

WE ARE CHEMICALS!

Creativity

3/2015

**WHO HAS IDEAS? WHO CONSTRUCTS THE FUTURE?
WHO CREATES NEW VALUES? WHO DISCOVERS THE
UNKNOWN? WHO DARES?**

Publication date:
October 2015

LIVE FROM THE BLACK-AND-YELLOW HEART OF SOCCER

Reading the Game. A Year in Black and Yellow – Borussia Dortmund's most dramatic season ever, as told by German literature's best-known players with soccer balls and words. Featuring guest pieces from Jürgen Klopp, Sebastian Kehl, and Oliver Kirch.



The book of the column
"Evonik Wortsport"
(Evonik Word Games)

MORITZ RINKE (PUB.)
Reading the Game.
A Year in Black and Yellow

248 pp. | Illustrated by Tim Dinter

Available only as e-book

Blumenbar

“Creativity is the force that transforms problems into progress.”



Klaus Engel, Chairman of the Executive Board of Evonik Industries AG



Dear readers,

Two thirds of all the professions that the coming generation will work in haven't even been invented yet. In addition, we aren't even aware of many of the problems that people will then have to solve.

Looking into the future requires a certain amount of courage and confidence. Indeed, even today we can see that current global challenges, such as population growth, climate change, water scarcity, and the understandable desire of everyone for prosperity, appear to be pushing the resources of our planet to the limit.

Still, human beings have a unique and inexhaustible resource at their disposal—their creativity. The ability to continually develop solutions for new challenges is what sets us apart from every other living thing on this planet.

Creativity is the most important skill of the 21st century. Researchers in all scientific disciplines venture into new territory every day, and people in business and industry are continually working on innovations. For us at Evonik, this means that we have to provide our employees with the freedom they need to awaken their talents, curiosity, inquiring minds, and courage. This is how creativity arises—the force that transforms problems into progress and thus makes the future possible.

Advanced technology is available to nearly every company in the world today. Any differences here often lie only in the details. Whether or not a company's innovations will be successful is thus determined by the employees' creativity. This involves questions such as: Who can understand customers' needs more quickly, and who can meet these needs more reliably? Who has the best ideas and is the first to develop solutions for challenges that others can't even see?

This issue of our magazine features stimulating profiles of creative people —those who will shape the future. Pleasant reading!

Sincerely yours,

Cre|ativ|i|ty

MASTHEAD

Publisher

Evonik Industries AG
Rüdiger Oppers
Rellinghauser Straße 1–11
45128 Essen, Germany

Publication Manager

Urs Schnabel

Consulting and Concept

Manfred Bissinger

Editor in Chief

Christof Endruweit
(responsible for editorial
content)

Editors

Ralf Grauel (Head)
Michael Prellberg (Head
of Text); Uwe Killing,
Tom Rademacher, Rainer
Schmidt, Petra Thorbrietz,
Klaus Vogt (Associate)

Managing Editor

Inga Borg

Picture Editing and Layout

C3 Creative Code and
Content GmbH Berlin

Translation

TransForm GmbH,
Cologne

Agency and editorial address

BISSINGER[+] GmbH
Medien und
Kommunikation
An der Alster 1
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info@bissingerplus.de

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Questions about Evonik Magazine

Tel.: +49 201 177 – 3152
e-mail: evonik-magazin@
evonik.com
Fax:
+49 201 177 – 703152

ORIGIN From the Latin word “creare”: create, generate, conceive, produce. In the 19th century, the word was exclusively reserved for the fine arts, but in the early 20th century it was also applied to the sciences and to nature.

TYPICAL ASSOCIATIONS Research, education, communication, innovation

SYNONYMS Ingenuity, imagination, inventiveness, genius, intelligence

ANTONYMS Lack of imagination, lethargy, dullness, conventionality

USAGE

GENERAL: The ability of a group or an individual to think and act in an imaginative and creative way.

BUSINESS: The generation of new markets, products, and services.

LINGUISTICS: The ability to conceive and apply new and hitherto unknown concepts.



“Nobody starts from scratch and invents something that the world has been waiting for. Chance favors only the prepared mind”

Holm Friebe thinks about ways in which creativity and industry can work together. The power to create is nimble and hard to take hold of. By contrast, organizations require standards. However, every industrial group started out as somebody’s visionary idea, as the story of the Velcro brand illustrates.

