

Off the BENCH

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The Eppendorf – LifeScienceStyle Magazine

SAVING OF GLOBAL HUNGER

Less meat – more fruits, tubers and grains. The ingredients of tomorrow's diet?

MUSIC HEALS

Mathematician and pianist Elaine Chew studies the effects of music

Dossier New Chances In the Crisis

presented by
eppendorf

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i Dear Reader,

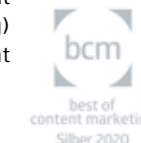
Times of crisis are challenging times as they demand a maximum of flexibility and engagement as well as solidarity and confidence. In the spring, the corona pandemic also led to changes at Eppendorf – these were not limited to "work-from-home" but also touched production and distribution processes.



We were thus able to meet the increased need for safety of our employees as well as the increased demand for our products and services with which we support diagnostic laboratories and producers of vaccines worldwide in their quest to control the novel coronavirus. In this way, we make an invaluable contribution which will benefit all people – we live in accordance with the mission of the founders of Eppendorf, Dr. Heinrich Netheler and Dr. Hans Hinz, which continues to guide us in the year of the 75th anniversary of our company, and which allows us to look proudly upon our achievements.

Crises always harbor opportunity – the chance that they will give rise to something new and positive. This is what we have learned from the past, and international studies agree. It is for this reason that we dedicate the dossier of this magazine issue entirely to this topic. We also explore the more significant challenges that the current corona-pandemic presents to us.

Apart from corona, much is happening in the world of science, and we are pleased to offer you an inside view. You regularly let us know that you enjoy reading "Off the Bench". Now, media experts have concurred and certified that our magazine is especially worth reading. We were delighted to be honored with Silver at this year's BCM (Best of Content Marketing) Award – the largest competition for content marketing in Europe. We are honored.



We hope you enjoy reading the magazine,

Eva van Pelt

Eva van Pelt
Co-CEO

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The Spectrum of Science



Diversity adé?
Insect mortality is no longer a regional problem

And Then There Were Fewer ...

A well-known fact: insects play a critical role in food networks and ecosystems. Another known fact: it is mainly terrestrial insects which are pushed further towards extinction through the destruction of their natural habitats. Whether these are limited phenomena, or whether insect die-off is observed globally, however, has thus far remained shrouded in mystery.

This question has now been tackled by an international team of scientists headed by Roel van Klink of the German Centre for Integrative Biodiversity Research (iDiv) with the most comprehensive meta-analysis on this topic to date. To this end, the team

analyzed data from 166 longitudinal studies at 1676 locations worldwide; they distinguished between terrestrial and freshwater insects, and they also captured the values separately by countries and regions. The core results: the abundance of insects is decreasing globally by one percent annually.

Doesn't sound like much? Think again: this number translates to 24 percent fewer insect species after 30 years and a reduction by half over a period of 75 years. The greatest losses were observed in parts of North America and in Europe, among them Germany. Meanwhile, the number of freshwater insects has increased by a solid percent per year.



In the Fur of the Sloth

Producing antibiotics to which bacterial pathogens are not yet resistant – this is the lofty goal of researchers worldwide. Time is running out – even if they do find and isolate natural antibiotics, it may be years until humanity will be able to benefit. There is, however, hope within the fur of the sloth, which is teeming with 900 moths and beetles and which is home to more than 80 different species of fungus as well as caterpillars and even algae. Within the matted fur of the sloth, scientists in the Panama rainforest have found microorganisms which are potential sources of new, more effective antibiotics. Not a cuddly animal, but one that may help us conquer one of the most significant medical challenges of the day.

DNA of Things



Shirt button, water bottle, optical lens: thanks to a common project between researchers of the ETH Zürich and an Israeli computer scientist, almost all common objects have the potential to store vast amounts of information; for example, 3D- printing instructions may be integrated into an object which can then be directly retrieved and read decades – or even centuries – later. The information is saved in the same way as that in living organisms: in DNA molecules. The team of researchers combined their work to create a new form of data storage that they call “DNA of Things”, in reference to the “Internet of Things”.

1,000

Universities worldwide were evaluated by the international university ranking consultancy Quacquarelli Symonds (QS) for their standing in 2021. Noteworthy: the top four spots go to American universities, led by the Massachusetts Institute of Technology (MIT). In addition, for the first time, 26 Asian universities rank among the top 100.

www.topuniversities.com

“Infodemiology” - Already heard?

How can good and bad sources of information be distinguished? This question becomes more and more relevant with increasing Internet consumption. The fact that an unmanageable amount of information during the corona pandemic could have a negative impact on health, as it can increase stress and worries, among other things, was discussed by scientists from various disciplines at an online conference of the World Health Organization (WHO) this summer. To explore the effects of this “infodemia”, the conference participants launched a new research discipline called “Infodemiology”.

Legendary Lakes

They hold a fascinating secret and they are the sources of myths and poetry: lakes which, based on their unusual origins or scientific phenomena, are unique on Earth. This exciting field allows researchers to continually make new discoveries – as well as occasionally face their limitations.

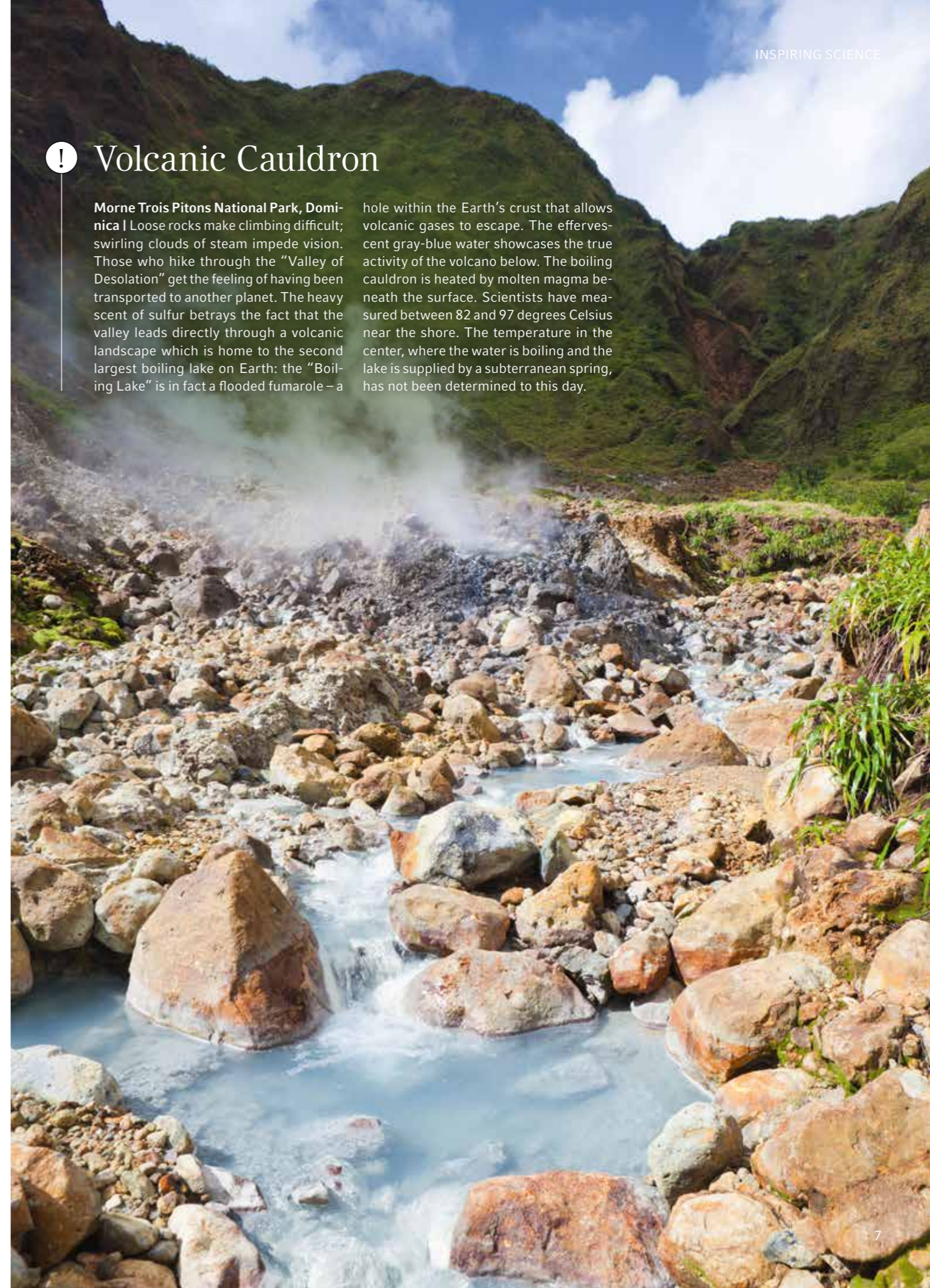
! Peaceful Stillness

Nelson Lakes National Park, New Zealand | Still lies the crystal-clear water of Blue Lake. Only the blue of the sky and the silhouettes of the trees near the shore reflect off the surface. No boats or bathing tourists disturb the peace; swimming is strictly prohibited. Blue Lake is sacred to the indigenous peoples of New Zealand, the Maori: “Rangimairewhenua” is the gateway to the beyond. It translates to “Lake of the Peaceful Lands”. Those who stand at its shores will understand: its clarity is breathtaking – it is equivalent to pure, distilled water – made possible by its spring: the lake is supplied underground by Lake Constance. Since Lake Constance is located above the tree line, its water is not clouded by falling leaves. In addition, multiple layers of rock filter the water before it reaches Blue Lake. These unique conditions make Blue Lake the clearest of all freshwater lakes in the world.

! Volcanic Cauldron

Morne Trois Pitons National Park, Dominica | Loose rocks make climbing difficult; swirling clouds of steam impede vision. Those who hike through the “Valley of Desolation” get the feeling of having been transported to another planet. The heavy scent of sulfur betrays the fact that the valley leads directly through a volcanic landscape which is home to the second largest boiling lake on Earth: the “Boiling Lake” is in fact a flooded fumarole – a

hole within the Earth’s crust that allows volcanic gases to escape. The effervescent gray-blue water showcases the true activity of the volcano below. The boiling cauldron is heated by molten magma beneath the surface. Scientists have measured between 82 and 97 degrees Celsius near the shore. The temperature in the center, where the water is boiling and the lake is supplied by a subterranean spring, has not been determined to this day.



! Sunken Forest

Tian-Shan Mountains, Kazakhstan | Like massive tin soldiers, they stand tall in the middle of a mountain lake: the dead trunks of spruce trees rise from the turquoise water and shape the "Sunken Forest", which is located at an elevation of roughly 1,870 meters above sea level in Kolsai Lakes National Park. The Kazakh name "Qajyngdy köli" translates to "filled with birch trees", even though it is actually Tienshan spruce trees which rise from the

water. In 1911, a landslide resulted in the formation of the Kaindy lake: earth and rocks blocked a waterfall and formed a dam behind which rainwater began to accumulate. The cool climate of this mountain range along the border between Kazakhstan and Kyrgyzstan ensures that even one hundred years later, the trunks stand tall. Even in the summer, the temperature of the water never exceeds six degrees Celsius – leaving the spruce trees perfectly preserved.

! Subterranean Depths

Baden-Wuerttemberg, Germany | "In the very depths of the Blautopf ("blue pot") once sat an aquarian maiden with long flowing hair", wrote Eduard Mörike. Like a massive barrel of blue ink, the Blautopf is located in the Swabian Alb near Ulm. It is known today that limestone particles solubilized in the water scatter and reflect the light at different strengths. But the bottom of the spring of the karst once held a secret: in the 1980s, divers, among them Jochen Hasenmeyer, discovered a passage 1.40 meters in width, at a depth of approximately 20 meters. This tunnel led to a gigantic system of caverns. They aptly named the caverns "Möriekedom" – Mörike's Cathedral. To this day, the true magnitude of the Blautopf-caverns remains unknown. Latest research estimates their total length to be 14,600 meters. Who knows – perhaps Mörike's mermaid resides here after all?



How a White Coat Sharpens Your Mind



A short excursion into the dressing room of life. Multiple studies provide evidence which supports a connection between certain clothing and deep-seated psychological effects – on the wearer as well as on their companions.

On occasion, your attention and your concentration begin to wane ... if this is the case, it may be worth taking a good look at the contents of your closet, or in the mirror. While the term “Clothes make the man” may sound old-fashioned, its wisdom still rings true. A number of recent studies have been able to show that attire indeed influences how well we can concentrate and how others perceive us.

