warming ambient air, as is commonly the case with air conditioners.

How strongly is this approach taken into consideration?

Over the past few years, the topic has gathered momentum, impacting the classic professions. Truly sustainable building is an interdisciplinary endeavor of architects, construction engineers, materials scientists, technicians and urban planners. At the same time, more participation is essential. The top-down approach – something is planned from above without involving the local people, their ideas and their knowledge – will not lead to the best outcome.

It sounds as though sustainable building will definitely incur increased costs?

It depends on how you make up the balance. Initial investments may be higher. If, however, you consider the costs of the entire life cycle which, in the case of buildings, encompasses the long term, sustainable models are more cost-effective. Green roofs for example, which protect buildings and retain rainwater, recover their cost after approximately 20 to 40 years while generating additional value appreciation through their livable green environment.

Good for the Brain

Shane O´Mara studies how leisurely walks affect our muscles, our immune systems and our brains. Read here how 5,000 steps a day can make a difference.

1 Brain

Walking influences the hippocampus and increases the production of the brain-derived neurotrophic factor (BDNF) – a protein which influences brain function. While we walk, the brain utilizes BDNF in order to create cognitive maps that help us explore the world around us. It also strengthens the connections between those areas of the brain that help us learn and remember. In addition, the protein ensures resistance against aging, trauma and infections.

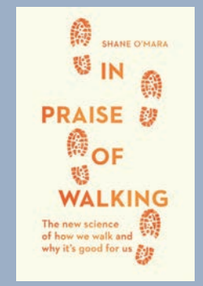
2 Muscles

When we walk, we are engaged in an aerobic activity that improves the health of the brain tissue, and molecules called myokines are produced inside our muscles. Increased physical activity during the action of walking allows more myokines to reach the brain. Myokines enhance brain performance by creating more connections among brain cells. Additionally, they support the circulatory system and thus enhance the resilience of the brain and the body as a whole.

3 Cardiovascular and immune system

Regular exercise – especially regular walks spaced throughout the day – improves cardiovascular health. Exercise increases the aerobic capacity of the heart and reduces circulating inflammatory factors and risk factors linked to heart disease. Moreover, physical activity supports the immune system through an increase in white blood cells which circulate through the body, and which help fight infection.

BOOK TIP

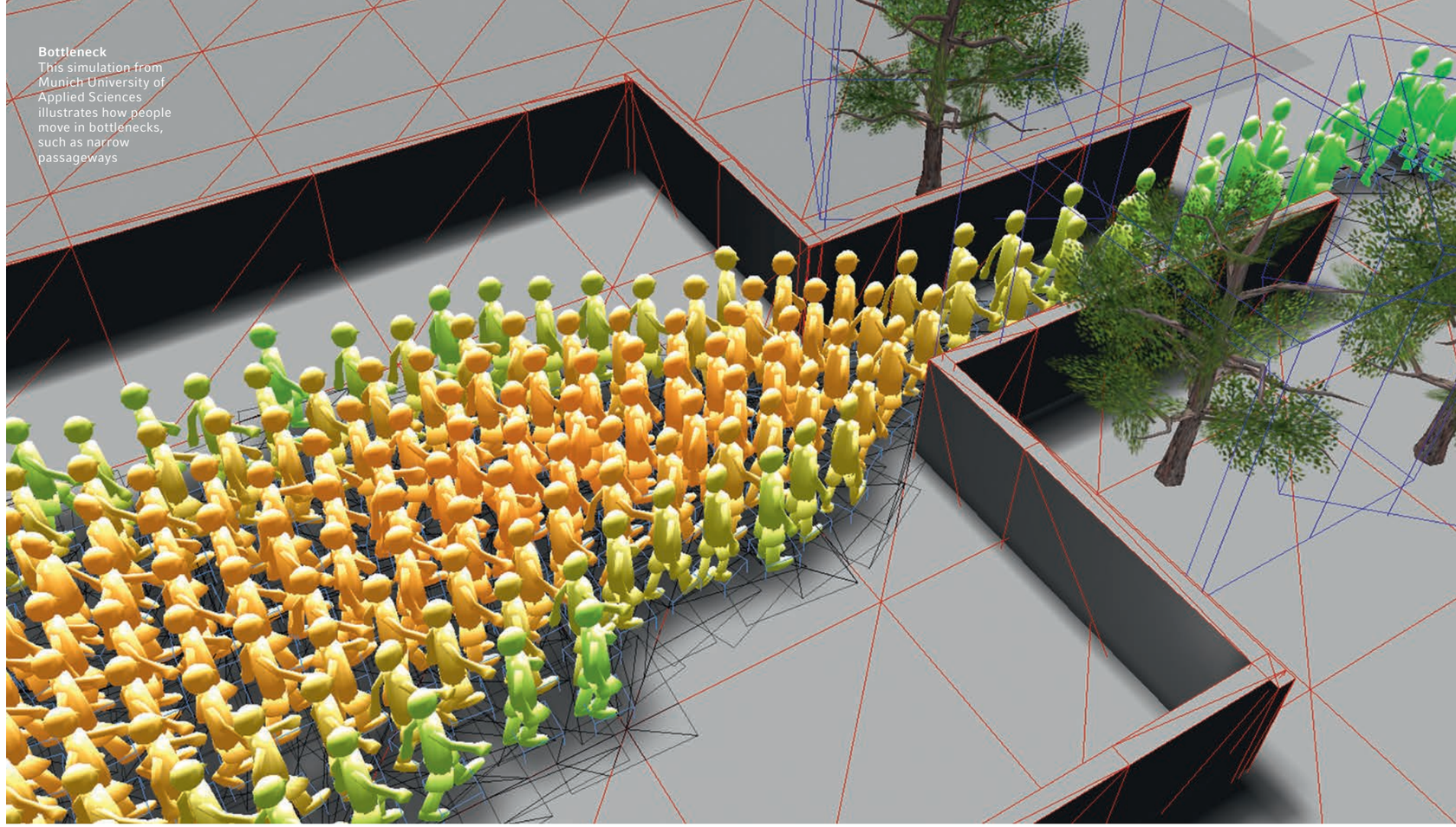


Last year, Irish brain researcher Shane O'Mara published his book "In praise of walking". In his work, he introduces a number of different studies on walking, and he emphasizes that walking, as a kind of self-repair mechanism, makes us healthier, happier and smarter.

"In praise of walking" – Professor Shane O'Mara; 224 pages; $25.95; W. W. Norton & Company

From Patterns and Models

Our daily lives are steeped in mathematics. According to Gerta Köster, professor at the University of Munich, there is hardly an area that is not influenced by modeling and simulation.



Bottleneck
This simulation from Munich University of Applied Sciences illustrates how people move in bottlenecks, such as narrow passageways

During this pandemic, the world is often explained using simulations.

Gerta Köster: Mathematics has been experiencing an upward trend for some time. Its triumph started about ten years ago, with the advent of AI. Mathematics could do quite well on its own, but would anyone really care about it? Not I! The advancement of mathematics is strongly driven by problems that arise in practice – now, that's a happy marriage.

Aristotle called mathematics "the art of learning".

In previous times, it was still possible to earn a Doctor of Philosophy in the field of mathematics. Today, most first-year university programs introduce structures that are ideally suited for learning and practicing logical thinking. One learns to discipline one's thought processes – but practical application is still best. Today, even the social sciences rely on mathematical models.

This is your area of expertise – you build models and simulate the movement of pedestrians.

The beauty of it is that one never works alone. Mathematics is located somewhere between the discipline of its application and informatics. Together with my students, I look at how people move through urban areas. With "Vadere", for example, we simulated the evacuation of a *Wies'nzelt* (Octoberfest beer tent) and recreated a model of how a subway car was vacated following a bomb attack in London in 2005. For these purposes, we collaborate with psychologists who alerted us to the fact that people do not flee alone but instead identify as victims and help each other.

You take empirical observations and describe patterns in order to derive models?

It is crucial to find out the defining characteristics about the observation, or else you will never finish. It is probably not hair color! In pandemic models, age plays a major role; in pedestrian simulations, it is group membership. The art of "leaving out" is the most challenging task of the modeler who always assembles their model in three steps: description of the real world – for example, capturing observations using a mathematical equation; translation into unequivocal rules of computation, also known as algorithms, and programming. It is imperative to continuously verify that the assumptions are still correct – on every level.

How do I know whether my model is valid?

You never know – that's the tragic part of modeling! I like citing British statistician George Box who, in the 1970s, said the following: "All models are wrong, but some are useful." One is bound to make mistakes during simplification and abstraction. The question is: are the assumptions wrong to the extent that their predictions are no longer useful?

Does every question require a new model?

It often helps to see if there are related phenomena; if there are, the borrowing begins. Pedestrian simulations were heavily influenced by models originating in physics; we now know that people do not quite move like grains of sand. For the pandemic, 100-year-old models are being used which were published in 1927 by Kermack and McKendrick.

They still work?

There have always been pandemics, and the principles remain identical. McKendrick was a British doctor; when modeling the Bombay (present-day Mumbai) plague epidemic of 1905/06, he assumed three groups: the non-immune healthy person (susceptible); those who are infected and contagious (infectious); and those people who have either recovered or died (removed). This marked the birth of the SIR model, which places these three groups in relation to the population as a whole and which can therefore simulate different scenarios. It is a macroscopic model that works well for considering the entire population, but it cannot explain how a localized infection from one person to another inside a supermarket will play out. This is the type of model on which we are working right now.

How long will it take?

Probably until the end of the year. We must first conduct a literature search – roughly 200 scientific articles on COVID-19 are published every day. We must filter the information and think about how to simplify, which type of algorithm to create and how to construct the software architecture.

The algorithm is defined as a solution to a mathematical problem which instructs the computer.

An example of a simple model: I will become infected if I breach the distance of 1.5 meters to an infected person. But what do we mean by "breach"? One second? One hour? Verbal communication does not require a strict definition – a computer does. Everything must be closed; there are only zeros and ones – no approximates. An algorithm closes these gaps; it is not in itself a computer program, but it translates facts into numbers.