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Creative people are guided by their inspiration, their intuitions, and their dreams. But they know what the next step is: hard work directed at their goals. Thanks to this combination, they enrich our lives



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Which exercises work, and which don’t? Best-selling author Bas Kast has tried out all the creativity strategies—and he presents the eight best ones here

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Creativity arises in the mind, but there’s another key factor: places that foster creativity

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Every industrial group is based on a key idea that generates momentum and success for decades. But what happens after that?

Creative reconstructions of the moments when popsicles, coffee filters, post-it notes, and ballpoint pens were invented

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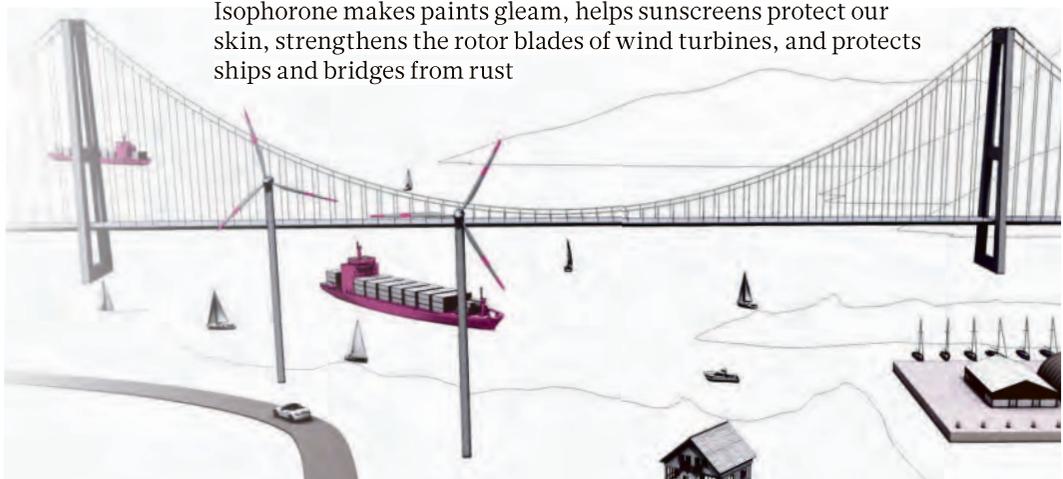
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Isophorone makes paints gleam, helps sunscreens protect our skin, strengthens the rotor blades of wind turbines, and protects ships and bridges from rust



Facts + Figures



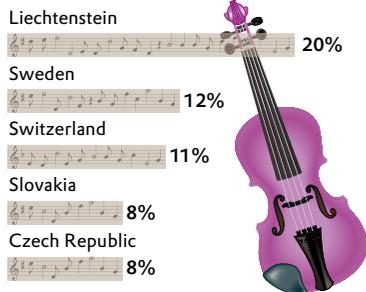
Making Music Makes You Smart

First, the bad news: For years, expectant mothers made a habit of exposing their bellies to music in hopes of giving birth to smarter children. Students at the University of California at Irvine had performed better than average on a test of spatial reasoning after listening to a Mozart sonata. Today, this “Mozart effect” is considered a myth, a statistical outlier, but four out of five Americans still believe it. As do many Germans.

But the good news is that listening to music can indeed make us smarter, but only if we’re the ones who actually make the music. A study carried out at Harvard University demonstrates that playing an instrument has a positive effect on the powers of concentration, discipline, and creativity of children.

Calling the Tune in Europe

Countries with the highest percentage of citizens visiting a music school



Listening helps a little. Although listening to music doesn’t actually make people any more intelligent, it does provide stimulation during work and study. Evidence of this was provided by the English behavioral therapist Emma Gray with her long-term study. For scientific or mathematical work, she recommends a style of music with 80 to 100 beats per minute, because the left side of the brain, which is

responsible for rational thought, responds well to that pace. That should be welcome news to fans of popular and classical music. The right side of the brain is the seat of our emotional responses, and it drives artistic processes. Preferably at a tempo of 145 beats per minute.

3 QUESTIONS FOR

Paul Collard
“Where Will the Jobs Come From?”