It begins at school – according to a 1991 study conducted by Dorothy U. Behling and Elizabeth A. Williams, well-dressed students strike their teachers as more intelligent. The fact that women who dress in a more masculine manner for an interview are considered more competent and given preference during the hiring process as a result was discovered by psychologist Sandra M. Forsythe in 1990. In the same vein, customers prefer to make purchases if the salesperson is well dressed – this is what Chris Y. Shao, Julie A. Baker and Judy Wagner concluded from their 2004 study.

By the way, the saying “Clothes make the man” has appeared in narratives dating back to the 16th century – more than 400 years ago. It was, however, the novella of the same title by Gottfried Keller, published in 1874, which introduced it to the broader public. It tells the story of Wenzel Strapinski, a poor tailor’s apprentice, who, based on his elegant clothing, is mistaken for a count and who takes advantage of the situation until the deception is eventually discovered.

Our attire, however, not only impresses others, but it also influences us – in a rather surprising way. As early as 1908, Canadian author Lucy Maud Montgomery had Anne of Green Gables exclaim: “It is ever so much easier to be good if your clothes are fashionable!”



Well-dressed – well done!

How much easier it is to be good if dressed formally was to be substantiated by science 100 years later. In 2012, American social psychologists Adam D. Galinsky and his colleague Hajo Adam discovered just how much influence clothing has on our own perception. Clothing can even make people smarter. Through experiments, the psychologists put their hypotheses regarding the control of cognition by apparel to the test. They asked test subjects to perform a Stroop test – i.e. demonstrate concentration while distracted. One subset of test subjects wore white lab coats – the classic accessory of doctors and scientists – while the control group wore their own informal clothing.

Indeed, the group in the white coats did better. The effect of feeling smarter in a white lab coat thus directly impacts performance.

The scientists sum up: wearing certain clothing activates the respective associations. And while we typically associate care and diligence with the white doctor’s coat, this perception is now transferred to our own behavior: we thus become more careful and diligent. This realization led to the theory of the dressed perception which psychologists have come to appreciate as an important basis in the research of cognitive processes.

Bikinis dull the intellect

Even the opposite effect has been demonstrated by scientists. Bikinis dull one’s intellectual faculties – at least as long as one wears them. Researchers at the University of Michigan came to this conclusion back in the 1990s. In a study, test subjects who wore bikinis while solving mathematical problems did worse than those who wore more clothing. While this series of experiments may appear amusing, the message is clear: clothes not only change our effect on others, but they influence our own performance.



Psychologist Abraham Rutchick and his colleagues at California State University confirmed these findings: in 2015, the team studied the effects of clothing on our thinking. Once again, the result was clear: the subjects who wore formal clothing were capable of more abstract and holistic thinking. The psychologists’ conclusion: especially since clothing is of such symbolic nature, it should be appropriate for the occasion.

To recap: pajamas are less conducive to efficient work than office attire is. This may be of special interest to those who are still working from home. A representative survey sponsored by the digital association Bitkom in mid-March revealed that about half of the German workforce (49 percent) was working either entirely or at least partially from home. In these extraordinary times, many people have the opportunity to observe for themselves how their choice of clothing affects mood, motivation and concentration. ■



Research in Space

During their mission, astronauts are on their own. They must be able to perform every single task themselves – while strictly following consistent steps when conducting their research. This is particularly true for pipetting.

On board the International Space Station (ISS), astronauts participate in long-term missions during which they conduct experiments and operate the systems of the station. They install, activate and test station components; they conduct research, and even act as test subjects for life science experiments. Every team member must at all times be able to perform the tasks of every other member.

Training and retraining all members of the team in the exact same manner is also a good idea for laboratories on planet Earth: this process significantly strengthens the flexibility of the team as a whole while simultaneously improving the quality of results.

Particularly during laboratory work, it is crucial that everyone be trained on the same SOPs – especially when it comes to handling liquids, as different pipetting techniques and pipetting habits may influence the series of results to a significant extent. In addition, since conventional balances are of no use under zero gravity conditions, astronauts must instead rely on volumetric data instead of weighing mass. They must also learn how to select the right pipette for handling difficult liquids as well as carry out maintenance work independently.

One of the recurring activities in research is pipetting. Those who are used to working in a terrestrial laboratory may be asking themselves whether it is indeed possible to work with an air cushion pipette under zero gravity conditions. The surprising answer: the differences are not that serious; in the absence of gravity, or in free fall, liquids respond directly to any and all forces applied to them. For these reasons, only two factors are relevant: the atmosphere within the space station and the surface tension of the liquid to be pipetted.

Outside, in the vacuum of space, pipetting with air cushion pipettes would not be possible as pipettes must generate a vacuum in order to aspirate liquid. This is achieved by moving air inside the pipette tip. Since the atmospheric pressure on board the ISS is the same as on Earth at sea level (101.3 kPa; 1.0 atm), this does not present a problem. The surface tension between the liquid and the inside wall of the pipette tip holds the liquid together inside the pipette. For these reasons, the mechanism of aspiration is basically the same as it is on Earth. Whereas on Earth, gravity facilitates dispensing of liquids into the desired receptacles, astronauts must

work even more diligently and always dispense the liquid directly against the wall to build the surface tension between the receptacle and the liquid. The rule of holding the pipette tip against the inner wall of the vessels during dosing of course also applies on Earth.

Even though it is not quite as important on Earth as it is in space, dispensing the liquid directly against the vessel wall does minimize the risk of error.

In principle, reverse pipetting is employed when working with air cushion pipettes in space – exactly as it is done on Earth for liquids of high viscosity, as well as for strong detergents and solvents which exhibit high vapor pressure. This means that during liquid aspiration, the button of the pipette is pressed down to the second stop, followed by pressing down to the first stop only when subsequently dispensing the liquid. In this way, residual liquid will remain inside the pipette tip following dispensing of the correct volume. There are of course other techniques which make sense on Earth only, such as, for example, pre-wetting of the air cushion to prevent

dripping when working with liquids that generate high vapor pressure.

In order to achieve the best results possible independent of the pipetting technique, care should also be taken to keep the air cushion between piston and liquid as small as possible. For the purpose of certain experiments, especially when working with non-aqueous liquids, direct displacement pipettes are often the better choice. Direct displacement pipettes have been shown to generate better pipetting results than air cushion pipettes with respect to both accuracy and precision.

Astronauts who conduct research always consider carefully which pipetting technique they will employ for any particular experiment – and they ensure that it executed in the exact same manner by everyone involved.

Inside the ISS, everything that is not secured will float through the air, and even the most minute impulse can influence its direction. For example, pipette tips kept in a regular box as it is used on Earth would be able to leave the box and float through the laboratory. Even more dangerous: after dislodging from the pipette, used pipette tips could easily turn into contaminated projectiles. Thus, care and attention – whether in space or firmly on the ground – will guide you to success. ■



DID YOU KNOW?



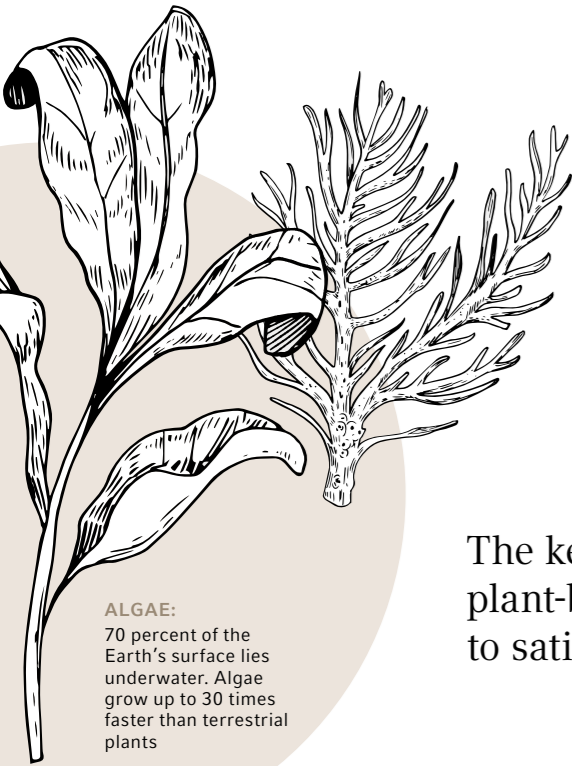
Professional training in three steps

During the course of their one-year-long basic training, which prepares them for their mission in space, astronauts become acquainted with space agencies and their respective programs. Astronauts also receive basic knowledge of space and electronic technologies, as well as multiple scientific disciplines. At the end of their basic training, they will complete a scuba-diving course – the buoyancy of the body during scuba diving resembles that in zero gravity. Last, but not least, astronauts receive Russian language instruction, and they complete courses in behavior and performance.

The second phase comprises additional training over the course of one year. This phase concentrates on capabilities that are required during every ISS mission: operation and maintenance of ISS modules and systems, load capacity and transporters; handling of resources and data, as well as robotics and navigation, where operation and maintenance on board as well as outside the craft are critical. In addition, astronauts receive medical training to the level of certified paramedics.

The final training phase provides the crew with the comprehensive knowledge that is required for their mission. This 18-month period will also strengthen the team spirit and the bond between the crew members.

What Will We Eat?



ALGAE:
70 percent of the Earth's surface lies underwater. Algae grow up to 30 times faster than terrestrial plants

The key to future food security lies in plant-based diets – even when it comes to satisfying our hunger for meat.

According to prognoses by the United Nations, the world's population may exceed the ten billion mark by the time we reach the middle of this century. To feed everyone, we will need more food. The latest reports by the International Panel on Climate Change (IPCC), however, state that food production is already the largest cause of destruction of ecosystems as well as climate change. Food production uses 40 percent of the land surface area and 70 percent of the world's freshwater, and it is also responsible for 30 percent of the greenhouse effect. Add to this environmental consequences and contamination of water, air and soil. "Feeding the world's population must change drastically", says Walter Willett of Harvard University, co-chair of the EAT-Lancet Commission on Food, Planet, Health.

Filling foods of the future

The commission comprising 37 international experts introduced the Planetary Health Diet in 2019. Its goal: to take the natural limitations of the planet into consideration and at the same time prevent diseases caused by unhealthy diets – for

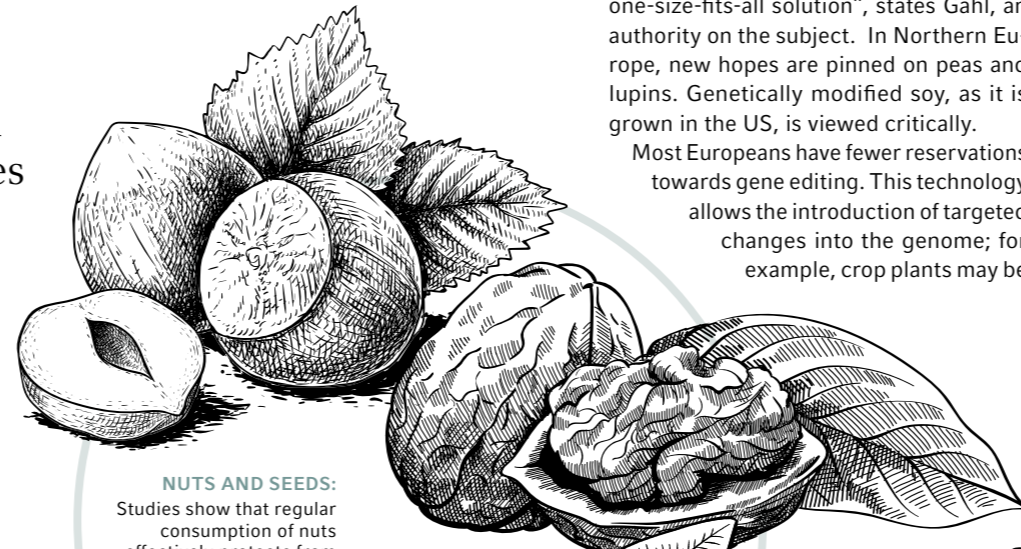
example, heart attacks or diabetes. Its foremost objective, however, is the reduction of meat consumption.

"Particularly in industrial nations, ways are sought in which to limit the consumption of animal-based foods", explains Antje Gahl of the German Nutrition Society. Furthermore, more and more people no longer accept intensive livestock farming and instead rely on plant-based foods.