Which part is the most labor-intensive?

During two of the three phases, you must never allow yourself to be rushed: if there is a mistake in the beginning, during the interdisciplinary collaboration phase, you may pursue the wrong lead for a long time. Actual programming is relatively quick, but a good tool – often tens of thousands of lines of code – will be continually tested. If you change one line of code, everything has to be tested to ensure that this one line did not introduce an error that will wreak havoc in a different area. All of this takes time. ■

SHORT PROFILE

Gerta Köster, 52, teaches mathematics at the University of Munich. A professor of scientific computing since 2010, she prefers to work in interdisciplinary teams with a focus on application. Her areas of expertise are model building and pedestrian dynamics. Her latest research project (local occurrence of infection) is funded by the BMBF (German Federal Ministry of Education and Research).

Things We Cannot Manage Alone

Community cohesion is considered to be the “glue” of our society. In times of crisis, it ensures that people will collaborate, close ranks – and surpass themselves.

We were born to work together like feet, hands and eyes, like the two rows of teeth, upper and lower.” This observation, delivered so poetically by Roman Emperor and philosopher Marcus Aurelius in the 2nd century BCE, is true to this day: humans are social beings. From the moment of his birth, Marcus Aurelius preferred to be social. Whether starting a family, working in teams, going to the pub, singing in a choir, or playing team sports, “Social relationships lay the foundation for personal identity and our sense of connectedness with others. This gives rise to positive emotions in an upward spiral relationship“, explains psychologist Andrew Kemp of Swansea University.

The principle of a community of solidarity with common values is considered the foundation of a successful society. Community cohesion has been proven to be the “glue” of our society – not only in times of crisis. From communal, cross-border garbage cleanup on the banks of the Rhine to the fight against a global pandemic: many things can only be accomplished if we work together.

This knowledge had been a trend since long before the COVID-19 pandemic. After individualism and self-actualization determined peoples’ attitude towards life for many years, we now share cars and scooters; vegetable gardens are cultivated together, and little free libraries are erected where favorite books are shared. The variations of community ►

reach from the rational, pragmatic exchange with little sense of community, as in the sharing economy, all the way to value-driven projects such as parent initiatives for childcare that demand a high level of engagement.

A sense of community is good for you

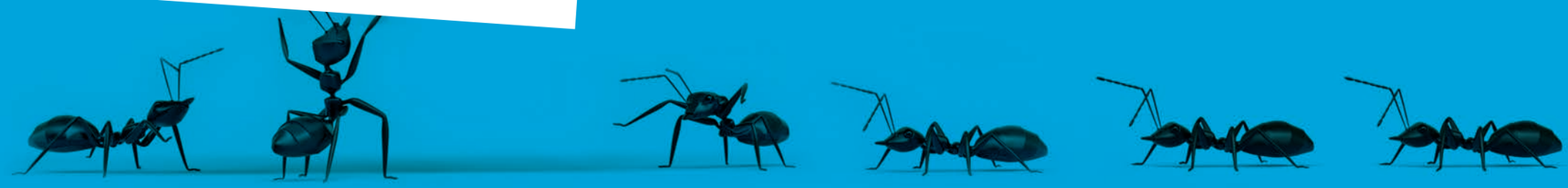
The rewards that members of a community reap will far exceed the success of their actual projects. Studies show that a successful community life has positive effects on overall health – even stronger effects than not smoking, weight control and exercise. A meta-analysis published in "The Journal of Clinical and Experimental Neuropsychology" by Australian psychologists Alexander Haslam and Jolanda Jetten of the University of Queensland points out that hobbies experienced as part of a community such as hiking, soccer or cooking foster the sense of belonging to a group and support mental performance and overall wellness.

Community cohesion also appears to strengthen society when it comes to mastering all kinds of crises. "The stronger the cohesion of any community, the more robust will be its coping mechanisms when faced with crises, catastrophes and social upheaval", were the results of the research project "Resilience through solidarity – the role of organizations" under the leadership of the University of Wuppertal in Germany. Social cohesion is found mostly in places where people know each other, trust each other and share common norms and values.

A crisis forges bonds

The COVID-19 crisis, too, has moved people closer together and forged solidarities among people who had not previously known each other, and many countries have even witnessed an increase in social cohesion. According to the "Social cohesion radar 2020" by the Bertelsmann Foundation, the proportion of people in Germany who worried about cohesion declined steadily throughout the pandemic. This is hardly surprising: the willingness to show consideration in everyday interactions is enormous. Most people wear masks and pay attention to hygiene and distancing without complaint, and "Social Distancing" has become a synonym for solidarity and social responsibility towards each other.

> *We might even be seeing a grassroots redefinition of what "community" means in the 21st century."*
>
> Fay Bound Alberti,
> University of York



All over the world, stories are told in which people will offer their help to complete strangers. In Brazil, for example, volunteers delivered food to the slums; in many European countries, volunteer organizations and neighborhood networks offered help with shopping, and in London, neighbors took dogs out for a walk for those who were quarantined. "Yet something quite profound is also happening in terms of our relationships with people we don't know", says cultural historian Fay Bound Alberti of the University of York. "Despite negativity about the societal impacts of COVID-19 – from increased levels of loneliness to the limitations of social media – we are seeing some positive and unexpected results, including widespread outpourings of charity, as well as togetherness and empathy for complete strangers. We might even be seeing a grassroots redefinition of what 'community' means in the 21st century", says Alberti.

Cohesion as a "social curse"

Despite its overwhelmingly positive effects, social cohesion also has the potential to turn into a curse: scientists from Vienna and Giessen discovered that people were more prone to "infection" by another person's stress if those affected are connected through feelings of cohesion, community and togetherness. The scientists named this contagious stress a "social curse". "It is reasonable to expect that people will be even more likely to contract the feelings of stress if they witness people in difficult situations with whom they share a strong, long-term connection, for example, family and friends", explains Professor Jan Häusser, lead scientist of the group.

The situation becomes even more problematic if members of a community separate themselves from outsiders in an extreme fashion. Various economic and political scandals, but also xenophobia within police forces and acts of violence within the military illustrate where an exaggerated sense of cohesion, which targets outsiders, can lead.

Cohesion is threatened by external circumstances

Social cohesion is also vulnerable to external forces – be it a crisis, poverty or polarization. Climate change, economic upheaval, migration or the collapse of democracy endanger the trust of many in their fellow humans and in the state, as exemplified in certain segments of the population even throughout the COVID crisis. "As if through a magnifying glass, COVID-19 amplifies preexisting social upheavals. Those who were previously disadvantaged will face an even more difficult situation in a crisis", reports Kai Unzicker of the Bertelsmann Foundation, where he is referring specifically to people with little formal education, low economic status or a migrational background, and also single people and single parents.

Whether the COVID crisis will in the long run unite or separate people is already a topic of heated scientific debate. When it comes to this question, cultural historian Alberti of the University of York is convinced of the principle of a "blessing in disguise": "The coronavirus is changing what is possible. Amid emotional devastation and uncertainty, it is providing the potential for more connectedness, as well as less, and for radically changing the meanings of community itself. This pandemic might, paradoxically, bring people closer together." ■

More togetherness
Cohesion in a social group can be shaped

The Emergence of a Sense of Us

A good community is not created from nothing. Small groups, more togetherness instead of solitary struggle, and a sense of humor foster a strong sense of unity.

Those who observe primates at play will discover interesting facts: for more than 120 hours, biologists Giada Cordoni and Elisabetta Palagi of the University of Pisa observed adult gorillas and chimpanzees at play inside a zoo. They noticed that in captivity, the social chimpanzees spent more time playing than the lowland gorillas whose groups are for the most part dominated by a single male. Their explanation: "In many adult animals, play is thought to reflect a species' degree of social cohesion and is usually more frequent in species with low levels of competition and high levels of social affiliation."

Animal behavior allows only limited conclusions to be drawn with respect to humans. At the same time, our group cohesion, too, benefits both from our urge to play and our sense of humor, found anthropologist Jeffrey Johnson of the University of Florida. On behalf of NASA, he studied the behaviors of teams which depend on each other for extended periods of time – similar to a future mission to Mars or a research station in Antarctica. His conclusions: the storyteller and the person with the sense of humor play the most important roles in these groups. According to Johnson, the sense of humor significantly enhances team cohesion.

Common experiences, common results

What are the other factors that influence a sense of unity – in scientific terms also known as "cohesion" – the force which binds the individual to a community? This question is the focus of the work by scientists in various disciplines – from sports science and business psychology to military science. Group cohesion benefits if membership in the group is highly attractive, if members interact often and if there is competition with other groups. Other important factors of group cohesion include passion for a common goal, group experiences and results – and even individual benefit calculations.

Israeli scientists discovered that synchronous actions will also strengthen group cohesion. They observed that the chants of a group of fans arouse positive emotions (with a simultaneous increase in aggression towards the opposing group of fans). Even just a walk seems to bring people closer together if they walk in step. "People who walk in step with one another are more likely to cooperate", says psychologist Liam Cross of Edge Hill University in England. He observed that synchronized walking broke down prejudices against the companion. "As our research shows, moving in time together gives people a greater sense of belonging and connection to each other. These feelings, in turn, set the stage for greater cohesion between different groups", says Cross.

Successes forge a cohesive team

Shared successes especially appear to weld teams together, found Canadian sports scientist Albert Carron and his group at the University of Western Ontario. The same is true for the reverse: a strong ►

team spirit increases the success of a community. An impressive experiment by social psychologist Lee Ross of Stanford University corroborates the theory. He played the same game with different groups of equal composition. To one group, he introduced the game as a "community game" – a game with the purpose of enhancing community benefit. In this team, around 70 percent of participants later collaborated closely with one another. The other group was instead presented with a "Wall Street Game", which would reward selfishness. As a result, approximately 70 percent of players subsequently played against each other. The name of the game alone influenced the behavior of the participants. The experiment also shows that those who bet on individual competition may miss a good opportunity.

