

# Off the BENCH

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— The Eppendorf – LifeScienceStyle Magazine —



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## OUR BRAIN – THE SUPER ORGAN

How we learn, why distraction  
can be an inspiration and  
when idleness is okay

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## OCEANS IN DANGER

The pollution of our oceans  
by microplastics endangers  
entire ecosystems

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presented by  
**eppendorf**

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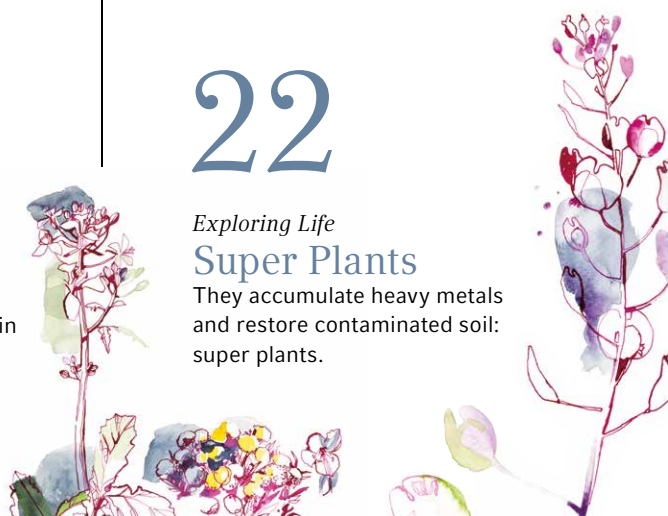
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*Exploring Life*

### Super Plants

They accumulate heavy metals and restore contaminated soil: super plants.



## SUBSCRIPTION AND FEEDBACK

You want to make sure that you will continue to receive future issues? Please send us a brief note.

We look forward to your feedback, which will tell us whether we have indeed achieved our goal with this issue. We invite you to submit your suggestions for improvement.

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# Editorial

## Dear Reader,

We at Eppendorf consider the Life-ScienceStyle magazine "Off the Bench" a matter dear to our hearts. As partners to our customers, we are delighted to invite you to take a look outside the laboratory-box, into aspects of life beyond the routine of the application. For this issue, our interdisciplinary editorial team has once again researched and prepared for you a number of moving stories and accounts on all aspects of the Life Sciences.

While we owe researchers like Madeline Lancaster a debt of gratitude for her groundbreaking research on the brain, her enthusiasm for her work in the laboratory is especially inspiring to young scientists and, above all, it shows how a stellar scientific career can go hand in hand with a rich family life. In our column "Inspiring Science", she vividly explains what motivates her and how she aims to find out with the help of her cultivated mini-brains what it is that makes the presumably most complex human organ so unique.

Researchers, too, are the ones who explain to our "Off the Bench" authors the worldwide danger posed by microplastics in the oceans. It is a controversial topic which has been intensely discussed since the first United Nations Ocean Conference was held in New York City in June, and which will weigh on humanity's conscience for decades to come. While we humans are tasked with protecting the oceans, other organisms within our ecosystem know how to help themselves: plants, for example, that independently clean soils contaminated with heavy metals such



as lead or cadmium and which have the ability to render these soils serviceable once again. Find out how exactly these superplants accomplish this feat in our topic-rich column "Exploring Life".

This time, our travelogue will take you to the political, cultural and culinary Washington D.C., which will host the "Neuroscience", one of the most important conferences for neuroscientists, in November. Eppendorf will be represented at the "Neuroscience", as well as at many other scientific trade shows. Please see pages 34–35 for a concise overview of where you can find our experts.

If you would like to receive future issues of Off the Bench in the mail on a regular basis, simply take advantage of our convenient and free subscription service. Visit us online at [www.eppendorf.com/otb](http://www.eppendorf.com/otb). In addition to in-depth content, this link provides you with access to all articles published in previous issues.

We hope you will enjoy the read,

*T. Bachmann*

**Thomas Bachmann**  
Chairman of the Management Board



# Lots Going on in Science!



**Museum, laboratory and zoo Micropia** demonstrates the world of microbes well



**Microorganisms**  
At 70 percent, microorganisms hold the majority share of all living material

## A Big Stage for Tiny Players

172 quintillions of microbes can be found on and in our bodies. Written out, it is number with 30 zeroes. Since 2014, the Micropia in Amsterdam has been the first museum worldwide to exhibit that which is invisible to the human eye.

It begins with a film projected in the elevator, which simulates the ride into the smallest organisms on our planet. During their daily "lab talk", laboratory technicians convey in a clear and vivid manner how microbes subsist and how they are harnessed by science. In a different area,

visitors have the opportunity to scan the microbes on their bodies or even measure how many organisms are transferred during a kiss.

Micropia is not only a museum, but is also a platform for knowledge transfer and a supporter of young scientists, as only those who have experienced insight into the world of research as young people will truly retain that fascination.

[www.micropia.nl](http://www.micropia.nl)

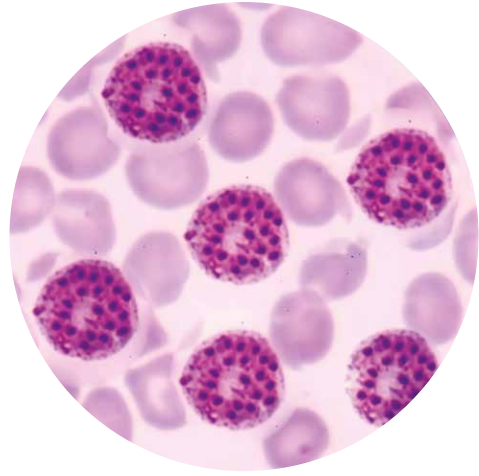
## On its way to Europe

*Aedes albopictus* likes it warm and moist and is mainly endemic in in subtropical Asian countries. Recently, however, the mosquito has been advancing into Europe, as attested by the European Centre for Disease Prevention and Control (ECDC) in Solna, Sweden. According to these reports, the insect, also known as the Asian tiger mosquito, is now firmly established in countries including Italy, southern France, Spain and Austria, where it can transmit the dangerous *Dengue* and *Zika* viruses. The main cause of the spread of invasive mosquitoes is globalization – in a plane or cargo transport, their eggs can easily reach faraway continents.



## Feeling guilty?

If a dog has been naughty, you can see it right away in that particular look in their eyes. While there is no hard and fast scientific proof that dogs are capable of feeling remorse or shame, according to author Nathan H. Lents, such demonstrations of subservience are to be interpreted as apologies and reconciliation.



# 100%

Protection from malaria!  
Researchers at the University of Tübingen in Germany have developed an extraordinarily effective vaccine that is now slated for testing in the African country of Gabon.



## Holding your breath for 18 minutes

While the naked mole rat will most likely not win a beauty contest any time soon, the rodent displays certain biological strengths that keep amazing researchers. It has been known for some time that the naked mole rat is resistant to certain types of pain and cancer, and that it easily gets by with very little oxygen. However, the ability of this mammal to survive entirely without oxygen for up to 18 minutes is a rather recent discovery. To this end, the naked mole rat reduces its heartbeat from 200 to 50 beats per minute and loses consciousness. In the meantime, its metabolism remains fueled by stored carbohydrates. As soon as oxygen supply is normalized, the naked mole rat recovers and continues breathing normally.



A passion for science  
Madeline Lancaster  
researches at the MRC  
Laboratory of Molecular  
Biology in Cambridge



“I am living my *dream.*”

# What Makes us Human?

## RESEARCH CAREERS

Madeline Lancaster, cell biologist at the MRC Laboratory of Molecular Biology in Cambridge, has developed a technique allowing her to create mini brains from cell cultures. These incredible organoids, no larger than the eraser at the end of a pencil, serve as a model for Madeline's research into early human brain development and are enabling Madeline and her team to tackle the age-old question: what is it that distinguishes us as humans?

**I** love when I have an experiment going and the first thing I want to check in the morning is the result of the experiment," Madeline says. Her research is aiming to determine what is special about our brains and what gives us our unique intellectual abilities. "We focus on how human neurons are made and try to understand what's different about that process in humans compared with primates and other animals."

“



**Object of desire**  
The mini brain  
from the Petri dish

Studying an organ which has been described as "the most complex thing in the universe" is a tall order, but Madeline knows what keeps her motivated: "to make a discovery that no one else has ever made. To find something out that nobody has ever seen before and you get to tell the world about it. That thrill of discovery is really unique."

### A child's dream come true

Madeline has been interested in the human brain ever since she was a child, when she first saw a neuron down a microscope in her father's lab. "And my mother is a psychiatrist, which is perhaps also where my interest in the brain comes from," Madeline explains. Apart from a temporary lapse as a teenager when Madeline dreamed of a career as an

astronaut, she has always known what she wanted to be when she grew up: "actually, for as long as I can remember, I wanted to be a scientist."

Madeline grew up in Salt Lake City, Utah, and after High School moved to Los Angeles where she studied biochemistry at Occidental College. Pursuing her dream to become a scientist, Madeline then joined the lab of Professor Joseph Gleeson at the University of California, San Diego, one of the world's leading public research universities. Here, Madeline researched the brains of mammals and earned her PhD in 2010.

Madeline went on to join the Institute of Molecular Biotechnology of the Austrian Academy of Sciences (IMBA), Vienna, as a postdoctoral researcher in Professor Jürgen Knoblich's lab. ►



Madeline conducted experiments with neuronal stem cells: “we started by looking at them in a dish and while I was playing with various culture conditions I stumbled upon this method of culturing the cells in 3D to generate these really beautiful self-organizing brain tissues.” Madeline had achieved something that until then had evaded all other scientists: cultivating complex neuronal tissue from pluripotent stem cells.

### Young and decorated

For the very first time, using these mini brains which are equivalent in developmental timing to an embryonic brain in the ninth week of pregnancy, structures of the brain could be recreated: the *cerebral cortex*, the retina, the *hippocampus* and the *choroid plexus*, a region in which the cerebrospinal fluid is produced. This breakthrough catapulted the 35-year-old into the top ranks of the scientific community. She received global recognition and numerous awards, including the 2014 Eppendorf Award for Young European Investigators.

Madeline is now a Group Leader at the MRC Laboratory of Molecular Biology, Cambridge. She places great importance on the work of her team and being surrounded by committed, enthusiastic colleagues. “I think the best motivation comes from within,” Madeline says. “We can support that motivation, but those with the most likelihood of success, I think, are highly intrinsi-

cally motivated. It’s wonderful to see that drive in my younger colleagues and I try to nurture that in myself and others as best I can.”

How does Madeline manage the contrasting responsibilities of a demanding family life – she has two small children – and an even more demanding job? “My partner is really instrumental in allowing me to have both a family and my career,” Madeline explains. “We really share the responsibilities of the children, the house, and so on. If it wasn’t for my husband I wouldn’t be able to do it.”



**Committed and successful**  
In 2014, Madeline Lancaster received the Eppendorf Award for Young European Investigators



**Taking a close look**  
The microscope as a daily work utensil





Four millimeters maximum. The mini brain as an object for great insights



Comparing size. Smaller than a one cent piece

“

*“All we do is support the cells and keep the tissue healthy with the right combination of nutrients, and these tissues essentially build themselves.”*

Thanks to this, Madeline can continue her ground-breaking research using her three-dimensional brain models. She focuses on diseases, such as a genetic form of microcephaly – a condition which results in an individual having a much smaller brain. Madeline and her team discovered that the disease is caused when neuronal stem cells prematurely switch to the production of neurons leading them to exhaust too soon, thus producing overall fewer neurons and a smaller brain.

#### Miniature brain at high value

“The human brain is equipped with vast developmental possibilities that have so far been difficult to study using traditional animal models,” Madeline explains. The study of schizophrenia or autism using mice is problematic. Not only is the human brain home to far more stem cells than the mouse brain, but the behavior of human stem cells is different to those found in mice. This illustrates the incredible value of Madeline’s mini brains for research, but she modestly says that their creation is rather simple: “it’s really quite remarkable that these tissues can develop by themselves with only little external intervention. Really all we do is support the cells and keep the tissue healthy with the right combination of nutrients, and these brain tissues essentially build themselves.”

Some of us may regard a brain grown in the lab with suspicion. Should we worry? Madeline dif-

fuses concern with a smile, “what we created is a piece of brain tissue without connections and without sentence.” This organoid could never achieve the complexity of a brain because, amongst other constraints, it lacks blood circulation. Oxygen and nutrients in the culture medium must reach the neurons in the mini-brain by simple diffusion. This places a size limit on the organoids, meaning they cannot grow larger than four millimeters.

Following the spectacular creation of a three-dimensional imitation of the human brain, is there still some sort of research jackpot to reach? Madeline smiles, “the most exciting finding would be if we could identify a unique trait of human neural stem cells, and then see if we could recapitulate that trait in a non-human cell type. That would be the ultimate evidence that we have hit on something real.”