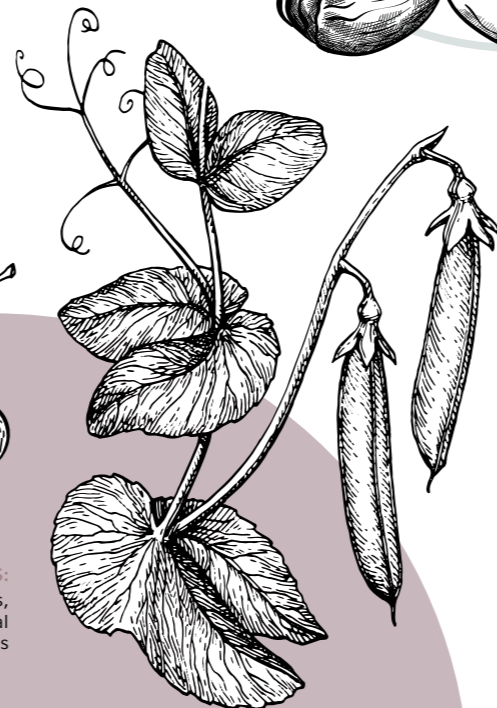
Those who envision the traditional wheat and potatoes are invited to think outside the box. Plants which were formerly considered "orphan plants" are now experiencing an unprecedented boom. The orphan crops are in fact crop plants which are characterized by their high nutritional value. Some have already been labeled



LEGUMES:
As protein sources of plant origin, peas, lentils, etc. can easily satisfy nutritional protein requirements



NUTS AND SEEDS:
Studies show that regular consumption of nuts effectively protects from cardiovascular disease, diabetes and strokes



AMARANTH:
The "fox tail" is gluten-free and thus has a lower carbohydrate content than common grains

"superfoods" – particularly those healthy fruits, tubers and grains that feature high levels of nutrients and vitamins. Sweet potatoes and quinoa (a South American crop; a pseudo-grain of the Amaranth family) have been formally integrated into our menus. Other plants such as millet, cassava, enset, teff and yams, which are integral to the basic diets in different parts of the world, have thus far not been subject to significant trade on the international market. "There is no such thing as a global one-size-fits-all solution", states Gahl, an authority on the subject. In Northern Europe, new hopes are pinned on peas and lupins. Genetically modified soy, as it is grown in the US, is viewed critically.

Most Europeans have fewer reservations towards gene editing. This technology allows the introduction of targeted changes into the genome; for example, crop plants may be

made more resistant to stress and pests. The harvest yield, as well as nutrient and vitamin content, can thus be increased. In contrast to classic gene technology, no cumbersome safety steps and time-consuming approval processes are required.

A turning point for meat

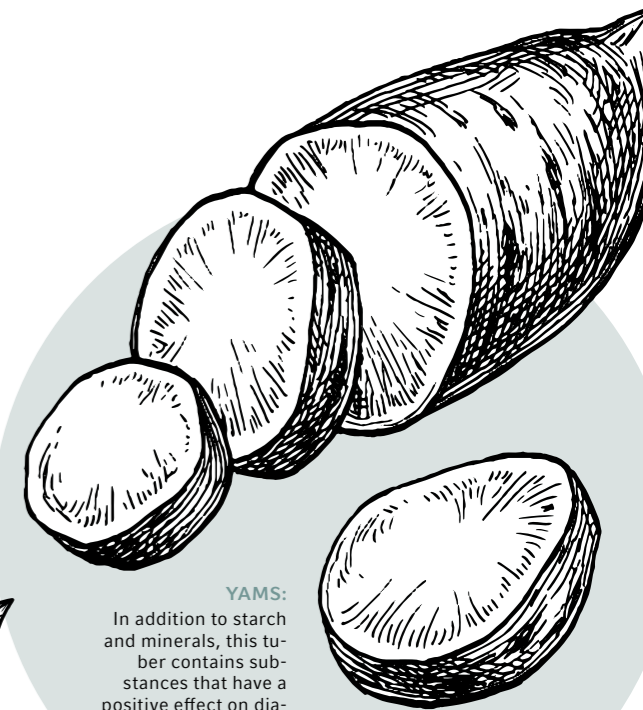
What if our appetite for meat will not abate? "We are facing nothing less than the end of meat production as we know it", predicts Dr. Carsten Gerhardt, partner and agricultural expert at Kearney, a management consultancy. His prognosis: "As early as 2040, only 40 percent of consumed meat products will continue to originate from animals."

Meat substitutes of plant origin are popular. The vegetarian substitute gains its meaty consistency from the thickening agent methylcellulose which is extracted from the cell walls of plants. The meaty taste is achieved by plant-derived heme, which originates from the roots of the soy plant and which is similar in structure to the iron-containing protein hemoglobin.

The juice of beets or carrots will provide the right color.

Is it healthier? "With respect to nutrient content, meat substitutes are in no way inferior to meat products. The fact that some of the raw materials must be imported from far away does present a disadvantage, as well as the fact that these are highly processed products which contain a number of additives and flavors", explains Dr. Claudia Müller of the Center for Nutrition at the State Institute for Development of Agricultural and Rural Areas in Schwäbisch-Gmünd, Germany.

Those who do not trust plant-based substitutes may hold out hope for clean meat. This is the name given to meat cultivated in test tubes from stem cells. In late 2018, an Israel-based Food-Tech startup introduced the first steak that was thus grown in the laboratory, with exclusively plant-based ingredients. Today, the company is capable of growing a wholesome steak in large bioreactors within a period of 3 to 4 weeks – wherever it is needed. At the end of September 2018, Russian Cosmonauts even printed a steak using the 3D-printer – directly on site, in the ISS space station. It was not consumed, however – instead, the samples were taken back to Earth for analysis.



YAMS:
In addition to starch and minerals, this tuber contains substances that have a positive effect on diabetes as well as on cholesterol levels

After the Crisis Comes Opportunity

Time and again, throughout the course of history, humans have found themselves facing the abyss. Crises, however, not only signify danger, but they also trigger positive developments.



Hopeless situation?

Crises do not necessarily mean the end, but in retrospect they often prove to be the motor for new solutions

The object which triggered one of the major crises of mankind was, in fact, notably small. It was also misshapen, shriveled and brown, and, from today's perspective, it was a common everyday item. It was the tulip bulb which, in 1637, plummeted the Netherlands into an economic crisis of massive proportions, and which brought the world's first stock market crash to the country. So great was the greed for the bulb which gave rise to the most elaborate dreams of bloom that collectors would pay as much as €25,000 in today's currency – until the speculation bubble burst and the market collapsed. It would take the Dutch economy a long time to recover from the tulip crisis.

The tulip crisis: it is but one example of a multitude of crises that have led humans to the edge of the abyss throughout history. In addition to personal life crises, it is political disaster, including the refugee crisis in Europe; economic and financial crises; ecological crises such as climate change – but also pandemics like COVID-19 that upset the stability of people and entire nations. Originating from Greek, "crisis" translates to "turning point" or "decision". Thus, the crisis will either end in disaster or the situation will improve. Crisis: it signifies the simultaneous co-existence of danger and opportunity.

Scientists have attempted to uncover common themes in the unfolding of crises. According to Swedish psychiatrist Johan Cullberg, every crisis can be subdivided into four phases: shock and inner chaos; reactions such as fear and hopelessness; processing and the search for solutions, and, finally, reorientation. Being aware of the phase of the crisis in which one currently finds oneself may help conquer the situation. At the same time, the way that people handle internal and external impacts varies considerably between individuals. Some people, and even companies and governments, will falter, whereas others will emerge from the crisis with renewed strength. ►

Flawed risk assessments

Companies, in particular, have been preparing for impending crises of all kinds for years, states the Institute for Crisis Research in Kiel, Germany. They appoint crisis and risk managers, conduct crisis drills and compile a crisis handbook. According to the "Crisis Prevention Survey 2019", most managers worry about hacker attacks, blackouts, "perfect storms", natural disasters, political upheaval and exposure by the media. On the other hand, almost nobody expected a pandemic. "The implications of climate change, new technologies, digitalization, demographic changes, artificial intelligence, and financial and political uncertainties have moved many of us. We saw a significant event coming, but the pandemic has likely taken it at least one level up from our expectations", says Felix Arndt, expert in entrepreneurship at the University of Guelph in Canada.

The fact that even crisis and risk managers often misjudge risks has been confirmed by Professor Werner Gleißner, member of the board of directors of the German Society for Crisis Management (DGfKM). For example, the risk assessment report of the World Economic Forum at Davos listed "green risks" like natural disasters and the consequences of climate change as the number one risks expected by experts. Topics such as pandemics or economic/financial crises of larger magnitude, on the other hand, ranked low on the list – a dramatic miscalculation, as evidenced by the global financial crisis of 2007, the Euro crisis of 2009 or the emergence of COVID-19.

If life hands you lemons, make lemonade

Despite all the negative economic and social fallout, there are solid reasons for taking a positive stance following a crisis. "When life hands you lemons, make lemonade", wrote Elbert Hubbard in 1915. Psychologists found that people do on occasion emerge from a crisis with renewed strength. They call this phenomenon, which allows people to experience inner growth following grave life crises, "post-traumatic growth". According to Michaela

Brohm-Badry, president of the German Society for Positive Psychological Research, empirical data from cancer patients, as well as data from victims of fires, maritime disasters or violence, show that suffering and the resulting stressful emotions may in fact be followed by strengthening, positive emotions. "I am happy and successful – not in spite of my life crises, but because of them", explains former kidnapping victim Marc Wallert. In 2000, he was held for a period of four months on the island of Jolo by Islamic extremists. In his book "Strength through crises: From the art of not losing your head", he speaks about his experiences.

Lessons from history

Economists Alexander Tziamalis and Konstantinos Lagos of Sheffield Hallam University in the UK, too, recognize the opportunity within a crisis, and they provide historic evidence to support their theory. "Crises often bring forward positive change", emphasize the researchers. "If there is one lesson from history, it is that the economy will pick up again. Unemployment will be reduced, salaries will increase, the stock market will rise to new unprecedented highs and our factories will be producing more goods than ever before", states their optimistic forecast – even in 2020.

The fact that crises may initiate positive change is also evidenced by the significant contributions that women made to the workforce in the UK during the First World War. More than one million women kept the economy afloat while working in positions that had thus far not been open to them, including

Going new ways

Psychologists call "post-traumatic growth" the newly gained inner strength after a crisis



If there is one lesson from history, it is that the economy will pick up again. Unemployment will be reduced, salaries will increase, the stock market will rise to new unprecedented highs and our factories will be producing more goods than ever before."

Alexander Tziamalis / Konstantinos Lagos

work in factories, as drivers or even in the police force. "The long – and still ongoing – process that would recognize women's skills and talents in the workforce was accelerated", summarize the scientists.

Inefficient structures dissolve

Following crises, inefficient or outdated structures are frequently abandoned, found Tziamalis and Lagos. In the opinion of the scientists, even the corona crisis harbors opportunities for positive change. "Stronger public health, reduced unnecessary commuting, less pollution and international pharmaceutical cooperation can improve our world. So can increasing the pay, as well as recognition, for key workers." Everyone has the opportunity to make a positive impact in the wake of a crisis.

At the end of the crisis, the motto is: look ahead into the future – and plan for the next disaster. Jena University, for example, will offer a degree program in International Crises this upcoming semester. "After the crisis equals before the crisis. The question is, what do crises have in common, and how can we meet them in order to better prepare society", says Jena-based professor Rafael Biermann. The next crisis is sure to come. ■

Through the Magnifying Glass

During a crisis, the problems and challenges of living together become evident. And suddenly, things are possible that were previously considered inconceivable. An overview of the lessons, as well as considerations and tasks for the future.

Suddenly visible
The corona pandemic exposes social vulnerabilities and opportunities

! Globalization

During the crisis, the whole world distanced itself. Global trade collapsed. Dependence on China, in particular, became a focal topic. More than a third of all industrial products worldwide, and close to 80 percent of the global supply of medicinal raw materials originate from China. The lack of personal protective equipment and medical products has highlighted this dependency. Did Corona in fact herald the end of globalization? Not really. "COVID-19 ignores borders, and the solutions to address it will need to overcome them too", emphasizes Rory Horner of the Global Development Institute at the University of Manchester. Medicines and vaccines must be made available to as many people as possible. This is hardly imaginable without China and India. It is true that European countries are now discussing ways in which strategically important production capacities could return to Europe. Turning their backs on globalization, however, is a strategy that nobody can afford. The price to be paid would include higher personnel and raw material costs, considerable losses in the standard of living and a regression to nationalistic thinking. ►



2

! Health Care

More basic research and international collaboration: according to experts, this must be the response to the global pandemic with respect to health care. "Fundamental science is the only weapon we have to anticipate and prepare for new challenges in health and other areas such as the environment, and thus defining public policies that safeguard European citizens' health", says biochemist Mónica Bettencourt-Dias, director of the Instituto Gulbenkian de Ciência in Portugal. Would better communication at the beginning of the pandemic have been able to stop the spread of the virus? Many facts affirm this possibility.

