Off the BENCH

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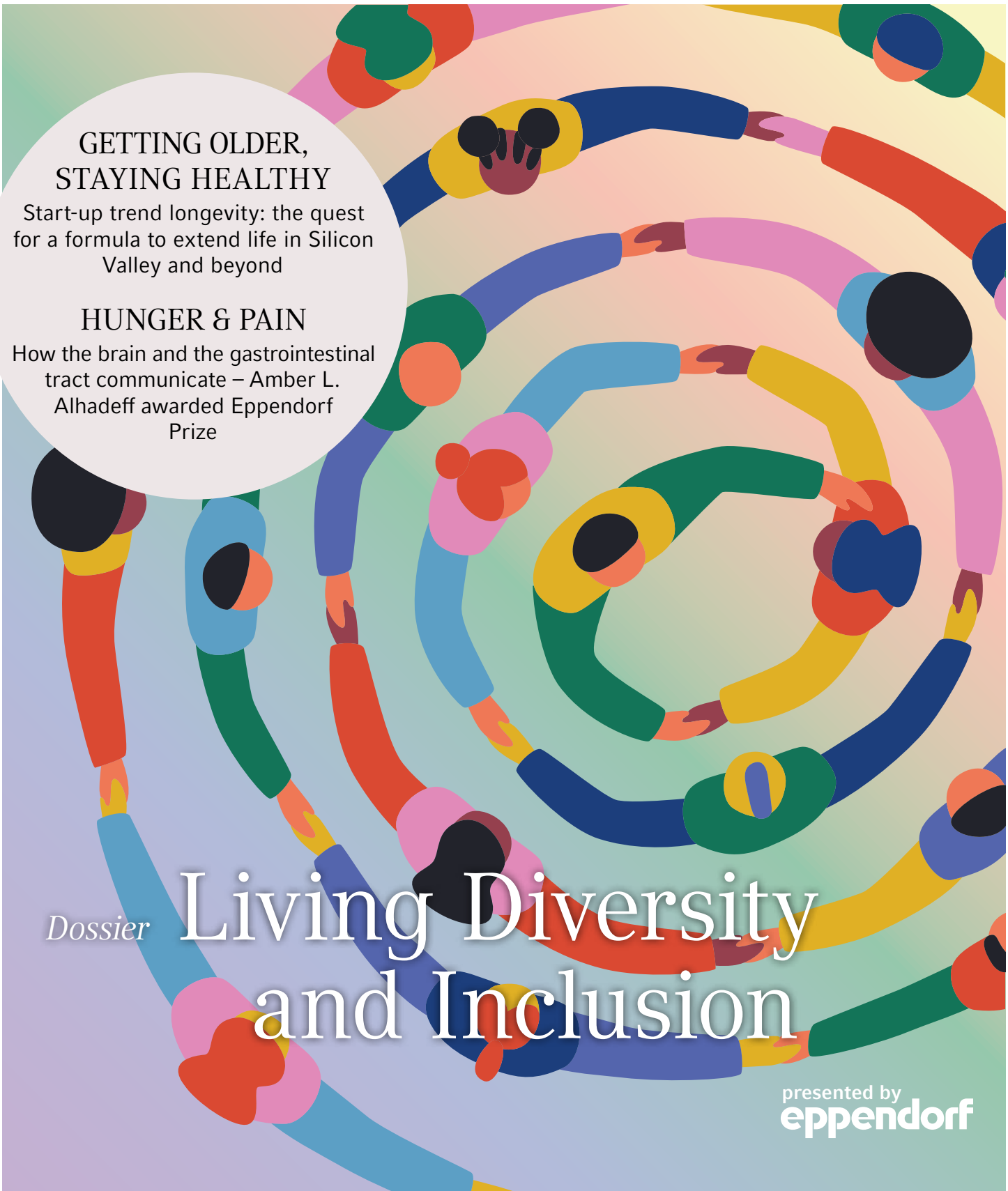
The Eppendorf – LifeScienceStyle Magazine



GETTING OLDER, STAYING HEALTHY

Start-up trend longevity: the quest for a formula to extend life in Silicon Valley and beyond

HUNGER & PAIN

How the brain and the gastrointestinal tract communicate – Amber L. Alhadeff awarded Eppendorf Prize

Dossier

Living Diversity and Inclusion

presented by eppendorf

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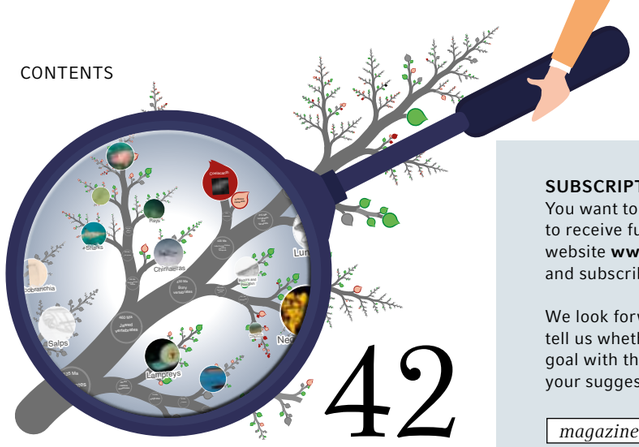

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Dear Reader,

With the presence of our group of companies in 28 countries, diversity is a given. This does not automatically mean, however, that diversity and inclusion are actively lived within an organization. Instead, it takes great effort, and the will to be colorful and liberal-minded, to truly anchor respect and regard towards all colleagues as a fundamental maxim within a company.

Diversity is the engine that drives creativity and innovation – essential factors for success. This is the reason why we at Eppendorf promote and support cohesion among people as well as curiosity for one another – across all locations and across all sectors. In the end, it comes down to attitude: do we really consider people, in all their diversity, an enrichment, independent of their background, religion or sexual orientation?

The fact that this is not always easy also has to do with our nature. We humans tend to think in categories. In our dossier on the topic, neuroscientist and diversity-and-inclusion expert Laura Wünsch Wendt explains how one can deconstruct these “unconscious biases”. We can reveal this much: making ourselves aware of possible prejudice, and not allowing exclusionary reflexes to surface, are first steps towards living and practicing diversity.

Diversity is at the heart of many of the contributions within this issue of the magazine – for example, in the interview with Ole von Uexküll on the presentation of the Right Livelihood Award – the alternative Nobel Prize – or the fascinating research by two scientists who have developed a type of “Google Earth of Biology”. Their work shines a new light on the interrelatedness of humans, plants and animals. After all, curiosity and diverse views constitute the very basis of excellent research – as well as a healthy company culture.

We hope you will enjoy the read,

Eva van Pelt
Co-CEO

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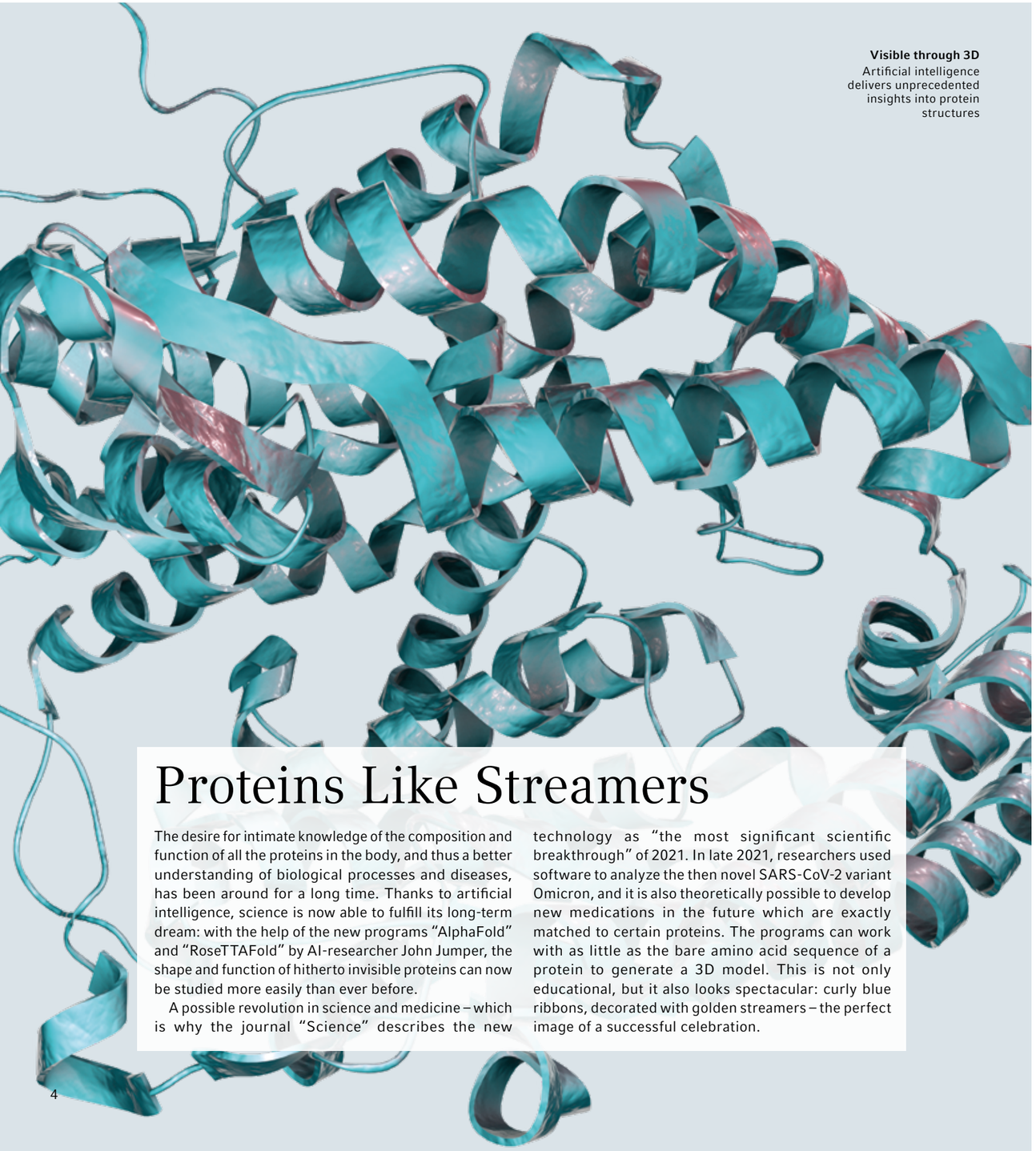
Discoveries



Visible through 3D
Artificial intelligence delivers unprecedented insights into protein structures

Proteins Like Streamers

The desire for intimate knowledge of the composition and function of all the proteins in the body, and thus a better understanding of biological processes and diseases, has been around for a long time. Thanks to artificial intelligence, science is now able to fulfill its long-term dream: with the help of the new programs "AlphaFold" and "RoseTTAFold" by AI-researcher John Jumper, the shape and function of hitherto invisible proteins can now be studied more easily than ever before.

A possible revolution in science and medicine – which is why the journal "Science" describes the new technology as "the most significant scientific breakthrough" of 2021. In late 2021, researchers used software to analyze the then novel SARS-CoV-2 variant Omicron, and it is also theoretically possible to develop new medications in the future which are exactly matched to certain proteins. The programs can work with as little as the bare amino acid sequence of a protein to generate a 3D model. This is not only educational, but it also looks spectacular: curly blue ribbons, decorated with golden streamers – the perfect image of a successful celebration.

Food for a Better Mood

Chocolate is always delicious, and it can be enjoyed at any time – in moderation, of course. Korean scientists have now identified another reason why we favor this tasty morsel made from cocoa: daily enjoyment of chocolate changes the intestinal flora, and as such, acts as an anti-depressive. For this effect to take hold, however, the cocoa-content must be at least 85 percent, the scientists state in the "Journal of Nutritional Biochemistry". The positive effect could be due to the polyphenol content of cocoa – which would be mainly catechin and epicatechin. These ingredients are capable of crossing the blood-brain barrier, and as antioxidants, they convey a protective effect on neurons.

Resurrection

Skull fragments, ribs, tusks, leg bones, teeth and vertebrae: in 2017, two fossil hunters near Bristol in England found the remains of a mammoth, later to be joined by five more skeletons. The ice-age giants died approximately 200,000 years ago. Researchers at Harvard Medical School are now planning to resurrect the woolly mammoth: to this end, well-preserved mammoth DNA is to be recombined with that of the Asian elephant. The plan is that the resulting embryos will be carried to term either artificially or with the help of a surrogate mother. If all goes according to plan, their dream of hybrids may become reality in about six years.