1 Is our educational system laying the right groundwork for tomorrow’s working world?

About 60 percent of the jobs that we’ll be doing in 20 years haven’t been invented yet. So at schools, we shouldn’t be educating job seekers but instead persons of character who are capable of exercising their creativity, social skills, and emotional intelligence. This will enable them to create a job themselves or carry out a variety of activities.

2 Where does your approach start?

With the organization “Creativity, Culture and Education,” we’ve worked on a project basis at about 2,700 schools in the UK, and now we’re also working in Norway, Paki-

stan, Australia, and Germany.

3 How do you measure the success of your work?

We see that the pupils are much more motivated, self-confident, and goal-focused than those in teacher-centered teaching. The same is true of the teachers. We also encourage them to tap into their creative potential to a greater degree and continue applying the methods after the program ends.

Paul Collard is a famous education reformer. About 140 German schools are taking part in pilot projects of his organization “Creativity, Culture and Education.”

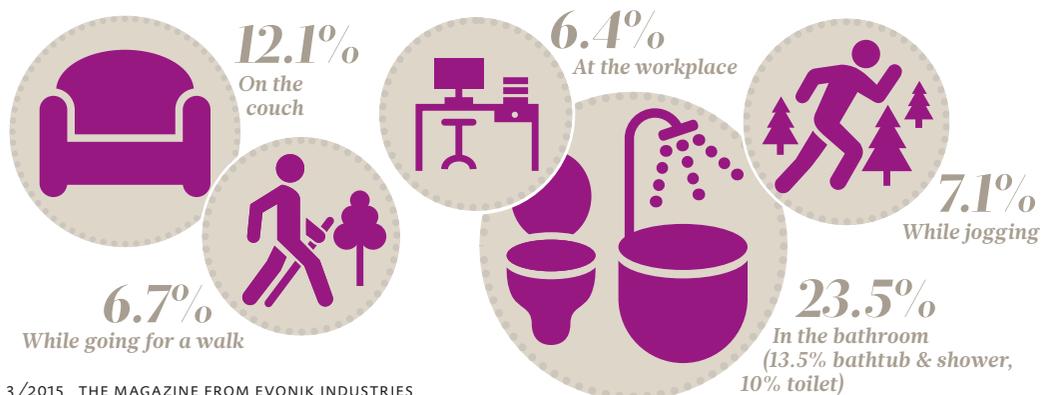
Blue

boosts creativity, researchers in Vancouver have discovered. Red, on the other hand, promotes concentration. Toys made of blue elements are enough to increase the thrill of invention.

Source: Survey by consulting firm IQiudo

TOP FIVE MOST CREATIVE PLACES

Where We Get the Ideas



Building block school: The curriculum is based on Lego bricks



THE LEGO SCHOOL

Playing in class is part of the curriculum here, as we discover on a visit to the International School in the Danish town of Billund, the home of Lego building bricks.

Math, English, Lego, and Biology: a typical school day at the International School in Billund. A lesson in "Freestyle Lego Building" is designed to strengthen both motor skills and creative thinking. There is, however, an additional reason that Lego blocks are such a natural and integrated part of the curriculum in this private school, and that has to do with its founder: His name is Kjeld Kirk Kristiansen, and the neighboring Lego Group belongs to him.

There are 130 students from 20 different countries attending the institution, which has a primary school, middle school (up to grade 10), and kindergarten. The curriculum is

based on the Danish school system and the requirements for graduation defined in the International Baccalaureate programs. Play laboratories, which may initially seem like the fun childcare centers found in shopping malls, are an integral part of the concept. They are all about promoting "systematic creativity," an idea which the developers of the concept say is rooted in scientific findings and studies (see "5 Advantages"). All of these studies conclude that playful learning is effective over the long term, and building with versatile Lego bricks strengthens self-confidence.

The mission statement of the school, which opened in August, 2013, says: "We

want to encourage children early on to become passionate, life-long learners so that they can develop strong personalities and face the challenges of a fast-changing world." The school is part of the Lego Group's commitment to making the town of Billund, with its 6,000 residents, the "Capital of Children."

Critics, on the other hand, say that the Group's private school is weakening the public education system. But many parents are impressed by the broad creative range of Billund's curriculum: There are more applicants than places (at a monthly fee of €470). The toy manufacturer is currently considering exporting its educational model to other countries.