While governments can order lockdowns at the local level to stop transmission, these measures are only effective if countries around the world make similar efforts to prevent renewed outbreaks. The World Health Organization (WHO) has been weakened by the withdrawal of the United States. However, only increased support for international organizations will be able to counteract future epidemics.

! Economy

For many companies, the pandemic was a wakeup call. Not only trade, but traditional industry and mid-size firms encountered a backlog and the need for digital upgrades. Overnight, many companies had to adapt their IT infrastructure to accommodate work from home and replace conferences and business trips with virtual substitutes. This process allowed firms to experience a boost in digitalization, and many intend to continue along this path. A solid digital infrastructure is a prerequisite which must be ensured by the public sector. According to Armin Grunwald, expert for the Prediction of the Consequences

of Technology at the Karlsruhe Institute for Technology, businesspeople should appreciate their stark dependency on technologies and economic processes. Without electricity and the Internet, without global supply chains and mobility, everything would collapse. "We have become too accustomed to everything working perfectly, all the time", says Grunwald. "We need Plan B, and we need technologies that do not put all their eggs into one basket. Decentralization is an option – for example, in energy transformation and digitalization."

3

4

! Environment

Planes were grounded, factories stood still, air pollution decreased. On the surface, the environment benefitted from the pandemic. This effect, however, is short-lived. For this reason, a broad coalition between politics, the economy and NGOs in Europe demands the restart of the economy under a green banner. Further to climate protection, the conservation of species is high on the agenda. According to the environmental organization WWF, the unsustainable trade of wild animals following the destruction of their habitats constitutes the second largest

threat to biological diversity worldwide. At the same time, the wild animal trade is a direct threat to human health. According to the WHO, COVID-19 is of zoonotic origin – as are 61 percent of all human pathogens. "We're calling on world leaders to support the closure of high-risk wildlife markets wherever they threaten public health and biodiversity", says Jan Vertefeuille, Senior Advisor for Advocacy at WWF-US. More public relations work and support for affected countries could contribute to a decline in the demand for wild animal products.

! Education

The corona-crisis struck students, parents and teachers out of the blue. Schools without hardware and functioning WIFI; teachers without a background in online learning; concerns about privacy. The corona-crisis has mercilessly revealed the failure of many states with respect to digital education. While some schools enthusiastically embraced online lessons, students at other schools either did not hear from their teachers at all or they received their assignments in the mail. The pandemic is a wakeup call to finally invest in (digital) education – and in the future. Markus Pissarek, professor for German didactics at the University of Klagenfurt in Austria, points out that during analog teaching, the actual effective practice time is often negligible – for writing, it is approximately two percent. During the crisis, students invested more time in practicing and their own writing. "Digitalization will give students the opportunity to gain more practicing time", says Pissarek. The biggest challenge is self-organization – one more thing that today's students will have to learn.

! Society

What is really important in life? The corona-crisis has forced many of us to ask existential questions. "We should think about how vulnerable we really are and how thin the ice is on which we walk. We now have a rare opportunity to reflect on such questions with respect to one's lifestyle and society as a whole", says theologian Thomas Schlag of the University of Zurich. The corona crisis has triggered a number of incentives; for example, workers in grocery stores and agriculture, in medical and long-term care facilities, in waste disposal and transport, were finally recognized as being "systemically relevant". In many cities, people stood on their balconies and applauded them for their work. These professions, however, deserve more than our applause. They deserve better working conditions and better pay. Politicians have shown what they are capable of: in many countries, they reacted quickly in order to absorb the negative effects of the crisis. Such decisiveness is also needed in other areas, for example the climate crisis – and it is evident that it can be done.

5

6

Acceptance

Man loves habits and plans. The corona pandemic and the associated lockdown have caused the illusion of a plannable future to vanish into thin air overnight. It is the right moment to consciously face the present, allow feelings to arise and live. This is followed by the acceptance that not everything is controllable.

Rituals

With the acceptance of the present and what is, space for new things is created. Rituals can help to increase productivity. While routine tasks, such as brushing your teeth in the morning, require little conscious action, rituals trigger feelings. Even small details can bring more joy to everyday life.

Reflection

With the arrival in the present, the reflection on the inner voice increases. Everyday life no longer has the steering wheel in its hands. Time to get to the bottom of the questions that are often ignored outside the crisis. A reflection of existing circumstances, wishes and fears can bring new motivation.

Initiate Change

Now it is time to get into action. Wishes for the future should be expressed. On an organizational level, now is the right time to take advantage of the new awareness and openly address changes. Transparency and trust of the managers can be actively demanded. Then the way will be clear for change.

And It Goes On

Crisis? Not with me! This is how you manage to turn the supposed threat into an opportunity.



INSIDE Eppendorf

On these pages: sustainability at Eppendorf, tips on pipetting for SARS-CoV-2 research, as well as product innovations and a prize contest on the occasion of the 75th company anniversary of Eppendorf.



IN TUNE WITH THE FUTURE

Sustainable consumables:
the current state of material,
packaging and storage

TIPS ON PIPETTING SARS-COV-2 TESTS

Precise, safe and efficient:
assistance for flawless
lab results

Moving Closer to the Goal

Environmental concerns continue to gain in importance during manufacturing as well as the use of laboratory consumables. How can sustainability and the high demands placed on these products be reconciled?

Pipette tips, petri dishes, plates – consumables made from plastic are in use in laboratories worldwide. This translates to an approximate 5.5 million tons of plastic waste that is generated in laboratories each year. As a result, lab managers, scientists and life science companies like Eppendorf are paying attention to the question: how can we reduce the use of plastic in the lab without jeopardizing product quality, and are there more environmentally friendly alternatives?

Research in this area focuses primarily on plastic recycling. The problem: the demands on laboratory consumables with respect to purity, precision, consistency and robustness cannot always be satisfied using current recycling practices. For this reason, in the laboratory environment,

recycled plastic can only be used in applications that are not entirely dependent on purity – for example, packaging. Chemical recycling constitutes a possible alternative; however, a current study out of the Netherlands shows that at this time, chemical recycling is still considerably more energy intensive than mechanical recycling of plastics. As a result, the CO₂ footprint is worse in comparison.

Neither bioplastic nor glass

What about bioplastics – i.e. plastics made from renewable biomass such as bioethanol or cellulose, which are independent of crude oil? The necessary acquisition of large amounts of raw material constitutes a major disadvantage, not least because it competes with food and feed production. Furthermore, it is currently not possible

to demonstrate that bioplastics products possess an environmental compatibility that is at least equivalent to that of products made from traditional plastics.

Avoid and reduce

Even glass is not a suitable alternative: the transition from glass to plastic was consciously promoted. The arguments in favor of plastic included its lesser weight as well as increased impact resistance. As such, the efforts of Eppendorf with respect to increased sustainability in the laboratory now focus on avoiding and reducing the use of raw materials in the products themselves as well as in packaging and storage. Eppendorf's new approach to changing the design and shape of its innovative products accordingly demonstrates how implementation can be achieved.

The new epT.I.P.S.® rack design for our

“Our customers' requirements and the laboratory applications in which our products are being used do currently require the use of high quality plastic consumables.”

Hans-Christian Stuff, Head of Consumables Divisions

pre-sterilized pipette tip variants saves considerable amounts of polypropylene plastic (PP) – between 19 and 35 percent, depending on the rack size, compared to previous racks. This is a convincing argument for Eppendorf customers for whom the reduction of plastic is a growing concern. “Our customers' requirements and the laboratory applications in which our products are being used do currently require the use of high quality plastic consumables”, says Hans-Christian Stuff, Head of Consumables Divisions at Eppendorf.

An additional advantage: the users of the new racks will also benefit from the new design and its optimized functionality:

- The slim rack format is now easy to carry, even for small hands
- Even safer: the lid is resealable after use
- All rack sizes can be stacked safely on top of each other

Something else the user will appreciate: the material that is used for the components of the new epT.I.P.S.® racks – i.e. lids, base and trays – is polypropylene (PP) that can* be recycled in suitable facilities. In addition, Eppendorf continues to strive towards using materials for its consumables which will satisfy all criteria – for sustainability as well as user needs – in the near future.

In-depth reading

Our Eppendorf Handling Solutions website offers more on the topic of sustainability of consumables:

eppendorf.com/lab-without-plastic

* The appropriate disposal procedures for laboratories as described in the legislative framework for waste management in your country must be complied.

WE INFORM

Those who would like to know more about how sustainability in the laboratory is made possible through small changes, Eppendorf has developed the poster “How to Become More Sustainable in Your Lab”. The motto: reduce, reuse, recycle! The poster is included in this issue of the magazine, and it is also available via the following link:

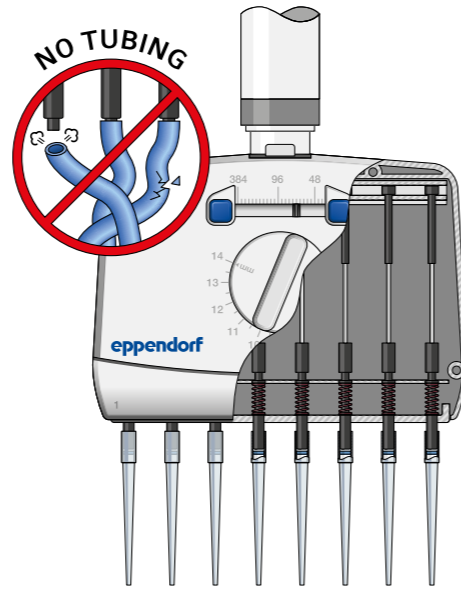
www.bit.ly/30BatZb

New design for the epT.I.P.S.® racks:
Less plastic for more comfort and convenience



Mr. Move It

Engineer Tobias David and his team have invented anew the most revolutionary pipette on the market, from the ground up. Join us on his exclusive backstage tour of the new Move It®.



Eppendorf's new autoclavable adjustable tip spacing multichannel pipette Move It® is now on the market. Movable tip cones enable simultaneous transfer of multiple samples between different vessel formats, which, in turn, allows routine tasks to be completed up to 70 percent faster than with single channel pipettes. "We continually check in with our customers to see what can be improved. Rapidly increasing sample throughput, which our customers often manage under immense time pressure, prompted us to respond with the appropriate product development."



“Simply put, we reinvented the adjustable tip spacing pipettes from the ground up!”

Tobias David, Project Manager Development at Eppendorf

drawing board and come up with an entirely new pipette design. It was my vision to build this product to the high quality standards that our customers have come to expect of us – which included ensuring the familiar performance and safety that distinguish Eppendorf pipettes.”

The best solution was the direct connection between pistons and cones without the use of tubing. "The technical solution to moving the cones, however, proved to be tricky and caused us sleepless nights. Exclusive, highly precise parts were required, and at the same time the product needed to remain affordable. Finally, thanks to the close collaboration with our customers and our suppliers, the project turned out to be a success. At the end of the day, it is safe to say that we have reinvented the adjustable tip spacing pipette from the ground up, thereby creating an entirely new instrument, with the usual quality, at an extremely attractive price. This, of course, makes us feel good."

Additional information is available at:

www.eppendorf.com/move-it



Knowing how to do it
There are many tricks
and tips for extensive
pipetting

Pipetting Solutions for SARS-CoV-2

Nucleic acid extractions, real-time PCR, etc., employed in SARS-CoV-2 research, may pose specific challenges. The following tips and tricks will help you get the most from your research.