> *"Smaller teams produce more innovative results. Large teams score more highly in developing existing knowledge."*
>
> James Evans, University of Chicago

Small teams – increased innovation

The trend towards teamwork is also firmly established in science; the phenomenon of cohesion has been a subject of study by the international working group "Social Cohesion Hub" since the fall of 2020. Whether large, interdisciplinary teams really deliver better results than small teams is subject to reasonable doubt. Sociologist James Evans and his team at the University of Chicago analyzed more than 65 million published studies, patents and software products launched between 1954 and 2014. His conclusion: smaller teams produce more innovative results whereas larger teams are better at enhancing existing knowledge. "Bigger teams are always searching the immediate past, always building on yesterday's hits. Whereas the small teams, they do weird stuff – they're reaching further into the past, and it takes longer for others to understand and appreciate the potential of what they are doing", says Evans.

Those who want to encourage team spirit within a company should therefore not follow every new trend: latest sociological research has discovered that the flattening of hierarchical structures will promote structural egoism. Therefore: the good old hierarchy is absolutely capable of enhancing the sense of unity within a team – and this includes gossiping about the boss. ■

Broad field of research
What constitutes good teamwork is something that scientific studies deal with time and again

Welded together
Shared experiences and memories strengthen the sense of togetherness and make teams more resilient

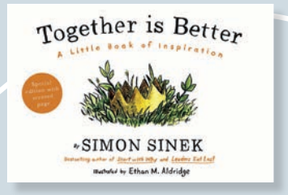
TIPS FOR MORE COMMUNITY

How a sense of community can be strengthened – particularly in times of crisis. Recommendations by the "European Federation of Psychologists' Associations' Support Hub" – a brief summary.

- Communities can strengthen the sense of unity by conveying the following emotions to their members: "What I do seems important to others. I have someone with whom I can exchange thoughts, experiences and emotions. They seem to know me and will care about me when needed. I am not alone." These sentiments convey to the group member a feeling of belonging to something larger and also of being needed.
- Communal engagement helps strengthen connections between people and helps foster a sense of belonging. People should feel that their involvement is in fact useful and that it contributes to solving a problem.
- People must be allowed to retain a certain level of control over themselves and their environment and be recognized for their efforts.
- Active participation in a social support network during or following a crisis may bring psychological benefits, particularly to young people. It strengthens self-esteem as well as the sense of individual and collective effectiveness.
- The promotion of a collective memory will reinforce both the power and the resilience of a community. To this end, community psychologists in Europe and the USA are collecting ideas, creative moments and individual and collective experiences in order to compile a "New Bank of Community Ideas and Solutions". With these common memories of our newly developed sense of community, our future communities can be rebuilt in order to become more resilient and more inclusive.

Learning about Ourselves

Why we need each other and why we are better than we often think: different views on us humans as a society.



Together is Better

A short story of inspiration

Community carries meaning – at work as well as in our private lives. The stronger our connections, the stronger our mutual trust and sense of cohesion. In this illustrated book, three children venture to a new playground. Together, they are about to face life.

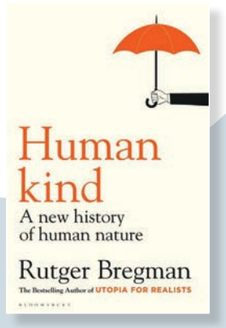
Simon Sinek, 160 pages, Portfolio, approximately $20.00 (Hardcover)

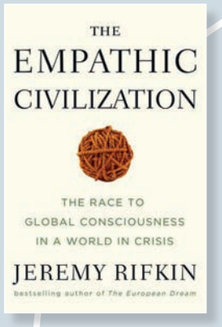
Basically Good

A new history of humanity

Humans are often dismissed as a horrible and loathsome species. A closer look, however, reveals quite a different side. Rutger Bregman reflects on the history of humanity, and he formulates a new, encouraging perspective. A plea for community spirit and cooperation.

Rutger Bregman, 480 pages, Bloomsbury publishers, approximately €24.00





The Empathic Civilization

Ways to a global conscience

Cooperation triumphs over competition. Building on a new history of civilization, Jeremy Rifkin defines a novel human image. He calls for a global community in order to avert a possible collapse of civilization. This book covers a subject that continues to be of great relevance.

Jeremy Rifkin, 468 pages, TarcherPerigee publishers, approximately €26.90

INSIDE Eppendorf

Digitalization, and the associated connectivity of Eppendorf products, continues to advance. Also: ideas for playful diversion from the laboratory routine – including a prize contest.

PIPETTING MADE EASY

Meeting challenges digitally with the VisioNize® pipette manager

SPECIALIZED IN AUTOMATION TIPS

The Eppendorf OEM-division offers tailor-made solutions for special requirements

Routine and Highly Professional

Mastering the basics of pipetting is one thing. Knowing the properties of liquids is another. The VisioNize® pipette manager from Eppendorf simplifies the processes – and digitalizes them at the same time.

Certainly, many routine tasks occur in daily laboratory work, commonly including pipetting. But even with repetitive workflows, users face different challenges every day:

- Time-consuming volume/parameter setting for each step,
- Restrictions in programming protocols,
- High manual documentation effort and lack of traceability and transparency in the experiment execution,
- Proper documentation for compliance with regulations and regulatory requirements (often manual/paper),
- Inaccuracy due to underestimated influence of fluid type,
- Quality issues due to transfers between different systems and manual steps.

These are just a few of the hurdles that need to be overcome in addition to routine tasks such as pipetting in the lab. Technology solutions are here to help scientists improve speed, accuracy and efficiency and collaboration. This is where connectivity and the Internet-of-Things approach come in.

With the introduction of the VisioNize pipette manager, we are redefining pipetting routines and taking a first step towards digitalization in manual pipetting. The system is ideal for scientists who manage a high workload and require many intricate pipetting steps. In the info box on the right you can see some of its many advantages!

Correct pipetting has to be learned

Back to pipetting, which, as mentioned at the beginning, is one of the routine tasks in the laboratory. Nevertheless, there are many things that can go wrong here. It is therefore not only important to learn pipetting from scratch – which is sometimes neglected in practice – but also to think about the fundamentals. About the pipetting tool itself and above all about the liquid used. As is well known, the devil is in the details.

Liquids can be divided into five main categories: aqueous, viscous (incl. cleaning agents), volatile, dense and infectious or toxic. Improper handling of these liquid categories has an enormous impact on pipetting results. While pipetting aqueous solutions (such as most buffers) is relatively easy and is mainly performed with classic air cushion pipettes, difficulties may well arise when pipetting volatile liquids, which include acetone, for example. The reason: volatile liquids have a high vapor pressure, which leads to evaporation into the air cushion and thus to droplet formation. Without the proper technique, this ultimately means sample or reagent loss. When pipetting volatile liquids, pre-wetting of the pipette tip, i.e. repeated aspiration and dispensing cycles to humidify the air in the tip, is mandatory to increase accuracy.

> *“Normally, I am using manual pipettes but testing the VisioNize pipette manager with the electronic pipettes has convinced me. Easy to use and helpful modes for my pipetting steps during qPCR.”*
>
> Petra Bakker,
> Leading Lab Technician, University Medical Center Groningen

Step forward
Routine manual pipetting is simplified and digitized by the VisioNize pipette manager

When a change of pipetting tools is necessary

A completely different liquid category includes viscous liquids such as glycerol. These have a very slow flow behavior due to a high inner friction of molecules leading to air bubble aspiration, residues in the tip and sample or reagent loss. A special pipetting technique called reverse pipetting is recommended when using classic air-cushion pipettes. But even better is usage of a different pipetting tool, a positive displacement device with a syringe-like tip working without an air cushion between the sample and the piston inside the tip. Liquid can be aspirated faster and easier with these tools. When dispensing a viscous liquid, the complete volume can be dispensed without residues in the tip.

Work & result optimization

So if you think about the liquid before starting an experiment, you can simplify and improve your workflow and thus your work results. It is practical that the VisioNize pipette manager has various liquid types preset or adjustable.

! FULLY NETWORKED

The VisioNize pipette manager and its many advantages:

- High manual documentation effort and lack of traceability and transparency in the experiment execution,
- Support in handling difficult liquids thanks to preset Eppendorf liquid types (e.g. acetone),
- More effective management of pipettes and better collaboration within the workgroup (e.g. through reservation option).

Discover more now at:
eppendorf.com/visionize-pipette-manager

According to Your Needs

With more than 150 parts per second, the production volume of automation tips at Eppendorf is enormous. Many of these tips are produced for the company's OEM division. Time to introduce the area.

Eppendorf offers a broad portfolio of products for the laboratory sector, covering a wide range of application areas. Nevertheless, there are industries such as diagnostics that place special requirements on products. These requirements range from detailed documentation and special packaging and sizes to specific surfaces or materials for consumables. The OEM department of Eppendorf is responsible for such inquiries and solutions that cannot be found in the Eppendorf catalog.

24/7 and fully automated
OEM product quality also plays a major role for Eppendorf. Production in our own plants means that every consumable is manufactured to the highest quality standards. A large part of the ISO 9001 certified production takes place in Germany and the USA. Production here runs 24/7 and is fully automated. This prevents contamination through human intervention. In addition, the in-house production of injection molds of Eppendorf makes it independent of external manufacturers, which increases the ability to deliver.

Excellence from head to toe
The OEM segment is characterized by long-term partnerships with customers. Eppendorf supports its partners throughout the entire product life cycle. From conception and design of the product according to customer requirements, provision of infrastructure, protoyping and performance testing and production, to packaging and delivery. The experts at Eppendorf OEM know how to do it. But even after delivery of the product, our colleagues take care of their customers, for example in the area of change management. In this way, Eppendorf supports its partners in keeping the total cost of ownership of their product as low as possible over its entire life.