5

Advantages of learning

with interlocking building blocks

1

Children develop ideas and become immersed in things.

2

I did it! Pride in accomplishment is stimulating and motivating.

3

Words and sentences are combined like building blocks.

4

Logic and imagination work together in "systematic creativity."

5

Sharing and helping strengthens social skills.

THE KISS OF THE MUSE

Creative Tricks



Brian Eno

The musician enjoys singing in an amateur choir "to just be part of a sound." He says that it heightens awareness.



Gerhard Richter

The painter sorts through things in his studio or plays with architectural models: "It's dangerous to wait for an idea."



Cornelia Funke

The writer withdraws to her summer house, listens to classical music, and whispers every sentence to herself before writing it down.



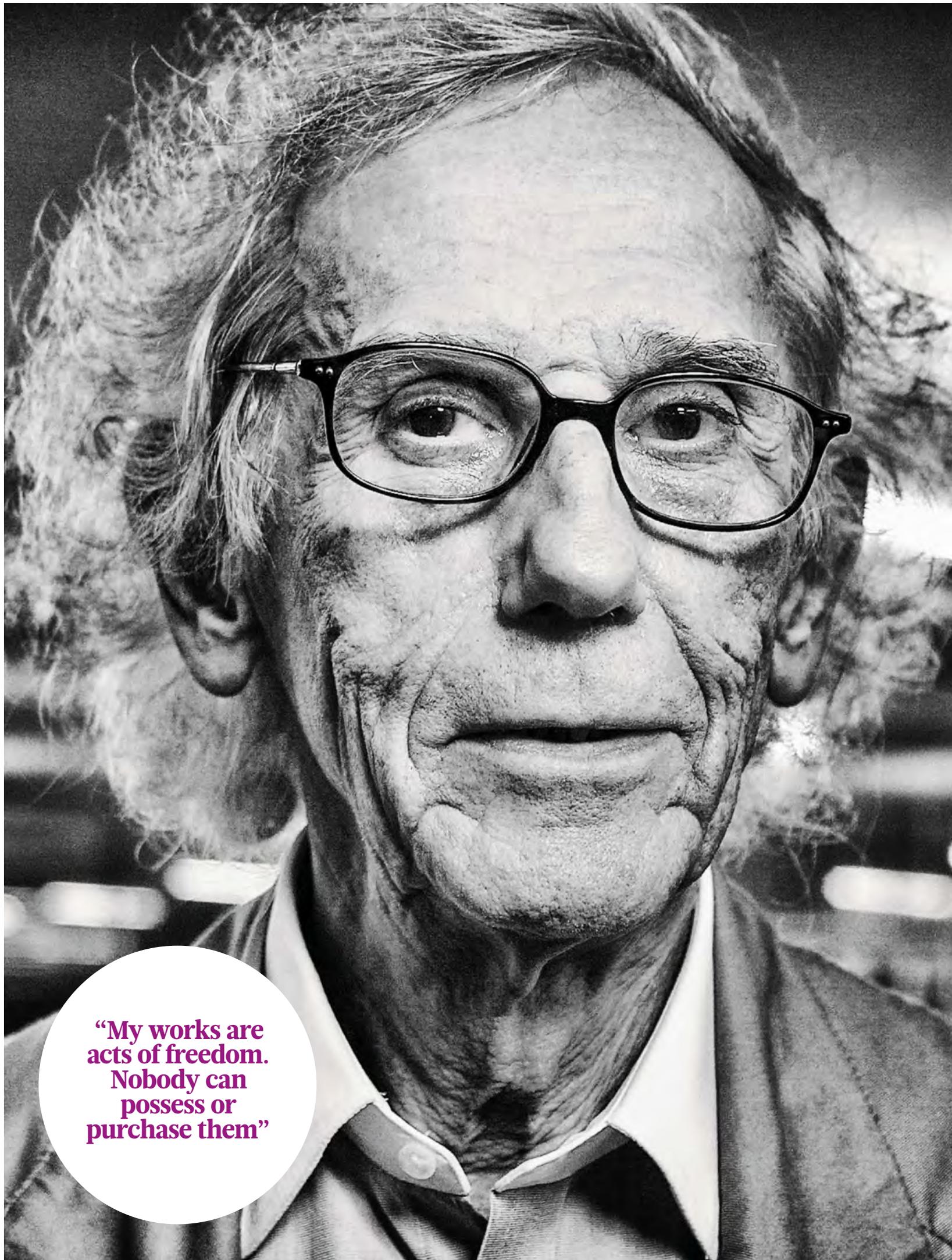
Woody Allen

The filmmaker finds waiting helpful: "I'll take off some clothes and try to give myself a little chill so I want to get in the hot shower."