Life in the lab is busy, but Madeline is content, “honestly, I am living my dream! I just have fun doing exciting experiments, and I will be happy if I can just continue to have that freedom to do discovery-based research.” ■

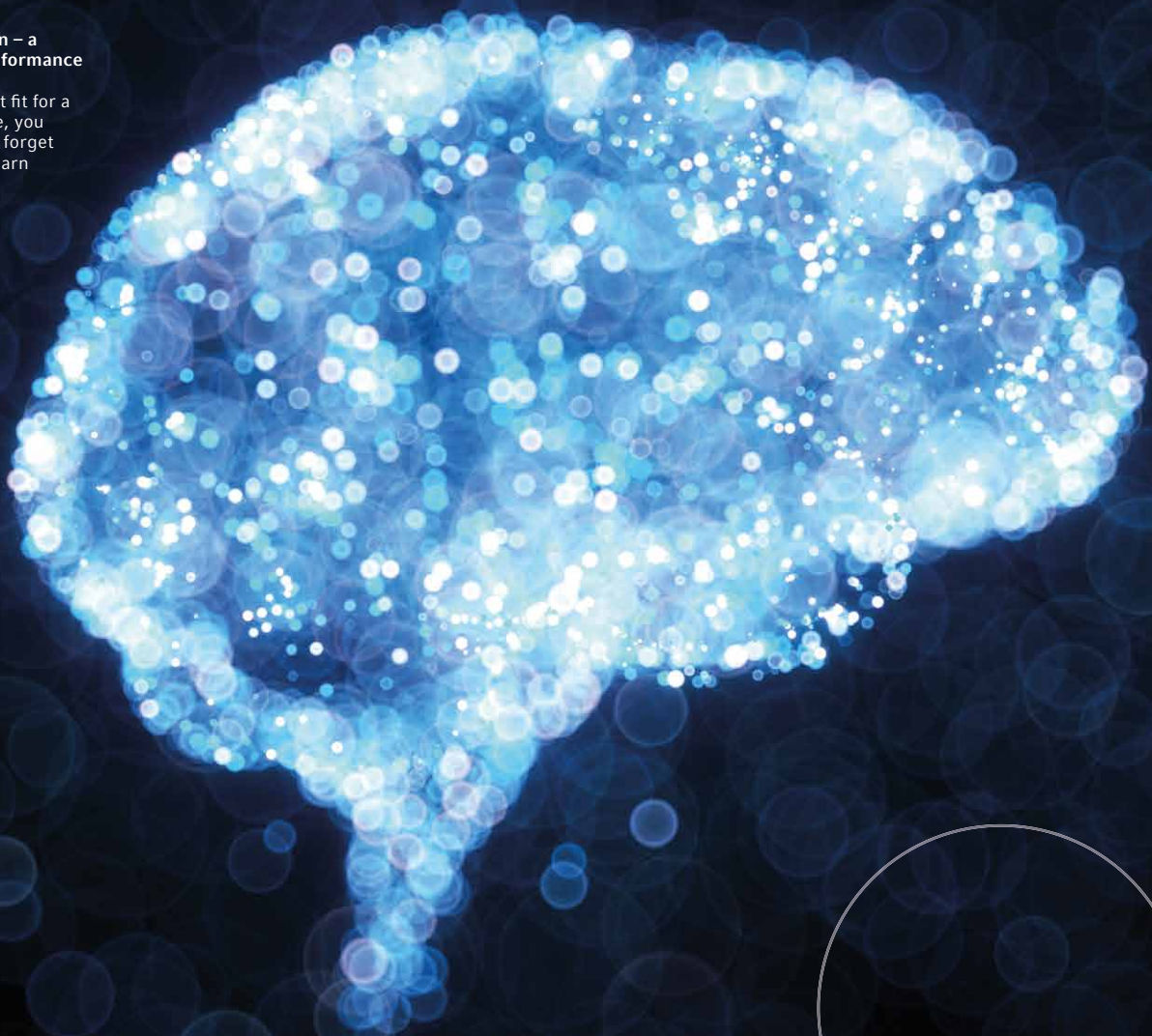


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The brain – a high-performance organ

To keep it fit for a long time, you must not forget how to learn



# It's All in Your Head

Firing neurons, useful errors: how we learn and why mistakes made by our brains are a prerequisite for creativity and fresh ideas.

Every day we are inundated with countless pieces of information, images and news. Interruptions from vibrating phones or push news on social media can certainly compromise our ability to concentrate. A study conducted by the psychologist Erik Altmann of Michigan State University shows: the performance of the brain is reduced by 20 to 40 percent if tasks are completed in parallel rather than sequentially. For the purpose of this study,

300 subjects were asked to solve problems requiring attention using a computer. Half of the participants were required to repeatedly type two letters into their smart phones. While the interruption only took 2.8 seconds, it led to a doubling of the error rate compared to those participants working without interruption. The explanation offered by the research team: distraction from one task in order to perform another triggers a disruption – independent of the

*“Learning and memory are based on the combination of very simple processes.”*

*“To keep the brain sharp, it is important not to forget to learn.”*

duration of the interruption. After all, those who wear blinders at all times will never be able to see beyond their own noses.

Distractions, multitasking and digital media are part and parcel of most peoples' everyday existence. “One of the most prominent weaknesses of our brain is its penchant for change. Mental digression may be triggered by a briefly vibrating phone”, explains Henning Beck, a neuroscientist from Frankfurt, Germany. In his book “To err is useful,” he recommends actively ignoring the ringing cell phone while setting aside a pre-determined time during which to retrieve messages. “When we actively decide against the incoming stream of information, the thalamus in the midbrain, which is responsible for filtering all sensory input, will with time build resistance against distraction”, says Beck. From a neurological perspective, however, distraction is not altogether bad, as short interruptions can also trigger inspiration as they help the brain pick up new ideas.

#### Emotion-driven knowledge acquisition

While the midbrain-based thalamus filters all sensory input, two long, curved structures, arranged in symmetrical order in both the right and the left hemispheres of our brains, constitute the true command center. The hippocampus connects the short-term memory with the long-term memory; if it is not intact, no new knowledge can be acquired. The beginning of each thought process is characterized by

connections between individual cells that possess extensions, dendrites and axons, and are connected with up to 10,000 other cells. “Cells that fire together, wire together” is the term coined by Canadian psychologist Donald O. Hebb. Firing, in this instance, refers to the short electrical impulses that a nerve cell generates for the purpose of signal transfer.

“Highly complex processes such as learning and memory rely on a combination of very simple operations”, explains Hannah Monyer, Head of Clinical Neurology at the German Cancer Research Center (DKFZ) and the University Clinic Heidelberg. Her research focuses on how our memory works and how we learn. Hannah Monyer, who co-authored the book “The Brilliant Mind” with the philosopher Martin Gessmann, states: “Learning happens through association. If different neurons, which are interconnected with each other, are stimulated at the same time, their connection will be reinforced by their simultaneous firing.”

#### Don't forget to learn

Learning is initiated once features and objects continue to present themselves in the same fashion. Emotional aspects such as fear, reward or new experiences initiate the learning process, and newly acquired knowledge is subsequently stored in the cerebral cortex. During recall, the stored memory path is once again activated. The memory itself is then subject to adaptation

to new impressions subsequently acquired. According to Monyer, the brain is less of a memory storage bank, but rather an “active organ of the future” that will influence our lives into old age. In order to keep the brain fit as long as possible, it is important to keep engaging in new activities and never to “forget to learn”.

An occasional lapse of memory, however, is not merely a weakness of the brain, but rather “a clever trick which helps to select and newly combine the most important information from a thicket of impressions,” explains Beck. Analog downtime and seemingly ineffective idleness are crucial for processing the flood of information. In fact, it is the apparent weaknesses of our brains, such as slips of the tongue and inadvertent mistakes that blaze the trail for innovative thought. In order to provide the best conditions for creativity, new ideas or learning, breaks are crucial. “The brain needs the opportunity to digest information. We must not begin to function at the level of the algorithm – computers will never take a break”, emphasizes Beck. He believes that the big global ideas of the future will not be generated digitally but rather that they will be conceived in the analog format. “Computers follow rules, but we are in the position to break these rules. While a positive outcome may not always be certain, it is in fact these inaccuracies of thought that make us superior to artificial intelligence.” ■



#### GOOD TO KNOW

From a neurological perspective, distraction is not automatically a bad thing. Short **interruptions may well lead to inspiration!**

Slips of the tongue or slips of the pen enable new **creative ways of thinking.**

**Breaks are a crucial prerequisite** for creativity, new ideas and learning.

**Analog pauses** and supposedly ineffective idleness help process the daily flood of information.





Honey producer, economic factor and indicator of a healthy environment: bees are important. Are they also endangered?

**B**ees are lazy – this may come as a surprise to many. All too often, the busy bee is used as a synonym for industriousness, whereas in reality the individual bee, with only three to four trips per day, may be considered rather idle. Its excellent reputation as a hardworking insect is instead due to its ability to reach the highest levels of achievement as a team. In order to collect sufficient nectar, together the roughly 50,000 workers of a hive make 7.5 million trips in one summer, totaling at

least 20 million flight kilometers. This combined effort will yield up to 300 kilograms of honey, only a tenth of which is stored in the hive and available for harvest by the beekeeper. While the golden blossom juice primarily sweetens our tea and toast, the honey bees, on the other hand, produce it almost exclusively to heat their nest and, especially in the winter, keep their colony alive.

#### **Problems, yes, but no danger**

Particularly during the cold season, a phenomenon occurs in many parts of the world that gives beekeepers as well as conservationists and scientists cause for concern. According to the German Nature and Biodiversity Conservation Union (NABU), Europe's bee population has declined by approximately ten percent compared to a number of years ago, whereas the United States reports a decline of 30 percent and the numbers in the Middle East are as high as 85 percent. There is talk of a global death of bees, of a world without natural pollination, with less fruit, vegetables and grain

and, as a result, increasing famine. A nightmare scenario that Jürgen Tautz, Professor Emeritus at the Biocenter at the University of Würzburg, considers an exaggeration: "According to the FAO (Food and Agriculture Organization of the United Nations), the number of colonies worldwide continues to grow", says the sociobiologist. There will always be temporary declines, especially with the Western Honeybee; the term "bee mortality", however, he considers very unfortunate. "It sounds like an unstoppable downward trend, but that is not the case." There are problems with beekeeping, but no threat of extinction.

But then what is it that bothers the yellow striped insects so much? They fly from blossom to blossom in lush, flowering meadows and thus collect sufficient nectar; however, they find hardly any food in monotonous agricultural landscapes or in corn fields devoid of herbs and flowering plants. Insecticides, too, frequently used in conventional fruit and vegetable farming, hurt the natural pollinator. All this aside, a small parasite measuring only one to two milli-



A great variety of flowers without any pesticides A basic requirement for healthy bee colonies

meters in length that infests bee hives, most likely turns out to be the bees' biggest nemesis. It sucks the hemolymph from the workers, transmits viruses and bacteria, and it lays its eggs inside the nesting cells of the hive. The varroa mite has thus far proved impervious to any measures that do not include chemicals. As a result, the efforts of scientists, among other targets, concentrate on the breeding of bees that prove more resistant as well as on the use of beneficial organisms to combat the mites and viruses in a natural manner.

#### 200 billion euros added value

The altered living conditions not only weaken entire honey bee colonies, but especially wild bees that travel through the countryside in solitude are seriously endangered. Meanwhile, both groups of bees pollinate approximately 80 percent of our agricultural crops and wild plants. Without bees, there would be no crop plants such as cocoa, vanilla or passion fruit; even vegetables would become scarce, which would result in shortages,

affecting a large number of people on a global scale. Last, but not least, bees are a gigantic economic force. According to the Laboratory of Theoretical and Applied Economics of the scientific research institute "CNRS" in Montpellier, France, the worldwide pollination work of bees contributes approximately 200 billion euros added value per year. It is therefore understandable that organizations all over the world are dedicated to the protection of bees. Private households, too, can participate by purchasing organic foods and honey from a local beekeeper or by conducting "urban beekeeping" themselves – caring for bee colonies on their balconies, roofs or in their gardens and this way harvest their own honey. According to Professor Jürgen Tautz, author of the book "The Honey Factory" (see book recommendation), every action counts: "Bees are an indicator of the state of the environment – they contribute significantly to the conservation of biodiversity – and are thus important ambassadors of developments that will ultimately concern us humans." ■



#### BOOK TIP

#### "Die Honigfabrik"

The reasons why bee colonies are in fact companies with up to 50,000 female staff and some male seasonal workers are explained in a scientific, easy to understand and humorous way by the authors Jürgen Tautz and Dierk Steen.