More info about OEM online
This is just a small insight into the OEM world of Eppendorf, which deals with special customer requests for Eppendorf products that are not included in the standard portfolio. Would you like more information or do you have a specific request? Just go to:

eppendorf.global/oem

"There are few consumables suppliers on the market that can produce on such a large scale as Eppendorf. Our fully automated manufacturing produces billions of parts annually with the highest quality and reproducibility."

Jon Smith,
OEM Key Accounts Americas

DID YOU KNOW THAT ...

... unlike in the laboratory sector, in the automotive industry the car manufacturer is referred to as the "Original Equipment Manufacturer (OEM)"? He sells the finished end product "motor vehicle", which he assembles from individual parts from his own production and parts from supplier companies, under his own brand.

Consumables according to customer requirements
In intensive discussions, our OEM experts identify the needs of our customers

More productive and connected
The VisioNize Lab Suite platform lets you manage the lab smartly

New Standards for the Digital Laboratory of the Future

The corona pandemic is having a massive impact on laboratory processes and workflows. Eppendorf has a digital answer with the VisioNize® Lab Suite.

The SARS-CoV-2 pandemic has a wide range of effects on laboratories around the world. And this does not (only) mean the current high number of requests for PCR tests for the new corona virus. It has challenged laboratories worldwide to quickly adopt digital technologies to cope with the new norms of social distancing, remote work and restricted access to their lab benches. These past months have proven that digitalization is central to every interaction – whether on an individual or organizational level – and has fast-tracked the acceptance of digital solutions. In fact, laboratory work will change significantly and permanently in the future.

Clever software solution from Eppendorf
There are numerous starting points for optimizing laboratories and for improving the use of existing assets through digital applications. To meet new needs and overcome challenges in laboratories worldwide, Eppendorf offers smart lab management software solutions, such as the VisioNize Lab Suite, that increase productivity for all routine tasks in the lab.

VisioNize Lab Suite is your solution for effective lab management. With one tool only, you gain access to a modular range of services and can flexibly choose what works for your lab. These services integrate to support you and your lab along your digital transformation.

VisioNize Lab Suite is designed as a vendor-independent solution and works with different levels of connectivity with Eppendorf and third-party devices. The service suite is constantly being expanded, making it a sustainable investment.

In one platform you as a lab manager or scientist will find everything you need to start digitally managing your lab for increased sample security, to be audit ready and to maintain smooth lab operations. Interested?

Start your free trial* of three months now: **www.eppendorf.com/visionize-subscription**

*VisioNize Lab Suite and services is not available worldwide. Check the website for more information.

FEATURES & BENEFITS

- **Connect devices and data:** From freezers to pipettes. All relevant documents available at your fingertips such as SOPs and operating manuals.
- **Remote monitoring:** Status checks of laboratory devices from anywhere at any time
- **Alert notifications:** Utilize escalation schemes and acknowledgement for advanced documentation
- **Plan maintenance tasks:** one-time or recurring tasks for all lab assets incl. notifications when due.

Learn more:

www.eppendorf.com/visionize

Lab Lifestyle

1

2

3

1 Science Rapped

Communicating science in the most understandable way possible and thus reaching more people has become all the more popular since the advent of social media. The ideas are becoming more and more creative: the University of Michigan Press, for example, has become the first scientific publisher to issue a scientific publication in the form of a hip-hop album. In “I Used to Love to Dream”, the author, A.D. Carson, assistant professor of Hip-Hop and the Global South at the University of Virginia, addresses the issues of racism and violence against people of color that he himself has experienced. Available via open access:

https://bit.ly/39y5ugp

2 Virtual Events & Online Seminare from Eppendorf

Crises are the mother of invention: due to Corona, personal contact with our customers is hardly possible. And so we have intensified our virtual formats. We look forward to presenting these to you in bundled form soon! Stay up to date with our Eppendorf Newsletter and never miss an event again: **www.eppendorf.com/newsletter**.
To expand your knowledge, we recommend that you get an overview of our diverse webinars: **www.eppendorf.com/webinars**. In addition, we look forward to meeting you virtually at ACHEMA Pulse from June 15–16: **www.achema.de/en/the-achema/achema-pulse**.

3 Film Star Eppendorf

Whether thriller or science fiction, film scenes set in a scientific laboratory have become quite typical, and not only for this genre. As a rule, they are recreated on the film set, as Eppendorf knows from first-hand experience, since its numerous devices regularly play the leading role in film laboratories.

Pipettes & Co. from Eppendorf can be seen not only in “Tatort” or “Polizeiruf 110”, but also in international series such as “CSI” or the cinema hit “Avatar”. Or how about the Netflix series “Biohackers”? The plot: the young medical student Mia enters a dangerous world full of illegal genetic experiments to solve the mysterious death of her brother. Naturally, she encounters adversaries along the way ...

Current broadcasts and film releases in which Eppendorf products are the secret star are always worth a note on our social media channels. It pays to check in regularly!

! Playfully Win!

When Caezar Al-Jassar and Kuly Heer developed “Lab Wars” (lab-wars.com), they thought of a game specifically for scientists: You run a lab and try to be the best by sabotaging others. In the process, the action cards are based on real situations from everyday life as a researcher.

Do you want to play “Lab Wars”?
Win one of 20 “Lab Wars” games and try your luck in the lab. All you have to do is answer the following question correctly:

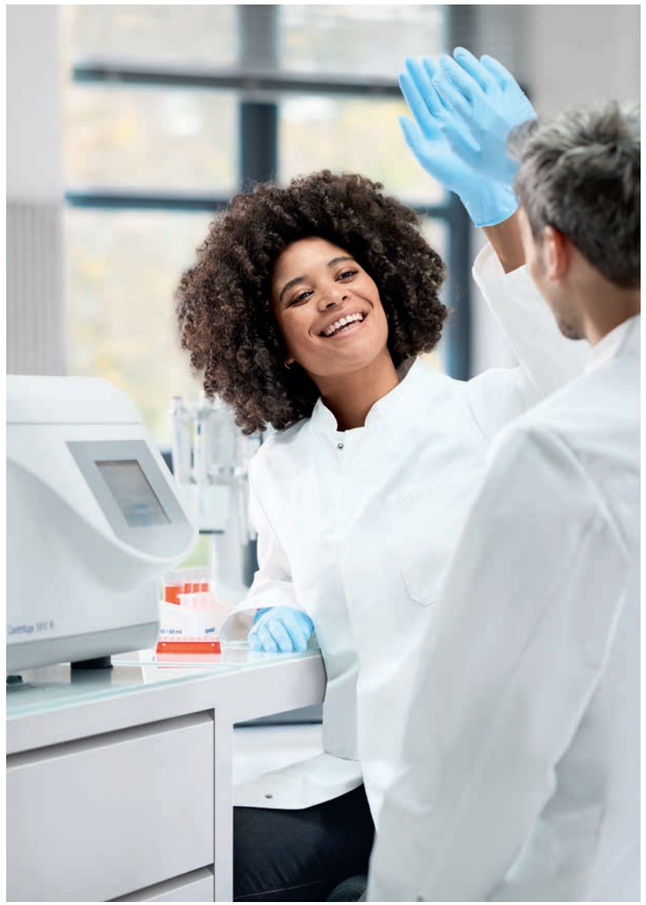
What is the name of the Eppendorf innovation that heralds digitalization in manual pipetting? Hint: You will find the answer on pages 26/27.

The deadline for entries is October 15, 2021. Send us an email at magazine@eppendorf.com or register as a subscriber and leave a message with the keyword “Lab Wars”. You can find the conditions of participation here:

www.eppendorf.com/otb

News at a Glance

Whether from an employer's point of view, with regard to innovative products or in terms of sustainability, a lot is happening at Eppendorf. A news overview.



Careers at Eppendorf

What connects all Eppendorfers with each other, and what distinguishes us as a community? We have always lived the mission of making a contribution to improving human´s living conditions. On the other hand, our working culture "Collaborate on new ideas" shapes our actions: innovations only come about through synergies between all areas of the company. We use individual strengths to shape the future together. Interdisciplinary collaboration on a global scale enables Eppendorf to constantly reinvent and develop itself. Would you like to become part of the Eppendorf community? Then find out more about our diverse areas of work at:
career.eppendorf.com

Spin the Smart Way

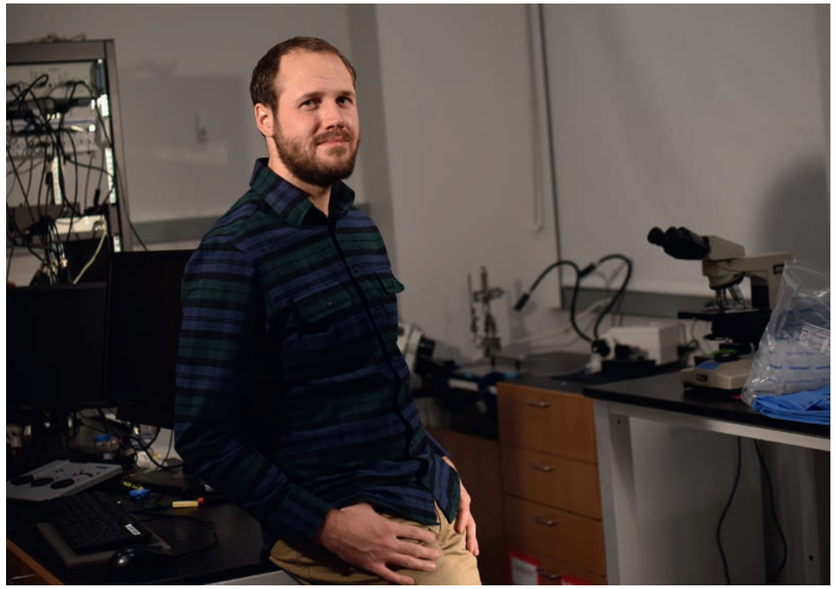
The new Eppendorf Centrifuge 5910 Ri features outstanding ease of use and high versatility: the large touchscreen with an intuitive user interface enables fast and error-free operation, ensuring efficient, reproducible runs. All runs and events are documented by the instrument and can subsequently be exported via USB or VisioNize® Lab Suite. In addition, the large selection of fixed-angle and swing-bucket rotors covers a particularly wide range of applications, so that your laboratory is well equipped for all requirements.
www.eppendorf.com/accelerate-your-research

Green Lab Products

Eppendorf cooperates with My Green Lab, an international organization that validates and certifies lab products with the "ACT - The Environmental Impact Factor Label". After a couple of CryoCube® ULTfreezers in 2020, we now received these independent certifications for the 25 mL tubes. Some more Eppendorf products are in progress of ACT certification.
This is a further significant step towards a green future. More info:
www.act.mygreenlab.org and www.eppendorf.com/sustainability

Thirsty – Lights On!