Peter Sloterdijk

Sometimes the philosopher wants to switch off his brain. So he gets on his bike and rides, often for 100 kilometers.



**“My works are
acts of freedom.
Nobody can
possess or
purchase them”**

AFTER THE IDEA, THEIR WORK BEGINS

They are guided by their curiosity, their intuitions, and their dreams—until the idea finally takes shape. These creative people know what happens after that: They have to roll up their sleeves and get to work! That's how they create things that are wonderful, breathtaking, and new

The magician

→ The artist Christo expands our senses. He helps us see things by hiding them from view.

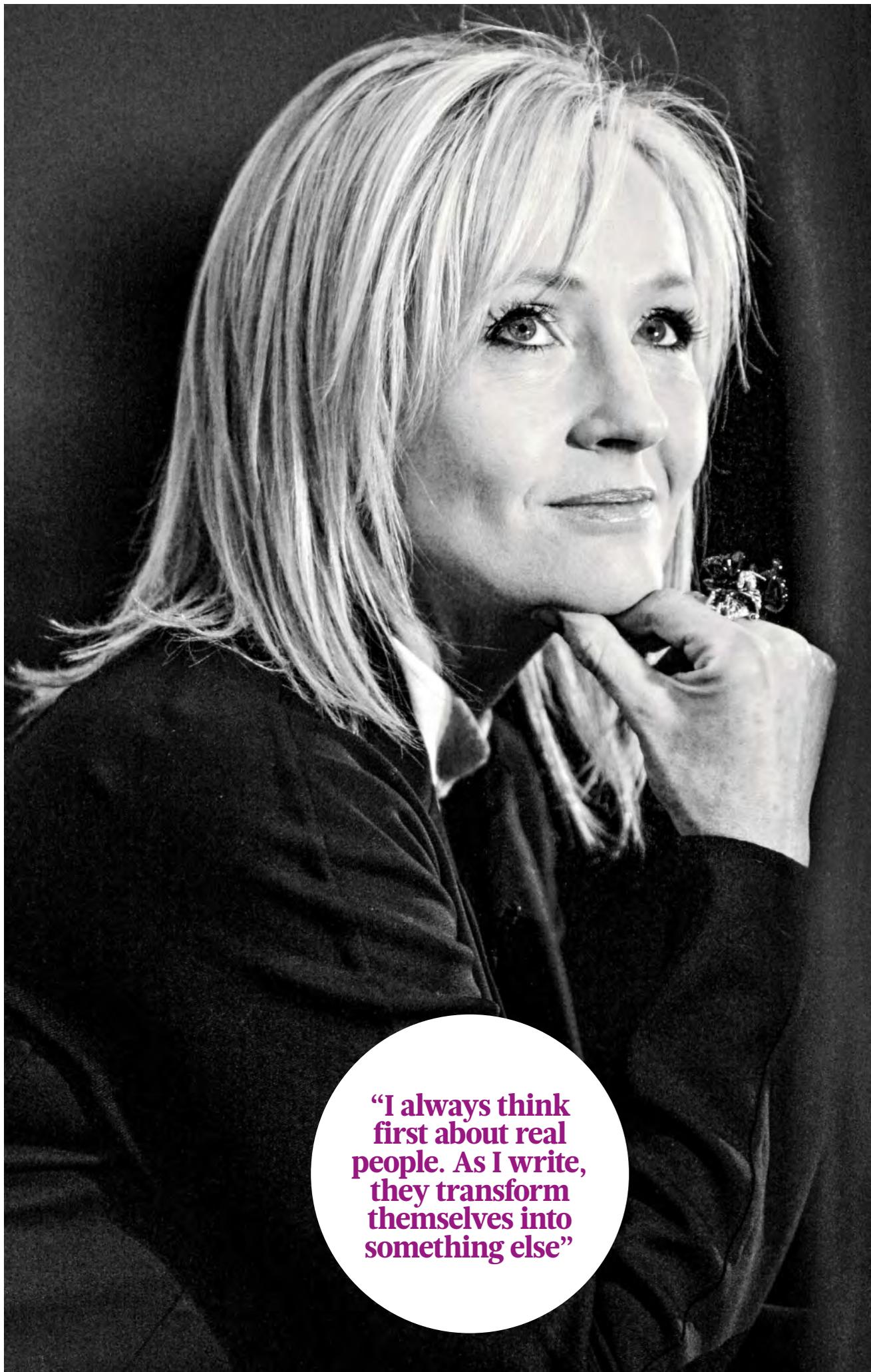
This sea snake glows, and it doesn't dive, on account of 20,000 air tanks. In June 2016 the "Floating Piers" installation will temporarily connect two islands in Lake Iseo in northern Italy with the mainland. Christo, a native of Bulgaria who is half expedition leader and half