25%

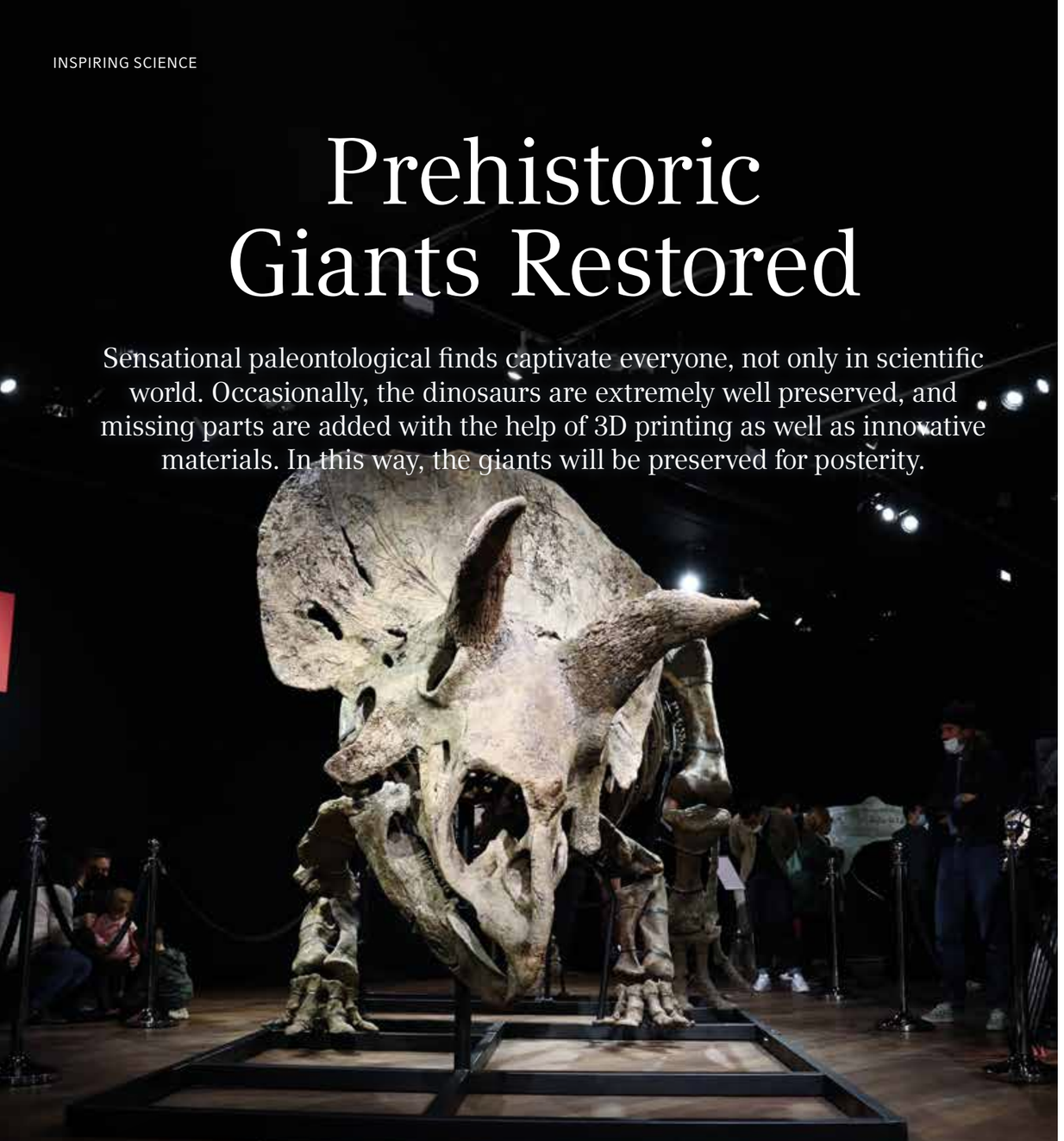
of our sleep is taken up by REM-sleep (rapid eye movement). Researchers from the University of Tsukuba in Japan were able to prove that during this time, the brain cleanses itself. Via increased blood circulation, neurons receive sufficient oxygen, and "garbage" and metabolic products are discarded as well. Presumably, learning processes are also tightly coupled with REM-sleep.

Afraid of a Jab?

Have you ever heard of trypanophobia? It is the term describing the intense fear of needles. Science is showcasing its creativity when it comes to the administration of certain medications via alternative routes. For example: the micro-needle pill. The patient swallows an acrylic capsule the size of a pill which will open up inside the body. A small stainless steel needle, mere millimeters in length, will dock painlessly to the stomach lining and subsequently retract. Another product in development is the "bubble gun": a laser pushes tiny liquid droplets through the skin. In both cases, patience is still required as research continues.

Prehistoric Giants Restored

Sensational paleontological finds captivate everyone, not only in scientific world. Occasionally, the dinosaurs are extremely well preserved, and missing parts are added with the help of 3D printing as well as innovative materials. In this way, the giants will be preserved for posterity.



Worth Millions

This past fall, a 66 million-year-old Triceratops was auctioned for 6.6 million euros in the auction house Giquello in Paris. The buyer was not a museum but a private collector from the US who had persevered against nine other bidders. The skeleton of this Triceratops, known as "Big John", is 60 percent preserved. With a total length of eight meters and a skull that measures two meters across and is adorned with a collar and three horns, Big John is the largest known individual of its kind worldwide. It is as yet unknown whether the collector will pass this skeleton, which was excavated in South Dakota in 2014, along to a museum and thus make it accessible to the public as well as science.

Puzzle Pieces Completed

Money talks – even when the topic at hand is ancient bones. An unknown American millionaire commissioned specialists at the Dinosaur Museum in the Bavarian city of Altmühltal to reconstruct a valuable dinosaur skeleton. The Tyrannosaurus rex consists of almost 400 bone parts, of which 75 are real fossils. The remaining bone parts were reproduced from plastic. Each individual component was numbered so that it could later be put together like a puzzle. The construction of the dinosaur took a total of four months. At the end, the printed bones were threaded onto a rod frame – and the result is impressive: the skeleton is close to 13 meters long, four meters high, and it weighs nine tons!

Dinosaur With a Toothache

Just how many individuals of the notorious predatory dinosaur, Tyrannosaurus rex, actually did exist on Earth? According to estimates by paleontologists at the University of California, it could have been as many as 2.5 billion. Among the best preserved skeletons is that of Tristan Otto – residing in the Museum of Natural History in Berlin. In late 2021, a radiology team at the Charité Berlin discovered that during his lifetime, the giant was plagued by an osseous tumor in his lower jaw which pressed against the root of a tooth. The technology of dual energy computed tomography (DECT) enabled scanning of the predator's petrified jaw which, due to its weight of 180 kilograms and high bone density, turned out to be a rather elaborate undertaking. Tristan Otto was not the only one who had problems with his dentition: Sue, a T. rex currently on display in Chicago, was also examined using DECT technology, which revealed injuries in her lower jaw.

Complete – Thanks to 3D Printing

Researchers at the Naturalis Biodiversity Center in the Dutch city of Leiden showcase the possibilities of today's technology. Commissioned by the Dinosaur Museum in Nagasaki, Japan, and with the help of a manually guided 3D scanner, the scientists created a detailed and accurate replica of the oldest known Tyrannosaurus rex. Many of the altogether 320 bones had already been scanned in a similar copy between 2014 and 2016; therefore, only a handful of parts required a repeat scan of better quality. In order to complete the skeleton, all scans were subsequently combined. While digital tools are exceedingly practical and capable of simplifying the process, the required quality was not achieved in all areas. The solution: modeling by hand! The year-long process – completed in 2020 – was on display live at the Naturalis Biodiversity Center, for audiences to follow.

Let's Play!

Play is deeply rooted in the history of humankind – evolutionarily as well as culturally. Should adults play more? A close-up view of the world of ludology research.

Before a child can even walk or speak, it will play. This is how children process impressions and how they test their abilities. They discover the world and begin to understand it. This type of childlike imagination – an unremarkable object suddenly transforms into a treasure – fascinates adults. Deep down we know: everyone – big or small – needs opportunities for play to relax and have fun.

In fact, play is a way of dealing with life's challenges that adults need just as much as children. Many activities like dancing, playing music or painting, are considered forms of play – as long as, according to Roger Caillois, the activity remains voluntary and pure, meaning, without a direct purpose or goal. In 1958, as a response to sociologist Johan Huizinga's "Homo ludens", the playing human, the sociologist outlined criteria by which to define play. However, play would not be play if it were this easy to press it into a category.

Already in ancient Greece, the nature of play was the subject of philosophy. Searching for a definition, one will find Plotinus: around 240 C.E., the philosopher stated: "Playing at first, before we set out to be serious." With this, he hypothesized that humans learn especially well through play. Since that time, many other philosophers and authors, including Friedrich Schiller, as well as researchers, have found their own ways to describe the phenomenon of play. While these authors may have not reached an agreement, it is clear that play has potential.

Creative access
Playing promotes the ability to develop strategies in new ways.

The modern science of play
Ludology, which is the technical term for the science of play, is a comparatively young field of research. While sporadic research was conducted into the nature of play as early as the 18th century, play-theory only took shape in the centuries following. This particular field of research was established in the 1990s with the founding of dedicated research institutes.

For example: the Center for Applied Game Studies at the University for Continuing Education Krems, directed by Natalie Denk. "Personally, I find it fascinating to explore the playful disposition in the context of the definition of play", she says. Her research focuses on how the properties of play may be translated into the educational setting. "Playing also means to be allowed to make mistakes", explains the educational scientist. "At school, mistakes are quickly penalized through bad marks; in the context of play, however, mistakes motivate the player." Within their current research project "StreamIT!", Denk and her team are working on a concrete lesson concept which centers around the production of gameplay videos.

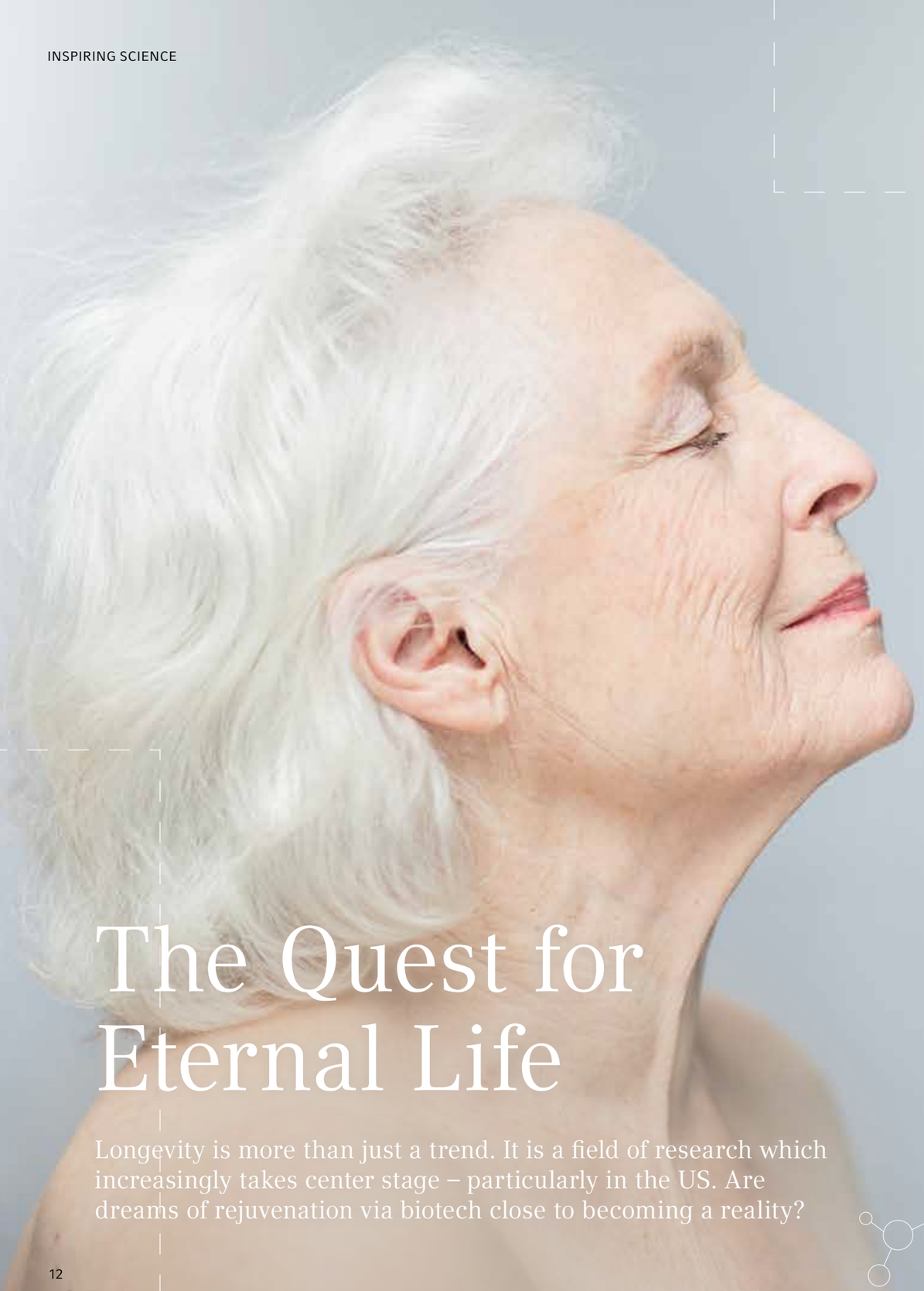
"Play is critical for cognitive development", confirms Manuel Ninaus of the Institute of Psychology at the University of Graz. At play, a child can pretend that a rock is a car. The symbolic, abstract thought processes the child thus acquires will come in handy when it's time for reading and math, says Ninaus. The neuroscientist further explains that during play, children also learn to handle failure and disappointment.

Play – because it's fun!
The impressions and expressions of childhood will remain relevant for a lifetime: "Play is an intrinsically motivating activity. We are not pursuing a higher goal; instead, we play simply because we enjoy it", explains the psychologist. Self-determination theory describes three basic psychological needs that are satisfied during the course of an intrinsically motivated action: competence, autonomy and social connection. When we receive positive feedback for an achievement, when we can make our own decisions and when we act in exchange with others, we are motivated.

"There is a very interesting idea that play promotes a 'growth mindset'", says Ninaus. Carol Dweck coined this term in her book 'Mindset: The New Psychology of Success'". Those who have internalized a 'growth mindset' are convinced that there is always something new to learn. "Games show us that things will always continue", says Manuel Ninaus. "Playing provides us with feedback, and it allows me to learn that I must stay in the game in order to reach my goals."

Creative problem solving
Professor Jens Junge of the Institute for Ludology in Berlin goes so far as crediting play with the potential of helping us meet the future challenges of mankind by employing creative strategies. The institute's director states that "Games open up new options; they convey optimism, and they allow us to negotiate different ways and courses of action." More and more companies recognize this potential and thus give their employees room to make mistakes and develop fresh ideas. The design-thinking approach is one opportunity to let go of expectations and instead assume a novel perspective. It is very well suited to the development of new strategies and business models in a team setting.

It makes sense that a relaxed attitude will benefit these creative spaces. As such, many companies start off their brainstorming sessions with simple games in order to take the pressure off. "In my opinion, the urgent problems of our society, in particular, call for a playful, creative approach", says Natalie Denk. "At the same time, work structures must also be reassessed. Time is the most precious commodity; unfortunately, it has become increasingly scarce in today's society which is predominantly shaped by performance." ■



The Quest for Eternal Life

Longevity is more than just a trend. It is a field of research which increasingly takes center stage – particularly in the US. Are dreams of rejuvenation via biotech close to becoming a reality?