For his PhD, American scientist Christopher Zimmerman studied how neuronal structures influence the behavior of drinking. His findings have since made their way into scientific textbooks.



Down to the last detail
Christopher Zimmerman is tenacious about his topic: exploring the complex relationships between thirst and drinking

The human body consists of 70 percent water, carefully calibrated: cells are only able to carry out their tasks if they are surrounded by the right volume and the correct concentration of water molecules. If our fine-tuned fluid equilibrium is under threat, we will experience an unmistakable warning signal – thirst!

Until recently, researchers worked under the assumption that a thirst center, located inside the brain, gave the order to "drink" and that, along the lines of a feedback system, neurons inside the brain would receive information from the circulatory system – for instance "the blood is too salty and too thick!" and that these neurons would subsequently sound the alarms in our brain.

Questions upon questions

The exact location of this area has been known for a long time: the subfornical organ of the third ventricle. However – inconsistencies remained. These were not limited to the physiological questions, such as: why can a cold drink quench thirst as soon as it enters the mouth – long before the liquid reaches the bloodstream? Or: why does thirst appear to be quenched after a few gulps of water, even though this amount cannot possibly be sufficient? Simple behaviors, too, remained unexplained: why do humans (and animals) like to drink with meals?

Christopher Zimmerman spent five years solving this mystery by conducting experiments on mice. It is a good thing that when it comes to drinking, the behavior of mice is analogous to that of humans and that the brain structures are also comparable. His research not only earned him his PhD, but it was also recognized through multiple awards. In 2020, the 31-year-old American scientist was awarded the prestigious "Eppendorf & Science Prize for Neurobiology" for young scientists, worth $25,000.

On the right track

Zimmerman reached his goal after navigating an academic detour: "I wanted to be an engineer, and I liked biology" – so he enrolled in the bioengineering program at the University of Pittsburgh in Pennsylvania. During one classroom course, when tasked with understanding the machines and techniques that allow doctors to peer into the brains of human patients, he discovered: "It was the brain itself, rather than the engineering aspect, that I was interested in." "For centuries", so Zimmerman, „it has been a mystery what happens deep inside the brain, but modern tools were finally allowing scientists to study these processes." Zimmerman's scientific instinct had been awakened, and as a natural consequence, he switched to the neurosciences. He joined the team of Zachary Knight in San Francisco: "This was where I learned to ask the right questions" – and this was also where he began to address the behavior of drinking.

Achieving a lot early on
The researcher received the "Eppendorf & Science Prize for Neurobiology" for young scientists in 2020

Zimmerman discovered that neurons within the cerebral thirst center do not act alone – they work as a team, and they are supported by cells from within the body. The scientist identified these cells in various regions of the body, including the oral cavity, the throat and the abdomen. How did he do it? The young graduate student "illuminated" the mice – in particular, their brains. To this end, he employed small fluorescent proteins that he channeled into the thirst center using viruses, also known as vectors. This approach allowed him to monitor when these neurons would become active. He was excited: "It felt as though all of a sudden, I was given permission to peek directly inside the brain."

Knowledge as the reward

The mice, with antennae on their heads, acted as amateur radio operators. When they became thirsty, a light came on. The light also signaled to the scientist which neurons were communicating, and when. "These are the most rewarding moments", recalls Zimmerman, visibly enthusiastic, "when, looking at the monitor, one suddenly understands something that one had been thinking about for a long time."

Thanks to the work by Zimmerman's team, it is now clear that these neurons inside the hypothalamus are flanked by two additional rapid sensory signals. The first signal encodes messages about the amount of drink – irrespective of whether it consisted of silicone oil or salt water. "This finding resulted in the question of where inside the body the nervous system identifies the actual nature of the drink", says Zimmerman, explaining his thought process

His team followed a hunch and also prepared the abdomens of the mice with catheters for infusions into the stomach. Lo and behold – they were right: the second signal receives its information from the intestines; it is able to discern whether the mouse had indeed been given water to drink and, if in doubt, also override the first signal (from the oral cavity) – in case the drink had been oil after all. Moreover, Zimmerman discovered that these two newly deciphered signals, which are transmitted from within the body, in fact act in an anticipatory manner, i.e., they predict the hydration level of the blood and are thus capable of prophylactically regulating thirst. This explains the fact that thirst is quenched after only a few gulps, even though it is not yet possible for the liquid to have reached the body's metabolism.

Visible scientific pride

By now, Zimmerman's discoveries have been incorporated into scientific textbooks. Put on the spot, he himself describes them as "groundbreaking", his scientific pride audible. It is also visible – even though he must wear a mask throughout our Zoom interview. The mask does not bother him; handling pathogens in the laboratory on a daily basis, he is used to it. What is worse, though, is the fact that as soon as Christopher Zimmerman arrived at his new place of work at the Ivy League Princeton University in New Jersey, so did the coronavirus: all laboratories were closed, and most of the the mice had to be euthanized.

Scientist through and through – ambitious, meticulous and extremely organized – he continued to further his career despite the lockdown. He loves reading historical research literature as well as retracing the scientific questions of the time. He also acquired new skills which include the management of large datasets.

The American researcher considers his scientific life to be "extremely challenging mentally." Taking a break from time to time and relaxing is practically a must. For him, this is best achieved in nature while hiking and climbing mountains with his wife, a fellow scientist. "She is an astronomer – that's much cooler", laughs Zimmerman. ■

> *Today, we are able to observe nerve cells deep in the brain. Neurobiologists had tried this for years, but they were lacking the necessary tools."*
>
> Christopher Zimmerman

LEARN MORE?

Click here for the website:

https://cazimmerman.github.io

Space Girls

Pioneer
Claudia Kessler brings 30 years of experience in the aerospace industry to the table. Her biggest goal? That the first woman finally flies to the moon!

Claudia Kessler, a German aerospace engineer, was denied the dream of flying to the moon. Today, the 56-year-old heads the private foundation "Die Astronautin" (The Female Astronaut), which makes women fit for one of the most important industries of the future.

Ms. Kessler, when did you first wish you could fly into outer space?

Claudia Kessler: I was four years old when I watched the moon landing on TV. After this event, I knew that that was where I wanted to go, and the desire to see Earth from space at least once is still with me today. I had also developed a passion for machines and technology. My father was a car mechanic, and even as a child, I enjoyed tinkering with cars in the garage.

After many years in industry, you are now investing all your energy in your private foundation "Die Astronautin". What goals do you pursue?

From within the foundation, we have founded a start-up. Space travel is strongly commercialized, and it generates lots of jobs for which we recruit and train female professionals. It is our most coveted goal to fly the first woman to the Moon. At the same time, we want to open the sector up to the public. There is still a substantial gap between the ivory tower of space exploration and the things one can experience during private journeys into space.

During the 1980s, you were the only woman in the university program for aerospace technology. Are there even enough female professionals who are interested?

Yes – the proportion of women in the relevant university programs is currently 20 percent and increasing. There is definitely an interest, which we see at events and also through the feedback we receive.

How are women becoming more successful in this industry?

In the application process for "Die Astronautin", we notice that many women call and ask if they are even good enough to be considered by us. This is a classic women's issue – the lack of confidence, paired with self-doubt. It takes significant perseverance, resilience, courage, stamina and curiosity to pursue such a major goal. In order to develop the necessary skills, we collaborate with experienced female trainers, and we combine elements of space travel with classic leadership training.

So – have you already identified promising candidates?

Yes, with Dr. Insa Thiele-Eich and Dr. Suzanna Randall, we have selected two female astronauts and trained them in such a way that they are ready for a mission of this kind. But we must also convince the German government to send the first woman into space using taxpayers' money and cover the ensuing government expenses of 50 million euros. I wrote a lot of letters – among them three letters to Angela Merkel, of which two were answered. In the past year, I have personally approached seven ministers. Everyone loves our idea and says that we must absolutely proceed. But it also takes budget approval.

> *"The more diversly I look at a problem, the better the solution is in the end."*
>
> Claudia Kessler

So far, your childhood dream of traveling into space has not been fulfilled. Why has it never happened?

In my case, it turned out that I was perpetually at the wrong age at the wrong time. After 30 years' experience in the aerospace industry, I say just like the USA, France and Italy, we need a quota – otherwise nothing is ever going to happen. I often ask myself how many more remarks women in Germany will have to continue to contend with.

What kind of remarks are you talking about in particular?

These are the classic excuses that men put forth in order to justify why a woman was not a good fit. For example: "You know, she is not ready." Or: "She will get pregnant anyway, and then she will leave." Another remark that I hear often is "We would love to hire a woman, but we just can't find one." It is also not well received when we appear confident and make demands: "I can do this", or "I want a raise." We are immediately deemed to be aggressive and demanding. These stereotypes are deeply rooted in the human conscience.

Until recently, there were no suits for female astronauts. How will the sector benefit if women partake in the decision-making process?

As all other industries, this one will also benefit from a more diverse approach to problems. More perspectives are revealed, and as a result, more approaches to solutions will be available. The more viewpoints are engaged in a problem, the better the solution.