a prophet with waving gray hair, is preparing to set up his "floating piers," which will be three kilometers long and made of tightly woven, shimmering yellow-orange nylon. It will be spectacular, like most of the creations of this globally active performance artist,

who is now 80 years old but still indefatigable. He transforms landscapes and simply removes key buildings from their cityscapes. For example, in 1995 he wrapped up the Reichstag in Berlin, and ten years ago he created 7,500 canvas gates for Central Park

in New York. For many years, Christo and his wife Jeanne-Claude, who died in 2009, were an artist couple that was admired all over the world. All of the installations they created have changed our perceptions in a magical way. Even long after the installations have

been dismantled, they will live on in viewers' memories. That will happen with the sea snake too. Christo says he wants people to be able to walk to the islands across Lake Iseo without getting their feet wet "while feeling the waves under their feet."



“I always think first about real people. As I write, they transform themselves into something else”

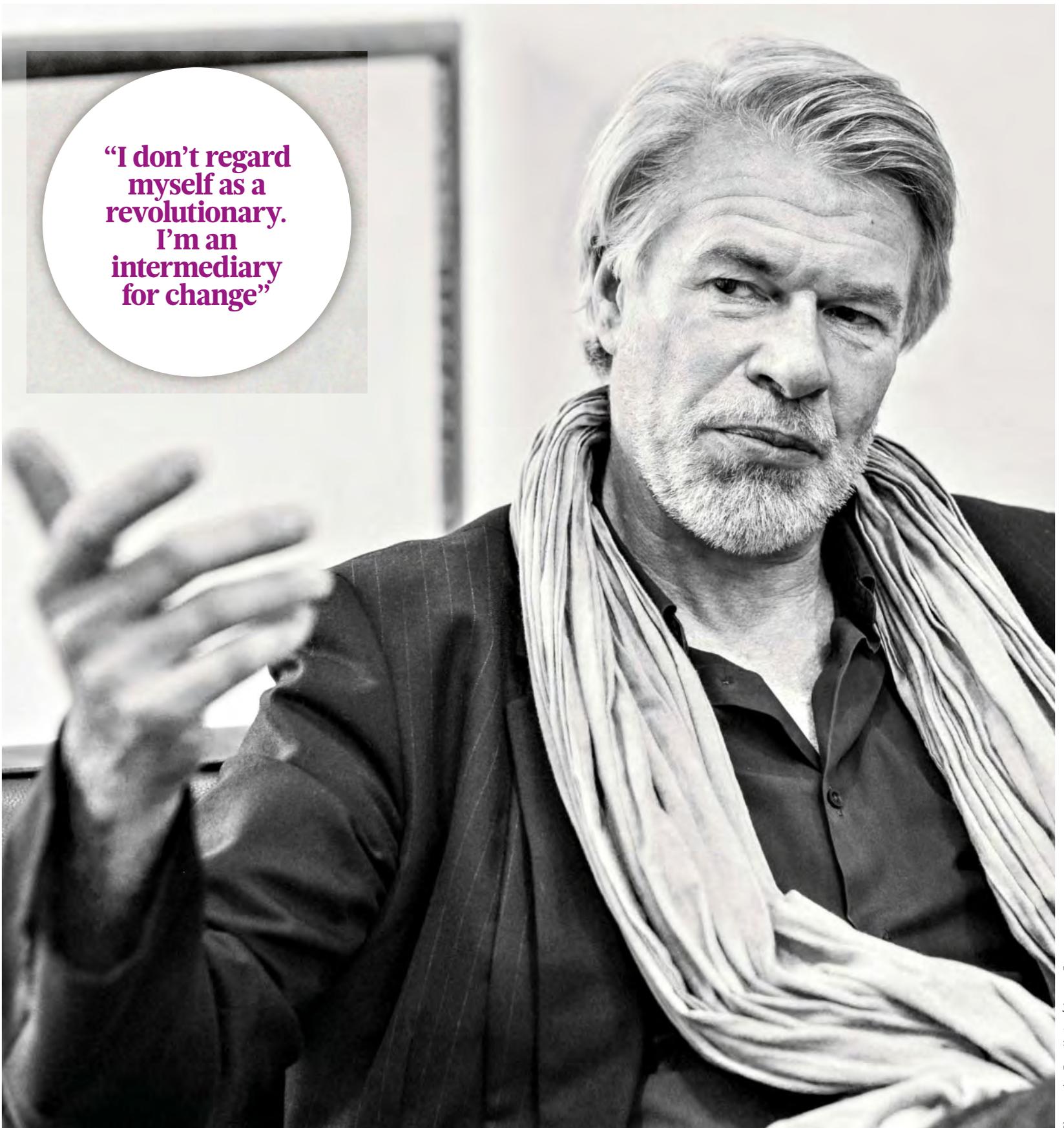
The creator

→ When Joanne K. Rowling had the idea for *Harry Potter*, she knew immediately that it would one day generate a new and unique universe.

Sometimes a person sitting in a railroad car just might think of invisible railroad platforms. In 1990 the 25-year-old assistant teacher Joanne K. Rowling was traveling to London by train when she suddenly had the idea of Platform 9 3/4, which would be visible only to magicians. This became the entry gate to a fantastic universe that Rowling would bring to life with her exuberant ideas and sparkling wit—a place where readers could grow up together with their heroes and heroines.

That was the intention, because when Rowling began to write *Harry Potter and the Philosopher's Stone* she already had all the subsequent volumes planned out in her head. Rowling had a vision that she was determined to expand: the world of *Harry Potter*. She had been writing since she was a child in England, and she was not discouraged by rejections from the first group of publishers to whom she sent her manuscript. Today she is the world's most successful author, having sold 500 million books and inspired eight blockbuster films. That's because Joanne K. Rowling knew she could rely on her persistence, her self-discipline—and her inspiration.