**Die Honigfabrik, 272 pages, publisher: Gütersloher Verlagshaus, 19,99 Euros, ISBN-13: 978-3579086699**

**A feast for  
the eyes**  
Pipettes in  
the dessert  
provide the  
wow-effect





# An Injection of Good Taste

No self-respecting kitchen is complete without one: pipettes are good for more than just cooking. As an accessory of finger foods or sweet treats, they are true eye-catchers at every buffet.

This dessert will surprise and amaze even seasoned gourmets: a liaison between mascarpone, grapefruit and green cardamom, served with a pipette filled with cold-brewed coffee. The coffee serves as the seasoning, to be sprinkled over the creation by the guest to his or her taste. Delicious! But that is not all: thanks to the coffee-pipette, this dessert, served in a Cologne Restaurant with a view of the river Rhine and Cologne Cathedral, is also an optical highlight.

## Pinpoint pipetting

A device that many of us will remember from chemistry class has become part and parcel of any good restaurant. "Pipettes are mainly utilized in high-end restaurants", says Sonja Kuhl of the German Association of Chefs. Chefs and pastry chefs use it not only for dropwise dosing of the smallest amounts of liquid, but also for the purpose of decorating a dish. As an accessory in finger foods, cupcakes, fruit or pralines, the transparent laboratory instruments are a true eye catcher at every buffet. To make children happy, use them to create gummy bears and other sweet treats.

Pipettes used in the kitchen are primarily made from polyethylene, rarely from glass. These mini-syringes are available online in different sizes – from one milliliter capacity, up to the large turkey basters. For the task of decorating foods on plates and platters, the sizes between one and 1.5 milliliter capacity seem to work best. There is no limit to the imagination when it comes to using the little

kitchen helpers. They are especially popular in the creation of cupcakes. Sweet liqueurs or fruit sauces, flavored cream, liquid white or black chocolate, vanilla cream, toffee cream or syrup in all different flavors are easily injected into baked goods. Fruits such as bananas, kiwis or strawberries, too, refined with a splash of liqueur, will guarantee surprising taste sensations. On the plate, every dessert is easily and effectively staged with a pipette filled with chocolate, coffee or cream.

Pipettes are equally indispensable when it comes to the preparation of sushi and appetizers. How about a California Roll with smoked salmon, cream cheese and sesame, speared by a pipette full of soy sauce? Or perhaps a skewer of cocktail tomato, basil and mozzarella, garnished with a syringe filled with balsamic reduction? This way, the guest is free to drip the desired amount of dressing directly into his or her mouth and thus achieve perfect dosing. The ideal liquids for savory dishes include oils, vinegars, chutneys, spices and a variety of sauces.

## Cooking as performance

Particularly original pipette-based magic is created by the molecular chefs, for example José Andrés of The Bazaar Restaurant in Los Angeles. His motto: cooking as performance. To this end, he effectively arranges barbecued shrimp, decorated with blossoms of pansies and a slim syringe filled with cocktail sauce on a plate. Everyone is free to copy it – and guests will be delighted.



**Exact dose**  
The right quantity makes all the difference

# Perfect Dosing with Pipettes

For savory or sweet dishes, for chefs or guests – refined dosing and dining with pipettes



*Katharina Rauscher of the star restaurant Burg Staufeneck in Salach is Germany's foremost young chef. With her expert knowledge and creativity, the chef from the German state of Baden-Württemberg left all competitors in the dust at the national youth competition of the German Alliance of Chefs and the Achenbach Delicatessen Manufacturing Company. In this interview, she reveals the magic that a pipette can bring to life.*



## How do you use pipettes during the cooking process?

**Katharina Rauscher:** Pipettes are ideally suited for injecting liquids into foods. These liquids can include sauces or chutneys that we inject into deep-fried cakes or profiteroles. Sometimes we add the ganache to a praline using a pipette – that's the chocolate filling with cream.

## So you use pipettes primarily for preparing desserts?

**Rauscher:** Not exclusively. An oven roast can be basted with its own juice very nicely using larger pipettes – it makes the skin nice and crispy. Finger foods benefit from pipettes as well.

## What is the advantage?

**Rauscher:** Pipettes allow you to dose perfectly. You always get the same amount of liquid in the same quality.

## Pipettes are often used for presentation ...

**Rauscher:** Yes, you are right, a lot of showmanship is involved. Sushi is sometimes served with small pipettes filled with soy sauce. Guests appreciate such dishes because they give the dish a premium touch and are creative. You don't see this in a restaurant every day, but practically only in high-end gastronomy. Pipettes are also useful in magically making dots or lines appear on a plate.

## Are there any practical advantages?

**Rauscher:** Absolutely. The guest can use the pipette to dose the sauce exactly according to their individual preference.

## Are you going to share with us a special trick of the trade?

**Rauscher:** I would love to! Aspirate any liquid – let's say rhubarb juice or soy sauce – with a pipette. Then release it, drop by drop, into alginate water, a gelling agent. You will get small, solid spheres that are perfect for decorating a plate. It's quite impressive. ■

Exquisite  
note  
Creative  
dishes  
skillfully  
served



“

*“Pipettes allow you to dose perfectly. You always get the same amount of liquid in the same quality. The guest can use the pipette to dose the sauce exactly.”*

# Lazy-Scientist Pan Buns

## Bring your own Recipe



### INGREDIENTS

100 g wheat flour,  
80 ml (approximately)  
warm water,  
1/2 teaspoon yeast,  
1/2 tablespoon olive oil,  
pinch of salt,  
pinch of sugar

### Science and art in baking and cooking

Eliza Loo from Malaysia is currently pursuing her Doctorate degree, majoring in Plant Immunity in Japan. Being in research, she likes to apply her scientific knowledge in coming up with simple and straight forward recipes. After all, baking and cooking is partly science and partly art.

### What's your favorite recipe?

We want to hear from our readers! Send us your favorite recipe, along with a photograph.

[magazine@eppendorf.com](mailto:magazine@eppendorf.com)

**1** Mix all ingredients into a bowl and knead until soft dough is formed. Cover and proof for 1 hour. (Tip 1: Amount of water used may vary depending on types of flour used. Tip 2: Make sure water is warm, not hot. Hot water will kill the yeast instead of activating it. Alternatively, mix yeast with warm water and a pinch of sugar. Wait until mixture gets frothy before mixing in remaining ingredients. This will ensure the yeast is active).

**2** Divide dough into small balls. Cover and let rest for 10 minutes.

**3** Flatten dough balls and wrap in desired fillings (Suggestions: Chocolate, peanut butter, mashed sweet potatoes, curried potatoes, cheese. Practically anything. Get creative!). Let rest for 10 minutes.

**4** Dry fry (no fats/oil required) on a pre-heated pan for about 2–4 minutes on each side until golden brown. (Tip: Place buns on pan and cover for 2–4 minutes, flip and repeat on the other side. No flipping required while dry-frying).



# In Every Nook and Cranny

By the year 2050, more plastic garbage than fish will swim in the world's oceans – if industry and society are not going to change their ways. Herein, we will explore the origins of microplastic pollution and its consequences.

**A** belly full of plastic took the life of a six meter long whale. It beached on the coast of Norway and died. The autopsy revealed more than 30 plastic bags and other plastic items in its stomach. According to estimates by the German Federation for Environment and Nature Conservation (BUND), up to 100,000 marine mammals and one million seabirds die every year. They mistake the plastic waste for food and subsequently starve with a full stomach, as their digestive system becomes blocked. While the animals starve, the oceans too are threatened with suffocation due to microplastics. Michiel Roscam Abbing of the Dutch nonprofit organization Plastic Soup Foundation explains: "Plastic doesn't biodegrade but it does fall apart into ever smaller pieces. The number of microplastics increases exponentially, even if we succeed in stopping the inflow of plastic waste into the oceans."

## Suffocating oceans

Even today the oceans already harbor at least 150 million tons of plastic garbage. These are subject to degradation by the

sun, wind and waves, only to be deposited on the ocean floor as "secondary microplastics" back in their original state as plastic pellets. According to the British Ellen MacArthur Foundation, each year a minimum of eight million additional tons of plastic end up in the oceans; and on top of that, according to data provided by the International Union for Conservation of Nature and Natural Resources (IUCN), 2.5 million tons of microplastics enter the oceans. This includes "primary microplastics" which, in the form of plastic pellets, are further processed by industry to become packaging material, cosmetic products or clothes. These particles, which are smaller than 5 millimeters in diameter even on land, cannot be filtered out by sewage treatment plants. A current IUCN study shows: tiny plastic particles from synthetic clothing that are released during the laundering process, as well as abrasion from tires, pollute the oceans to an extent not recognized previously.

Accumulation of microplastics in the food chain cannot be ruled out either. Nadja Ziebarth, Head of the BUND Office for Ocean Protection, says: "A large number of studies have shown that microplastics are in fact taken up by zooplankton that

**Not always visible**  
Microplastics are gradually polluting the seas

constitute the food of fish and mammals. This does not necessarily mean, however, that it also reaches man, as stomachs of the animals are generally removed prior to human consumption. The notable exceptions: mussels and shrimp. A team of researchers at the Laboratory for Environmental Toxicology of the University of Ghent in Belgium found plastic particles in the tissue of mussels in the North Sea. According to the researchers, whoever consumes a meal that contains 300 grams of mussels will also swallow 300 plastic particles. The exact ways in which microplastics may be transferred to humans and the potential impact of toxins, however, is not clear at this time.

#### Environmentally friendly filter systems

In order to tackle the problem, Ziebarth considers a general reduction in plastic to be pivotal. On a societal level, this would mean rethinking our consumption as well as acting in a more environmentally friendly manner. Companies should manufacture clothes, cosmetics and tires in such a way

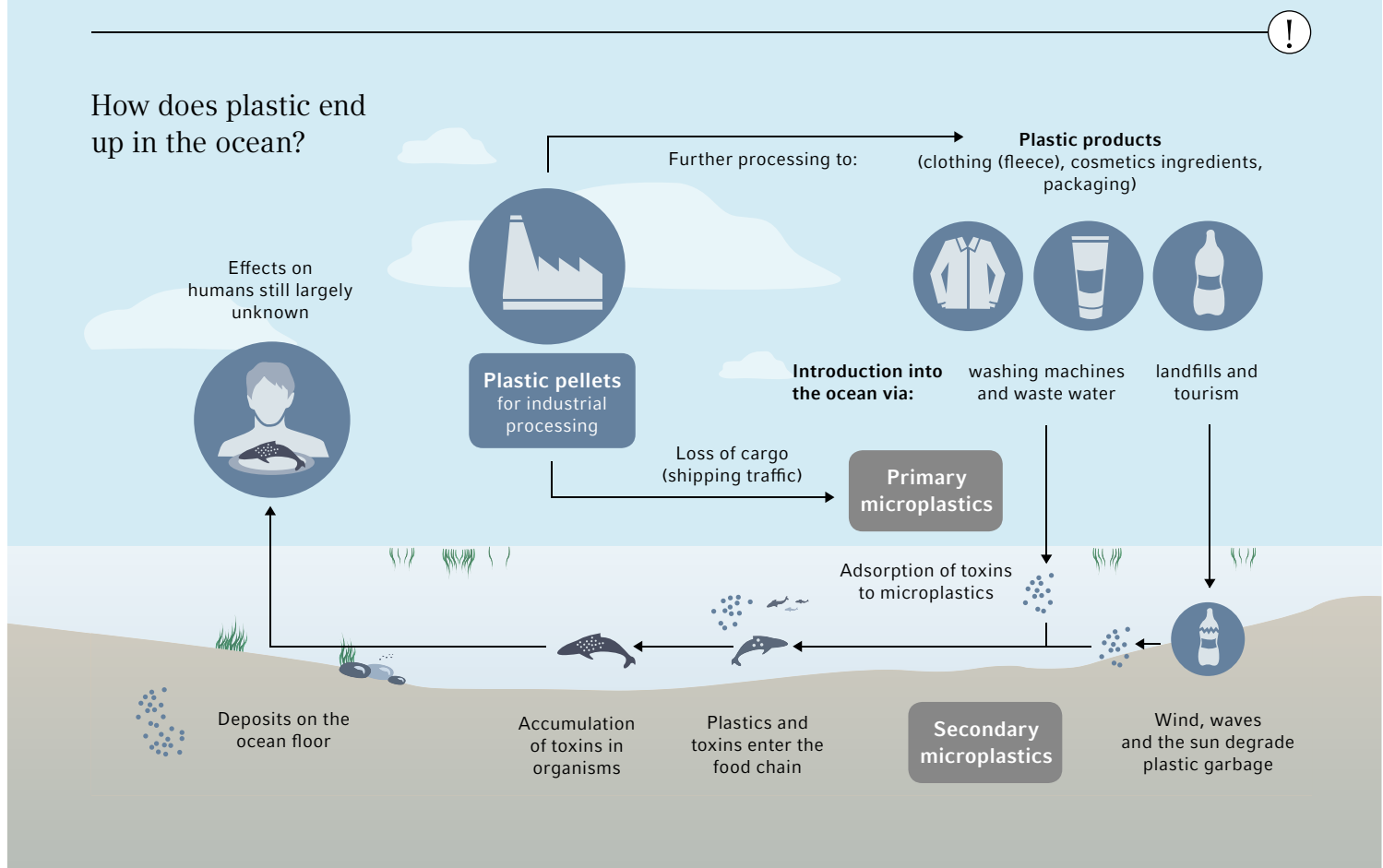
that they will shed fewer plastic particles. "Synthetic fibers from clothes comprise a large proportion of the pollution caused by microplastics. Filter systems in washing machines would be a good countermeasure. But also plastic particles from tire abrasion and road markings are carried directly into the ocean by rain water, without filtration. Retaining basins or filter systems for sewage drains may be an option", says Ziebarth. A special system for the filtration of microplastics is already in the testing phase at the Technical University in Berlin. The cartridge can be suspended under a manhole cover and is expected to catch up to 95 percent of particles.