You want to conquer high sample throughput? The preparation of nucleic acid isolation and subsequent real-time PCR for the purpose of qualitative in vitro detection of SARS-CoV-2 involves multiple pipetting steps. You should be familiar with the following tricks regarding efficiency and precision:

- Mechanical and electronic 8- and 12-channel pipettes help to efficiently distribute mastermix in 96-well plates, as several wells are filled simultaneously. However, the electronic multichannel pipettes with their dispensing function offer an extra advantage here: they speed up plate filling even more because one tip filling can be used to fill several rows at once.
- Electronic direct displacement systems such as the Multipette® E3/E3x are a good choice especially for foaming master mixes. In dispensing mode, they also significantly accelerate distribution. The process speed can be increased even further by using the "automatic dispensing" function.
- Contaminations can lead from an impairment of the PCR reaction to false results.

For this reason, pipette tips should always be of PCR-clean and sterile quality and equipped with an aerosol barrier (filter).

Your thumb cries out for relief during repeated pipetting and mixing? Methods for qualitative in vitro detection of SARS-CoV-2 involve countless pipetting and mixing steps. The use of a vortexer for the purpose of mixing can potentially damage the samples. This is where good pipette ergonomics are important:

- Electronic pipettes can minimize physical tension.
- Smooth-running mechanical pipettes with optimum angle ratios of the control knobs and easy-to-read volume settings are advantageous from an ergonomic point of view.

You worry about safeguarding sample integrity? You work on ice? The precise pipetting of ice-cold liquids requires special attention due to their different physical properties compared to water at room temperature. The right tools and the right pipetting technique are essential. Our tips:

- Direct displacement systems get the most out of cold and difficult to dose liquids such as foaming master mixes.

You want to protect your pipettes? Aggressive chemicals are often used to decontaminate pipettes to protect samples and users. These can attack pipettes. Therefore, it is important to observe the following:

- Since SARS-CoV-2 viruses can be inactivated by autoclaving at 121 °C, mechanical pipettes should be completely autoclavable without disassembly. For electronic pipettes, the lower part should be autoclavable without disassembly.
- The material of both mechanical and electronic pipettes should be as resistant as possible to common decontamination agents and chemicals such as RNase AWAY®.

Eppendorf solutions, along with additional information, videos, posters, etc., are available at:

www.eppendorf.com/virus-research-pipetting

MASTHEAD

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Lab Lifestyle

1

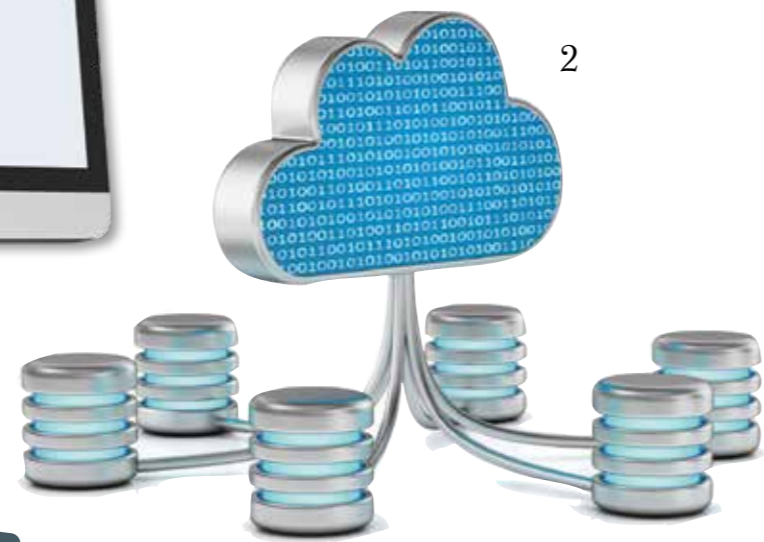


1

Photo Editors

Attention, photography aficionados: the imaging service Artbreeder, which is based on neural networks, allows the fusion of different subjects to create new images or videos which will contain characteristic features of both originals. One more way to express photography as art.

www.artbreeder.com



2

2

Donating Computer Power

For almost two decades now, private individuals have been able to make the computing power of their desktops and laptops available to the non-profit project Folding@Home for the purpose of simulating protein folding, thus helping advance medical research into diseases such as Alzheimer or cancer. Folding@Home, backed by California-based Stanford University, has recently become actively involved in SARS-CoV-2 research by illustrating the movable elements of proteins using complex computer simulations. The larger the computing capacity, the better. When are you planning to donate your computer power?

www.foldingathome.org

3

Dear Science

Dear Science, we need to talk. What is going on? Conspiracy theories and crude distortion of scientific fact have been around for some time – but now, this type of thinking is affecting the top political leaders of large nations, with the result that it has become socially acceptable. Man-made climate change? A figment of the imagination. COVID-19? – A simple cold.

best possible compromise – this would be a comforting counterweight to populist gut reaction.

It is also important to explain that scientific progress is not linear, and that only rarely will it go according to plan. In science, to err is not only human – instead, it is woven into its very fabric. It is equally crucial to recognize and admit to the error after checking the data, and to change course accordingly.

Dear Science, you say it's not your fault. You conduct research, you publish, you advise the politicians. The things you concern yourself with are complex, and it is not always possible to communicate scientific facts in a way that is easy to understand without simplifying too much. And you avoid presenting yourself to the general public because you have been warned that it will jeopardize your credibility.

At times, it is the aberration itself that forms the basis for new scientific knowledge. While searching for new, powerful glues, Dr. Spencer Silver discovered an unwanted by-product, which turned out to be the adhesive that made Post-It notes a success. In the same vein, Roy Plunkett, engaged in the search for new coolants, discovered Teflon, the material to which nothing sticks (not even the aforementioned Post-It notes ...)

But, dear Science, let's be honest: if you permit non-scientists to gain insight into your work and thereby show how versatile you are – do you think it will really harm you? Showing the public that there are many different viewpoints on any given topic that need to be weighed against each other, and that typically, there is not only one correct solution to a problem but only the

Dear Science – we feel that we should talk about this!

Dr. Helga Hofmann-Sieber, virologist at the Heinrich Pette Institute in Hamburg, likes to call a spade a spade in science. With Timo Sieber, she co-authored the book "Wild Genes".

www.bit.ly/33mqeoW



3



LOTTERY

! The Lucky Winner!

The year 2020 marks the celebration of the 75th anniversary of Eppendorf. To learn about the exciting and successful history of the company, visit our anniversary page: www.eppendorf.com/75-years

On this page, you will find information about our contest question: Who were the original founders of Eppendorf AG? With a little luck, you could win the large Eppendorf merchandise package with mug, notepad, the popular Eppendorf pipette-pen, and much more (see image left)!

Send us an email to magazine@eppendorf.com or register as a subscriber and leave us a message with your answer. Terms and conditions can be viewed here:

www.eppendorf.com/otb

News Ticker

Whether business expansion, innovative Eppendorf solutions or events for our customers: an overview of what we do.



Himac and Eppendorf

In March, it was announced that Eppendorf would acquire the centrifuge business of Koki Holdings Co., Ltd. of Japan and henceforth distribute their products under the brand name Himac. On July 1, Eppendorf Himac Technologies Co., Ltd. became a part of the Eppendorf Group, which is expanding its centrifuge portfolio to include floor-standing and high-speed centrifuges, as well as clinical and automated centrifuges. Gradual global distribution is scheduled to begin in early 2021. "With Himac, we are expanding our product range specifically to include those products that have thus far not been a part of our portfolio. In this way, we are becoming a "one stop shop" for centrifuges globally", says Dr. Peter Fruhstorfer, Co-Chairperson at Eppendorf AG.



◀ Just Stay Cool

In 1964 Eppendorf introduced the first microcentrifuge for laboratory applications to the market. Today Eppendorf develops innovative, high-quality centrifuges for a wide range of applications. The new refrigerated Centrifuge 5425 R is the youngest generation in a family tradition of more than 50 years: It represents the new laboratory standard for temperature-sensitive samples up to 10 x 5.0 mL. It also features state-of-the-art cooling technology that guarantees 4 °C even at maximum speed for maximum sample protection and optimal separation results. A wide range of six rotors provides space for vessels from 0.2 to 5.0 mL. The Centrifuge 5425 R is our solution for your daily challenges.



Update Eppendorf Award

Due to the COVID 19 pandemic, the Young European Investigators Conference at the EMBL Advanced Training Centre in Heidelberg, planned for June 25, 2020, was postponed to June 24, 2021. At this top event with high-caliber Award Alumni, we will honor both the Award winner 2020, Randall Platt (see also p. 33) and the winner 2021. Infos: www.eppendorf.com/award/25years. For applications: www.eppendorf.com/award/application



When Cells Learn to Talk

The young Switzerland-based biotechnologist Randall Platt develops tools for genetic research. His method is the first to allow the efficient manipulation of entire gene networks. And, by the way, his lab teaches cells to record their biographies. ▶



If Randall Platt wants to hang a picture on the wall of his Swiss residence, chances are the project may fail due to his lack of technical skills. "I am not a home improvement genius", he admits, and laughs. At the same time, the American is a tool enthusiast. It is one tool in particular that makes his researcher's heart beat faster. It is sharp – really sharp. He is referring to the gene scissors known as CRISPR/Cas. Platt has given this cutting tool, discovered in 2012 by Emmanuelle Charpentier and Jennifer Doudna, a new cutting edge and turned it, piece by piece, into a universal instrument for gene repair.

Within the realm of science, his developments have earned him the title "toolmaker of modern biology." At only 33 years of age, he is the man of the hour when the genome is on the cutting board. Despite the glory, the scientist, who grew up near Salt Lake City, keeps his feet firmly on the ground. Formalities are not important to him, and he can do without "Professor" – and Randall. "My name is Randy", he says, and he is exactly where he says he belongs – at eye level with all humans!

The problem-tackler

A desk, two chairs, a computer, a blackboard and a stack of books – his office in the Department of Biosystems Science and Engineering at the ETH Zürich, located in Basel, which he has recently joined as professor of bio-engineering and where he runs his own lab, speaks to the minimalism he prefers. "It helps me concentrate fully on my work", says the Swiss resident. Indeed, the sparse environment appears to inspire him to do great work. Amidst the bareness of his office, he continually develops new ingenious CRISPR tools, or he improves on previous versions: "It's my joy of learning and tinkering

with biology to create new technologies", confesses the passionate researcher, who started out studying biomedical technology and chemistry at the University of Utah in Salt Lake City in 2011. "I enjoy nothing more than diving deep into the literature about a peculiar biological system and then working with my team to figure out how we can hijack it to do something new or useful."

Randy Platt scored his first major success based on the genome scalpel while completing his doctorate at the Massachusetts Institute of Technology (MIT) in Boston in 2016: he developed the Cas9-mouse. This animal model makes it possible to manipulate genes and study their respective functions. A breakthrough discovery! At the present time, more than 1,000 research laboratories worldwide utilize the Platt method of genome editing.

Favorite place
Randall Platt in the laboratory at the Department of Biosystems Science and Engineering of ETH Zurich in Basel



Innovation through order
His daily tool, detailed labeled and neatly lined up - Randy likes it clearly arranged



It's my joy of learning and tinkering with biology to create new technologies."

Randall Platt

Changing gene networks

For the determined scientist, who joined the Eidgenössische Technische Hochschule Zürich (ETH) in 2016 as the youngest professor on the faculty, this was no reason to rest on his laurels. Instead, Randy did more work and promptly delivered the next brilliant research discovery: using a CRISPR-Cas12a technique, he and his team developed an approach that enabled the correction of not only two or three genes at a time, but 25. "This number can be further increased, up to hundreds of genes", explains Platt: "With our method, we are able, for the first time, to alter entire gene networks in a single step, in a targeted fashion." For people who have exhausted all treatment options for their illnesses, this breakthrough represents more than just a glimmer of hope. "Many

illnesses that have thus far been considered incurable are in fact based on malfunctions of multiple genes simultaneously."


Randall Platt's work has inspired the international scientific community, and as a result, the biotechnologist has been endowed with a number of prizes. For his latest invention, Platt was awarded the Eppendorf Award for Young European Investigators 2020, worth €20,000. He successfully recorded the course of gene expression using the CRISPR-Cas system, i.e., the process during which the genetic information is transformed and made available to the cell. "We programmed the cells in such a way that they can recount their own life stories", he explains his latest masterpiece: the reconstruction of a cell's biography allows one to draw conclusions about the moment during which the genetic change occurs. "This could give rise to future non-invasive diagnostic tools and personalization of therapies for patients worldwide."