In the industrial countries of the West, life expectancy has doubled within the past 120 years. Thanks to medical progress, previously lethal infectious diseases such as smallpox have been conquered. Today, more than half a million people are alive on Earth who have broken through the magic barrier of 100 years of age, and in 2020, more than 20,000 centenarians were counted in Germany alone. A French woman named Jeanne Louise Calment holds the age record: she lived to be 122 years and 164 days old. The oldest man in the world was Saturnino de la Fuente García from Spain; he died in early 2022 at the age of 112.

Determining the age of cells

Indeed, despite all the advances and expertise, human performance begins to decline at age 30 – on average one percent per year of life. But why do some people age faster than others? And how can science even measure the age of a cell? For the longest time, the credit went to telomeres – the ends of chromosomes which tend to fray after a certain number of cell divisions. Telomere data, however, were not quite accurate enough. In 2013, Steve Horvath of the University of California, Los Angeles discovered the "epigenetic clock", which is able to accurately determine age within a range of 3.6 years: a milestone for scientists.

Age in and of itself is of course not a disease – which is why clinical trials of any agent that only aims to prolong life may not be approved. Old age, however, is generally accompanied by numerous maladies. The last phase of life is often plagued by age-related illnesses such as diabetes, cardiovascular disease, dementia or cancer. Does it have to be so? It is a fact that more and more prominent and powerful investors, including, for example, Google co-founder Larry Page, Paypal founder Peter Thiel and Amazon boss Jeff Bezos, invest in research companies like the California startup "Altos Labs", which has raised over 270 million dollars in the hope of beating age at its game.

Sales of longevity products are on the rise The sector benefits from the method of "biologic reprogramming" which has already allowed the rejuvenation of ageing cells in the laboratory. In an interview (page 14), gerontologist Dr. Sebastian Grönke explains how it works, as well as some of the drawbacks specific to how the method is applied to the human species. The transformation of cells using genetic factors, however, is not the only method – research companies like "Neteos" in Germany, as well as "Alkahest", "Life Biosciences" and "Turn Biotechnologies" in the United States, are working to turn the wheels of time with the help of blood plasma. The dream of a long and healthy life is boosting business. In 2021, "Business Insider" predicted revenues of 216 billion US dollars, up from 2015 revenues of slightly less than 140 billion dollars.

In the lab, eternal youth is studied using fruit flies and nematodes, as well as the vertebrate species killifish, and mice. Approaches where older killifish received transplanted intestinal bacteria from younger members of the same species are promising, and young blood plasma gave nematodes back their fitness and flexibility. In addition, the administration of anti-inflammatory and rejuvenating proteins led to improved memory function. While such experiments are impressive, human benefit remains uncertain.

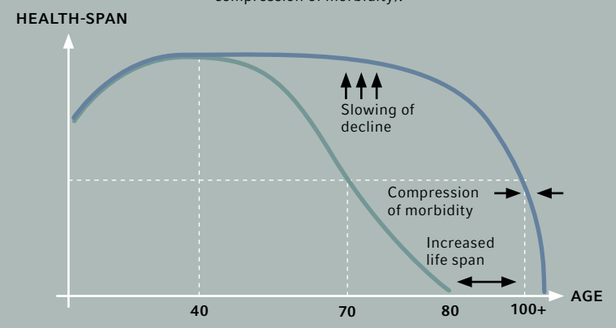
According to the expert opinion of Sebastian Grönke, two additional options are beginning to take shape: "In the laboratory, we achieved life extension for flies of 30 to 40 percent using a combination of two cancer drugs and lithium." The advantages: the drugs are already approved, and cancer is considered to be one of the age-associated diseases. Apparently, it is the combination that makes the difference, as "one substance alone achieved a maximum of 10 percent life extension." Initial US Studies testing the diabetes drug metformin in humans are expecting similarly encouraging results.

On a strict diet

Science agrees on the fact that the influence of genes on longevity is comparatively small, at only 10 to 15 percent. Lifestyle is key. Dr. Sven Voelpel, Professor of Business Administration at Jacobs University in Bremen, Germany, known for his books including "Decide for yourself how old you are" ("Entscheide selbst, wie alt du bist"), wants to employ behavioral correction in order to come closer to a fountain of youth formula. Grönke's animal experiments, too, point in a similar direction: the rodents lived longer with intermittent fasting and a carbohydrate-rich diet. Grönke's team puts mice on a diet: the animals receive only 60 percent of their customary portions – once per day. This measure alone prolonged their life spans by 30 to 40 percent. ■

LIVING A LONG AND HEALTHY LIFE

Around 1900, life expectance was 40 years; today, it is twice that. However, the gain in life span comes with all the negative signs of old age (cancer, dementia, etc.). Longevity aims to extend life AND improve quality of life (scientific term: compression of morbidity).



Interview

“Biological Reprogramming” plays a major role within age research. Dr. Sebastian Grönke, molecular biologist at the Max Planck Institute for Biology of Ageing in Cologne, explains the rejuvenation method and its pitfalls.

Is the concept of reverse ageing a breakthrough for age research?
Dr. Sebastian Grönke: It is absolutely a novel approach, although its effects will need to stand the test of time. Interestingly, rejuvenation of older cells was not only achieved in the lab, but it was also accomplished in mouse studies. However, these were progeria-mice – especially short-lived mice whose life-spans could thus be extended. The gold standard is of course proof in the wild mouse, which is still pending.

In any case, “Ärzteblatt” has published an article entitled “Stem Cell Genes as Rejuvenation Treatment for Mice”. How does the method of “biological reprogramming” work?
Almost ten years ago, Shinya Yamanaka was the first to show that it was possible to harvest an ageing body cell – for example, a skin cell – via biopsy and subsequently rejuvenate it in the laboratory. This was made possible by the discovery of four factors which are highly expressed in the very early stages of development. In short, these are four genetic transcription factors named Yamanaka factors, after the person who discovered them. If these are activated in adult cells, the cells can then be transformed back into artificially induced embryonic cells, and we refer to them by their scientific term, “induced pluripotent stem cells (iPSCs)”.

Sounds complicated …
The idea behind it is simple. If one enriches the skin cells with the four Y factors over a period of 15 days, a process will be initiated inside the cells, the term for which is indeed “reprogramming” – the former skin cell becomes a stem cell once again. Within the context of ageing, however, complete transformation is not intended; as an embryonic cell, the thus reverted skin cell can no longer function as a skin cell. If, however, one initiates the genetic program using the Y factors and subsequently stops it after four or five days, the skin cell will rejuvenate without complete reprogramming, and without losing its function. Why it rejuvenates, however, is not yet completely understood.

Initially, the thus rejuvenated mice suffered the side effect of tumor growth – not a promising outlook for humans.
This problem has been solved – no further tumors have developed in current studies. Human cells were even successfully removed from elderly people and rejuvenated. In the case of humans, this process is of course carried out ex vivo, meaning, in cell cultures. The conclusion: It also works in humans – at least in theory. The big question remains: how can this method be applied to the human organism? In the case of mice, experiments were carried out on a transgenic mouse: the Y factors had previously been integrated into its genome in such a way as to allow their experimental activation. This, of course, is not possible for humans as ethical considerations forbid genetic alterations. ■

Smart Food

Much is published on the connection between nutrition and brain performance. Through her research, Soyoung Park has now discovered additional profound facts. How you can kick-start your cognitive powers

1 Nutrients

Our brains command 20 percent of our nutrient requirement. Only a versatile diet can satisfy this need. Here, the Mediterranean or Scandinavian cuisines offer valuable guidance: lots of vegetables, fruits, legumes and fish, paired with high-quality olive oil, should make up the bulk of our diets, whereas meat should be consumed in limited amounts. Food that is in season will help avoid the habituation effect which can occur when repetitive meals lack versatility.

2 Habits

Especially during the developmental phases of childhood and adolescence, a diverse and fresh diet is crucial, as the dietary habits learned in childhood will influence food preferences for life. This, in turn, will impact our health and our brains. In addition, this fact explains the failure of many a diet, as dietary habits established during childhood will be extremely difficult to change later on.

3 Lifestyle

It goes without saying that fresh, unprocessed foods, also known as brain food, support our brain health. On the other hand, relying exclusively on such foods, while denying ourselves the pleasure of certain treats, leads to imbalances. The brain needs variety. If we lead an active and balanced lifestyle, exercise may even be able to reverse some of the detrimental effects of unhealthy foods.

SHORTPORTRAIT

Dr. Soyoung Park,
Professor at the Charité University Hospital Head of the Department of Neuroscience of Decision and Nutrition at the German Institute of Human Nutrition, focuses on the connections between brain and body in numerous studies. In addition to nutritional and social neuroscience, her research areas include brain-body interaction, consumer behavior and the psychology of reward processing.

DOSSIER

Colorful, Not Black and White

When it comes to the equality of people from diverse backgrounds, religions or sexual orientation, much is still left to be desired. Why a commitment to diversity and inclusion is worth it.

Added value through diversity
A successful inclusion culture promotes togetherness, equal treatment of all and shared success.

When it comes to filling a vacancy, who will be the preferred candidate for German HR professionals – Sandra Bauer or Meryem Öztürk? Doris Weichselbaumer wanted to get to the bottom of this question. Over the course of a year, the economist from Linz sent close to 1,500 fictitious applications to companies across Germany. Sometimes she applied as a fictional German (Sandra Bauer), at other times she chose the Turkish name Meryem Öztürk. The feedback Weichselbaumer received in response to her otherwise identical applications was sobering. While the seemingly German applicant received an invitation for an interview in 18.8 percent of cases, the apparently Turkish applicant received a positive response to only 13.5 percent of her applications. If her professional photo also showed her wearing a headscarf, only 4.2 percent of her applications resulted in a positive reply. According to the researcher, this means that a woman of Turkish origin wearing a headscarf must write 4.5 times as many applications as a German woman in order to receive an invitation for a job interview.

Likewise, people with a disability, people of color, or those of diverse sexual orientation, have ample experience with the "glass ceiling", which is still stopping many life plans and careers in their tracks – in private companies as well as in science and politics. Despite public commitment to diversity and inclusion, the corner offices of large companies are still mainly inhabited by white men. And regardless of their education, people with disabilities are more frequently unemployed than people without disabilities who are not as well educated.

Even in the area of sports, diversity continues to be an elusive goal as the coming out of the first gay major league soccer player in Germany during their active career is yet to take place.

Where are the female professors?

Even science is not immune to unfairness when it comes to gender. For example, the new U-Multirank Gender Monitor, a sample of close to 2,000 universities in 96 countries, shows that especially in research-intensive universities, the careers of women are thwarted at every level. While women make up approximately half of all undergraduate and Master's students, they go on to later occupy only 28 percent of professor positions. ▶

Scientific journals, too, are often lacking in diversity: scientists at the University of Rhode Island took a closer look at the journal "Biological Invasions" and found that the editorial board was "overwhelmingly American, overwhelmingly white, and with more men than women", explains Laura Meyerson, Professor of Natural Resources Science and the journal's deputy editor-in-chief. "Most of our papers were published by Americans and Europeans, though there were many from New Zealand as well. English speaking countries dominated", adds Meyerson. Data from Africa and Asia are sparse, as only very few studies from those parts of the world are published in peer-reviewed English language journals. "We're making assumptions and hypotheses and coming to conclusions with only partial information", criticizes Meyerson.

Exclusively European-derived cell lines

Even medical research still lacks diversity. According to a study published in "Cell", 95 percent of cell lines used in research worldwide are derived from Europeans. "If most of the cell lines used to discover new drug treatments are from people of European descent, do those drugs work equally well in non-European individuals? More and more evidence has come to light showing that, unfortunately, this is not always the case", says Sophie Zaaijer of the New York start-up "FIND Genomics", urging researchers to take underrepresented populations into consideration.