If the pollution continues on the same trajectory, there will be more plastic than fish in the oceans by the year 2050. The ball is now in the courts of politicians and the business world alike. Ziebarth states: "They have the option of approaching the problem on a regulatory level and to use innovative technologies in order to address the sources and points of entry." ■

# 63,000

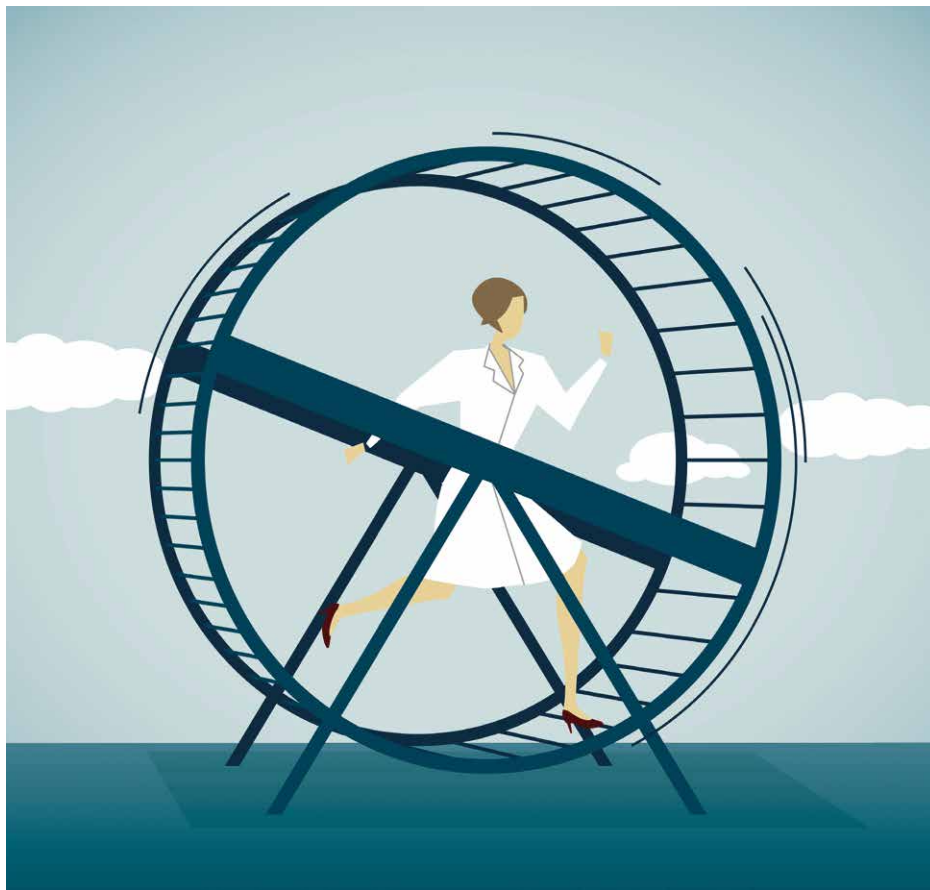
*plastic particles per square meter of water surface were measured by the scientists on the research vessel TARA in the Barents Sea and off the coast of Greenland. This is roughly a third more than the amount found in the notorious large garbage islands in the subtropical regions of the Pacific and Atlantic oceans. The Arctic is the end of the line for the global ocean currents that convey heat – and plastic.*

## How does plastic end up in the ocean?





# Lab Lifestyle



## Top-5 for your Lab

"Tell us your top five favorite songs for the lab!" – You answered our call for your favorite tunes on the Eppendorf Facebook page, and the results are in. Here are the top 5!

- |   |                         |   |             |
|---|-------------------------|---|-------------|
| 1 | Alestorm                | – | Alestorm    |
| 2 | Shape of you            | – | Ed Sheeran  |
| 3 | Nothin' But a good time | – | Poison      |
| 4 | Papercut                | – | Linkin Park |
| 5 | Children of the dark    | – | Mono INC    |

Equally worthwhile: see what happens when a composer makes music with just the materials on hand in a lab by following this Youtube®-link:

<http://bit.ly/2uihn5T>

## Fighting the routine

"Last Friday night, yeah we maxed our credit cards and got kicked out of the bar so we hit the boulevard" sings famous Katy Perry in her song "Last Friday Night." While I am listening to the song FACSing my samples of the experiment, I try to think about my last Friday night. Using the FACS (fluorescence activated cell sorting) machine is one of my highlights at the end of a week.

Those weeks always follow the same rhythm: sample acquisition, sample preparation and sample analysis. Last minute changes of the protocol included. And those weeks end with a long session of sitting in a room without a proper window and fresh air supply. To be fair: there is a window. One that shows the long hallway of the institute. Doing a 384-well plate for

a qPCR or preparing 87 different samples can lead to a boring lab routine. In those moments you have to stay focused, otherwise the whole experiment will fail and you have a good story to tell your grandchildren why you didn't receive the Nobel Prize.

### Working with music

When you are after a long lab week finally analyzing those samples on a FACS machine the routine kicks in. The same hand movements, the same quiet atmosphere of a lab on a Friday night. Not falling asleep or letting the machine suck in your whole sample plus those hideous tiny air bubbles your core-facility manager will kill you for seeing it in the system the next day are things to take care of.

There are different strategies to fight lab routines. I always listen to music. Not with headphones though. It scares me to

death, when someone enters the room on Friday night when you thought you were the only one left in the institute. I want to hear if some lab-loner is wandering around the hallway. Others are constantly texting with friends. Getting to know what normal people their age are up to on a Friday night.

I heard of a girl who even walks down the hallway on her hands. Handstand down the lab alley to fight the routine. In the end what keeps us all awake is the hope that this time it worked. The long awaited last result needed to publish. Until that happens – lab routine can't kill the excitement.

**Dr. Elisabeth Mettke (32)** is a dedicated immunologist and did her PhD in molecular Biomedicine at the Rheinische-Friedrich-Wilhelms University Bonn. In her freetime she spends nights thinking about how to show the world what she is doing. The results are Science Slams and talks about a DC life. Find an example here: <http://bit.ly/2umhmPe>





LOTTERY

### Do you want to play Lab Wars?

Win Lab Wars and try your luck in the lab. The deadline for submission is January 15, 2018. Send us an email to [magazine@eppendorf.com](mailto:magazine@eppendorf.com) or register as a subscriber and leave a message with the keyword "Lab Wars." Please find the terms and conditions on our website [www.eppendorf.com/otb](http://www.eppendorf.com/otb)

## Time to play!

"Lab Wars," a game sponsored by Eppendorf, is not only fun for researchers. Developer Caesar Al-Jassar about the idea behind it.

### How did you come up with the idea of Lab Wars?

**Caesar Al-Jassar:** I was reading "The Secret Anarchy of Science" – a book about the chaotic nature of scientific discovery – and was working at Cambridge University as a post-doctoral researcher. While playing games on holiday, it suddenly dawned on me and my partner Kuly Heer that we should try our hand at game de-

sign. We specifically made the game with scientists in mind and to make the experience funny, as a way of laughing at the idiosyncrasies of scientific life. We spent months play-testing and revising the game and raised \$65,000 having been featured in some prominent science magazines. We were really pleased that our hard work and community building paid off.

### What is the game about?

**Al-Jassar:** You are running a lab, trying to gain prestige while sabotaging others to get to the top. Interest-

ing to know: the action cards are based on real life sabotage events that have happened to scientists.

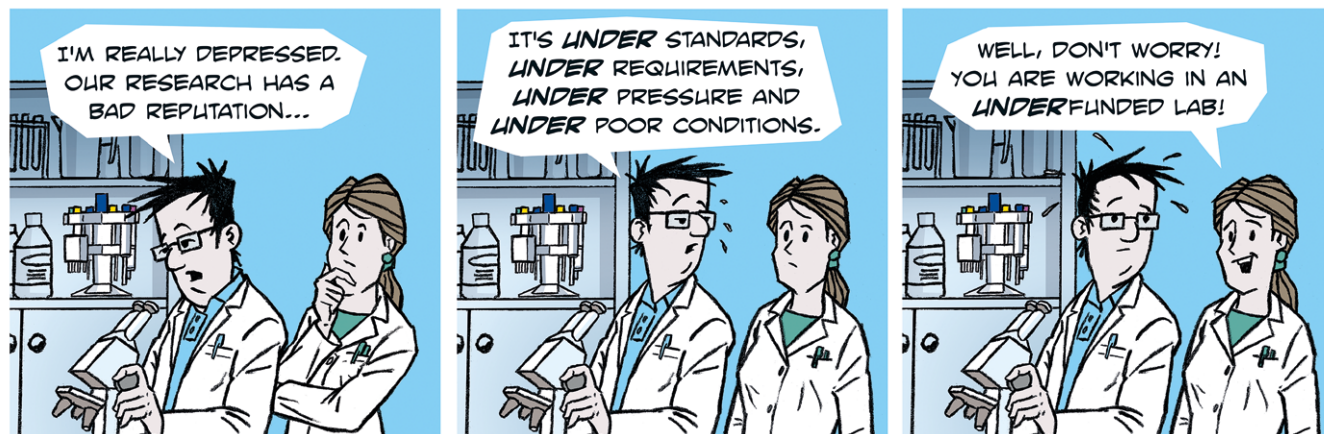
### What will be your next game?

**Al-Jassar:** We already kickstarted "Cauldron Master" in April 2017. Our next game will probably be our biggest since it has had rave reviews and lots of people are waiting for its arrival: "Dice Hospital" sees players run their own hospital. The more patients you discharge the more points you get!

[www.lab-wars.com](http://www.lab-wars.com)

## At the Bench

[www.eppendorf.com/pipetting](http://www.eppendorf.com/pipetting)



# Harnessing Super Plants to Combat Eco-Sins

Heavy metals burden the soils of our planet. Researchers have identified more than 500 super plants that independently clean the earth and may even generate raw materials.

**N**ickel, lead, zinc, highly toxic cadmium – all over the world, scientists across all disciplines are searching for methods to reclaim the contaminated sites of former mines and industry for renewed use. Decontamination using classic methods such as exchange or heating of the soil to 800 degrees centigrade is costly. However, help is on the way, and it originates in nature itself. Heavy metal contamination has finally met its match, and super plants are the new focus. “They are capable of concentrating toxic metals to amounts which are a hundred to many thousand fold above the levels found in other plants”, says Ute Krämer. The plant physiologist at Ruhr University in Bochum (Germany)

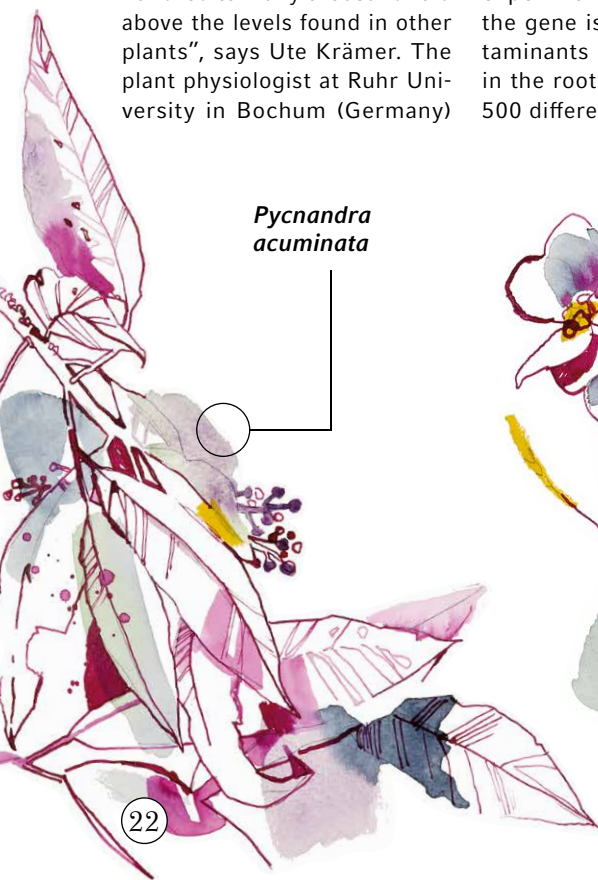
researches the DNA of *Arabidopsis halleri* (see info box).