Which trends will move the industry into the future?

The topic of networks will increase in scope. Communication from space will become faster because data exchange will function better. Gigantic data centers will be built which will be based on new technologies such as blockchain. Research will focus increasingly on understanding how space works, i.e., how planets and comets came into existence, or which resources may be utilized – for example, through asteroid mining.

Looking at all the visions of space – which one fascinates you the most?

This year, three probes will land on Mars. I hope I will be around to see the first woman land on Mars 20, 30 or 40 years from now. ■

www.dieastronautin.de

Everything to Our Satisfaction?

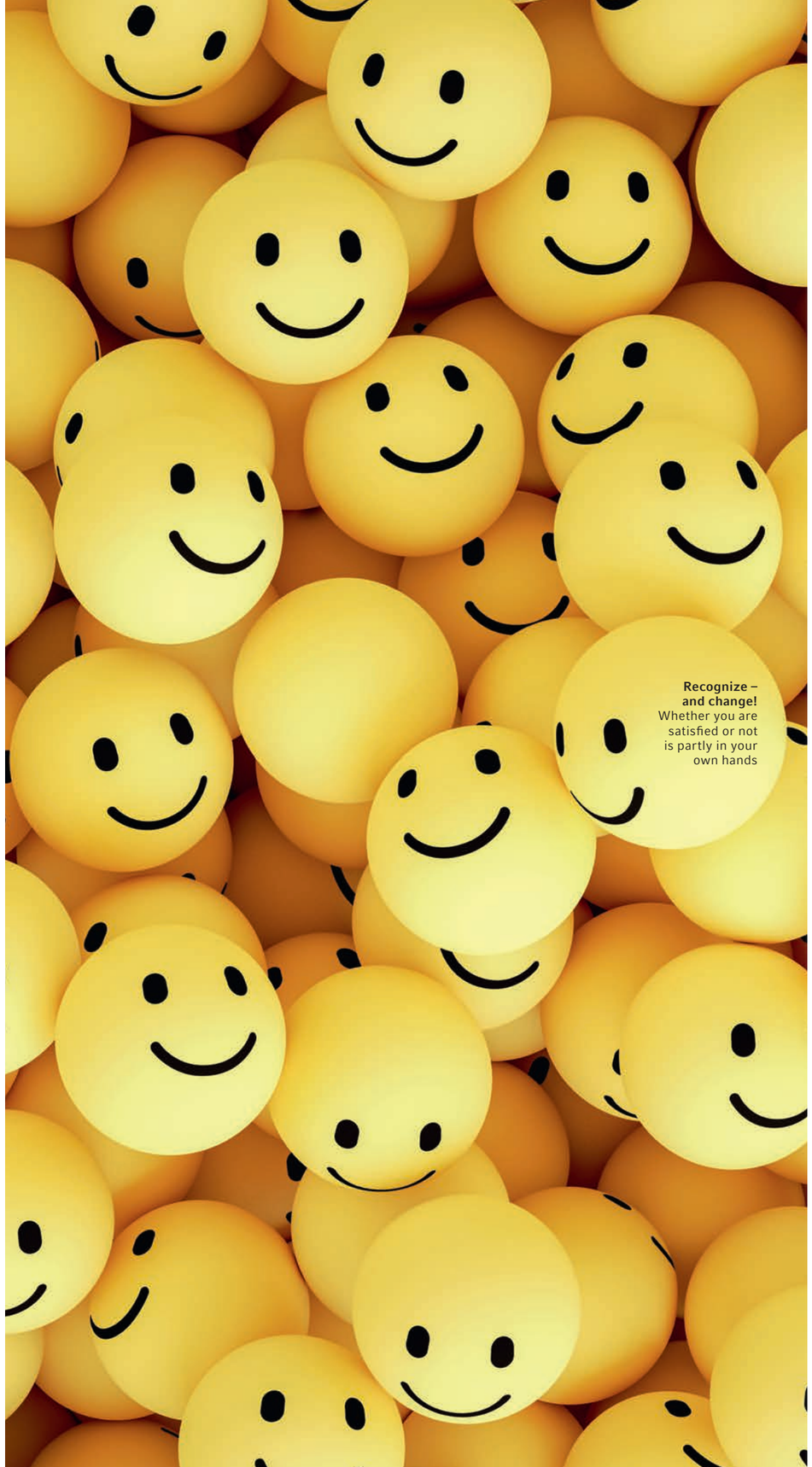
Sociologist Martin Schröder studies what makes us feel content: he analyzed a huge database, compiled over 34 years. Five findings that resulted from his work will surprise, explain and potentially even induce contentment.

What Increases our Sense of Contentment?

The factors which are most closely linked to contentment include sleep, a healthy diet, gratitude and relationships. But we cannot influence everything. “One can consciously choose gratitude”, explains Martin Schröder; “however, it will not work with sleep. We simply wake up.” The sociologist was surprised to find that children do not significantly increase contentment. One possible explanation: “Children make one feel contented, but so do all the other things that are possible without them.” Even money does not always increase contentment – as long as there is enough to live. The threshold is approximately 2,000 euros per month. Unemployment is a striking exception. It affects us tremendously – men even more than women.

Why are There Limits to Contentment?

Irrespective of whether we experience something negative such as a car accident or something positive like a promotion – according to the “set point theory”, our level of contentment will eventually revert back to the level which is predetermined by our genetics. For most people, this level reaches roughly seven out of ten points. If we were to be highly satisfied at all times, we would, according to Schröder, not feel the necessity to change our lives even a little bit – we may stop having children or making any kind of progress. On the other hand, dissatisfaction is equally important: it serves as a signal that something must change before our well-being will suffer even more.



Recognize – and change! Whether you are satisfied or not is partly in your own hands

What Makes Women and Men Be Content?

“The pure data indicate that people are quite happy in what we might consider rather traditional couple patterns”, says Martin Schröder. Women, for example, are less satisfied if they earn more than their male partner, or if the partner looks after all the housework. And fathers are more content the longer hours they work – which, in turn, will lead to higher levels of satisfaction in the mothers. How is this possible if everyone talks about and strives for equality? Martin Schröder: “We must not forget that the data represent the past. For this reason, I advise caution when it comes to making recommendations for political action based on these findings.”

What Do the Data Tell Us – and What Do They not Tell Us?

Martin Schröder’s research is based on the socio-economic panel (SOEP) – the largest longitudinal study in Germany. Since 1984, the same roughly 30,000 people have been asked about their contentment; the dataset shows what has made Germans happy over the course of 34 years. At the same time, it does not imply hard-and-fast conclusions; the factors which correlate with our contentment do not necessarily cause it. According to Schröder, it is therefore also not a good idea to make assumptions about one’s own life – and the things that need to change in order to attain a higher level of contentment – based on published data alone.

How Can We Work on Our Own Contentment?

Whereas happiness is more of a chance event, contentment lends itself well to evaluation – a brief glance inside us will suffice. We can identify what bothers us and then do something about it. According to Schröder, striving for contentment is more helpful than striving for happiness. We need to know: one-third of our contentment is linked to things we cannot control; one-third is linked to long-term developments such as career, and one-third is derived from short-term goals such as getting more exercise. There are, however, tried-and-tested ways which help us become more contented, and they include two variables that we can control: gratitude and building and maintaining social connections.

BOOK TIP

For those who want to delve deeper: Professor Martin Schröder, who teaches at the Philipps-University in Marburg, Germany, has compiled his findings in a book.

Martin Schröder: “When do we reach a state of contentment? Surprising findings about work, love, children and money” (in German, Martin Schröder, 20 €, C. Bertelsmann publishers

A Broader Scope

They are the ones who make science accessible – researchers who blog and who are active on social networks are becoming the digital voices of the future. Digital science communication, however, is no longer a sideline. Those who want to be noticed will have to depend on Twitter and Co.

Dice with effect
The social media building blocks are colorful – many scientists use them for their communication

Listen to the scientists", the Fridays for Future movement has been preaching for years. The COVID pandemic, too, has shown us that the public expects a clear position, as well as transparent communication, from scientists. German scientists who have recently risen to fame, such as virologist Christian Drosten and chemist Mai Thi Nguyen-Kim, represent a new trend in science: communicating clearly to a lay audience.

The same is true for Stina Börchers. The neuroscientist is completing her PhD at the University of Göteborg in Sweden, where she studies communication between the gut and the brain and its effect on our emotions and eating habits. Since 2016, the 26-year-old has been allowing her more than 10,000 followers to share her work on Instagram. With her profile, she contributes to making science accessible to other people – science which to her when she started out seemed like an "impenetrable jungle". "I often receive messages from high school students who feel inspired by my work and who consider entering the field of science – this makes me especially happy", says the PhD student.

Function of scientists within social media
"For the longest time, the realm of social media has been left to the opposing side – to the conspiracy theorists and skeptics", judges Beatrice Lugger. Ms. Lugger is the managing director of the National Institute for Science Communication (NaWik) in Karlsruhe, where she teaches the use of social media, among other topics. "This is why it is even more important to present a consistent position within these media." Researchers on social media thus act as gatekeepers between the media and the general public.

> *"I often receive messages from high school students who feel inspired by my work and who consider entering the field of science."*
>
> Stina Börchers

Apparently, young scientists in particular, even digital natives, are interested in entering into a digital dialog with a lay audience. In 2018, Carsten Könneker, Philipp Niemann and Christoph Böhmert interviewed high-ranking junior scientists from 89 countries with respect to their attitudes towards science communication. Whereas the majority offered a positive opinion about exchange beyond their immediate research communities, they did, in fact, tend to utilize more traditional formats. Presentations and tours of institutions still beat social media. Most interviewees, however, share the opinion that science communication is fun. Why, then, don't more young scientists join the conversation online?