A lack of diversity has dire consequences

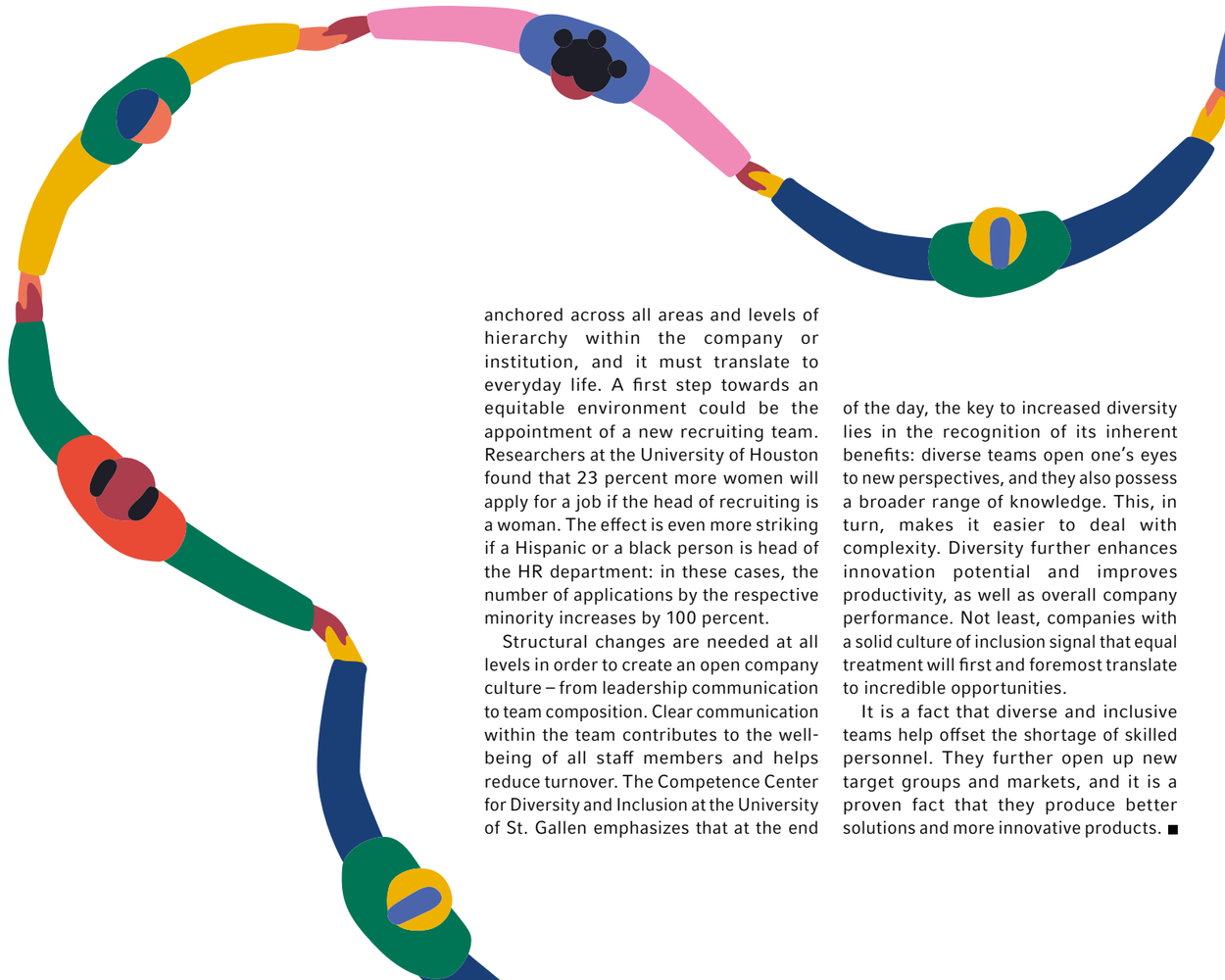
– not only for medical research. The unequal treatment of people who look different, as well as think and function differently from oneself, is hard on those affected – in their everyday lives as well as at work. For example, according to a study conducted at the University of Bath, members of the LGBT+ community experienced more conflicts in the workplace than their heterosexual colleagues. They perceive a lower level of psychological safety and also experience lower job satisfaction. This illustrates the difference between diversity and inclusion; inclusion can only thrive when the members of different groups actually feel accepted and valued. The study's authors urge employers to actively advocate for minorities. "Being proactive on inclusion sends a clear message to current and future employees on the values of your organization regarding how it supports its people", says Luke Fletcher, Associate Professor, School of Management at the University of Bath.

At least, there is increasing awareness of the problem: within a representative study by Monster, a career portal, half of all those interviewed preferred companies that value diversity. Many firms, however, still have a long road ahead of them: according to Monster, 39 percent of German companies have not yet implemented a diversity and inclusion strategy. This, however, is urgently needed as an inclusive culture will not grow on its own, emphasizes Petra Raspels, Head of People & Organization at PwC Germany and Europe, a consulting firm: "It is not sufficient to simply put diversity and wage inequality on the agenda; companies must tackle them in a concrete and recognizable manner."

Diversity management at all levels

The "Charta der Vielfalt" (Charter of Diversity) delivers practical ideas for successfully lived diversity in the workplace. According to this organization, good diversity management must be

> *Diversity is a fact; inclusion is an attitude, and belonging is an experience."*
>
> Dr. Eva Voß,
> Vice President of the Board,
> Charta der Vielfalt e. V.

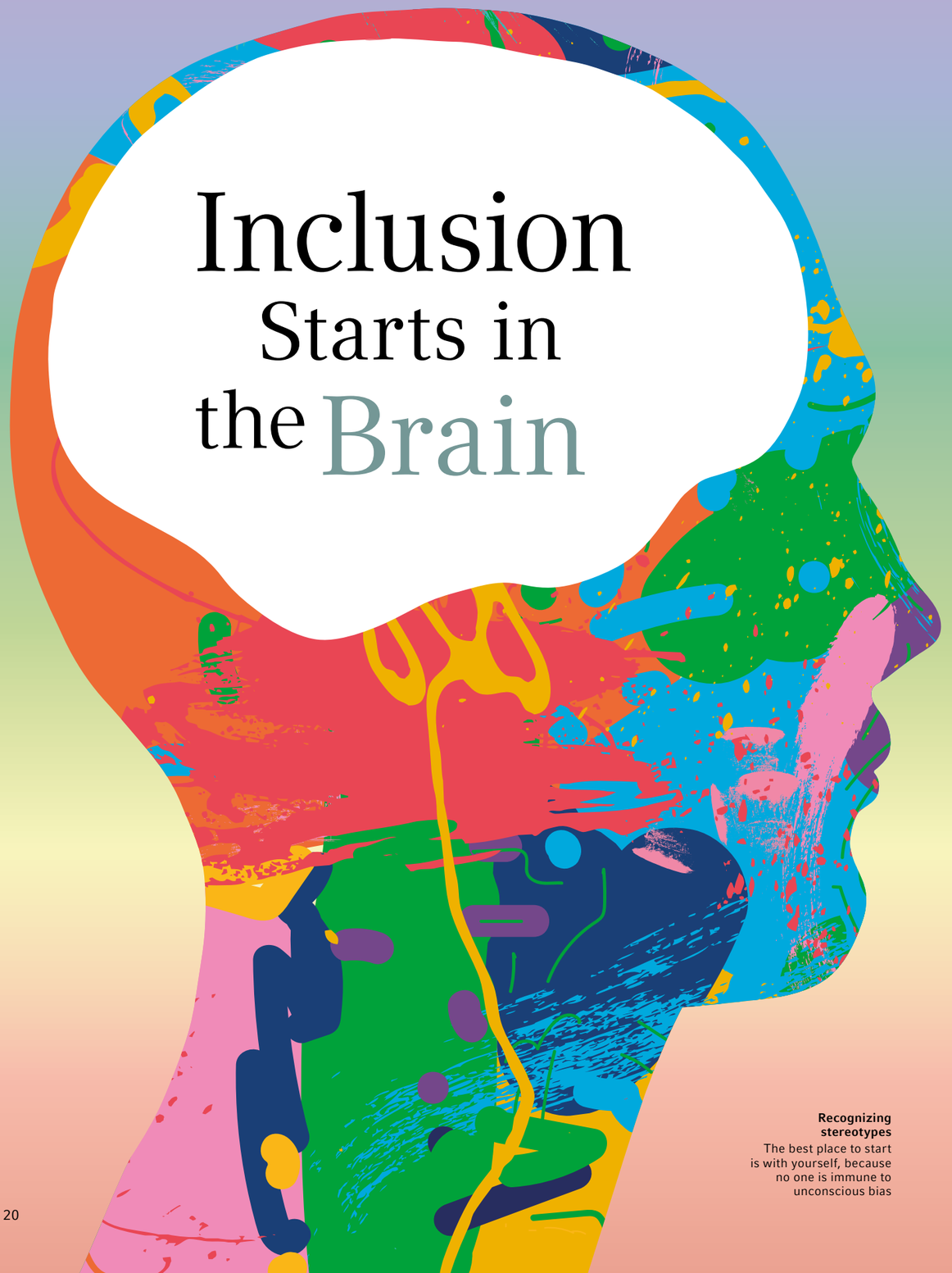


anchored across all areas and levels of hierarchy within the company or institution, and it must translate to everyday life. A first step towards an equitable environment could be the appointment of a new recruiting team. Researchers at the University of Houston found that 23 percent more women will apply for a job if the head of recruiting is a woman. The effect is even more striking if a Hispanic or a black person is head of the HR department: in these cases, the number of applications by the respective minority increases by 100 percent.

Structural changes are needed at all levels in order to create an open company culture – from leadership communication to team composition. Clear communication within the team contributes to the well-being of all staff members and helps reduce turnover. The Competence Center for Diversity and Inclusion at the University of St. Gallen emphasizes that at the end of the day, the key to increased diversity lies in the recognition of its inherent benefits: diverse teams open one's eyes to new perspectives, and they also possess a broader range of knowledge. This, in turn, makes it easier to deal with complexity. Diversity further enhances innovation potential and improves productivity, as well as overall company performance. Not least, companies with a solid culture of inclusion signal that equal treatment will first and foremost translate to incredible opportunities.

It is a fact that diverse and inclusive teams help offset the shortage of skilled personnel. They further open up new target groups and markets, and it is a proven fact that they produce better solutions and more innovative products. ■

Inclusion Starts in the Brain



Recognizing stereotypes
The best place to start is with yourself, because no one is immune to unconscious bias

Unconscious bias against strangers has been anchored deep inside our brains since the beginning of time. Neuroscientist Dr. Laura Wünsch Wendt explains in an interview where this comes from and how it can be.

Let's imagine that during a symposium, a surprise guest is announced – a senior business executive. How will most people imagine the person who is just about to step up to the podium?
Dr. Laura Wünsch Wendt: When people close their eyes and imagine a boss, studies show that more than 90 percent see a man. The same is bound to happen in this case. Many will envision the stereotypical modern manager: extroverted, athletic, middle-aged – a marathon runner who adheres to a mostly vegetarian diet. I am from Germany, so I also see the engineer's glasses that are so quintessentially German. In America, it could be running shoes – but these are only cultural details.

Why do most people envision a tall, slim man rather than a short black woman?
The brain resorts to heuristics, meaning simple rules of thumb. The brain is lazy. It practically searches its database, and whatever is represented the most will light up first. This is the reason why people make quick decisions. There are, after all, very few women, people in wheelchairs or openly homosexual people who occupy C-suites. I, at least, do not know of a single executive board member within the DAX 40 who is gay. This is why such a person does not enter our minds.

Where do these stereotypes come from, and which unconscious processes inside the brain control our thoughts and emotions?
Stereotypes are deeply anchored inside us. Today, we live in an environment that is not appropriate to our species and which, in contrast to ourselves, has changed much too quickly. In reality, we still operate with the brain of a Neanderthal. Humans are made to live in small groups. In ancient times, we had to run across the savanna and decide quickly whether someone was friend or foe. This is why we are still afraid of everything that is strange or new. Our brains strive for control and security.

Is our "black-and-white" thinking exclusively innate, or is it also learned?
"Unconscious bias" – for example, our preference for attractive people and those from our own culture – can even be observed in babies. In a study, researchers showed babies photos of faces of different ages, genders and ethnic heritages. These faces had previously been evaluated by students and rated on a scale from attractive to ugly. The result: the more attractive the person, the longer the babies focused on the face. In addition, Caucasian babies focused longer on a Caucasian face than on an Asian face. Not only do babies prefer faces of their own ethnic heritage, but they are also better at distinguishing these from one another as compared to faces of other ethnicities. A certain racism is thus inherent in us – and it persists into adulthood. When I travel to Africa or Asia, I am regularly mistaken for other blond women. I take it with humor, as I am aware of cross-racial bias. ▶

43%

The probability of higher profit increases by 43 percent for companies with an ethnically and culturally diverse board of directors.

Source: McKinsey&Company (2018): Delivering through Diversity, McKinsey&Company (2020): Diversity wins. How inclusion matters

Are people even aware of their "unconscious biases"?
No – we erroneously believe that we are in control of our thoughts, emotions and decisions; in reality, however, we are very much shaped by the environment. Why not test yourself: observe yourself as you walk down the street and listen to your brain as it judges. We constantly evaluate people and compare ourselves to them, sometimes as chubby, skinny, ugly, smart, vain, lazy, or golfer, fast food junkie … Our attention resembles that of a flashlight: we illuminate a mere section while ignoring the bigger picture. This, in fact, is our basic problem: only rarely are we completely alert and mindful.

What can we do against unconscious bias?
Not much! It is a part of our nature. We must learn to perceive and acknowledge it. We hardly ever do that, but we should not be too hard on ourselves. Our brains are, after all, Neanderthals. Being offered a wide selection of choices, for example, when it comes to food, is actually an unnatural situation. In the stone age, there were no supermarkets; instead, we ate the same thing day after day. The same is true for diversity: our ancestors never came into contact with different kinds of people, as they typically traveled with the same group. Choice overwhelms us, which is another reason why our supermarket culture contributes to the increasing problem of obesity.

To what degree do relics from the ancient past influence our decisions?
Our brains must be able to imagine something in order to believe it. Nobody has yet seen a young woman at the top of a DAX company – which is why such a woman is not promoted to such a position. People are quite bad at evaluating others based on their performance alone. We support people we like, which often has to do with the fact that the person resembles us in some way. This is why we have fewer women in management positions.

Why is an open attitude towards others worth it? Studies show that employees who exchange ideas with others who are different from themselves are the most creative. A conversation with the janitor, for example, may lead to a flash of inspiration. Firms in which friendly exchange happens regularly are more resilient in times of crisis and also more innovative. This, admittedly, takes energy: the more diverse the people are with whom I work, the more intense my physiological stress response will be. Once engaged, however, the ideas start coming. If one spends all their time with the same people, one tends to exist in a bubble, which, in turn, contributes to cultural poverty. It is so important to overcome this!

Are there scientifically proven methods that help dismantle unconscious bias?
There are, in fact, rather horrible training sessions that often do more harm than good. If a trainer stands up before your team, demonstrating their "unconscious biases" to them, the team members will retreat even further into their small groups. They will feel accused and, in the end, may become really angry. After all, we can never really "get rid of" unconscious bias. The best is getting to know oneself better. This is a slow process as we must persevere in working against our nature. Mother Theresa once said: "If you want to change the world, go home and love your family." This is a good start. Diversity and inclusion start in our brains and in our homes.

It is often said that the key to success is an inclusive company culture. In what sense is fighting for diversity worthwhile?
Studies have shown how much more successful diverse companies are. For this reason, the topic should be considered top priority for management. The inclusive culture is the most important agenda item as diversity is easy to achieve. Include a person in a wheelchair, a black person and a woman in upper management, it's as simple as that. If they do not feel comfortable, they will quickly leave the company which, in turn, will dampen morale. Inclusion is often a painful process – comparable perhaps to a nutritious diet or an exercise regimen. It will only make a difference if we don't just talk about it but also take action. Our brains need to exercise on daily basis. ■

95%

of companies name women as the main target group of their diversity activities, and 80% focus exclusively on measures for women.