## Hoover for heavy metals

Super plants take up the heavy metals with their roots like a biological vacuum cleaner. Plant cells push the toxic cargo further to the surface, where it is then deposited inside the vacuole, a cellular component, in the outer layers of the leaves. In the case of *Arabidopsis halleri*, a specific gene appears to be responsible for this logistical masterpiece: nicotianamine. It was discovered by molecular biologists at the University of Bayreuth during experiments involving zinc. If the gene is inhibited, the contaminants remain sequestered in the roots. So far, more than 500 different super plants have

## *Sinapis alba*

One super plant can even extract gold from the soil: mustard. Since the yield is negligible, however, this particular method of harvesting gold is best left to nature alone.



*Pycnanandra acuminata*



*Arabidopsis halleri*





been identified, raising scientists' hopes twofold: decontamination of industrial wastelands, also known as phyto-remediation, as well as the extraction of valuable raw materials, aka phyto-mining. If these plants, also called hyperaccumulators due to their capacity for storage, are burned, the respective accumulated heavy metals are left behind in the ashes and may be eluted with the help of acids. Mining with plants instead of pickaxes and mallets.

### The plant as a miner

Farmers in Albania already benefit from green mining: on the banks of Lake Ohrid, they harvest *Alyssum murale*. The ashes of the weed consist of twenty percent nickel. An even higher concentration was found in a giant tree in New Caledonia by the Dutch ecologist Antony van der Ent. If the bark of *Pycnanthus acuminata* is scratched, blue-green plant juice will emerge which consists of 25 percent nickel.

In contrast, storage of especially high amounts of cadmium, a raw material used in cell phone batteries, is a strength of *Nocca caerulea*, which also blossoms in the alpine meadows of the European alpine upland. The current joker among the magic plants is the South African *Berkheya coddii*. It is capable of extracting up to ten-fold concentrations of four metals simultaneously from the ground: nickel, cobalt, platinum and palladium. Platinum is indispensable in the

automotive industry as well as in medical engineering – the noble metal is a component of every catalyst and pacemaker.

### Heavy metals as a defense mechanism

What prompts the super plants to subsist on such heavy fare? Professor Krämer speaks of a natural defense mechanism: "They use the heavy metal concentrations as a defense against predation by animals." Some magical plants benefit from their heavy-metal content in yet another way: by securing their habitat. Once the contaminated leaves fall on the ground, no other plant will thrive.

Many questions remain open, however. Why do some plants display a preference for heavy metals, while others do not? Why are they impervious to the toxic substances? Ute Krämer: "We want to understand the mechanism behind the extremely high accumulation of metals in these plants, and what this means for the pathways on the molecular and physiological level." It is still a long way before any lucrative commercial exploitation of the hyperaccumulators will be feasible. ■

*Nocca caerulea*

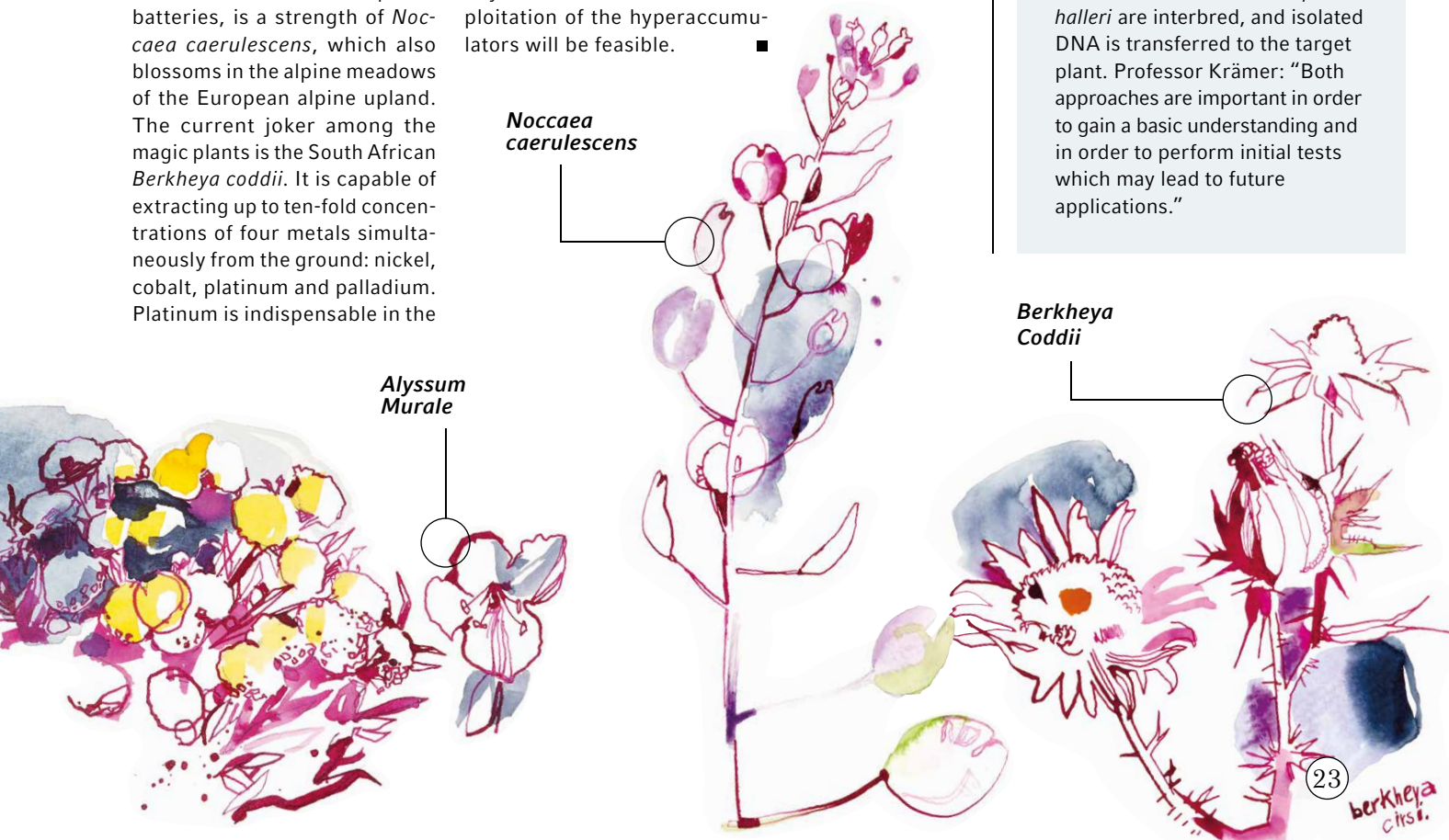
*Alyssum Murale*

*Berkheya Coddii*

### INFO

## The search for *Arabidopsis halleri*

In the past several years, Professor Ute Krämer and her team have traveled more than 40,000 kilometers across Europe in order to collect specimens of *Arabidopsis halleri* from industrial wastelands. This effort resulted in a collection of approximately 3,000 plants, kept at Ruhr University in Bochum (Germany). At this time, it is not clear why this plain weed is able to tolerate toxic heavy metals at such elevated concentrations. The researchers do know, however, that it is the plant itself, rather than the ground concentration levels, that determines how much lead, zinc or cadmium it will accumulate. "This is due to certain small but momentous genetic differences. We keep identifying more and more things, and we are investigating the functional context in detail", says Ute Krämer. In addition, different strains of *Arabidopsis halleri* are interbred, and isolated DNA is transferred to the target plant. Professor Krämer: "Both approaches are important in order to gain a basic understanding and in order to perform initial tests which may lead to future applications."





# The Desert is Alive

Spectacular display of nature: following a five year drought, heavy rains have transformed the California desert into a sea of flowers this spring.

**G**old is the new Green,” read the large letters on signs that adorn many a front yard in California, meaning: we save water and leave our lawns to wither. Until early April 2017, an extreme drought had kept California on tenterhooks for five whole years – until unprecedented amounts of rain began to come down on the Golden State. Dams burst, bridges collapsed. But then, in the spring, the tormented US state was compensated with an exceptional display: California’s deserts came into full bloom.

## **Hundreds of thousands of spectators**

“Super Bloom” is the term used for this breathtaking natural phenomenon, which plummeted several nearby desert towns into a state of emergency. Hundreds of thousands of visitors from the big cities descended on the area in their cars to admire the sea of millions and millions of flowers that had fought their way to the surface through the parched desert soil. On their way to the Anza-Borrego Desert State Park, for example, curious onlookers spent hours in traffic jams in order view up close rare beauties such as Bigelow’s monkeyflower, blooming cacti and Aloe vera as well as the pink glowing thorny bush Ocotillo. Even visitors from Asia deemed the flowering deserts worth a visit to California.

The super bloom was the result of a combination of fortunate circumstances. Heavy rain fell between December and February, after which temperatures rose to above 30 degrees Celsius over a period of two weeks. This perfect mix of rain and sunshine was precisely what the flower seeds beneath the

desert surface had been waiting for, some of them for decades, as Park Ranger Steve Bier informed journalists. “Some of the regions that are in bloom now had not seen rain in 20 years,” he reported. In fact, the west coast state had suffered an especially intense and long-lasting drought since 2011. Tree ring analysis revealed that the last drought period of this magnitude had hit California as long as 1,200 years ago. Authorities restricted the use of water, and any wastefulness was severely punished. Bumper stickers reading “Go Dirty for the Drought” were to convince drivers to forego washing their cars.

## **The heat suppressed invasive plants**

The suffering aside, the heat of the past years had at least one positive outcome: “It destroyed the many invasive grasses and plants that out-compete our native wildflowers,” said Richard Minnich, Professor of Geography at the University of California, Riverside, in an online article published in the San Francisco Chronicle. According to Minnich, “The best blooms often occur in the first wet winter following protracted drought, when there is limited interference from sparse exotic annuals.”

By January, the drought had come to an end. The deserts, however, displayed their blossoms well into early summer, at which time they, too, succumbed to heat and aridity. Until the next super bloom. While there is a chance of a repeat in the deserts of California, Arizona and Utah between March and April of 2018, the actual probability is low: the latest sea of flowers had kept us waiting for twelve long years. ■



A wide-angle photograph of a desert landscape during a super bloom. The foreground is filled with dense, low-lying purple flowers. In the middle ground, there are patches of white flowers interspersed with the purple ones. The ground is sandy and appears wet, reflecting the warm, golden light of the setting sun. The background shows a hazy desert horizon with some distant vegetation and mountains under a soft, orange-pink sky.