Happiness through joy

The outcomes, however, are not always newsworthy: "Sometimes this results in obnoxiously over engineered Rube Goldberg machines", Randy mocks the failures that come out of his own lab. Self-deprecating humor is just one of his talents outside the laboratory; the scientist faces the absurdities of everyday life with good humor and serenity. His interviewer was greeted with overwhelming, genuine warmth: "I am very much a creature of my environment", he says. "When my actions contribute to the happiness or success of someone around me, I relish in enjoying their happiness with them." If Randall Platt cannot be found in his laboratory, he will most likely

be roaming through the Swiss countryside: "Most weekends you will find me, my wife and our two children hiking, mountain biking or skiing in the Swiss Alps. What else does Randy need for a perfect Sunday? "A really good, carefully prepared cup of coffee in one hand and an interesting book in the other – for example, "The Innovator's Dilemma", while "The Gummibear Song" plays in the background", he says and laughs. He admits that the choice of music still leaves room for improvement, "but right now, my two kids won't let me listen to anything more sophisticated!" What does he have in mind for his career – does he have a vision? "Most of my career has focused on creating radically new early stage technologies, which usually culminate in proof of concept experiments in mice. My next professional goal is to move one of these technologies forward towards translation in humans." ■

FIND OUT MORE?

 This way to the website:

www.bsse.ethz.ch/platt

 New podcast with Randall Platt: **Hijacking the CRISPR System to Create "Living Diagnostics"**

www.go.nature.com/eppendorf2020

Precise and hungry for knowledge
The winner of the Eppendorf Award for Young European Investigators researches in the field of genome editing

The Secrets of Eternal Ice

With the help of satellite images, Angelika Humbert studies the ice sheets of the Arctic and Antarctica. Her findings contribute to a better understanding of climate change and rising sea levels – and to finding possible solutions.

Explaining her work as a glaciologist, Professor Dr. Angelika Humbert likes to compare the movement of the polar ice sheets to honey. If she were instead to speak of topographical factors and conditions, flow rate and supraglacial lakes, she would leave most conversation partners completely in the dark. “Similar to honey on bread”, Humbert begins to explain, “- this is how glaciers flow once their mass has become large enough from plenty of snowfall. Glaciers flow to the edge of the ice shields of the Arctic and Antarctica, where they will then break off.”

These broken-off icebergs have long since become a symbol of climate change. Global temperatures rise, ice sheets melt, sea levels rise. “The breaking off of ice is a completely natural phenomenon”, says Humbert. “What we are worried about, though, is the speed at which this occurs.”

Humbert has been studying the movement of ice for 20 years; for the past eight years she has been based at the Alfred

Wegener Institute, Helmholtz Centre for Polar and Marine Research (AWI). Her area of expertise: glacial modelling and remote sensing of ice. For the ice scientist, too, climate change presents the most pressing question of our time. With her work, she can further the understanding of the mechanisms by which glaciers change, and her model calculations can contribute to finding solutions to the problems presented by rising sea levels. “It is likely too late to stop this process entirely, but if we are successful in reducing the temperatures, there is a chance that glacial melting could at least be stabilized.”

Science of societal relevance

According to the Intergovernmental Panel on Climate Change, 680 million people who live in the low-lying coastal regions around globe, 65 million inhabitants of island nations and 670 million people who live in alpine regions are threatened by rising sea levels and melting ice, with a simultaneous

increase in extreme weather phenomena. “We are aware that in the face of doubt and insecurity, people will have to rely on our calculations”, says Humbert. “Day-to-day, however, one tends not to think about it too much.”

Day-to-day, to the 50-year-old scientist, involves computer work and analyzing massive amounts of satellite data. Approximately 16 million square kilometers of the surface of the Earth – an area almost the size of Russia – are covered in ice. While her research area covers a mere fraction, analyzing 10,000 square kilometers based on topographical images can take years. The better the image, the better the result. The available data originate from commercial as well as scientific satellites. High-resolution images covering an area of 25 square kilometers can easily cost 4,000 Euros. “Sometimes, when we receive really good images, we do celebrate with a shot of whiskey”, reveals Humbert. Whereas conventional photographs are often used to interpret shadows, premium images offer clear views to the bottoms of the ice lakes – which, according to Humbert, makes a huge difference to the work.

Computer-based glacial research

“Contrary to common belief about polar researchers, I am not much involved in expeditions to the Arctic regions”, says

Humbert. Due to the COVID-19 pandemic, two planned expeditions had to be cancelled. “The only expedition left to me this year is my commute on the train from Darmstadt, where I live with my family, to the AWI in Bremerhaven”, says Humbert and laughs.

Fascination from the very beginning

With polar research being her dream job, Humbert has no problem with the many hours of commuting. Following her studies of physics in Darmstadt, it was purely by chance that she became involved in glaciology. During her maternity leave, in her mid-twenties, she began reading the literature on the topic which she had touched on briefly during her studies – and she was hooked. “Ice fascinates me to this day”, says Humbert. “If you think about how much ice there is on Earth, how important the ice is to our Earth, and how little we really know about it – I could not imagine a more fascinating area of research.” The Geoscience students at the University of Bremen agree. Humbert, professor of ice modeling at the university, passes her knowledge and her experience on to the next generation. She is pleased: the students are very engaged, and they come prepared with plenty of prior knowledge. “They don’t need me to talk to them about honey.” ■

! SHORT PROFILE



Prof. Dr. Angelika Humbert is a glaciologist at the Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research. Humbert, who holds a PhD in physics, specializes in computer simulation and remote sensing of ice sheets, ice currents and shelf ice. With the help of physical formulae and computer modelling, she aims to depict and predict processes far into the future. She is also Professor for Ice Modelling at the University of Bremen.

Covered by ice
How long will landscapes and habitats like this last? Among other things, glaciology deals with this



Musical mathematical talent
Elaine Chew was herself a heart patient when she came across an exciting research approach

Musical Beats For a Healthy Heart

Elaine Chew, mathematician and pianist, explores the impact of Chopin, Bach and Berger on circulation and blood pressure. She also performs for people with pacemakers.

At the Paris-based research laboratory Sciences et Technologies de la Musique et du Son, you developed a mathematical model for analyzing the perception of music. You commute between Paris and London and also between your main job as a mathematician and your training as a musician – why?

Elaine Chew: Yes, I am very happy that I can fully immerse myself in my two passions, mathematics and music. The so-called spiral array model was part of my doctoral thesis at the MIT Operations Research Center. The model formed the basis for algorithms to solve problems in music perception, such as key determination and quantification of harmonic tension. The mathematical language provided a means of expressing and communicating aspects of musical know-how. My work is now at the STMS laboratory at the Institut de Recherche et Coordination Acoustique/Musique, a mecca for composers and researchers who are interested in combining music and technology. My family is still in London because of my daughter's schooling, hence my commuting.

You yourself suffered from cardiac arrhythmia – to what extent did this give you the idea of investigating the influence of classical music on circulation and blood pressure?

Chew: When I was lying on a table in a catheterization laboratory at St. Bartholomew's Hospital (Barts) in London – with tubes reaching into my heart – looking up at the marvelous signals and images on the monitors, a conversation with the registrar about his guess-the-arrhythmia music game at the cardiology department's Christmas party sparked a train of thoughts about the crossovers between music and EKG signal analysis. Abnormal heart rhythms form musical patterns and I wondered if all natural sounding musical rhythms have a physi-

ological basis. By notating the abnormal heart rhythms as is done in contemporary classical music and matching them to musical fragments, collage compositions emerge that convey an individual's experience of that arrhythmia at a particular point in time. From a scientific viewpoint, this means that techniques for analyzing musical rhythms can be applied to abnormal heartbeats, with implications for individualized treatment and medical education. Coming full circle back to Barts, I embarked on a study on cardiac response to live music performance for patients with biventricular pacemakers with Professor Pier Lambiase, who co-

Chew: Music that encourages long breaths, which increases heart rate variability, is widely regarded to benefit cardiovascular health. This points to some level of continuity and periodic structure. Another theory is that feelings of safety bolsters heart health; such feelings, and having a sense of predictability, is good for the heart.

We do know that the strongest musical experiences result from anticipatory processes, which are usually consummated through moments of change. That is why, in our work, we have examined changes in cardiac electrophysiology at such moments of change. To some degree, music provides a safe environment through which to explore a plethora of experiences. So the safety requirement underlies most musical experiences. Even if music excites, it could be like exercise, where the therapeutic effects are only seen afterwards during rest or ambulatory monitoring.

How exactly could you prove that classical music has a calming and hypotensive effect on people's stress levels?

Chew: Research studies of heart patients listening to music found that music can stabilize life signs and alleviate symptoms; it can modulate heart rate and heart rate variability, alter cerebral blood flow, reduce anxiety and lower cortisol levels. Classical music, like many other types of music, has the ability to transport us to other worlds and induce feelings of calmness, exhilaration or despair. It can delight us, and make us laugh, which can be hypotensive, or it can make our hair stand on end. What we hope to determine is if certain music or musical parts have a hypotensive effect on a particular person. And this we can do by tracking their physiological response to the musical and linking it to music features. ■

“
Music that encourages
long breaths is widely
regarded to benefit
cardiovascular
health.”

Elaine Chew

directs cardiovascular research at the Barts Heart Centre. Data was downloaded from the left ventricular lead of the patients' pacemakers/ICDs while I performed classical music from Bach to Berger and two arrhythmia pieces to them. These experiences led to our upcoming project using physiological feedback to tailor music interventions to lower blood pressure and improve cardiovascular health.

Which compositional characteristics of classical music have a particularly favorable effect on the cardiovascular system?

A Cloud for Science

Research is becoming more and more interdisciplinary, but efficiency could be improved if scientists had access to data from different disciplines. The European Open Science Cloud is going to provide just that.

In the beginning, it was the virologists, the epidemiologists and the medical doctors; they were soon followed by economists, social and educational scientists, psychologists and other disciplines which entered the field: the coronavirus pandemic is a good example which illustrates that certain research topics cannot be viewed from a single perspective alone – the interests in data are too interwoven. While the concrete research questions of the various disciplines may be entirely different, many require the same basic data. How practical it would be to upload a website, enter a few keywords and discover which studies and which data on the desired subject have already been captured across Europe, and which are in progress. This vision is on the verge of becoming reality. The European Open Science Cloud (EOSC) is to become the central research data hub in which scientists will be able to find and access available material from all disciplines.

Almost six years ago, this idea was developed by a high-ranking group of experts from the EU Commission tasked with finding solutions for the Europe-wide

management of research data. A member of the team from the outset: Professor Dr. Klaus Tochtermann, Director of the ZBW – Leibniz Information Center for Economics and Professor for Digital Information Infrastructures at Kiel University. His idea of research is the concept known as “open science” – an open research culture in which free access to data is a central ingredient. “The trend is moving towards interdisciplinary questions”, says Tochtermann. Research in silos – isolated from other disciplines – is ever less capable of answering the current questions of our networked universe. The EOSC wants to tear down the barriers between the disciplines and instead connect them. The platform is the first European project to tackle this challenge; until now, similar networking models have only existed within the individual sciences.

Metadata research

How, though, will hundreds of different disciplines “deposit” their data in the newly created digital environment? Is it not true that data collection in the field of astrophysics follows an entirely different

pattern from that of water research? “Absolutely”, confirms Klaus Tochtermann, “But it is metadata, i.e. descriptive data such as the date of sample collection, the temperature and the location, which are deposited into the search engine of the EOSC.” Those who suspect or see something interesting within these metadata can reach the original dataset through a link. If someone conducts research on the water quality in the Amazon and requires the stellar constellation above the area in order to formulate the correct question, then – this is the idea – the EOSC would be the first port of call for any research, and, in the best case scenario, the answer would be available.

This concept is based on two considerations: on the one hand, shared knowledge prevents unnecessary slowing of the research process. “With respect to

corona, this means that if the data collected on the virus in Wuhan had been freely available earlier, the world would have been able to conduct research more efficiently on that basis”, clarifies Tochtermann. On the other hand, the platform supports equality within science. “Some countries and their institutions cannot afford to order expensive publications to obtain research data”, explains EOSC founding member Tochtermann. Therefore, they would be at a constant disadvantage compared to more affluent science communities. To sum up, more can be achieved together.

Who will receive credit for scientific success?