Source: Roland Berger Strategy Consultants (2012): Diversity & Inclusion; Tagesschau (2020): How high is the gender pay gap really?

62%

is the employment rate for 60- to 64-year-olds in 2019, up 23 percent in ten years.

Source: Federal Statistical Office: Employment of older people continues to rise, labor market (2021)

SHORTPORTRAIT

Dr. Laura Wünsch Wendt is an international speaker and author, as well as the founder and managing director of Neuroscience Consulting. Prior to that, in the position of Global Head Diversity & Inclusion (D&I), she led the global culture transformation at Siemens Healthineers and Kearney. As an expert in the neurosciences with a doctorate in Medical Psychology and Behavioral Immunobiology, she has been teaching her approach towards D&I at international universities, as well as advising companies on how to create a sustainable inclusive culture, for more than twelve years.

73%

Three quarters of the signatories who took part in the survey still see a need for action on the topic of religion as a diversity dimension.

Source: Diversity Charter and EY (2016): Diversity in Germany. Study on the occasion of the 10th anniversary of the Diversity Charter

More on Diversity

Books and podcasts on the topic of Diversity and Inclusion are available in all shapes, sizes and colors. What to read and listen to? Three recommendations.

Blind Spot

Biases of Good People

Are you able to always judge others fairly and accurately? Psychologists Mahzarin R. Banaji and Anthony G. Greenwald doubt this, at least, and examined the hidden prejudices that we all seem to have. The message: if we become aware of our tendency toward unconscious bias, we have a chance to be fairer to our fellow human beings. An accessible book that helps to understand one's own thinking.

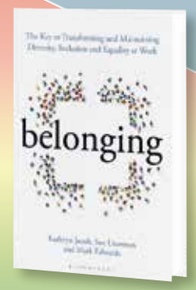
Mahzarin R. Banaji,
Anthony G. Greenwald, 272 Pages,
Bantam, approximately €20

Belonging

The Key to Transforming and Maintaining Diversity, Inclusion and Equality at Work

Social progress on diversity and inclusion is evident, no question about it, but the team of authors Kathryn Jacob, Sue Unerman and Mark Edwards have concluded after surveying more than 200 international companies: Men are not engaging enough! The lessons in this book are designed to help us work together to create a better workplace where everyone feels a sense of belonging.

Kathryn Jacob, Sue Unerman, Mark Edwards, 288 pages, Bloomsbury Business, approximately €18



The Diversity Gap

A podcast exploring race concious leadership

Writer, researcher and farmer Bethaney Wilkinson thinks: good intentions on the topic of diversity are not enough; real cultural change is needed! Her podcast "The Diversity Gap" is characterized by attentive conversations and authentic narratives. With success: the format is already entering its fourth year.

Can be found on Spotify, Apple and Google Podcasts, among others.

INSIDE Eppendorf

Plan International helps people to help themselves in Ghana – Eppendorf continues to support the organization in its second year. Also: digital solutions that facilitate the documentation of laboratory results.

HELPING WITH CONVICTION

Clean water – in Ghana,it cannot be taken for granted. Eppendorf supports vital projects

LIGHTER, SAFER AND MORE EFFICIENT

Thanks to clever solutions, documentation is now going digital

INSIDE EPPENDORF

A Good Plan for Clean Water

For the past year, Eppendorf has been supporting the project "Clean Water for Ghana" by Plan International. It is now time to take a look at the achievements to date.

Help for Ghana
Clean water and better hygiene conditions for girls – Plan International is helping

The UN goals "Good health and well-Being", "Gender equality" and "Clean water and sanitation" are part of the global sustainability goals formulated in 2015. In Ghana, Plan International has been working since 2018 to reach these goals through concrete measures – for instance, by building and renovating access to water and constructing sanitary facilities in schools. The project agenda also includes education on sanitation and hygiene – with great success!

Much has happened during the reporting period between September 2020 and February 2021:

- Four additional water supply systems were established.
- The construction of 36 girl-friendly sanitary facilities has been completed.
- 192 hand washing stations were installed in schools and health centers.
- 25 communities now have access to sufficient sanitary facilities.

Moreover, refresher courses were conducted for 96 members of the working groups on sustainable water management, and media-based education about the interconnections between hygiene, sanitary supply and disease prevention was provided.

Vital assistance

Eppendorf has been supporting these important activities since 2021 through its "Eppendorf Life Improving Program". A total of 75,000 euros have been donated to the project "Clean Water for Ghana". "With Plan International as a partner for the 'Eppendorf Improving Life Program', we are able to provide specific support for children – in line with the mission of the founders of Eppendorf: to improve human living conditions", says Cordula Richter, Corporate Citizenship & Governmental Affairs at Eppendorf. What makes this project special: it was chosen by the 4,500 employees at Eppendorf, and it is therefore a commitment that is supported by the entire company.

Goes down well
Workshops and bags with hygiene products – a targeted aid from Plan International for girls and young women

And it is bearing fruit: there is now access to water in 40 locations within the 36 project communities. To ensure regular testing of the drinking water, water quality analyses were once again on the agenda. The result: in five communities, the water showed elevated levels of iron and cyanide. For this reason, Plan International installed water treatment plants in these locations.

In two project communities, drilling operations encountered dry soil, thus necessitating alternative options to guarantee the water supply. Through the installation of pipe-extensions, these communities were successfully connected to existing water systems. In order to safeguard the continued long-term maintenance of these systems following the completion of the project, every person collecting water now pays a set price per water container. This money will be used for securing the functionality of the wells into the future. In addition, all participants were trained in the maintenance of the water supply systems as well as in the performance of minor repairs, should the need arise.

A focus on girls

The needs of girls differ from those of boys, and until now, this was not a topic of concern in schools. With the construction of seven additional girl-friendly sanitary facilities, Plan ensured that female students now have safe and clean places of retreat to attend to their personal hygiene. As a result, all project schools are now equipped with bathrooms separated by gender.

All these initiatives only have a chance to make a sustainable difference if the population is educated with respect to hygiene and disease prevention. Respective media-supported campaigns within the communities provided this essential knowledge.

The support of Plan International is dear to our hearts at Eppendorf – and so the successful partnership is set to enter its next round in 2022. ■

"With Plan International as a partner for the Eppendorf Improving Life Program, we can provide targeted support for children – in line with our mission and the founders of Eppendorf: to improve people's living conditions."

Cordula Richter,
Corporate Citizenship &
Governmental Affairs

Documentation at Your Fingertips

Capturing research data in a notebook? There is a more efficient way. The Eppendorf Centrifuge 5910 Ri, together with eLABJournal®, allows digital documentation of laboratory results.

Spreadsheet programs or classic notebooks – many researchers still resort to these tried and true solutions for documenting their experiments, even though considerably more modern digital options are available today. Digitalized laboratory instruments, such as the Eppendorf Centrifuge 5910 Ri, which capture run and user information, offer a safer and more efficient option for the documentation of research data. In combination with eLABJournal®, a web-based software, it is now easier than ever before to document the data generated.

Traceable documentation counts among the most vital – and least popular – laboratory tasks. It is particularly important in pharmaceutical laboratories which are subject to compliance with government regulations. In cases where data, text or images must be retained for the purpose of scientific publications or compliance with GxP/GLP standards, it is the manual effort which constitutes the real challenge. Furthermore, conventional documentation is saddled with a number of drawbacks: data are saved in different locations including laboratory notebooks and local computer drives, which means that they are not accessible to everyone, or from anywhere, and it is even possible that these data may be lost or damaged.

Towards a paperless laboratory

Digitalized Eppendorf products such as the smart Centrifuge 5910 Ri offer three-step user management and documentation options which will help meet the requirements of the paperless and networked laboratory of the future. The instrument automatically documents all the data that would otherwise have to be taken down by hand: run details including time, temperature and speed; whether the run was stopped manually; which program was used; which user carried out the run – and much more. The internal memory of the centrifuge allows documentation of up to 1,000 run protocols.

In addition, the option of filtering by either data, users or even programs greatly facilitates exporting only those data sets which are required. Data may be exported via PDF or csv file and subsequently documented in eLABJournal®. Last, but not least, the user can network the centrifuge via the VisioNize® Lab Suite – for even higher productivity in the laboratory.

Favorites and personalized programs

The intuitive user interface of the Centrifuge 5910 Ri offers exceptionally comfortable operation. With the help of the Favorites function, the four most frequently selected values for the parameters time, speed and temperature may be saved and selected with one click. This allows a new run to be programmed and started with only four clicks. The Program function further allows the user to create personalized programs with the desired parameters – thus minimizing the risk of unintended errors while at the same time ensuring good reproducibility of results. ■

www.eppendorf.com/accelerate-your-research

Paperless and secure
Digital documentation brings an enormous simplification of work in the laboratory

Networked laboratory work
The digital Eppendorf Centrifuge 5910 Ri documents up to 1,000 run protocols

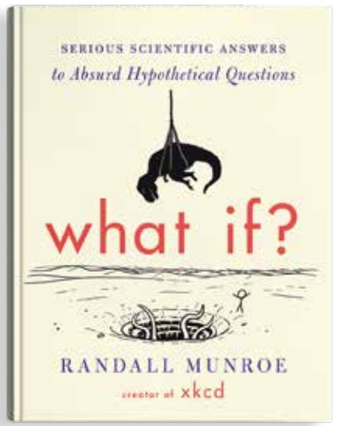
Would you like to learn more about the new touch interface of the Centrifuge 5910 Ri?
bit.ly/3GvnTrE

Or are you interested in the new documentation function? If so, this is definitely for you:
bit.ly/3rrooOZ

INSIDE EPPENDORF

Lab Lifestyle

1



2

1 Nothing is Impossible

He creates transparent wood, he turns jewels into pure gold, and he removes caffeine from the energy drink Red Bull: YouTube star "NileRed", also known as Nigel Braun. The chemist from Montréal, Canada, has made a name for himself with his experiments: more than four million subscribers follow the creative ideas that he puts into practice with skill and perseverance. "In every video that I make, I attempt to create a balance between theory and purpose. It is my goal to convey the beauty of chemistry in a way that is both entertaining and interesting", says "NileRed".

Following the completion of his degree, he worked as a laboratory technician, followed by graduate studies in chemistry. However, he quit his studies to focus instead on his YouTube activities. "The creation of chemistry videos is now my full-time job", says the science communicator who is operating multiple channels and offering his own merchandise for sale: key rings in the shape of molecules, or a cap – also very popular with his followers.

bit.ly/3D3NXtu

2 The Laws of Science

You are intelligent – and you want to become even smarter? In this case, the book "What If?: Serious Scientific Answers to Absurd Hypothetical Questions" is an absolute must on your bookshelf. In this New York Times bestseller, Randall Munroe, who is mostly known for his popular web-cartoons "xkcd", offers funny yet educational answers to questions about life that don't normally cross our minds.

For example, Munroe's fans are curious to know what would happen if the Moon disappeared. Or how fast you can drive over a bump in the road without risking your life. Particularly exciting: the way that the author tracks down his answers: he conducts computer simulations, and on occasion, he has conversations with the operators of nuclear power plants in order to explore the complexity of a certain fact. The book is available as a Kindle version.

LOTTERY

Network and Join In!

As early as 1961, Eppendorf launched the world's first microliter system, the "Marburg Pipette". Now, Eppendorf is embarking on the digitization of manual pipetting and supporting scientists on their way to the laboratory of the future.

The VisioNize® pipette manager is ideal for scientists who manage a heavy workload and have to perform many complicated pipetting steps. Volumes can be entered quickly via the touch control panel and all settings are immediately transferred to all networked electronic pipettes. Thanks to its retrofittability, this applies to both new and existing electronic Eppendorf Xplorer® pipettes on the market, including the Move It® variant.

The integrated software of the pipette manager provides useful assistance for precise work with different liquids.

Learn more about the VisioNize® pipette manager at: **www.eppendorf.com/visionize-pipette-manager**

Do you want to network your laboratory?
Experience the future of manual pipetting! **Win a VisioNize® pipette manager.**

Share your pipetting experiences with us and tell us why you want to improve your pipetting capabilities through digitization.

Note: The prize includes a VisioNize® pipette manager, an Eppendorf Xplorer connect m€odule and an Eppendorf Xplorer® electronic pipette (Move It® variant is excluded) of your choice. The winner agrees to be available in a field report in a future issue of Off the Bench. See prize conditions on the OTB website.

www.eppendorf.com/otb

News from Eppendorf

The future of laboratory work is digital, easy, efficient, safe and reliable. An overview of solutions by Eppendorf which make this possible, and more.

Optimized Harvest

Pelleting of bacterial culture and cell cultures by way of centrifugation is one of the most important preparation steps for the isolation of plasmids, recombinant proteins or exosomes, to name a few. Handling the individual bottles, however – which includes filling, balancing, decanting and cleaning – is time-consuming. Luckily, this is now a thing of the past: with the help of the new high-speed centrifuges and the unique 1.5 L bottles by Eppendorf, up to 6 L can now be harvested using only four instead of six bottles. This reduces processing time by up to 32 percent when compared to working with standard 1L bottles. Learn more in Whitepaper 64! **www.eppendorf.com/WhitePaper64**

e-book Filled with Knowledge

Since the 1950s, we at Eppendorf have been working hard to make liquid handling in the laboratory easier and safer, as well as more reliable and efficient. Our decades of experience have now been compiled in an e-book. This book is meant to support you throughout all your challenges surrounding the dispensing of liquids in the lab. Be it the right combination of pipette and pipette tip; handling challenging liquids; or the benefits of regular maintenance of your pipetting systems – this comprehensive handbook will provide you with helpful tips & tricks, helping you advance science. Download the e-book now: **www.eppendorf.com/download-pipetting-guide**

Women Researchers Ahead!

Increased visibility of women in science – with full support from Eppendorf. Eppendorf recently affirmed its long-standing connection with the "European Molecular Biology Laboratory" (EMBL) with a donation of 20,000 euros to benefit the project "Advancement of Women in Science". This donation allows 20 female postdocs to embark on a management career path in a scientific profession. "An important signal for the qualification of women researchers", says Edith Heard, Director General of EMBL.