### Brought to life

Where there is normally a drought, the California desert flowered in the spring

## INFOBOX

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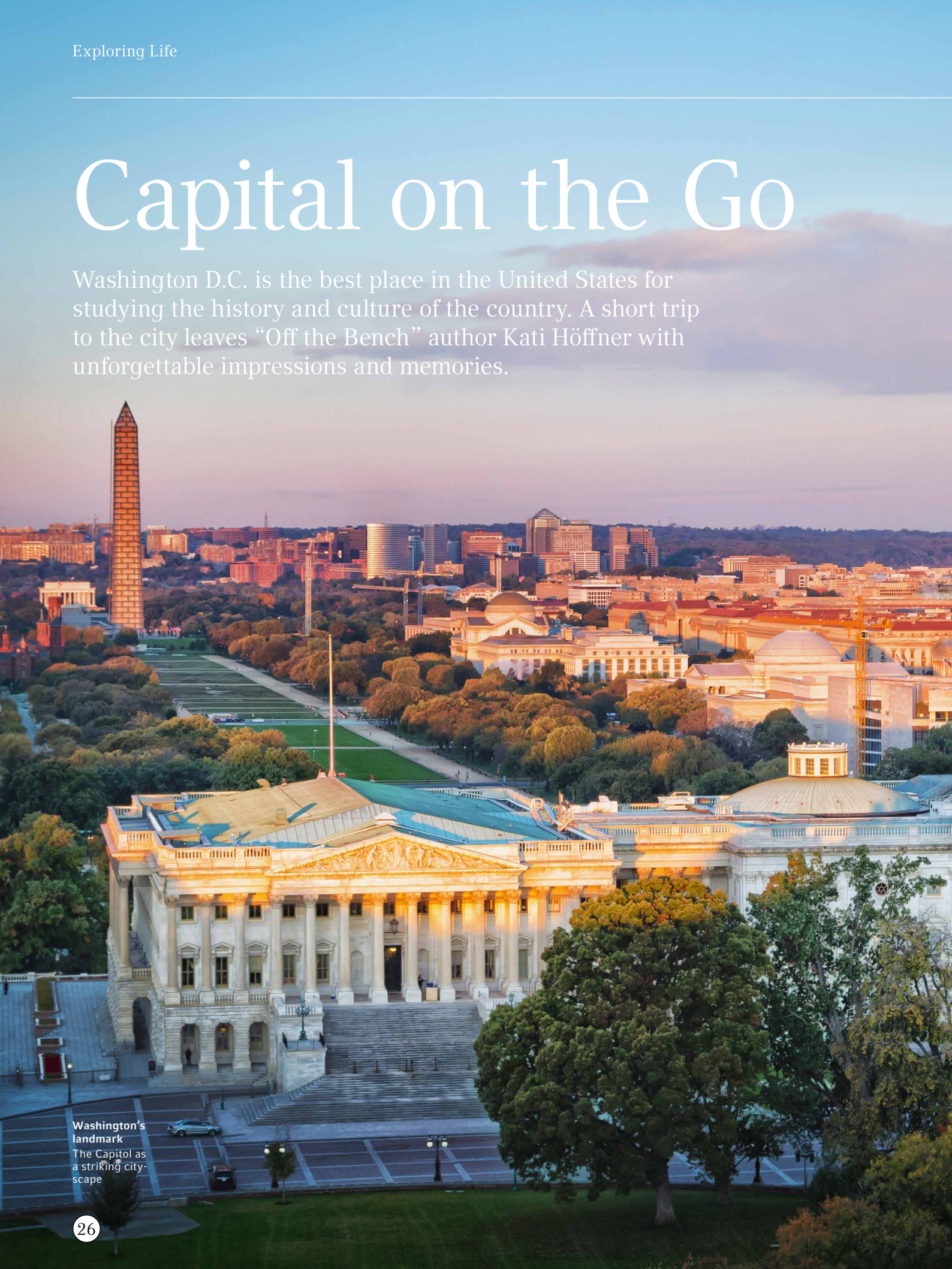
### BLOOMING DESERTS

The super bloom observed in the legendary Death Valley is particularly impressive. The National Park of the Mojave Desert stretches across the US-States of California and Nevada, and it is one of the driest regions on earth. The reason: on their way from the Pacific Ocean to the center of the continent, clouds first release their rain against five mountain ranges before they reach the valley. The valley's lowest point measures 85.95 meters below sea level. Death Valley has come by its name honestly – it is a hostile environment with temperatures rising to over 50 degrees Celsius in the summer. Despite this hardship, close to 400 animal species and approximately 1,000 species of plants manage to survive under these extreme conditions. In the winter, several days of rain ensure short flowering periods. A super bloom, however, requires larger amounts of rain. The Colorado Desert, between San Francisco and Los Angeles, too, experiences a vast number of desert flowers after a rainfall, but the Anza-Borrego Desert State Park is home to the most spectacular bloom. During the flowering period, the Joshua Tree National Park in southeastern California is also impressive. The park is named after the Joshua palm lily, which opens its flowers between March and May.



# Capital on the Go

Washington D.C. is the best place in the United States for studying the history and culture of the country. A short trip to the city leaves “Off the Bench” author Kati Höffner with unforgettable impressions and memories.

An aerial photograph of Washington, D.C. at sunset. The U.S. Capitol building is in the foreground, illuminated by warm golden light. The Washington Monument stands tall in the background to the left. The city skyline is visible in the distance under a colorful sky.

Washington's  
landmark  
The Capitol as  
a striking city-  
scape



66

*“Over the past 200 years Washington has morphed into a green, cultivated and hip metropolis.”*



It is humid, and people are sweating. If you intend to embark on an extended sightseeing tour in Washington D.C. in the summer, make sure to get an early start and definitely fuel up at one of the cozy cafes in Dupont Circle before you set out. We decide on the more convenient version and join John in his air conditioned minivan. A stroke of luck: our tour guide is a safe and swift driver, who all the while manages to familiarize us with the history of the American Capital.

We learn that Washington was founded here on the swampy grounds between the states of Virginia and Maryland as recently as 1790 and declared the capital in the year 1800. It must have been a dismal place, with few people, very few buildings and little infrastructure. Even so, curious visitors soon arrived to get an idea of what the new center of power of the New World was all about. As such, the English novelist Charles Dickens described in detail all the deficits of this artificial city, ranting about savage customs, decayed carpets in the Capitol and senators who refused to spit into their personal spittoons but rather spat wherever they pleased.

#### **Close to the political scene**

Dickens would be surprised today. The District of Columbia, abbreviated D.C., was planned with foresight on the drawing board and over the past 200 years has morphed into a green, cultivated and hip metropolis. We are passing the White House that we, as foreigners, are unfortunately not allowed to visit. John stops at the fence and we admire the home of the President from afar. Off to the White House Visitor Center, which provides ►

a good insight, and then onwards to the Capitol of the United States. The Capitol, a classical building featuring a rotunda and columns of Corinthian style was, alongside the White House, one of the first buildings in the city. It is home to Congress with its two chambers, the House of Representatives and the Senate. We are in luck, as we were able to snag a couple of tickets at the Visitor Center.

From the hills of the Capitol, we have a view of the National Mall and the Washington Monument in the distance; the marble memorial in the shape of an Obelisk measures close to 170 meters and is one of the tallest buildings in the city. We observe parents who explain veterans' memorials to their children. In between, there are the eleven museums and galleries of the Smithsonian Institute, the world's largest museum complex. We decide on the National Museum of American History to start our day of exploration. Its exhibits feature the most diverse artifacts, including a number of dresses worn by former First Ladies. There is one other highlight that we definitely did not want to miss: the National Air and Space Museum, where airplanes piloted by flight

pioneers can be admired alongside rockets and the lunar module. It is difficult to envision space pioneers Neil Armstrong and Edwin "Buzz" Aldrin using this tiny capsule to land on Earth's satellite.

#### A burger and a beer by the port

So many impressions to digest! We ask John to recommend a pleasant place for dinner. He takes us to the upscale neighborhood of Georgetown where we drive past many impressive mansions. This is how the Washington upper class lives! In a small pub by the port, we order a burger and a beer; a combination strongly recommended by Mike, our waiter, who has a great sense of humor. Mike explains that a number of local craft brewers brew their own beer. When we finally make our way home, we are very tired but filled with new impressions, and we decide to take it easy and preserve our strength during the following day's cultural excursions. We plan on joining a twilight tour, complete with night life, in the trendy neighborhood of Adams Morgan. If we cannot fit in everything that is on our list, no matter – we will return. ■



## LET'S GO!

Tours and Food: Discovering Washington D.C. in more than one way.



# 1

Tours of Washington may be booked through the **CAPITOL VISITOR CENTER** ([tours.visitthecapitol.gov](http://tours.visitthecapitol.gov)) or via the "Office of Visitor Services" by calling (202) 226-8000. For Capitol Hill, we recommend guided tours. A number of providers offer tours exploring specific areas of interest, such as **ART AND HISTORY**.

[www.washington-dc-tour.com](http://www.washington-dc-tour.com)



**A BOAT TOUR ON THE POTOMAC RIVER** is particularly charming; whether you choose a large river cruiser, an amphibian vehicle or a small and fast motor boat with only two guests and the skipper – a view from the water offers an entirely new impression of the capital of the United States. You will have a choice between pure **SIGHT-SEEING** and tours that include **BRUNCH OR DINNER**. If you are still up to partying in the evening, consider ending your sight-seeing day by joining a party river excursion.





**Record** In 2016,  
21.3 million people  
visited the capital



**A change in perspective**  
Washington seen  
from the water



**The Supreme Court**  
Marble pillars form part  
of the majestic building



## SCIENCE IN WASHINGTON

Neuroscience 2017 will be held in Washington DC this year. At the Eppendorf booth, we will feature new products such as our CryoCube® F740 series of Ultra-Low Temperature Freezers which combine maximum sample security with an energy efficient design. Our new biological shaker, the Innova® S44i is designed for 24/7 operation, meeting the needs of the most demanding applications. It offers a greater capacity in a smaller footprint – unmatched for 2L flasks! Also on display will be our new PCR thermal cycler! High speed runs with a 10C/s ramp rate, expanded networking capabilities and enhanced optimization functions like the 2D-Gradient make the Mastercycler® X50 the ideal tool. And especially relevant for this market, customers can sit at our microscope table and use our microinjector and micromanipulator with live samples.

# 3



The White House provides excellent meals, which is why many Presidents have preferred to dine at home. Not so for Barack Obama, whom many restaurant testers nicknamed **“THE FIRST EATER.”** Together with his wife Michelle, he sampled Washington’s rich culinary scene and thereby gave it a significant boost. Washingtonians were delighted to see that the Obamas did not

limit their dining to first class restaurants but also frequented **BURGER SHACKS** and **SIMPLE FUSION** restaurants.

**TED’S BULLETIN:**  
[tedsbulletin.com](http://tedsbulletin.com)

**BOBBY’S BURGER PALACE:**  
[bobbysburgerpalace.com](http://bobbysburgerpalace.com)

**SCION:** [scionrestaurant.com](http://scionrestaurant.com)

[www.washingtonian.com](http://www.washingtonian.com)

# 4

In addition to a large number of inexpensive restaurants, beer gardens and pubs that offer menu items between \$10 and \$20, Washington D.C. – like all cities that attract money and power – is home to a culinary premier league. It often serves as the preferred place for **“POWER DINING”**: the dinner to close a business deal or reach a political agreement. If you are able to secure one of the coveted tables (definitely make your reservation prior to your trip), you may have a chance to spot **CELEBRITIES** from the realms of politics, Hollywood or popular culture, such as former Vice President Joe Biden and his wife or Hollywood stars like Pierce Brosnan.

**LE DIPLOMATE:**  
[lediplomatedc.com](http://lediplomatedc.com)

**CASA LUCA:**  
[casalucadc.com](http://casalucadc.com)

**FIOLA AND FIOLA MARE:**  
[fiolamaredc.com](http://fiolamaredc.com)





Help!

# Knowledge Transfer

The knowledge portal “Eppendorf Handling Solutions” conveys expert knowledge on all aspects of laboratory work. The field of competence “Sample Handling” is its latest addition.



## Liquid Handling

All those who visit the area “Liquid Handling” will encounter the “Pipetting Ninja”. In this game, everyone is invited to put their pipetting skills to the test. In addition to entertainment and fun, and the conveyance of expertise through videos and links to webinars, visitors to this field of competence will discover what is really important when handling difficult liquids.

Young researchers and seasoned laboratory experts alike may be interested to learn how ergonomic pipetting can help prevent discomfort in hands, shoulders or backs. A total of four articles are dedicated to this health topic.



## Cell Handling

When the scientists George and Margaret Gey cultivated the tumor cells of a cancer patient back in 1951, they gave medical research a pivotal boost. In addition to historic background, the areas of cell identification, reproducibility and contamination convey profound laboratory knowledge. The latter topic is particularly controversial as contaminations compromise cell cultures and may render research results unusable.

With the initiative “Who has seen these villains?” Eppendorf is drawing attention to these dangers lurking in laboratories, for example, in the shape of mycoplasma. Interested researchers will find recommendations on a number of “posters.”



NEW

## Sample Handling

The area “Sample Handling” is the latest addition to the Eppendorf Portal. Young scientists, in particular, may be interested in the general education piece covering all aspects of working with centrifuges. It explains how the various instruments differ from one another, which model may be best suited to one’s own research and how to handle it safely.

Safety plays a prominent role within this area of competence, and respective articles are highlighted with an icon. If you click on “user safety”, for example, you will automatically be immersed in the world of “aerosols”. A small taste of the topic can be sampled in the article on page 31 (see right).