“I don’t regard myself as a revolutionary. I’m an intermediary for change”



Photography: Enno Kapitza / Agentur Focus

The man of action

→ **Museum? Theater?** Chris Dercon is ripping open the walls. Berlin will soon be his next major construction site.

Ideas ought to be able to develop freely, and anything that stands in their way has to go. “Change always hurts,” says Chris Dercon. In any case, it always hurts those who have cozily embedded themselves in the status quo. The 57-year-old Dercon, who was born in Belgium, wants to give such

people a good shaking-up. His next chance to do so will be as the Director of the Volksbühne Theater in Berlin. “I’m thinking about the structures of the theater of tomorrow,” he says. He’s the right man for the job, because the Volksbühne already considers itself the theater of tomorrow.

But do we really want so much “tomorrow”? Wherever Dercon has worked in the past, he has stirred things up, most recently in London, where he opened up the Tate Modern, a showcase for contemporary art, to audiovisual experiments, dance, and music. That’s because he felt it was not enough to

simply hang up pictures in the exhibition halls. With a similar ignorance of supposedly established limits, Dercon had previously propelled Munich’s Haus der Kunst into the 21st century. In person, Dercon is eloquent and charming; for the people he works with, he’s a relentless driver. He’s an

art and theater studies graduate, but he so far he has never been a theater director. It’s an interesting challenge to have the central question suddenly be “What does theater want to accomplish, and what can it do?” With Dercon as a director, the answer will certainly be “To surprise.”

The chemist

→ Ferran Adrià has enriched molecular cuisine with an additional ingredient: the joy of experimentation.