Of Signals and Neurons

"Mega-exciting" – this is how neuroscientist Amber L. Alhadeff of the University of Pennsylvania describes the relationship between hunger and pain – as well as the reasons why fat and sugar are especially good at rewarding our brains. ▸

We are also interested in whether there are neurons that code for hunger and thus possibly modify other behaviors."

Amber L. Alhadeff

Initially, Amber L. Alhadeff had planned to become a doctor. As the time of enrollment came closer, she thought about possible prerequisites. A little research perhaps? She then leafed through the directory of her university in Pennsylvania and sent a very brief message to a guy named Harvey Grill: "Do you need help? Count me in!" Who could have guessed that this would turn out to be the start of her academic career? "Within a few months, I turned all my career plans upside down", she laughs in retrospect. While today she holds a doctorate degree, her passion no longer lies with medicine.

It is worth knowing that her mentor, Dr. Harvey Grill, is not just anyone, but rather a renowned neuroscientist who studies complex connections between the brain and eating habits. As a young student, who was 18 years old at the time, she was fascinated by the subject matter, but also by the way of working and exchanging ideas within a research team: "Where else can you combine curiosity and creativity in such a wonderful way?" This being a rhetorical question, Alhadeff has nonetheless remained faithful to scientific research – for 15 years and counting!

Food intake screened

Food, she tells us during the call, is the one true constant in her life. Her family celebrates food and eating. Every evening, the family dined together, without exception. And on the weekends, with the grandparents, dining became a feast. It implies social exchange, pleasure and joy. Later, in college, it took on an entirely new meaning. She started running – long-distance running. Food was now checked for certain fitness criteria. Nutrition and metabolism: as an athlete, she began looking at nutrition from a theoretical perspective. A rather profitable alliance: she finished her last marathon in 3:22.

Today, Amber L. Alhadeff is not only 15 years older; the 33-year-old is a highly successful neuroscientist, and on the topic of eating, she is more than capable of serving a number of new ingredients which spring from her own research. Food has been promoted to be her professional main course, or, as she describes it, "My personal life is reflected in my professional life." She recently published the results of her research into hunger-sensitive neurons in the brain and the ways in which they communicate with signals from the gastro-intestinal tract, as well as influence survival strategies, in the journal "Science". For this work, the Principal Investigator was awarded the 2021 "Eppendorf & Science Prize for Neurobiology", worth $25,000. Welcome recognition indeed as she starts her own laboratory at the Monell Chemical Senses Center in Philadelphia, which she has been heading for two years now – having opened it a mere three months before the pandemic struck.

When the stomach growls

"One cannot think well, love well, sleep well, if one has not dined well." This quote is featured on her carefully designed website. It originated from the writings of Virginia Woolf – but it could just as easily have been penned by Amber L. Alhadeff. After all, it touches the core of her scientific questions: why do we feel different when our stomachs growl? Nervous. Unsettled. A bit off. "Hunger", says the researcher, "definitely alters our perception." In her "Science" essay, she writes about her research: "I wanted to connect the brain networks governing hunger with other signals in the body."

The sensation of hunger originates in the brain – in the hypothalamus, to be exact. This is where many signals converge, and where hormones can be released. However, Alhadeff and her team are also interested in finding out "whether there are neurons that code for hunger and thus possibly modify other behaviors". And what is the actual role of the reward system in the brain? How are the homeostatic, i.e., the metabolism-dependent signals connected with one another? She observes mice to find out how this information from the interior of the body influences brain activity.

The young scientist is grateful for state-of-the-art technology. The mice can move freely while specific fiberoptic cables, or miniature microscopes, illuminate their interiors and thus transmit hitherto undetected nutrient signaling pathways to monitors and scans.

Open for new avenues

Absolutely – science is her dream job; she can't imagine doing anything else. But it is not an easy profession. Her desk is a mess, with papers over here and more piles over there. She understands that one must remain flexible and should not focus too hard on one specific topic from the outset. The first of her two discoveries was practically the product of chance. While studying to find out how hunger codes in the regions of the brain, she realized: "Those who are hungry will also experience pain." And she asked herself: what will happen if one is also injured, or if inflammation ravages the body? "How will the brain tell us what is more important – hunger or pain?"

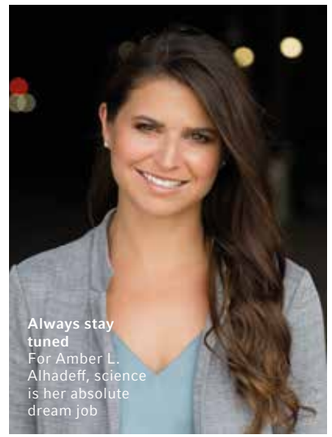
It is precisely this process that Alhadeff and her team were able to investigate. The result: extreme hunger can displace the perception of pain caused by injury or inflammation. The mice ignored the inflicted pain and secured their survival by searching for food. Alhadeff finds this "mega-exciting", and she can imagine that additional research could contribute to, for instance, conquering the serious problem of opioid abuse in the US.

Why do fat and sugar reward us?

The second discovery concerns the signaling pathways inside the body. Alhadeff's team discovered a hitherto brain-gut connection. If the mice received fat through a catheter leading to their stomachs, the fat signals were transmitted to the brain via the vagus nerve. Sugar, on the other hand, utilizes neurons in the spinal cord – afferent cells – to communicate with the hunger-neurons in the hypothalamus. The question is not what is better; rather, the award-winning scientist speculates that this might explain why foods that contain both fat and sugar are especially adept at activating our reward system inside the brain. With obesity being another serious problem, Alhadeff once again takes the broader picture into account.

Something else is important to her: cultivating a more inclusive culture within the harsh reality of science; and promoting women, as well as all others who would otherwise fall through the cracks due to their race, ethnicity, sexuality, or their socio-economic background. The job is challenging; it takes many different perspectives for innovation and for scientific advancement – not only the mainstream view. ■

Inspiring entrance
The researcher maintains her own lab at the Monell Chemical Senses Center in Philadelphia her own laboratory



Always stay tuned
For Amber L. Alhadeff, science is her absolute dream job

Place of new ideas
Alhadeff pursues her research in the lab – and is always always open for unexpected discoveries

LEARN MORE?

Click here to the website:

www.alhadefflab.com

At the top
Beate Heinemann, Director of the Particle Physics division at DESY, is a professor at the University of Freiburg. Between 2013 and 2017, she was deputy spokesperson for the ATLAS experiment at the Large Hadron Collider (LHC) at CERN

Subterranean Quest: in Search of the Big Bang

What holds our world together at its very core? This question engages particle physicist Beate Heinemann at the German Electron Synchrotron in Hamburg. Also: why scientific success takes luck.

You study the Higgs boson and search for dark matter. How do you explain to your parents what you do on a daily basis?
Beate Heinemann: We want to understand the fundamental laws of nature which determine the evolution of our universe as well as its future. In the subatomic realm, there are many phenomena that we can describe very well but not yet fully explain – for example, why there is more matter than anti-matter.

What is essential about this question?
Today's universe consists almost exclusively of matter. According to the theory, however, the Big Bang should have generated equal amounts of matter and anti-matter. The problem: when matter and anti-matter collide, they extinguish each other – and become light. Therefore, a physical phenomenon must have caused matter to be left over and anti-matter to disappear. Otherwise, none of us would be here. It is therefore literally an existential question that we cannot answer based on today's theory.

Your research takes you back to the beginning of the universe.
During the experiments that we conduct – for example, in the particle accelerator Large Hadron Collider (LHC) at CERN – we generate very high energies similar to those that existed following the Big Bang. We hope to come across hitherto unknown laws of nature which may be able to explain the asymmetry between matter and anti-matter. These experiments also serve as microscopes with which we can study the subatomic universe – i.e., particles that are a billionth the size of an atom. And the higher the energy the smaller the particles we can detect.

As the first woman since the founding of German Electron Synchrotron (DESY), you have held the position of Director of Particle Physics since February 2022. What would you like to promote and advance in this role in the future?
Particle physics at DESY is already very well positioned. We are heavily involved with international projects at CERN and in Japan, where we play a decisive role. We are currently working on new trackers which are of critical importance to the experiments conducted at the LHC. In collaboration with international as well as German universities, we also carry out local experiments: for example, we have built a program to look for what are known as axions. These are hypothetical particles which, according to the theory, zip all around and through us. Axions are considered hot contenders for particles that make up dark matter. This is matter that does not interact with light – meaning that it is ultimately invisible.

Of which there is considerably more than there is normal matter.
According to our current understanding, there is almost six times more dark matter than there is normal matter – but we do not know what it actually is and what it consists of. This means that we have currently no idea about a large part of our universe. So far, dark matter only gives itself away through its gravity. And it is exactly this gravity that is impossible to study in particle accelerators because in comparison with other natural forces it is much too weak. We have now planned three experiments for the purpose of detecting these axions and, along with these, ideally also the dark matter.

In one of these experiments, you attempt to shoot light through a wall.
The idea behind it is this: inside a strong magnetic field, the axions can transform into light particles, also known as photons, and vice versa. We utilize a high-intensity laser – a lot of light – and shoot this through a strong magnetic field, onto a wall. And if light particles transform into axions, these will be able to pass through the wall due to their low interaction with matter. In the magnetic field on the other side of the wall, they can then transform back into photons. If, in fact, light shines through the wall, this would constitute proof that there at least are axion-like particles. Starting this summer, the experiment is scheduled to deliver the first results.

Nobel laureate in physics Leon Lederman identified luck as one of the most important ingredients of scientific success.
As a female researcher, one must specialize. And this also includes deciding in favor of a research subject, as well as a path. One must be lucky when it comes to searching for the right thing in the right place – after all, we don't know whether axions actually exist or not. Many Nobel Prize discoveries in particle physics and other areas were based on luck. Even the mechanism of action of the mRNA molecule, on which the vaccines against the coronavirus are based, was discovered by chance during the course of basic research. For this reason, research for the sake of research is at least as important as applied science. It's the only way to find that which you were not looking for.

When it comes to science, what has been your luckiest moment?
On the one hand, it was certainly the discovery of the Higgs boson. The fact that we were able to detect a particle through experimental means which had been suspected to exist for the past 50 years was, and still is, beyond belief to me. On the other hand: if, after many all-nighters, these complex, highly technical detectors that we have been developing and building for more than a decade, actually work – that can also be considered tremendous luck. ■

Science as a Transformative Force

Since 1980, the Right Livelihood Award has been presented annually to individuals or organizations who have come up with solutions to the most pressing challenges for humanity.
A conversation with Ole von Uexküll, Executive Director of the Right Livelihood Award Foundation.

Creates a stage for research
Ole von Uexküll has been executive director of the Right Livelihood Foundation since 2006

Mr. von Uexküll, every year, an international jury comprising former award winners, successful activists and scientists from a broad spectrum of disciplines decides who will receive the coveted Right Livelihood Award. How significant is science in this context?
Ole von Uexküll: In the case of award winners from the fields of science, the impact of scientific knowledge on society is paramount. Our selections are primarily guided by impact, meaning practical problem solving, in connection with a long-term vision that the world could in fact look very, very different. Most people to whom we award the prize already have decades of successful work behind them. These days, good research is extremely expensive, which is why there is always a danger that science will work to the benefit of those who are already privileged in this world. Our 2016 award winner, for example, has shown how science can serve society: environmental lawyer Robert Bilott used compensation damages which the company DuPont had to pay as a result of polluting drinking water to finance large-scale studies with those affected. In this way, epidemiological proof of the dramatic health impacts of perfluorooctanoic acid (PFOA) could be obtained. The Hollywood film "Dark Waters", released in 2019, is based on this true story. 20 years ago, we honored the most important scientist behind the development of solar cells, physicist Martin Green from Australia. Someone like Dr. Green is actually deserving of the Nobel Prize in Physics!

For years following the first award ceremony, your foundation received an invitation to present the award, which was initially not taken very seriously, in the Swedish parliament – similar to the Nobel Foundation which annually honors distinguished personalities. What are the differences between the "real" and the "alternative" Nobel Prize?
The deciding factor is the transformative force of science – the same idea, in fact, that Alfred Nobel had documented in his will at the end of the 19th century. When it comes to the creation of societal transformation, however, all people must be allowed an equal voice which, in practice, is unfortunately not the case at all. As well in science, the massive global unequal distribution of power and resources play a large role. The Nobel Prizes in the sciences, and particularly the Nobel Prize in Economics, at times leave the impression of intentionally reinforcing the problem. With the Right Livelihood Award, we expect to identify and promote people who, at the time of the award ceremony, are often not yet well known globally, as well as topics which have not yet caught on.

In 2021, the prizes went to three activists from Cameroon, Russia and Canada, as well as to an environmental organization from India. Each award winner received a cash prize of approximately 100,000 euros. In addition, the award includes long-term support in order to promote the award winners' work as well as increase visibility. What exactly does this support look like?
This may be quite different, depending on the individual case. The prize money is always used to further the work of the recipient. Our support includes publicity, but also content, as we bring our laureates together and thus allow new networks to develop. Our prize also serves as protection. In many parts of the world, people who devote themselves to the service of human rights, democracy and the environment are in danger. Through the fact that we have consultative status with the United Nations, as well as an office in Geneva, we are in the position to offer our award winners a global stage for their concerns, even if the governments of their home countries actively oppose them. ■

FOR A BETTER TOMORROW

Former European Parliament member Jakob von Uexküll is the originator of the award, often referred to as the "Alternative Nobel Prize". Initially, he had suggested the inclusion of two additional prizes, for Environment and Development, to the Nobel Foundation. Since his proposal was rejected, he sold a valuable stamp collection, and with the proceeds – more than one million dollars – he then established the Right Livelihood Foundation. Both the environmental activist Wangari Muta Maathai and the physician and human rights activist Denis Mukwege were recipients of the Right Livelihood Award, followed later by the Nobel Peace Prize. In 2021, 206 individuals and organizations from 89 countries were nominated for the Right Livelihood Award – more than ever before. Among the former award winners are American whistleblower Edward Snowden (2016) and Swedish environmental activist Greta Thunberg (2019). Research, as well as the management and translation of scientific knowledge, continues to play a prominent role.

rightlivelihood.org

Science award winners (selection)
- 2021: Marthe Wandou (Cameroon) "for the creation of a model for community-based child protection in the face of terrorist attacks and gender-specific violence in the Lake Chad Region of Cameroon".
- 2018: Tony Rinaudo, an Australian agronomist who, by implementing the reforestation technology he had developed, was able to successfully regenerate vegetation in parts of the Sahel region.
- 2013: Hans Rudolf Herren, a Swiss entomologist, is considered the pioneer of biological pest control.