Reaching new target audiences
"The overall picture shows that communication competencies are hardly ever anchored in the curricula of university programs", Beatrice Lugger of NaWik identifies the underlying problem. "We need more educational opportunities on this topic – at least at the doctoral level." After all, social media open up entirely new opportunities for scientists to generate attention. Digital media, particularly social media, allow science to reach a target audience that would ordinarily not have access to its contents. For the first time it is possible to make research transparent. In this way, appreciation of its efforts and achievements will only increase, along with its impact.

In addition, Stina Börchers uses social media for an exchange with colleagues and for research. "My social media activities have provided me with additional opportunities such as participating in important events, giving presentations, writing guest contributions and collaborating on YouTube videos", recounts the scientist. In the digital era, effectiveness is measured in accordance with the SEO principle: those who want themselves and their work to be visible will have to depend on social networks. Academic selection committees, graduates and journalists use Google, Twitter and other services for their research.

Social media contributions work!
In 2012, Melissa Terras, a Professor at University College London, embarked on self-experimentation. Even before, Terras had begun using Twitter to advertise her work. She was surprised by its effectiveness. She wanted to know how exactly advertisement via Twitter would affect the number of downloads. Out of four articles, she shared three via this platform. The latter achieved between 142 and 297 downloads; the non-tweeted article reached twelve – even though all four articles were available in the same location. A 2018 study led by Clayton Lamb at the University of Alberta confirmed this trend.

The researchers working with Lamb uncovered a further development: "Our results indicate diminishing returns: it now takes more effort to achieve an adequate citation rate than five or ten years ago." The researchers explain this decline with the increasing number of people who communicate online.

"Twitter is a very fast medium that allows users to participate easily without any major barriers", agrees Beatrice Lugger. But what does intelligent use of social media look like? Many research institutions and universities have established their own guidelines that also apply to social media communication. Coordination with the in-house communication department may also be helpful. "The first thing to consider is my intended target audience and the medium which will best reach this target audience", advises the director of NaWik.

Twitter, Instagram or YouTube: all platforms have unique features. After all, communication via social media should be enjoyable, and communicator and platform should be a good match. "And finally: networking, sharing, liking, building community, posting at a reliable frequency and a really smart profile are what counts." ■

! 3 TOP PROFILES

- **Stina Börchers** can be found on Instagram, Twitter and LinkedIn as Stina.biologista. Topics: neurosciences, eating habits, emotions.
- **RealScientists** on Twitter opens the stage each week for a scientist. Topics include all areas of science.
- **Rhiannon Morris** blogs as Scientist_rhi on Instagram and Twitter. Topics: biochemistry, hematology, cancer research.

Dangerous Encounters

Borreliosis, Creutzfeldt-Jakob disease, Ebola, Malaria or Covid-19 – many dangerous infectious diseases are transmitted from animals to humans. The ever-increasing risk of infection is partly caused by humans themselves.

SARS-CoV-2 carrier? Presumably, the virus passed from a bat to humans via another animal

Looking back upon history, July 6, 1885 was a significant day for humankind: French microbiologist Louis Pasteur conducted the first successful vaccination against rabies. With this remarkable feat, he saved the life of a nine-year-old boy who had been infected through a dog bite – and millions of human lives thereafter. To this day, his work stands as one of the most significant contributions to the principle of successful vaccination against many diseases that can be transmitted from animals to humans. However, the risk of contracting a zoonotic disease is on the rise – and it is largely due to human interference in natural ecosystems.

Zoonoses are diseases that are transmissible from animals to humans (zooanthroponoses) as well as the other way around (anthropozoonoses). Most pathogens are either bacteria or viruses, but also parasites, fungi and prions (proteins which are present in forms that are deleterious to health) can cause disease. In particular, those areas with increased contact between animals and humans will favor the development of zoonoses.

Zoonoses are man-made

"Utilization of habitats by humans impacts local zoonotic host communities on both global and systematic levels", explain scientists from University College London and Imperial College London, Oxford University and the "Zoological Society of London" in a study published in the renowned scientific journal "Nature". Principal investigator of the study Rory Gibb explains the background: "Over the past few years, there has been a lot of discussion about increasing land use by humans, and whether it increases the risk of transmission of zoonotic diseases. We wanted to find out whether there was a verifiable global connection."

Over a number of years, the team analyzed 6,831 ecosystems and 376 species of potential host animals. In 2019, they presented their results to the scientific journal for the obligatory peer review. Their findings were published in the summer of 2020 – after the world had already been hit by the first wave of COVID-19.

Coronaviruses are advancing

The coronavirus is a zoonotic disease that is transmissible from animals to humans as well as the other way around. SARS-CoV-2 probably originated from a wholesale market for fish and seafood in Wuhan in central China. This market also offers wild animals and organs of other animals, including those of reptiles. The novel coronavirus SARS-CoV-2 was most likely transmitted through a bat.

In contact with the hosts

German researchers of the joint project "Ecology and Pathogenesis of SARS" recently discovered that every tenth domestic bat already carries coronaviruses that are distantly related to the causative agent of the lung disease SARS. These results correlate well with the above-mentioned study: ecosystems which are influenced by humans harbor more species and a larger number of known disease transmitters than undisturbed habitats do – not, as commonly assumed, habitats undisturbed by humans. "The global change of ecosystems allows more and more contact between humans and potential hosts of human diseases", explains study director Gibb, while he qualifies: "the actual source of COVID-19, that is, the initial transmission from animal to human, has yet to be identified. It is not clear at this time whether human interference in ecosystems was indeed a deciding factor."

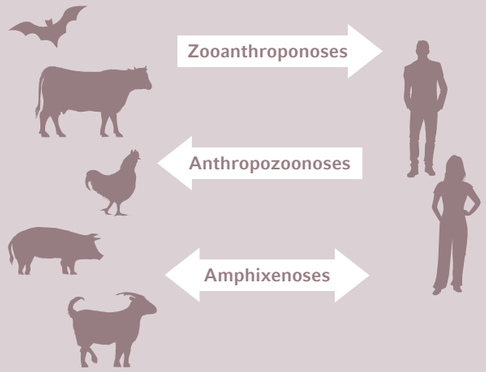
One thing is certain: the study confirmed that through the expansion of land development, humans also alter the fauna of global ecosystems. The winners of this transformation include those generalists that make few demands on their environment or their food. Rodents, in particular, tend to benefit from the human influence. But these animals especially, as well as bugs and ticks, are ideal hosts for zoonotic pathogens.

What helps combat zoonoses?

As a conclusion of their study, the researchers in the group led by Rory Gibb demand sustainable management of habitats and access to high-quality health care, particularly in poorer countries that are increasingly affected by clearcutting of forests and the rapid expansion of agriculture. "Improved monitoring of these ecosystems could help recognize disease outbreaks such as Ebola or coronavirus quickly in order to take immediate action", the scientists explain.

After all, many zoonoses that are caused by viruses can today be prevented by vaccines – even the coronavirus. The hope: as in the case of the Ebolavirus in Africa, vaccination is ideally expected to provide herd immunity. On July 6, at the latest, it will once again be time to remember Louis Pasteur and his first successful rabies vaccination – July 6, is official World Zoonoses Day. ■

INTERPLAY OF INFECTIONS



The word zoonosis is derived from the Greek words zoon (living creature) and nosos (disease). It describes infectious diseases that can be transmitted in a natural manner from a human to an animal (anthropozoonoses), from an animal to humans (zooanthroponoses), or in both directions (amphixenoses). At this time, a total of roughly 200 pathogens are known which are transmitted in such ways. Close to two-thirds of all pathogens that are capable of causing disease in humans can be transmitted from animals.

Green Greater London

Royal parks with lawns trimmed to perfection; rose tendrils in front of ornate townhouses and parks offering rest in the shade by the Thames: green, green everywhere in London.

London's green facet
From the Millennium Wheel, take in the view of the metropolis of almost nine million people – with its multitude of parks, waterways and picturesque gardens

On the southern bank of the Thames, only a few minutes' walk from the Millennium Wheel, the highest Ferris wheel in Europe, we come across the small Jubilee Gardens. Winding sand paths lead through carefully manicured lawns; children play in the adventure playground, and street performers send massive colorful, shimmering soap bubbles on their way. The scent of roasted almonds completes the experience. The atmosphere resembles that of a country fair. As one of altogether 1,700 parks in Greater London, Jubilee Gardens is the perfect starting point for a walk along the Thames.

Sightseeing from the riverbank

Those who do not suffer from a fear of heights might start their tour on the Ferris wheel called the London Eye. The glass gondolas that wind their way to the top at double the pace of a turtle, however, are often overcrowded, and tickets are expensive. The banks themselves offer a beautiful view of the characteristic landmarks of the city. Diagonally opposite, beside Westminster Bridge, rise the stone walls of the Houses of Parliament. Behind its pointed windows, kings of the country resided in chambers below the steep turrets until the middle of the 16th century. Today, the two Parliaments of Great Britain are based here: the House of Lords and the House of Commons. Elizabeth Tower rises over Westminster Palace – its bell, Big Ben, which weighs as much as two elephants, announces the full hour. Welcome to London, the capital of Great Britain and the former empire!

Jubilee Gardens are located along the Thames Path, which follows the full length of the more than 300-kilometer-long river, from its spring to the Thames flood barrier in London. The water meanders gently to the southeast; depending on the time of day and the inflection of the light, it is reminiscent of liquid lead or honey. Twelve bridges cross the river Thames inside the metropolis, and between Waterloo ▸

Bridge, London's longest bridge, and the Venetian style Blackfriars Bridge, we come across the picturesque Bernie Spain Gardens. They are named after Bernadette Spain, a psychologist who, until the mid-1980s, considered the question of how her own neighborhood could be designed so that it might become a better place to live and work. The park in South Bank that was dedicated to her intends to achieve exactly that: offer people a space for leisure and recreation, right here in the city. "There is nothing more lovely than to sit on the grass with a glass of juice in the summer and watch people passing by – perfect", says resident Claire.