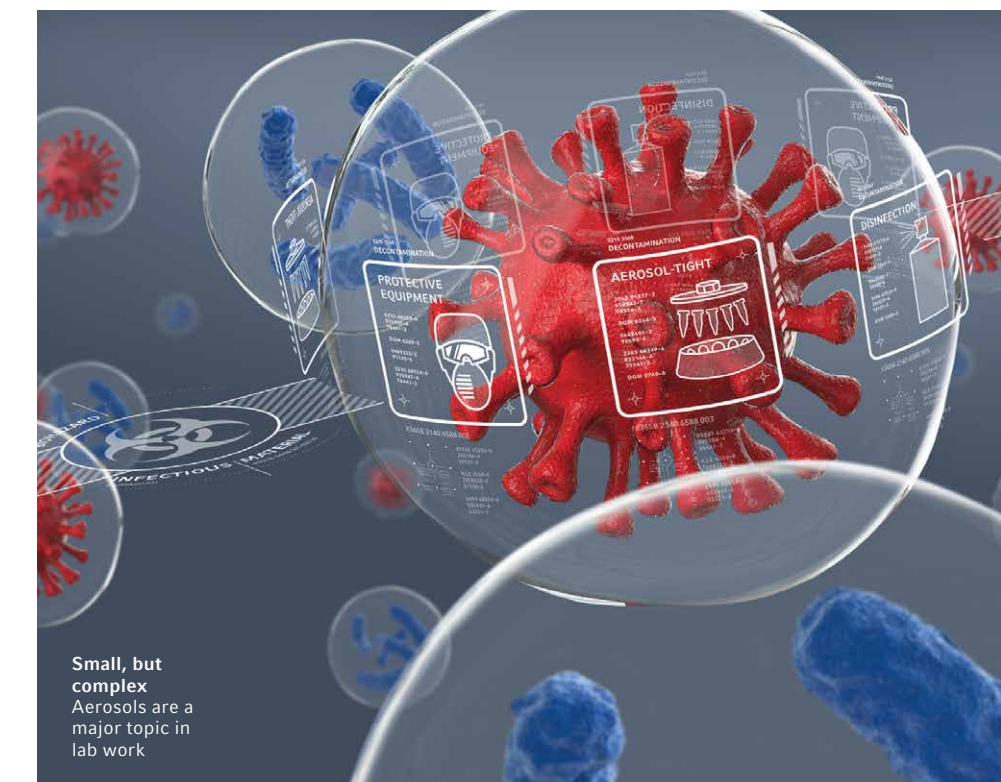
# There's Something in the Air

Aerosols are omnipresent. In the laboratory, they have the potential to harm the worker. The area “Sample Handling” sheds light on the safe handling of these micro-particles.

Let's take a deep breath. With this breath, you have inhaled millions of particles, so called aerosols. An aerosol is defined as a colloidal system of solid or liquid particles in a gas. Hardly any place in the world is free of aerosols, and all of us inhale them continuously. We differentiate between aerosols of natural and anthropogenic origin. Natural aerosols can be fog, sand, forest exudates, and sea spray just to name a few examples. Aerosols of anthropogenic origin are deodorants, cigarette smoke, dust, and exhaust emissions. In nature, airborne dust consists of up to about 25 percent biological particles; in urban and agriculturally dominated areas, this percentage is usually higher. In the following, we will focus on bioaerosols because they are the most interesting type of aerosols to those working in labs.

## Bioaerosols

Bioaerosols are complex mixtures consisting of several components that can stem from simple organic molecules, as well as viruses, bacteria and bacterial spores, mold spores and hyphae and pollen. It's easy to imagine the kind of critical role these bioaerosols can play in your daily laboratory work! The generation of aerosols not only takes place through breathing, speaking, coughing and sneezing; it also occurs through everyday lab activities such as pipetting, centrifuging, opening of ampoules, and shaking – just to name a few. Aerosols are classified in three different size ranges: Droplets ( $> 100 \mu\text{m}$ ) tend to land on the ground before they evaporate. They can cover surfaces (like tables, instruments, etc.) and contaminate them and therefore constitute a source of staff exposure to infections via ingestion and dermal contact. Dust ( $10\text{--}100 \mu\text{m}$ ) and droplet nuclei ( $< 10 \mu\text{m}$ ) are very small aerosols. Droplet nuclei consist of bacteria (or another biological agent) in a droplet. When the droplet fluid evaporates, the bacteria remain in a dried state. Due to their low settling velocity, droplet nuclei may remain



suspended in the air for several hours and can be widely dispersed by air currents (caused by movements of people, but also air conditioning etc.). The settling velocity of aerosols (the number of microorganisms that settle on a petri dish in a given time) can vary greatly and depends on the particle type: The bigger the particle is, the greater is the settling velocity and the lower the risk of inhalation through the lab personnel and vice versa. This means bioaerosols can potentially expose personnel in different ways: With every breath, millions of particles come into contact with our respiratory tract. Some of the particles, especially the ones smaller than four micrometers, will gain access to lung tissue. And some can even reach our bloodstream.

## Laboratory-acquired infections and bio-safety levels (BSL)

When working in laboratories where potential infectious bioaerosols appear, cer-

tain security standards are required to protect the health of the employees in the lab and the environment. These standards are displayed in so called biosafety levels from 1 to 4, whereas level 1 represents the lowest and level 4 the highest standard. Only for those working with potentially infectious material of security level 2 or higher, aerosols in the lab can become a health hazard, a so-called laboratory-acquired infection (LAI). Even though serious LAIs are quite rare, there is still a risk for infections not only for you, but also for your colleagues or even your family. On our website “Eppendorf Handling Solutions” the section “Sample Handling” offers more detailed information about aerosols, and more importantly how you can work with infectious agents in a safe way.

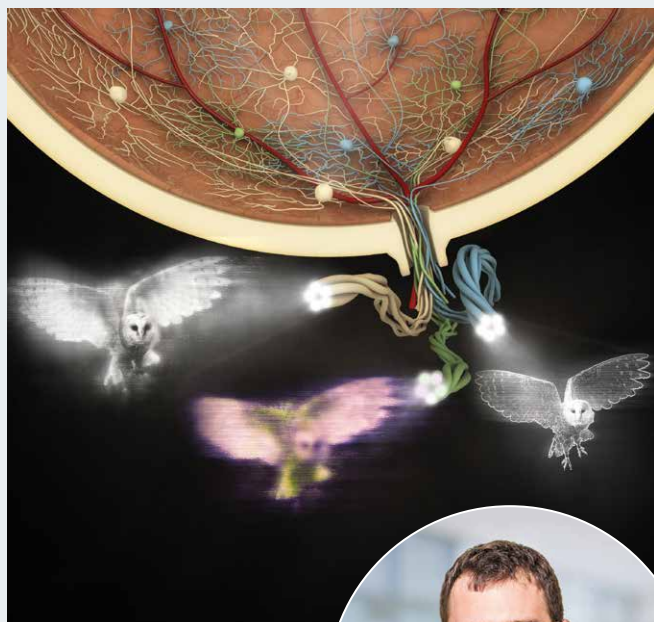
<https://goo.gl/b4kq39>

# Tom Baden wins Eppendorf Award 2017

The 22nd "Eppendorf Award for Young European Investigators" was presented to Dr. Tom Baden on June 22nd, 2017 in Heidelberg, Germany. The Senior Lecturer in Neuroscience at the University of Sussex in Brighton (UK) was recognized for his research on signal processing in the retina. "I am humbled and delighted by this award, which recognizes a long-standing team effort that involved the hard work of several talented colleagues", the 35 year old award winner thanks the jury. In his scientific presentation, Baden de-

scribed how light patterns, which act on millions of light receptor cells inside the eye, are eventually transferred to the brain in the form of a multilayered, highly parallelized representation of the world. With this award, Eppendorf recognizes exceptional biomedical research by young scientists from across Europe. The award is endowed with 20,000 euros and is presented in cooperation with the scientific journal *Nature*.

[www.eppendorf.com/award](http://www.eppendorf.com/award)



**Tom Baden** On his site [badenlab.org](http://badenlab.org) the award winner reports on his research projects such as his work on signal processing in the retina (Picture: © Thomas Splettstoesser, SciStyle)



## Twice in first place

During the presentation of the Scientists' Choice Awards® at the International Conference and Expo "Pittcon" 2017 in Chicago, Eppendorf was recognized not once, but twice: while the Eppendorf Centrifuge 5920 R impressed as "Best New General Laboratory Product", the Eppendorf Customer Service was awarded the title "Customer Service of the Year". Kerry Parker, Editor-in-Chief at the host journal "Select-Science": "When investing in their laboratories, scientists read other scientists' assessments and rely on those evaluations. It is therefore a great distinction for Eppendorf that customers rate their Service and Support to be the best within the scientific industry."



## Fast, flexible and safe

Biosimilars are pharmaceuticals that are manufactured through biotechnological means and that are comparable to the original medication, and which are approved after patent protection of the original pharmaceutical has expired. In an article published in the journal "BioProcess International", different cell cultivation methods for the manufacture of biosimilars were compared: batch, fed-batch and perfusion. All experiments were performed using the Eppendorf BioFlo® 320. The bioreactor control station allows flexible exchange between different processes, while the single-use bioreactors further shorten the setup time between two experiments as well as drastically reduce the risk of contamination. The result of the experiment: especially in combination with perfusion techniques, higher product yields can be achieved.



**THERE'S MORE:** Visit the website

[www.eppendorf.com/otb](http://www.eppendorf.com/otb)



## Invest in the future

Since March 22nd 2017, Eppendorf AG has been holding a majority share in the Groningen, Netherlands-based firm Bio-ITech B.V. "For over a year now, we have been working closely with Bio-ITech on the subject of device and data networking", states Thomas Bachmann, Chairman of the Board of Eppendorf AG. With this majority stake, both firms are counting on a long-term collaboration.



## Eppendorf App: new version

If you diligently collect ep-Points, entering your points is now even easier. This is how it works: open the Eppendorf App, scan the QR code on the label using a mobile device and secure awesome premiums. Additional new App functions are waiting to be tested: optimized full-text search, new calendar functions and a CCC calculator as well as the game "Master of Dexterity", which challenges you to build the highest tower. The "Off the Bench" magazine, by the way, is also available within this App.



**THIS WAY TO THE APP:**  
Scan the QR and get the Eppendorf App!

<https://goo.gl/mUQ9Fy>

**Adrian Liston**  
Professor at the life sciences research institute VIB and University of Leuven (Belgium), Eppendorf Award Winner 2016



## It's all about communication

Adrian Liston is a frequent user of social media and blogger. A hobby with benefits for his work.

### What social-media-tools do you use?

**Adrian Liston:** The most important format for me is my lab blog (see below), since it allows as much room to write as I need to articulate a thought. I publish a blog post on average once per week, and I have been doing so since I started my own lab in 2009. Next would be twitter®, which is a personal account rather than a lab account, but which is usually about science, science policy or the like. I tweet more often, perhaps twice a week on average. LinkedIn® I largely use it to post job opportunities to alumni from my lab.

### What are the benefits?

**Liston:** If someone is thinking about joining my lab it is quite easy for them to get an idea on my philosophy of science and research, which is probably useful. Sometimes I have patients contact me because they came across my research write-up and it interested them. Certainly frequent blogging is a great way to practice

writing non-technical summaries of my work – it makes me much better at identifying which stories are likely to get picked up after a press release, and helps me write a press release which is interesting without over-selling the work. Science isn't science until it is communicated, and good writing skills are the foundation of communication.