Activist for 30 years
The lawyer and gender and peace peace activist Marthe Wandou received the Right Livelihood Award in 2021. She says, "Poverty has a female face."

It's All Part of Science

Counting birds, collecting flotsam and jetsam, discovering plants: those who want to help science can choose from a large selection of exciting – and sometimes eccentric – citizen science projects. Thanks to digitalization, data transfer is now easier than ever.

Helpers like you and me Which stars can be seen? Anyone can submit data to help research light pollution

1 A Quiet Space for Observation

Some avoid it as it is a place for the departed; others come to remember their dead. And then there are those who enjoy a walk in the cemetery for the very reason that it is a haven of quiet natural beauty. Scientists at the University of Vienna are now tapping into this pastime: with their citizen science project "BaF – Biodiversity in at Cemeteries", they ask those who visit the cemetery to submit photos and observations in order to capture the biological diversity of Vienna's cemeteries. These are home to a long list of different organisms: not only foxes, deer, hamsters and many birds feel at home here, but also endangered species such as the Aesculapian snake – a rare snake species that can grow up to two meters in length. All discoveries can be submitted easily via e-mail, through the app "Wildtiere" (Wild Animals) or the website *stadtwildtiere.at*, thus supporting the Institute of Paleontology at the University of Vienna in their efforts to maintain and expand their database.

2 A Hobby for Night Owls

Particulate matter, nitrogen oxides, ozone – hazardous substances such as these increasingly pollute our cities. Light pollution, i.e., the brightening of the night sky by artificial light sources, is also on the rise. The project "Loss of the Night" aims to measure light pollution and study its impact. All one has to do is take a smartphone and step outside on a clear night. An app then connects with certain stars and asks whether they are visible – an indicator of the brightness at that particular location. All measurements are sent anonymously to the database of "Globe at Night", an international citizen science project that has been documenting global light pollution since 2006. These data are converted into maps which illustrate the distribution of brightness as well as its development over time; scientists can then use these data to determine the change in light pollution. In the medium term, approaches to solutions for modern and "more night-protective" illumination concepts are planned to be developed based on the results of this research.

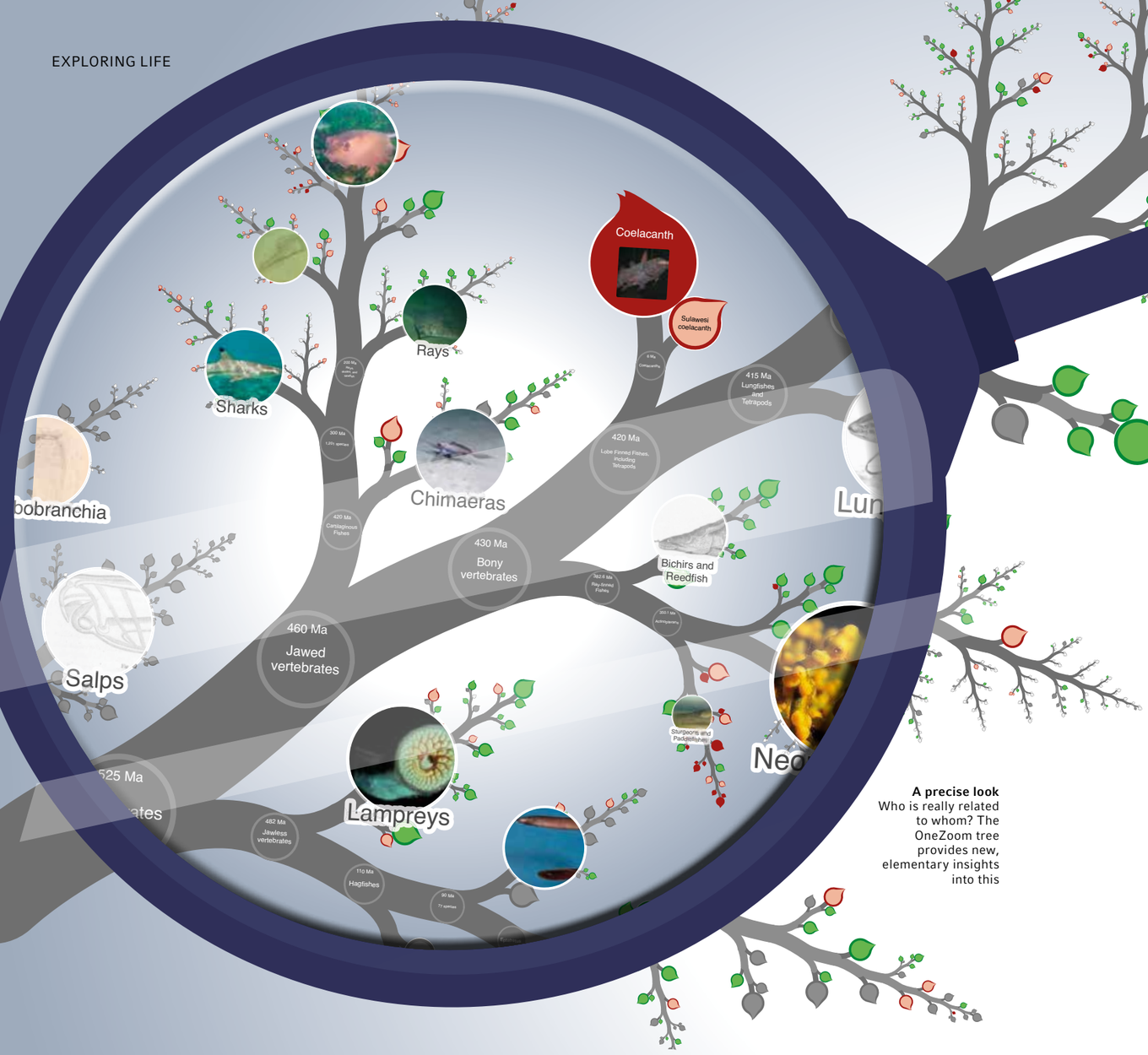
3 Data on a World Tour

In 1992, a container ship from Hongkong sank in the North Pacific. The freight that went overboard included plastic bathtub toys, including rubber duckies, beavers, turtles and frogs – a total of 29,000 toys! One good thing that came out of the disaster: driven by wind and currents, the bathtub delight made landfall on a number of different coastlines and was collected by people strolling on the beaches. The locations where these "drifters" were found provided insight on travel routes and times. American oceanographer Curtis Ebbesmeyer thus gathered important knowledge about the global ocean currents. He was aided by the fact that in the wake of a previous similar shipping disaster he had founded a network of beachcombers who were now eagerly sending him data. Among the most exciting results: some of the bath toys had drifted from the Pacific Ocean into the North Atlantic. And who knows – perhaps 30 years from now, one duck or another will still show up somewhere in the world. After all, plastic is durable.

4 Full Computing Power

In order to assist science, it is sometimes sufficient to do nothing; for example, during a coffee break. Those who are not actively using their computers, tablets or smartphones may as well allow them to scan the data of different instruments of astronomy for signals from neutron stars, i.e., remnants of exploded stars. "Einstein@Home" is the name of the computing project by the Max Planck Institute in Hanover and the University of Wisconsin-Milwaukee. The discovery of new neutron stars helps astronomers better understand the origin and the life of stars. The goal: the first direct measurement of the continual gravitational waves which these fast-rotating stars radiate if they are not perfectly round. These spacetime curvatures had already been predicted by Albert Einstein 100 years ago and confirmed for the first time in 2015. Approximately 500,000 volunteers have already scanned the galaxy using this platform, thereby discovering more than 80 neutron stars.

EXPLORING LIFE



A precise look
Who is really related to whom? The OneZoom tree provides new, elementary insights into this

Zoom into Life

Who would have known that the common ancestor of humans and the European oak lived 2.15 billion years ago? Or that fungi are more closely related to animals than they are to plants? All these facts are now vibrantly illustrated in a new virtual tree of life.

Those who enter a species into the search field of the website www.onezoom.org, for example, humans, will experience a dramatic zooming "flight" as the interactive map races at top speed through the many branches and sub-branches of the tree of life, i.e., the history of evolution. You will zoom past intricate and winding branches and arms, from the origin of life, roughly 3.8 billion years ago to your destination at the present day. Finally, you will stop at a branch with an image of a human within a gray leaf. Zoom out a little, and you see leaves with pictures of chimpanzees and gorillas, and learn that the last common ancestor of humans and chimpanzees lived approximately five million years ago during the Neogene period.

Google Earth of biology

The interactive tree of life is rather like a "Google Earth of biology", and it was created by British scientists James Rosindell and Yan Wong. With this tree, the biodiversity theorist and the evolutionary geneticist illustrate, for the first time, an explorable tree of all known living organisms with images and all evolutionary connections. The leaf depicting each species – a total of 85,000 – appears in green color if the species is not under threat of extinction; red indicates under threat of extinction according to the International Union for the Conservation of Nature Red List of Threatened species. Most leaves, however, are gray as it's not known whether or not these species are threatened.

Rosindell came up with the idea for this explorable tree of life on a day in the spring of 2011, when he visited the home of Charles Darwin for the very first time. His friend Luke Harmon, with whom he strolled through the English county of Kent, southeast of London, was convinced that that while ambling on the "sandwalk", a path where Darwin went to think , they would experience some kind of flash of inspiration. "I was skeptical", remembers James. "But when Luke explained later that day how difficult it was to study the large trees which illustrate evolutionary relationships between different species or other taxonomic units, I suddenly realized the solution. An interactive explorer of huge trees could be done with a combination of zooming and the fractal objects that I had learned about in maths studies. This allows viewing individual branches on any chosen level, at any scale."

> *"I didn't realize that there are almost as many species of birds as there are lizards and snakes: just over 10,000 each."*
>
> Yan Wong

Insight into the diversity of nature

It took eleven years for this flash of inspiration to become a digital reality. People interested in biodiversity can use this interactive tree of related living beings for research while museums and zoos can use it in the future to illustrate nature's diversity. Throughout these eleven years, patience was of the essence. "If you take a look at the tree", says Yan Wong of the University of Oxford, "you could easily think that it took all this time to populate the tree with the 2.2 million species. That was not the case at all, and it would not have been realistically possible within the space of decade. Instead, we had to develop tools and algorithms which automatically access data sources such as the "Encyclopedia of Life", "Wikipedia" and the "Open Tree of Life" to collate the information needed. "Another issue is that traditional graphics methods are not sufficient to save the entire tree. It was necessary to develop custom tools for the purpose of reading and matching files several gigabytes in size.

Those who use the tree for their research can easily dive into evolutionary history – while continuing to encounter ever more novel interesting relationships. Evolutionary biologist Yan Wong had been aware of many of these connections. For example, he knew of a 2001 study which states that hippos are the closest relatives of whales and dolphins. He was also familiar with the now accepted close relationship between fungi and animals. Still, he continues to come across surprises on the OneZoom tree: "I didn't realize that there are almost as many species of birds as there are lizards and snakes: just over 10,000 each", he recounts. "They are closely related, so this means that approximately 300 million years ago, one branch of the tree developed into lizards and snakes whereas the other developed into birds, turtles, crocodiles and dinosaurs. But they both ended up producing almost exactly the same number of living species!"

Strange, colorful and surprising

Through the OneZoom tree, James Rosindell and Yan Wong have been dealing with 2.2 million species. Over the course of this project, have they found a favorite species? "Difficult to say", both scientists agree, and James adds: "I like the strange and the colorful; for example the poison dart frogs, the blue ringed octopuses and the carnivorous plants". Yan's answer comes complete with extra information gleaned from zooming around the tree: "Ctenophores! Some look like peculiar flatworms whereas others resemble glowing disco balls or shiny ribbons. There are even species that are reminiscent of carnivorous plastic bags. On this topic, truly amazing videos are available on the Internet: one of these species accomplishes the seemingly impossible feat of swallowing another that is larger than the individual itself." ■

www.onezoom.org

Beautiful Old Beijing

Glistening highrises and narrow hutongs and courtyards – China's capital city Beijing combines opposites. There can be no modern age without the past: a stroll through the Beijing of the dynasties.

Strolling along Beijing's paths
The Forbidden City, a UNESCO World Heritage Site since 1987, comprises 900 palaces and 9,000 rooms. It is considered the largest imperial complex in the world

The morning sun sends golden light across the Forbidden City in the center of Beijing; roofs and cupolas shimmer yellow, walls radiate red. It is still quiet in Tian'anmen Square, the space fronting the Forbidden City, where Mao Zedong declared the Peoples' Republic of China in 1949. A few minutes from now, tourists from all over the world will flock into the labyrinth of terrasses, courtyards and halls to relive magnificent historic Beijing. It begins with the Ming Dynasty in 1420, and ends in 1912 with the Qing Dynasty and the founding of the Republic of China.

In the "Hall of Supreme Harmony", admiring the Dragon Throne, visitors can imagine past celebrations of coronations, baptisms and birthdays. Gardens and the Summer Palace evoke the lives of empresses and concubines. In the "Hall of Mental Cultivation", you may ask yourself what it must have been like for past emperors, living in the Forbidden City. This hall was where the sovereign came to rest in solitude. What may have been the memories of China's last emperor? At the age of two, Aisin Gioro Pu Yi ascended to the throne in 1908, and in the years to follow, all who came in contact with him, eunuchs, teachers, cooks and advisors, among them his father, had to perform the "kowtow" before him: worship him in humility, their foreheads repeatedly touching the ground.