Where art meets nature

In the same neighborhood, we find the Tate Gallery of Modern Art. The collection of modern and contemporary art resides in a former turbine hall with a sky-high brick chimney, and even the space between the river and the museum entrance has been decorated in an artful manner: birch trees planted by Swiss landscape architect Günther Vogt. Strolling among the trees, they are reminiscent of the forests in the Russian tundra and its vast expanse. The theme continues inside the museum, which awaits garden aficionados with the impressionist water lilies by Claude Monet. Since the permanent exhibits at the Tate are free of charge, even a brief visit is absolutely worth it.

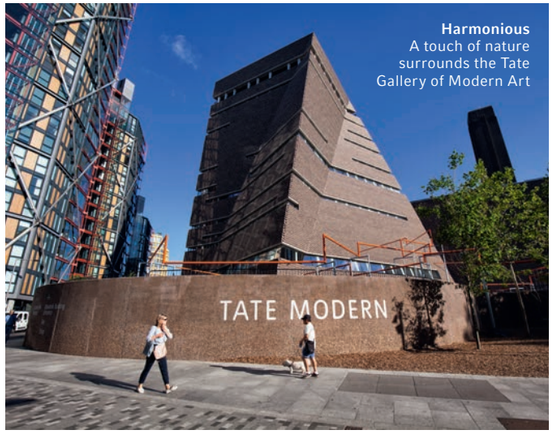
Shakespeare was a plant lover

Close to the museum rises a round Elizabethan-style house which might have been transplanted from a small village. It is a replica of the Globe Theatre which William Shakespeare, together with the acting troupe "The King's Men", had constructed in 1599 not far from today's location. In the original building, the audience stood in the open air, surrounding the stage, enduring storm and snow, and cheered on "Romeo and Juliet", "Hamlet" or "MacBeth".

Today, this Elizabethan theatre is usually open for guided tours, and performances take place in the evenings. The plays by the famous playwright concern themselves with love, betrayal and power. And plants. Shakespeare mentions 120 varieties of plants, among them mandrake, the love tree, medlar and henbane. From the Globe Theatre and the Tate Modern, the Millennium Bridge leads like a catwalk to the North Side of the city, into the City of London, with a view of the stone-gray dome of St. Paul's Cathedral, haunted by pigeons and blanketed in clouds. This classic church, too, is surrounded by parks; as an extension of the bridge, the footpath leads through Carter Lane Garden, and Festival Gardens stretch out to the southeast of the cathedral.

Both parks were established as places of hope following the Second World War, which is what they are to this day: in the summer of 2020, members of the initiative OurCityTogether planted flowers in the colors of a rainbow in Festival Gardens. With this gesture, they honor those who, through their professions, continue to contribute significantly to society throughout the COVID pandemic. "Let's hope that our next project in Festival Gardens will convey more than a mere message of optimism", states ourcitytogether.com, "but that we will celebrate a complete recovery." Surrounded by green, it is bound to be a success. ■

Time to chill
Festival Gardens at St. Paul's Cathedral



Harmonious
A touch of nature surrounds the Tate Gallery of Modern Art

Change of perspective
135 meters high is the "London Eye" - with a view of the Jubilee Gardens

Shakespeare's legacy
The replica Globe Theatre on the banks of the Thames

EPPENDORF ON LOCATION

If Lewis Hamilton, the current Formula One world champion, set off from London and drove at his top speed, he would reach his birth place of Stevenage in just over 10 minutes. Located 33 miles (or 53km) North of London, this is the home of Eppendorf UK and Ireland. Stevenage is a scientific powerhouse: the Eppendorf office is directly next to the Stevenage Science Park, a hub for GlaxoSmithKline pharmaceutical development and the Stevenage Bioscience Catalyst centre which supports scientific start-up companies with facilities such as a community lab. With its close proximity to the established scientific communities Cambridge, Oxford and London, we are in a great place to support scientists.
www.eppendorf.uk

LET'S GO!

Feasting and strolling through green London

Covent Garden is located in the West End, London's prominent theater and entertainment district, and is best known for the Royal Opera House. The historic Market Hall, which dates back to 1654, is the heart of the district: every Monday, antiques are sold here, whereas Tuesdays to Fridays, it is mostly household items and clothes. By the way, Eliza Doolittle sells her flowers here in the marketplace of Covent Garden in the musical "My Fair Lady".

Covent Garden,
London WC2E 8HH,
United Kingdom

www.coventgarden.london

The rooftop terrace of the **Culpeper** is a mix of garden, bar and restaurant. It is a green oasis of peace in the midst of London's commercial center, and throughout the summer, Londoners spend their after-work hour here. Even vegetables are grown are in the garden, which are subsequently put to good use in the restaurant. Particularly appealing: desserts such as shortbread with raspberry jam and the chocolate-walnut brownie in salty caramel sauce.

40 Commercial St, Spitalfields, London E1 6LP,
United Kingdom

www.theculpeper.com

The **Holland Park** is situated in the Royal Borough of Kensington and Chelsea, only six stops on the tube from Oxford Circus, and is less overcrowded than Hyde Park – which makes a sojourn between cherry and plum trees, alpine roses and ferns particularly pleasant. The highlights include Holland House, a city palace in the Jacobean style, and the Japanese Gardens with their waterfall, koi carp pond and bamboo well. Victorian townhouses and small cafés are found close to the park.

Ilchester Pl, Kensington,
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EXPLORING LIFE

Learning to Lead

Science
AAAS

THE SOURCE

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About a year ago, I took on the best imaginary job out there: CEO of CryoThaw, the finest company that never existed. I had come across a tweet announcing the 2017 Young Entrepreneurs Scheme competition, sponsored by the University of Nottingham with partners from the UK government and industry, in which teams form hypothetical startups based on feasible scientific ideas. As a graduate student unsure of my career plans, I was excited to explore outside academia. I also saw it as a way to develop my leadership skills. So, with the support of my supervisors and funders, I decided to give it a go. I recruited three other students, and we chose to focus on improving organ transplantation. I thought I had everything under control. I couldn't have been more wrong.

They say successful teams are part art, part science. Initially, we were neither. We were just four students with remarkably different personalities struggling to work toward a shared goal. I had allocated tasks based on each team member's skills, but I confused delegation with leadership and failed to motivate the team to work together. Our initial meetings went in circles – repetitive conversation with no clarity and a lot of time wasted rehashing previous decisions – and frequently ended in turmoil. As a result, the project started with frustration and animosity. The tension between being perceived as my teammates' competent CEO and who I actually was – their grad school buddy with no prior leadership experience or training – became intolerable. I considered opting out of the whole thing.

After a few weeks, a teammate confessed to me that he found our meetings stressful, too. I finally grasped that this culture was unsettling for everyone, not just me. "Oh boy, I suck!" I thought. Something needed to change.

I turned to my go-to tool for working through my thoughts and seeking clarity: I wrote in my notebook. I reflected on our performance and how each team member was an asset. I articulated examples where everyone, myself included, could do better. I thanked them for pushing me. When I saw that what I had written actually made sense, I decided that there was nothing to do but e-mail it to my team as what I called an "open letter from your CEO." Maybe it would help us find a way forward, because otherwise we were going nowhere.

For a day, I could hardly bear to check my e-mail. Then I cut myself some slack and decided I could feel proud of this appreciative, frank, vulnerable e-mail. It felt like progress. Soon, my teammates called and thanked me for what I had written. They were relieved to learn that they were not the only ones struggling. Ultimately, the e-mail served as a bond. And it taught me that being a leader is all about authenticity.

From there, team chemistry took off as we spoke our minds, good and bad. I found my voice as a leader, fostering an environment where we acknowledged our individual strengths and weaknesses, and where I wasn't expected to have all the answers but could nevertheless provide guidance. We read and watched everything we could find about heart transplantation, learned from webinars about startups, networked with experienced entrepreneurs, contacted national health services for data and arranged consultations with medical experts. Then, one day, a teammate entered the meeting with his hands full of papers and his breath shallow with excitement. "This cryopreservation thing is wicked!" he exclaimed. Soon after, we came up with CryoThaw Heart, a gold nanoparticle and laser-based approach to rapidly freeze and thaw hearts. We put together our business plan, pitched it, got selected for the finals – and won our division as well as the people's choice award.

Looking back, it wasn't just a matter of how successful we turned out to be; it was also how far from successful we were at first. Our initial failures made me realize how being a leader starts with being your better self. Heartbreak doesn't have to be the end of the world. In many ways, it can be a beginning. ■

Lucka Bibic is a PhD candidate at the University of East Anglia in Norwich, UK

Continued Research

Despite the corona pandemic, the expedition ship “Polarstern” set off for the Southern Ocean in winter. On board: about 50 scientists from all over the world.

On January 31, 2021, the launch of an expedition made headlines: Lufthansa took an international team of researchers aboard an Airbus A350-900 – the world’s most the world's most environmentally friendly long-haul aircraft – on the longest nonstop flight in the company’s history from Hamburg to Port Stanley on the Falkland Islands. There, two days later, approximately 50 scientists started their two-month expedition to the Antarctic Weddell Sea on the research icebreaker “Polarstern” from the Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research (AWI).

Seals as research assistants

The aim of the expedition, which was completed at the end of April, was to decipher interactions and changes in the ocean system during climate change and to better predict their consequences. The hard-working helpers here: Weddell seals. The animals were equipped with sensors that measured salinity, temperature and depth of the water. As soon as the seals surfaced, these sensors transmitted the data to the home institutes via satellite. Animal lovers need not worry about this: The next time the seals change their coats, the sensors stuck to their heads will fall off.

So research is defying the pandemic. Just last September, a one-year expedition of the “Polarstern” near the North Pole came to an end. This project also focused on climate research.

Expedition helper
Weddell seals provide researchers with valuable data with their head-mounted sensors that fall off when they shed their fur

On behalf of research
The expedition ship “Polarstern” – underway even in times of a pandemic

MASTHEAD

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