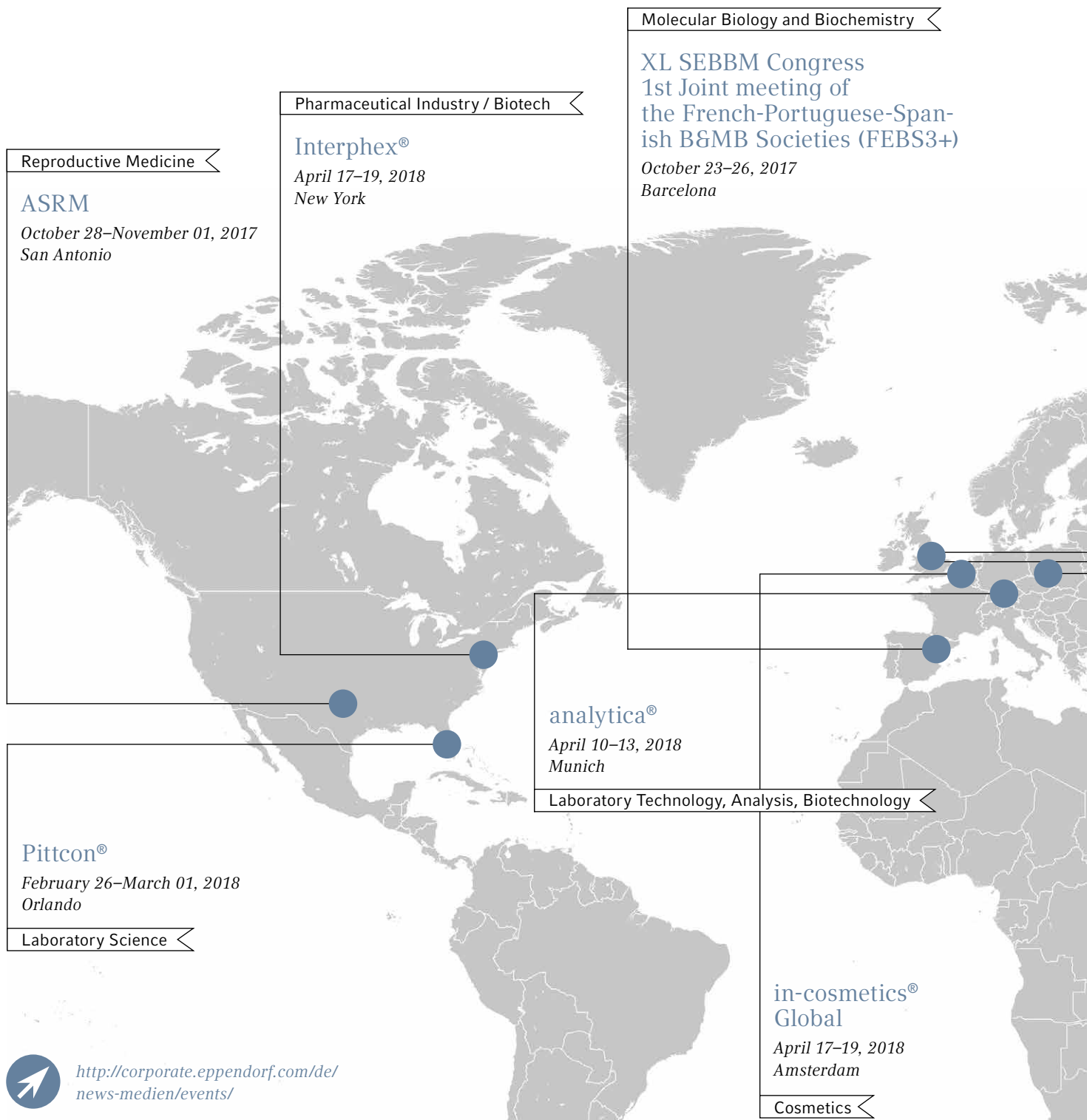
### How much time do you spend on social media?

**Liston:** A blog is not a formal paper, it is a thought bubble. So usually I will just have an idea, spend perhaps 15 minutes typing it out and then release it. Or I am writing up work that I have already written up formally, so again, it doesn't take that long. I consider social media my hobby; I use it because I enjoy it. If I get too busy I just put it aside for awhile.

<http://liston.vib.be/blog/>

# Meet our Experts

Learning and communicating innovations:  
Eppendorf is represented at many of the world's  
leading trade fairs. Here is a brief overview.



<http://corporate.eppendorf.com/de/news-medien/events/>

#### Cell Culture/Bioprocess

### 6th Annual Cell Culture and Bioprocessing Congress

November 06–07, 2017  
London

#### Laboratory Equipment

### Lab Innovations

November 01–02, 2017  
Birmingham

#### Pharmaceutical Industry

### Pharmtech & Ingredients

November 21–24, 2017  
Moscow

#### Laboratory Equipment and Chemical Reagents

### Analitika Expo

April 24–26, 2018  
Moscow

### EuroLab

March 14–16, 2018  
Warsaw

#### Laboratory Equipment

## Comprehensive connectivity

A vision of the future working life in the laboratory was showcased by Eppendorf in collaboration with twelve partners from science and industry at the smartLAB at Labvolution in Hanover, Germany in May 2017. With its smart surfaces and laboratory furniture, the laboratory of the future not only convinces on an optical level – networked devices and central data archiving simplify the workflow, thus readying the laboratory for the future. “The smart-Lab combines market-ready applications with long-term visions. The most outstanding features of the smartLAB are not limited to individual components, but rather their interplay makes the difference”, explains Sascha Beutel of the Institute for Technical Chemistry at Leibniz University in Hanover, the institution is responsible for leading the project. In the meantime, a nationwide innovation network – supported by the Federal Ministry for Economic Affairs and Energy (BMWi) within the framework of the Central Innovation Program for the mid-sized sector (ZIM) – promotes the development and standardization of innovative laboratory technologies.

### The digital lab is becoming a reality

In a separate exhibition booth, Eppendorf was then able to demonstrate to visitors of the Labvolution how far the company has already progressed in all things device-networking. The Eppendorf VisioNize® System, introduced in selected countries and comprising hardware and software components, will allow the user to interconnect and monitor multiple Eppendorf instruments with a central software application. The system further offers central data management for all connected instruments.



### Eppendorf at the Labvolution

The new VisioNize® system as home base for laboratory device networking



# The Transcontine

WIM DELVA

I suppose my penchant for crossing international borders started when I was just 3 months old. That's when my twin brother and I flew across the ocean from Chile after being adopted by Belgian parents. Later, my undergraduate research led me to Kenya for a 3-month research internship, where my interest in HIV and statistics was born. Then, halfway through my Ph.D. studies, I moved from Belgium to South Africa, where my wife is from. In the 8 years since, I have found career opportunities that keep me connected to both countries, and I have experienced the rewards – and challenges – of being a human bridge across two continents.

## Moving for career prospects

I decided to move to South Africa in part because I was excited about what it could do for my career prospects, even though I knew that it would be hard to be away from

aries. Today, I am affiliated with three Belgian universities and a national research center in South Africa. This has been possible thanks to my ability to do my work – mainly computer simulations and statistical analysis – almost anywhere, and the open-mindedness of my Belgian and South African bosses, who understand the value of international mobility.

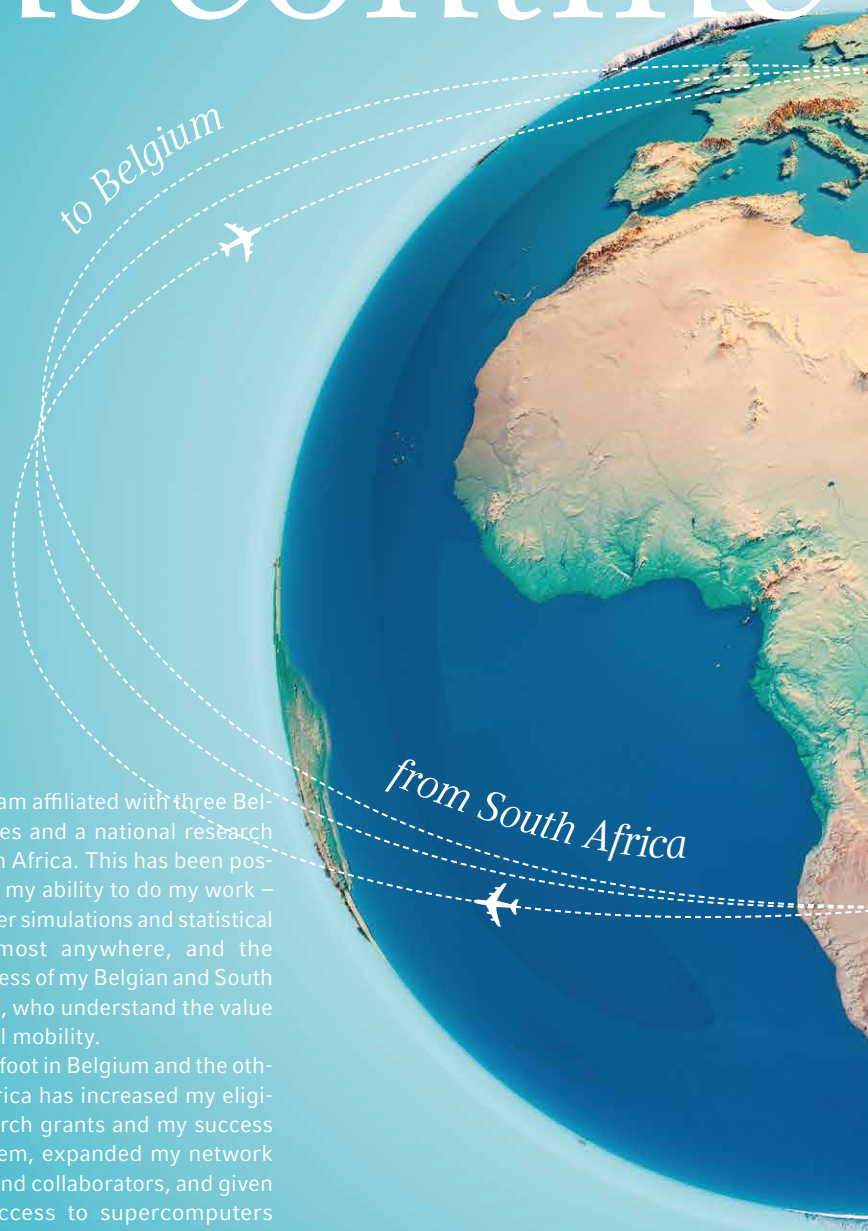
Having one foot in Belgium and the other in South Africa has increased my eligibility for research grants and my success in securing them, expanded my network of colleagues and collaborators, and given me greater access to supercomputers and other research infrastructure. My cross-continental connections have also benefited the students I work with. For Belgian medical students, doing fieldwork in poor South African communities that are heavily affected by HIV adds purpose and perspective to their textbook constructs of how social circumstances influence health. Students based in South Africa benefit from additional guidance from senior Belgian statisticians.

“I have experienced the rewards – and challenges – of being a human bridge.”

my family and Belgian colleagues for much of the year. South Africa and the unit I was joining were a perfect fit for my research on sexual behavior and HIV transmission, and I expected that potential future employers would view my move as valuable international experience.

## International mobility welcome

I have gone on to build an independent research career across continental bound-



# ntal Scientist



## From challenge to opportunity

Yet, there are times when I feel stretched to the limit. Each of my academic homes expects me to supervise students, apply for grants, and contribute to the institution's strategic planning, among other responsibilities. Keeping professional and social ties strong on both sides of my Belgian-South African double life also requires flying back and forth a few times each year,

on top of routine travel for conferences and workshops. This transcontinental commuting is tiring, and it imposes stress on my young family. Our coping strategy has been to turn the challenge into an opportunity whenever we can. In the past year, I have taken our 3-year-old daughter with me to Belgium four times. It's expensive but worth it. It helps balance parental responsibilities, allows her and my Belgium-based family to build a strong relationship, and gives her an immersion in Dutch.

## Managing family and career

In the future, I dream of having part-time tenure in both countries, though whether

such a scenario is achievable – or even desirable as our kids grow older – is unclear. Sacrificing proximity to family for academic opportunities is a dangerous game. I was reminded of this last July, when my father died after a 7-year battle with cancer; I arrived in Belgium just in time to say goodbye. He had worked very long hours for most of his life, and I know he regretted not spending more time with my brother and me when we were kids. I hope that I won't feel the same 30 years from now. On the other hand, in those last days together as a family I thanked my father for the wonderfully empowering outlook on life that he imparted: If you truly believe in your dream, pursue it regardless of practical obstacles. ■

*Wim Delva is a postdoc at the University of Leuven and Hasselt University and an assistant professor at Ghent University in Belgium. He is also the deputy director for research at the South African Centre for Epidemiological Modelling and Analysis at Stellenbosch University.*

**Science**  
AAAS

INFOBOX



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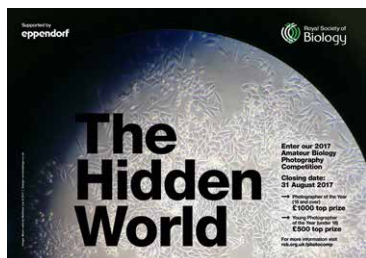
# The Autumn's Beauty

His photograph did not win Amitava Chandra the title "Photographer of the Year" in 2016, but it certainly impressed the jury. Receiving a "special mention," it was highlighted among other remarkable works.



## About the photograph and its master

"This unique white grass, a gift from nature to enhance the beauty of autumn, is called kash in vernakular. For a short period during the fall it erupts in abundance without any cultivation or help from mankind," Amitava Chandra describes his photograph, taken in Kolaghat, West Bengal (India). Chandra, who has won several major international awards, explains his passion for photography as follows: "In the world of daily mundane reality, it is that magic realism which supplements and provides with the source of sustenance and impetus to me, whenever I personally encounter the sense of disbelief of my very existence."



### CAPTURING THE HIDDEN WORLD

The theme of this year's Royal Society of Biology amateur photography competition is "The Hidden World". Supported by Eppendorf since 2012, the competition invites photographers to submit their pictures and compete for the title "Photographer of the Year" (18 and older) and "Young Photographer of the Year" (under 18).









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# The Next Stage

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[www.eppendorf.com/mastercycler](http://www.eppendorf.com/mastercycler)

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