Appealing and imperial

The Forbidden City was declared a UNESCO World Heritage Site in 1987: it comprises close to 900 palaces and 9,000 rooms. It is considered the largest imperial construction in the world, and those who explore it will afterwards feel it in their feet. A break is welcome – preferably in Jingshan Park, which is made from the earth of the moat surrounding the Forbidden City and which is located on an elevation, directly across from the Northern gate. In historic times, the park served the court as a place of quiet; today, it is mostly the tourists who enjoy taking repose here. It is picturesque: the expansive green, feather-like cypresses, as well as pine trees, stretch towards the sky, and each of the five peaks of the park is adorned with a pavilion. ►

LET´S GO!

Discovery, amazement and culinary delights in Beijing

The **Olympic Park** was built for the 2008 Summer Olympic Games, located approximately eight kilometers from the Forbidden City. The National Stadium, also known as the Bird's Nest, host to the spectacular opening and closing ceremonies, as well as the National Aquatics Center with a façade reminiscent of soap bubbles, are among the most well-known buildings of this complex. The village is surrounded by a forest – instantly combining the visit to the former sports facility with an excursion into nature.

1 Guojiatiyuchang S Rd,
Chao Yang Qu

Mutianyu is the name of the section of the Great Wall of China which is located roughly 70 kilometers from Beijing, and which is considered the most well-preserved. Situated amidst green mountains, it is adorned with battlements and watchtowers. There is an option of taking the gondola to the top and tobogganing back down into the valley. Alternatively, 4,000 steps await the visitor. The village of the same name, Mutianyu, is close by – an excellent destination with good restaurants.

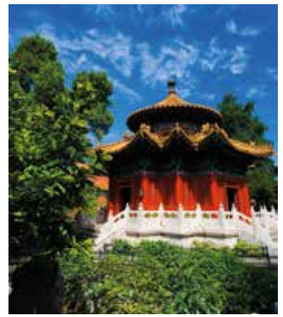
Mutianyu Village,
Huairou District

No visit to Beijing is complete without Peking Duck – at least if one is not limited to a plant-based diet. The city's best Peking ducks are said to be served in the restaurant **"DaDong Roast Duck"**. The restaurant is named after its founder's nickname Da Dong, and his roast duck is called "SuperLean" (酥不腻). This Peking duck restaurant is so famous that even Patricia Schultz included it in her book "1,000 Places to See Before You Die", a classic among travel guides, as a suggestion for one's own personal bucket list.

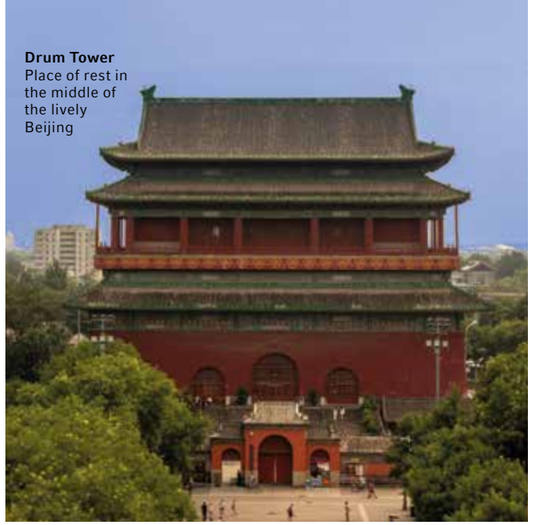
Jinbao St. 88,
Dongcheng

Jingshan Park
A pavilion peeks out from each of the five park peaks

Into the action
Gongjian Hutong – always bursting and filled with life, is a place with good cuisine



Wanchun ting
The highest point of the Chinese capital allows a panoramic view



Drum Tower
Place of rest in the middle of the lively Beijing

The most spectacular view across Beijing can be enjoyed from the "Pavilion of Everlasting Spring" (Wanchun ting). At 43 meters, it is the highest point of the capital, and if skies are clear, it offers an unimpeded view of the straight North-South axis – the backbone of ancient Beijing. All important buildings, such as the emperor's palaces and temples, were dependent on this road. Directly surrounding Jingshan Park, however, the many hutongs spread out like a vast carpet, with alleys that are too narrow for cars or horse carriages. This was where the commoners lived, in open courtyards. They were forbidden to enter the emperor's palace – hence the name, Forbidden City. Hidden away in one of these streets is the restaurant "Huangjia Bingjiao Xiaoyuan". It is known for simple but authentic Beijing cuisine, for example, baozi: yeast buns filled with vegetables or meat. In ancient times, the ice cellar of the Forbidden City was also found in this location; ice from the North Sea was used to keep the food for the palace cool. Today, visitors can still peek inside the several-meters-wide room which these days is used to chill wine. The restaurant may be a little hard to find, but it is worth the detour: when in Gongjian Hutong, look for a red varnished front door with brown doorknobs and decorative lampions.

Rediscovery of the slow

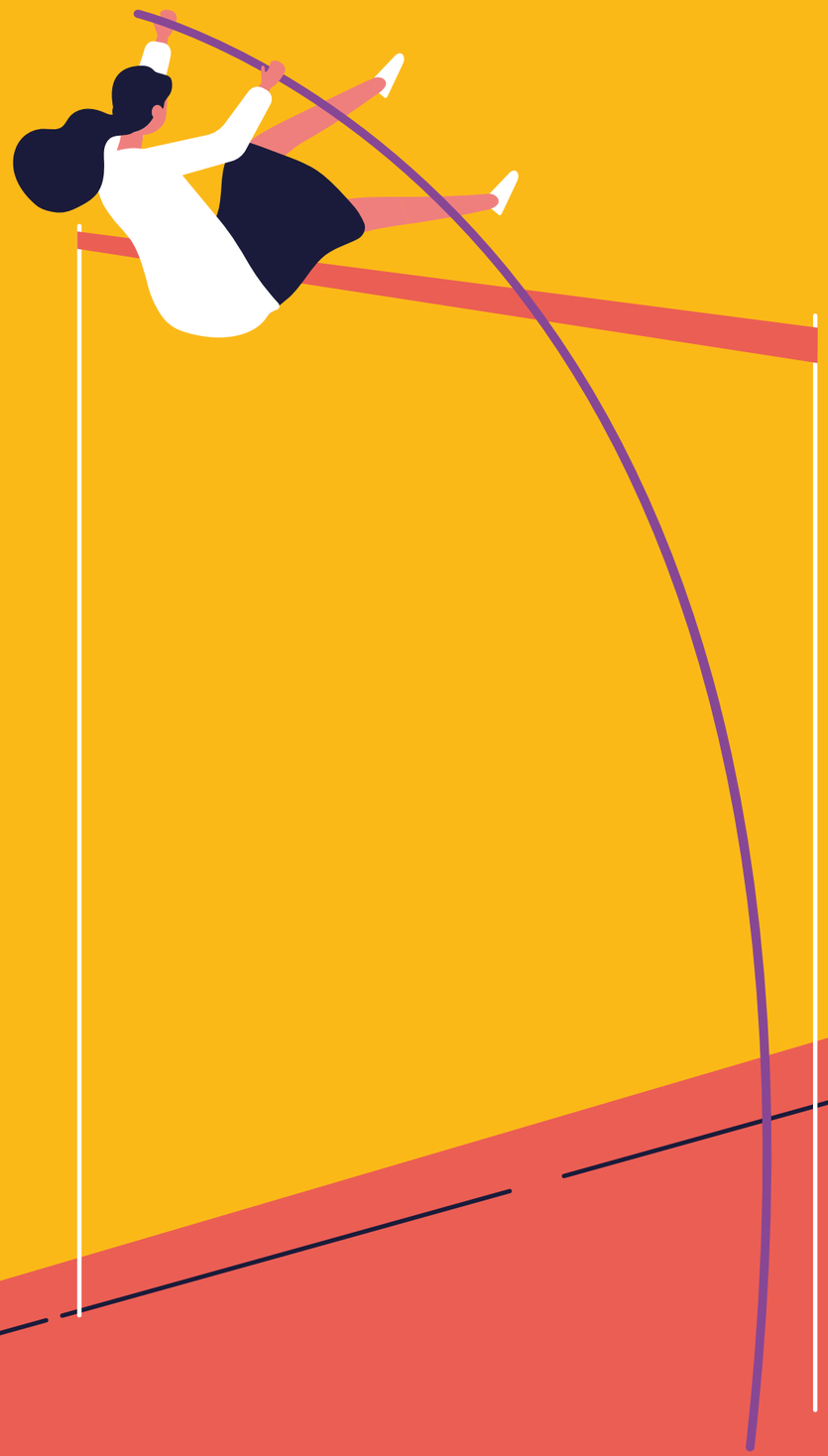
Across from Jingshan Park, at the northern end of the downtown axis, you will find the Drum Tower – another symbol of old Beijing. This mighty building, painted in oxblood red, was constructed during the early Ming Dynasty at the beginning of the 15th century. It speaks of how nearby, the city gates were closed for the night, as well as of slowly ticking clocks in historic China. In those days, bells and drums first and foremost served as ceremonial musical instruments; only later were they used to announce the time. They did not sound hourly, as is customary in the West, but every two hours – six times during the day, and six times during the night.

With this history, the drum and bell towers invite today's visitors, surrounded by the bustling city of Beijing, to rediscover the slowness of the past for themselves – and perhaps adapt a more leisurely pace when exploring the square near the towers: a place which, in historic times, served as a marketplace for herbs, and where today people practice tai chi. In Wudaoying Hutong, a hip street not far from Confucius Temple, modern China meets its ancient counterpart. One Western café follows another; you can find a Mexican and a Greek restaurant, right next to shops which sell traditional artisan pieces – for example, handmade cat porcelain. 欢迎来到北京 – Welcome to Beijing. ■

EPPENDORF IN SHANGHAI

Eppendorf currently employs 270 people in the China market region, 135 of whom work in Shanghai, the company's headquarters. Employees in sales, service, marketing, supply chain, IT – and a few more – are based at the headquarters, in the calibration center, and in the warehouses. The 1,620-square-meter site, which will be newly occupied in 2019, is located on the 10th floor of an office complex with modern, open-plan offices – some with floor-to-ceiling windows for a sweeping view of the hustle and bustle of the city of 26 million people.

Lessons From the "Real World"



When I left my tenured professorship for a nonacademic job, I thought I had already done the hard part: making the decision to leave the professional world that had been my home for many years. I had little inkling of the culture shock that awaited me in my new sphere of science policy and how disorienting it would be. In the 17 years since, I've seen that I'm far from the only one who struggles with this transition. Regardless of career stage, leaving academia requires some adjusting. For those who, like me, make the move later in their careers, after decades as established academics, it can be even harder. Knowing what to expect beforehand can take some of the shock out of the transition to the world outside academia.

You aren´t the center of the world, and you will have an actual boss

If you're a senior academic, teaching, advising, and managing a research group can turn your world into a solipsistic universe where what you say goes. Most students are attentive and agreeable, no matter what they really think. The dean and department chair are loosely construed as your supervisors, but they generally want you to focus on your own ideas so that you can bring in grant money and prestige.

Outside of academia, on the other hand, collaboration in service of a common goal is far more important than any one person's ideas. That is true even if you are in a very senior leadership role. There are goals to achieve and relationships to manage; you can't pursue just your own interests. Having a more formal boss might feel odd, but be open to it. Bosses can offer support in ways that university structures can't.

You won't have nearly enough time to do background work you'd like

Completeness and thorough examination are hallmarks of a serious scholar. In academia, you can usually take all the time you need to do plenty of background research, talk to colleagues, and cogitate before producing a decision or a publication. But in the outside world, you may have 30 minutes to come up with an answer. This was a particularly hard lesson for me to learn. Sage advice from someone more junior than I but with more "real world" work experience helped immensely. They said that sometimes I just had to go with my gut and call it a day.

Summer is not special

After a long academic year, summer feels different and, in some ways, special. It can be a time to regroup and refresh – write, develop ideas, even spend a few months away from the distractions of campus. Outside of academia, summer is generally three more months in the workplace. It might be punctuated by vacation, but by and large, work goes on as usual for 12 months a year.

There is no tenure

This is a tough one! Many in the professoriate value this near-guarantee of steady employment for a lifetime. But leaving tenure can actually be liberating for a go-getter with a good work ethic. Employers want to keep strong, creative employees around, and they realize that individuals are not necessarily there for life. That means that organizations can be very loyal to their long-term, high-performing employees and treat them well. And if you don't enjoy the work or feel badly treated, there's no reason to stay.

If you decide to take the plunge into the outside world, take some time to acclimate to the new environment. You'll probably experience some initial surprises, but give yourself a chance to see whether things get better. And if this article convinces you that academia is the right place for you and that you should stay and flourish there, then that is a win, too. ■

Barbara A. Wanchisen is the director of the Board on Behavioral, Cognitive, and Sensory Sciences at the National Academies of Sciences, Engineering, and Medicine in Washington, D.C.

Science
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THE SOURCE

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Insights into the Laboratory

The illustrations by Katarina Liberatore are detailed and multi-faceted, and they showcase the diverse world of research conducted by women.

Who and what comes to mind when we think of a female researcher? During her undergraduate studies in biology, Katarina Liberatore wanted to portray her laboratory colleagues as authentically as possible in order to disprove stereotypical images of a scientific laboratory while at the same time drawing the attention of the broader public to women in the STEM professions. Her goal was to provide an insight into the laboratory as she saw it: women in action.

After the biologist had drawn her lab colleagues, she posted her illustrations on Instagram and was delighted with the positive feedback as well as the support from scientists all over the world. “Since visual representation is critical to the formation of expectations, I believe that depiction of women from all the areas of STEM is of crucial importance”, says the artist. She is currently a PhD-candidate at Weill Cornell University, and as a colleague in the STEM sector, she wants to share her stories through her art. Liberatore: “I am creating a supportive space in order to build a larger community of women in science.”

instagram.com/fiddleheadartdesign

MASTHEAD

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Discover excellent versatility with 10 different rotors and our universal rotor concept.

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