The disclosure of knowledge stood the test during the EHEC epidemic of 2011. Following the successful identification,

the genetic information of the diarrhea-causing bacterium was made openly available to all; scientific discussion occurred in open forums. Collaboration generated results much quicker. Now, some researchers are concerned with the academic spotlight shining on someone else – someone whose success is based on information one has oneself discovered. “One solution would be, for example, to consider not only the frequency of citations of a publication as an assessment criterion for success, but also how often a dataset was ‘cited’”, says Klaus Tochtermann. Everything considered, science is becoming more and more responsible for increasing transparency and credibility – internally as well as externally. The EOSC is therefore in the position to not only improve further research but also the critique to which it is subjected. ■

A lot of research data,
one platform for all
The European Open
Science Cloud is gradu-
ally taking shape



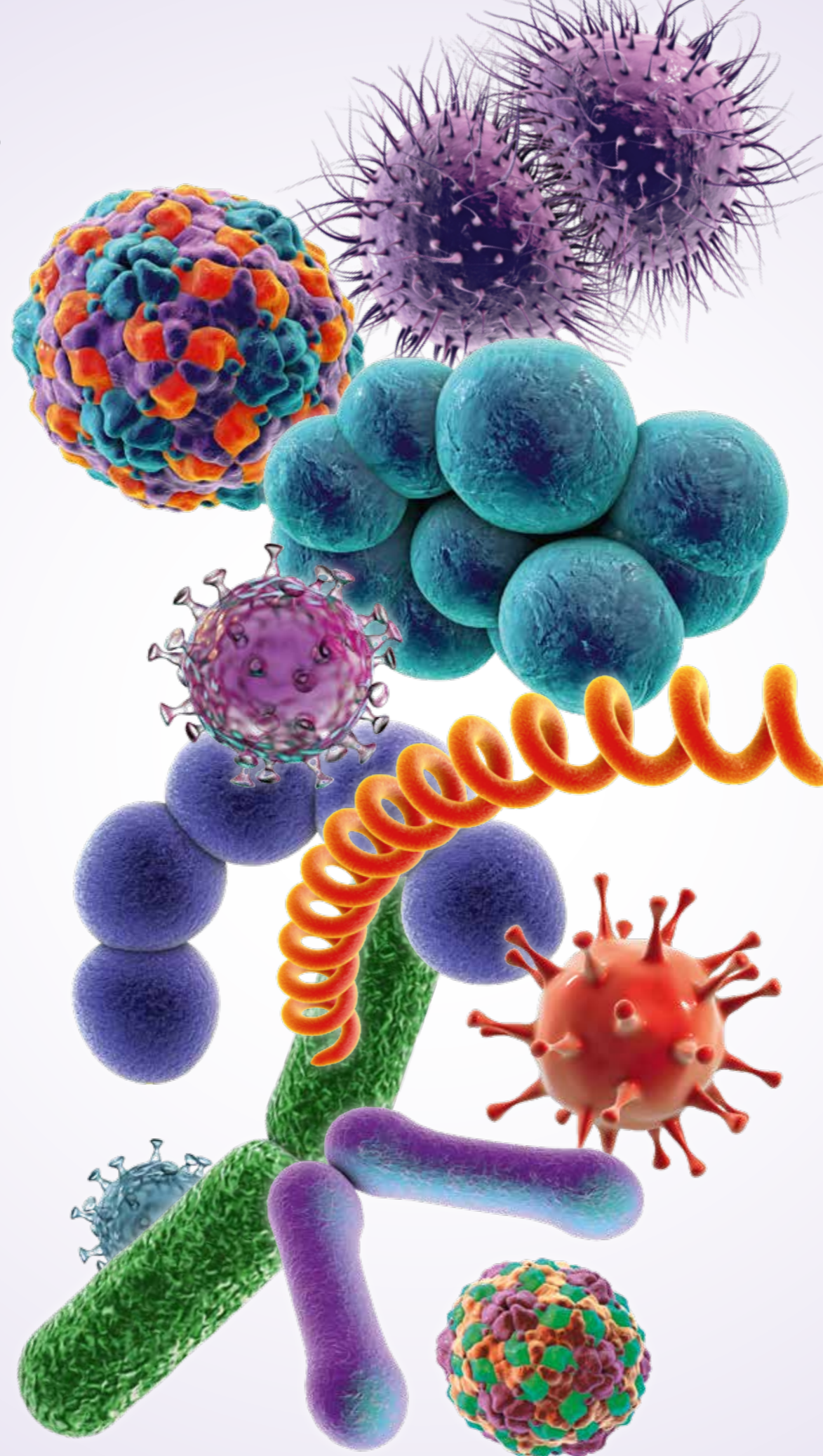
! STICK WITH IT!

The EOSC is still on the journey between vision and reality. The EOSC portal represents an illustrated “intermediate step”; first applications (Use Cases) may be viewed on a project basis. “Services & Resources” demonstrate what the platform is planning to offer users worldwide: central aspects of course include data sharing and discovery, as well as data management and networking. From this portal, the final database will emerge – sticking with it is worth it!

www.eosc-portal.eu

Viruses: Better Than Their Reputation

Image correction: if you say virus, people think of disease, transmission, pandemic; but microbes can do so much more, and they can certainly do good.



! Drivers of Evolution

As parasites, they multiply inside the host cell which then either dies or undergoes change. Therefore, viruses apply high selective pressure and thus ensure genetic variation. Virologists suspect that viruses brought about the different sexes, as well as sexuality. Viruses are not limited to inserting themselves into a genome; they also serve as transport vehicles for sections of genetic material from other living organisms which they subsequently smuggle into the human genome. This much is certain: 145 human genes originate from organisms like bacteria, plants, fungi and animals. The human genome revealed: more than eight percent of human DNA originates from viruses. Bremen-based marine biologist Antje Boetius concludes: "Viruses are the accelerators of evolution"

! An Alternative to Antibiotics

What if antibiotics (due to multi-drug resistant pathogens) will no longer work? Viruses may be an alternative – particularly phages. Natural enemies of bacteria, they occur in every environment where bacteria reside, even inside the human body. Félix d'Hérelle discovered their significance as early as 1917: phages exclusively infect bacteria and propagate inside their host cell until it bursts and disappears. At the same time, phages are specialists that only react with specific bacteria. At the present time, they are not approved for therapeutic purposes in Germany. The country of Georgia is considered the global center of phage research; however, pilot studies have now started in Germany, with the Fraunhofer Institute and the Charité participating in "Phage4cure".

! Coast Guard on Patrol

Viruses are ubiquitous – they even exist in the vast depths of the oceans. One teaspoon of sea water teems with up to one hundred million viruses. Canadian marine biologists calculated that every second, 1023 viral infections take place in the oceans. This number alone illustrates the influence that viruses have on the marine ecosystem. In the US state of Maine, researchers observed how the excessive growth of the algae species *Emiliana huxleyi* is slowed by a virus. Their conclusion: viruses act like the Coast Guard. Since they are host-specific, they control species that threaten to dominate a habitat. Bremen-based microbiologist Rudolf Amann knows: "Viruses kill the victors" and thus ensure the continued diversity of species.

! Active Against Cancer Cells

Some cancer patients are cured after an infection with a cold (Adeno) virus. The background behind this chance phenomenon is the tendency of certain viruses to feel at home inside cancer cells and propagate in such a way that tumor cells are destroyed. The German Cancer Research Centre in Heidelberg studies the potential of "oncolytic virotherapy", which, at this time, is still in its infancy. To date, successful non-clinical studies, as well as initial clinical studies, have been completed. The first oncolytic virus therapy was approved in 2015 – against skin cancer. The University Clinic Ulm plans to combine biotechnology and genetics in order to transport the cancer killers directly via the bloodstream to metastasizing cells.

! Save the Chestnut!

Along the East Coast of the United States, almost the entire population of chestnuts (*Castanea dentata*) has been destroyed by the Asian chestnut blight fungus *Cryphonectria parasitica*. A more moderate form of this illness, commonly known as chestnut blight, is now moving across the European Alps. A specific therapy has recently been developed in Switzerland. The therapy harnesses hypoviruses in such a way that sick trees are inoculated with a virus-bearing fungus. The sores of the tree trunks must be painted individually. While this type of biological pest control is cumbersome, it is in fact successful. Researchers were delighted to observe that the virus subsequently spread to other trees naturally (perhaps via insects?).

Grand Old Lady Boston

Boston, the capital of the New England state of Massachusetts, on the East Coast of the United States of America, charms visitors – not only with its mix of brick buildings and skyscrapers. A stroll:

Metropolis with many perspectives
The Boston skyline at sunset as a place of longing for cosy story discoverers

Boston Common, in the center of the city, is a beautiful place, but it is particularly so during the time of year known as Indian Summer. Trees glow orange-red and curry-yellow, while the blue-tinted windows of the surrounding skyscrapers reflect the sun. Squirrels rustle through the fallen leaves; runners enjoy their daily routine and pedestrians point to the golden cupola of the Massachusetts State House one street over, on Beacon Hill. This building is the seat of the Commonwealth of Massachusetts, with columns and arcades reminiscent of a temple.

Federal Style and the clay brick charm

The Boston Common was dedicated in 1634, and it is considered the oldest city park in the US – as Boston itself ranks among its most venerable metropolises. Hardly any other American city can look back on such tradition. It is this tradition that makes the city of 700,000 on the East Coast something of a Grand Old Lady in the New World, with brick buildings, Colonial and Federal Style homes and an expansive harbor. The Lady speaks of a time when Boston and New England were a British North American colony; for this reason, many visitors are enchanted by its European character.

Nowadays, the narrow streets and alleyways, which are illuminated by gas lanterns at night, teem with everyday life. This is due mostly to the students from all over the world, who are enrolled in one of the over 50 universities and colleges of the area – among them famous Harvard University in nearby Cambridge, the Alma Mater of Barack and Michelle Obama, as well as the Massachusetts Institute of Technology (MIT), America's incubator for bright minds and company founders. The people from different cultures and backgrounds bring with them a breath of fresh air that continues to enrich the center of New England. ▶

LET'S GO

Wonderful Boston – inside and out

History unfolded in Boston

Those who look to the ground at Boston Common, at one of the paths arranged in a star formation, will discover a trail of red clay bricks: the famous Freedom Trail. Over a distance of 4 kilometers, the Freedom Trail leads to 17 sites of historic Boston, illustrating the founding history of the country. Among the stations, you will find a statue of Benjamin Franklin, one of the authors of the Declaration of Independence, as well as Park Street Church, inside which human rights activist William Lloyd Garrison gave his first public address against slavery.

Liberation from the colonial rulers

The Old State House, a brick building with turrets, gables and white transom windows, lies a mere ten minute walk from Boston Common. Situated among the steep skyscrapers of the financial district, it rather resembles a forgotten toy. The lion and the unicorn on the roof are the same as those on the crest of the United Kingdom, indicating the past purpose of the building as the seat of the colony government. The relationship between the English and the Native Americans at the time was fraught with tension. When, in 1770, the British king levied draconian taxes on everyday items such as tea, an event that was to go down in history as the Boston Massacre took place outside the Old State House: British soldiers shot five citizens of the city. Three years later, Bostonians, some dressed as Native Americans, boarded the ships of the most prominent British trading company, the East India Company, and threw hundreds of crates of tea into the ocean.

This act of resistance against the British crown would become known as the Boston Tea Party, and it is considered to be an important step on the way to American Independence. On July 18, 1776, it was accomplished; from the balcony of the Old State House in Boston, the Declaration of Independence of the United States of America was read before a cheering crowd. With this document, the country's 13 states declared their detachment from Great Britain.

Right in the city center, Massachusetts Institute of Technology (MIT) graduates opened a restaurant in which robots – not chefs – man the kitchen. **Spyce** is the first restaurant worldwide with a robotic powered kitchen that prepares complex meals to order. Guests compose their vegan or vegetarian dishes using a computer terminal with touch screen!

Robot Restaurant Spyce,
241 Washington Street,
Boston, MA 02201, USA

www.spyce.com



1



2

The **Mapparium** is a three-story stained-glass globe which was opened to the public in 1935 and which illustrates the political world map of the time. Visitors reach the inside via a 9-meter-long glass bridge. From this perspective, they can see the proportions of the individual continents as they are in reality: Africa is huge, whereas North America, Europe and Asia crowd close together, hugging the North Pole. This correct representation makes their sizes and positions appear unfamiliar and brand-new. The political divisions, of course, are completely obsolete as, for example, Africa is still shown as comprising mainly European colonies.

200 Massachusetts Ave, Boston

www.marybakereddylibrary.org

An old sailing ship and an obelisk

Following the red markings of the Freedom Trail, you will pass the residence of the American national hero Paul Revere and a cemetery with moss-covered headstones, and crossing Charlestown Bridge to the other side of the Charles River, you will reach Cambridge and Charlestown. Here, in the harbor, the freedom of the big wide world and nature is palpable: seagulls cry, the wind, directly off the Atlantic, pulls on your hair, and snow-white clouds. The most prominent rigging belongs to the USS Constitution, the oldest seaworthy warship in the world, survivor of three sea battles the United States fought to secure their independence.

Today, sightseers have the opportunity to board the USS Constitution for a tour through the harbor; they can imagine how the ship, made from the trunks of 2,000 Virginia oaks, was launched right here, after two unsuccessful attempts, and christened with a bottle of madeira. A walk along the waterfront is equally beautiful. On the Harborwalk, the Grand Old Lady appears simultaneously relaxed and alive. And she has much more in store than what

she reveals so readily on the Freedom Trail. The Freedom Trail ends not far from the USS Constitution, near the Bunker Hill Monument – a granite obelisk whose 294 steps will reward you with a stunning view. The venerable Old Lady entrusts her stories to the wind in all the languages of the world. ■

294 steps up
The 64.3 meter high Bunker Hill Monument - a historic granite obelisk in the Charlestown district



Colorful Boston
Especially during Indian summer the city glows with incomparable beauty



Inspiration for the eye
The Ray and Maria Stata Center at MIT is located in a crooked and inclined architecture designed by Frank Gehry

Cape Cod, situated a one-and-a-half-hour drive south-east of Boston, resembles an arm reaching into the Atlantic Ocean. With its picturesque villages and natural beaches, Cape Cod has always been a popular summer destination. Many celebrities have come here to spend their summer holidays, including John

F. Kennedy, Martin Luther King, Tennessee Williams and Benjamin Franklin. In Nickerson State Park, visitors can enjoy canoeing and kayaking or fish for trout. Monomoy National Wildlife Refuge is home to a migratory bird sanctuary. The oldest light house on Cape Cod was first erected in 1797.



3

! EPPENDORF ON LOCATION



From Hauppauge, New York, to Framingham, Massachusetts: 100 Crossing Blvd. is the new address of Eppendorf's headquarters in the Americas market region. "We are delighted to join the Massachusetts life science community," says Dennis Barger, President of Eppendorf Americas, about the move. "We believe that Framingham's proximity to life science innovators will greatly contribute to our growth strategy by providing better collaboration with our customers and access to the talent we need to grow our business. Eppendorf celebrates its 75th anniversary this year, and the move is designed to help the Americas market region continue to successfully support scientists around the world.

Leaving My Comfort Zone

I never thought I would venture far from home. I was a mediocre high school student from a working-class family, and I didn't think traveling the world was in the cards for me. For my undergrad degree, I only applied to universities within an hour of my hometown in the United Kingdom. When I decided to pursue a PhD, I stayed at the same university. I still wasn't convinced I was a great student (even though I was near the top of my class), and staying seemed like the safe option. It allowed me to remain close to friends, and I was familiar with the department, which put me in a good position to pick my supervisor wisely. A few years later, as I was considering a postdoc, I was tempted to once again stay close to home, in the comfort of my PhD lab. My experience there had been very positive, and previous doctoral students had stayed on, so why shouldn't I? It would have been so easy. But I hope to run my own lab one day, and I knew that seeing a different approach to science would be valuable.

I heard about a fellowship program in Japan that sounded like a good fit. I had always been interested in Japan, and the flexibility of the program appealed to me. I could choose the institution where I would work, the research I would conduct and how long I would be there – from as little as a month to as much as a year.

I decided that, if I were accepted, I would stay for three months – long enough to experience a new place, learn and get some research done, but short enough to make the prospect less intimidating. I thought of it almost as a holiday, somewhat like going to a conference in an interesting far-off place.

But when I was accepted, the head of the group I was going to join wanted me to stay for the full year. I hesitated. I was excited about the research and the opportunity to learn and experience a new environment. But the thought of being so far from home for so long made me anxious. I didn't speak any Japanese. I wouldn't know anyone. Would I be miserable?

After much deliberation, I worked up my courage and signed on for the year – knowing that, if things went badly, I could come home earlier.

Almost everything was different from what I was used to. Even commuting to the lab and shopping for groceries were so unfamiliar that I found myself constantly taking out my phone to snap pictures, like a tourist. In the lab, too, the practices and culture were new to me. The expected working hours were different. Lab technicians did much of the work that I was accustomed to doing myself. In group meetings, questions were restricted to the end, as opposed to the more open structure of my old lab. Many of my new colleagues were not native English speakers and came to me for language help, which was a new experience for me.


But getting used to these differences was easier than I had expected. One of my favorite new routines was going out to lunch with my labmates. Back in the United Kingdom, going out was too expensive, so I usually packed my lunch and ate it in my office. In Japan, on the other hand, eating out is common and offers a great bonding opportunity.

My new co-workers came from all over the world, primarily across Asia. My previous lab had also been international, but most of my colleagues there were from Europe and China. Talking with my new colleagues about their experiences conducting research and garnering funding in other countries and scientific cultures helped open my eyes to new ways of doing things.

After my fellowship, I thought I would leave Japan to do a postdoc elsewhere. But when my fellowship adviser offered me a longer-term position in his lab, I couldn't say no. This time, though, it wasn't because I was afraid to go somewhere new. It was because I wanted to take advantage of an exciting opportunity. After the leap I took with my fellowship, I now feel I can do anything. ■



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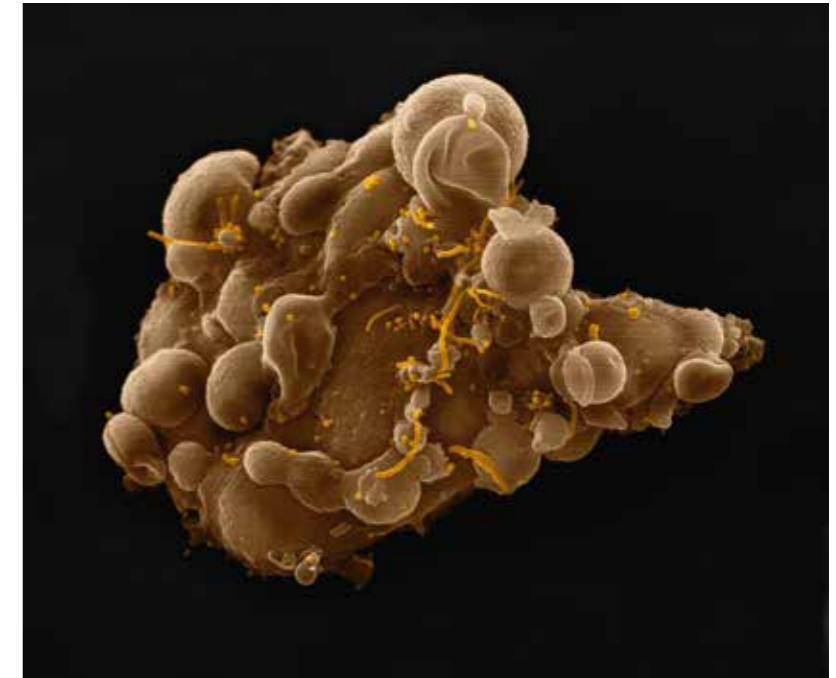
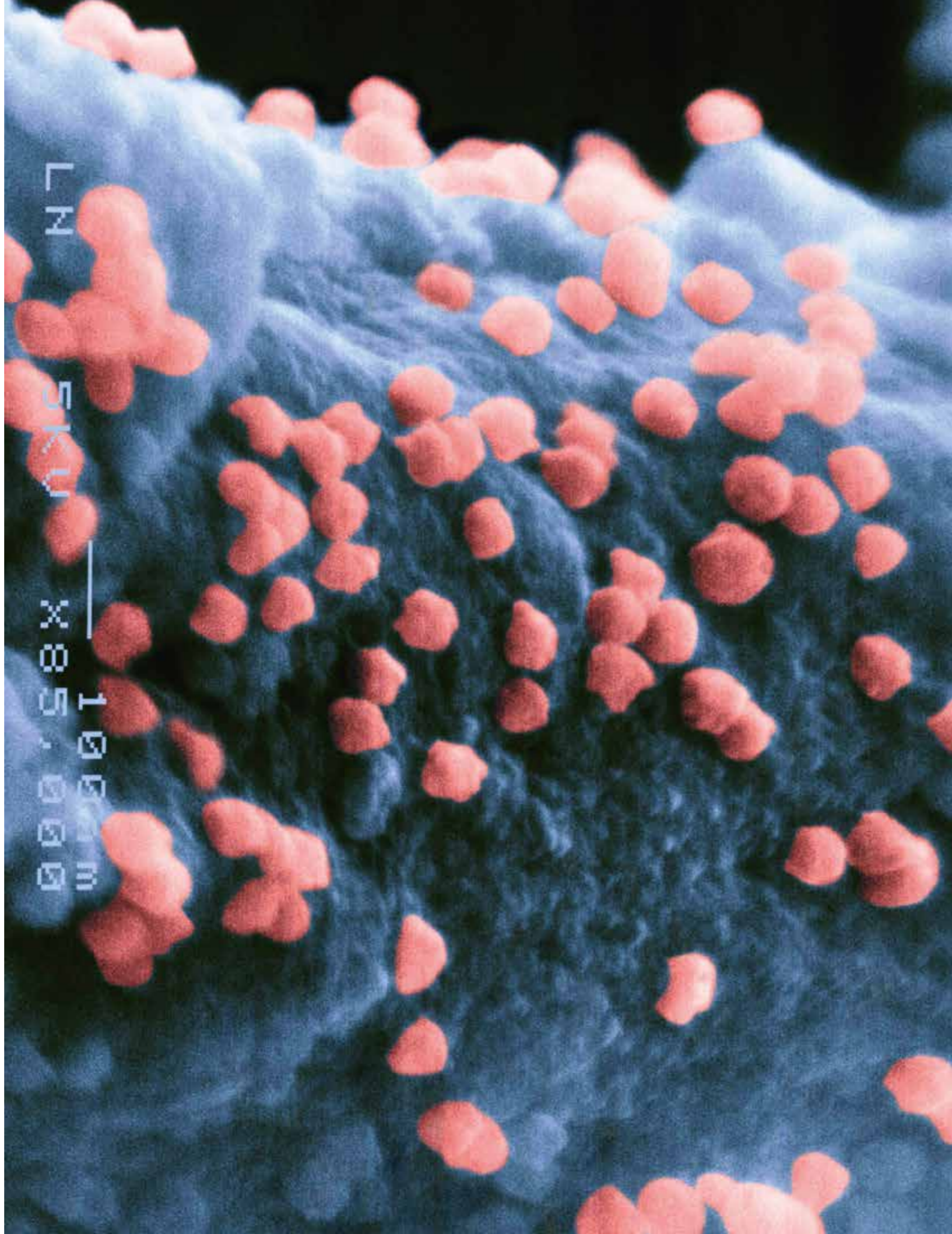
Jet-Sing M. Lee is an assistant professor of chemistry at Kyoto University in Japan

Viruses Inside the Cell

Science photographer Lennart Nilsson captured the invasion of cells by viruses, enriching science by making groundbreaking new discoveries available for the first time. It was his last project.

Escape From the Cell ▶

This colored scanning electron microscope image shows how H5N1 virus particles of the bird flu virus (pink) break out of an infected cell. The virus shown here possesses a gene that is derived from H5N1, a type of influenza virus that causes influenza in birds. Cases of bird influenza of the H5N1 type occasionally occur in humans after they have come in contact with infected poultry; this virus, however, will not be further transmitted from one human to another. If humans do become infected, the mortality rate is approximately 60 percent. Influenza viruses are subject to continuous genetic changes.



▲ Like a Comet in Space

This image represents a colored scanning electron microscopic photograph of a cell that is infected with the bird flu virus H5N1. The virus shown here, too, possesses a gene that is derived from H5N1, the type of influenza virus that causes the flu in birds.



Lennart Nilsson (1922 – 2017) was a Swedish photographer and producer of scientific films. His pioneering work included photographic images of embryos and microscopic pictures of human tissues as well as bacteria and viruses. In 1965, the first edition of his book "A Child is Born" was published. It was translated into English in 1967 and from there into many other languages; the book has been revised a number of times and remains in print today. These spectacular photographs of the entry of viruses into cells were taken by Lennart Nilsson in 2004, as part of a scientific project.



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