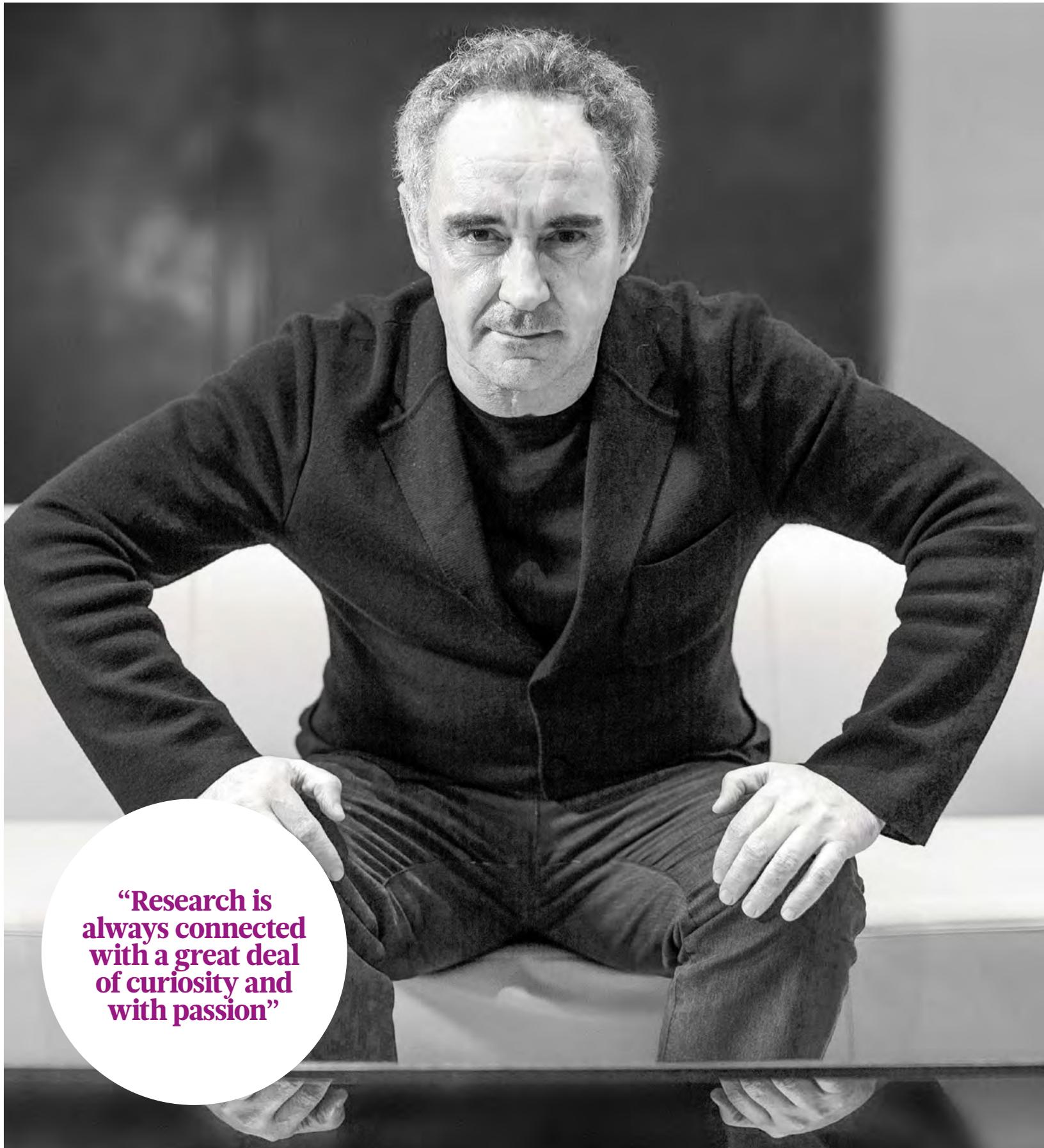
The revolution began with a squeezed orange. One evening after work, the chef Ferran Adrià was watching a bartender stirring orange juice foamy with a spoon. He thought to himself, "It

should be possible to make foam in a different way." That's how he began to transform the kitchen of his restaurant "El Bulli" north of Barcelona into a kind of chemical laboratory. Adrià crossbred flavors

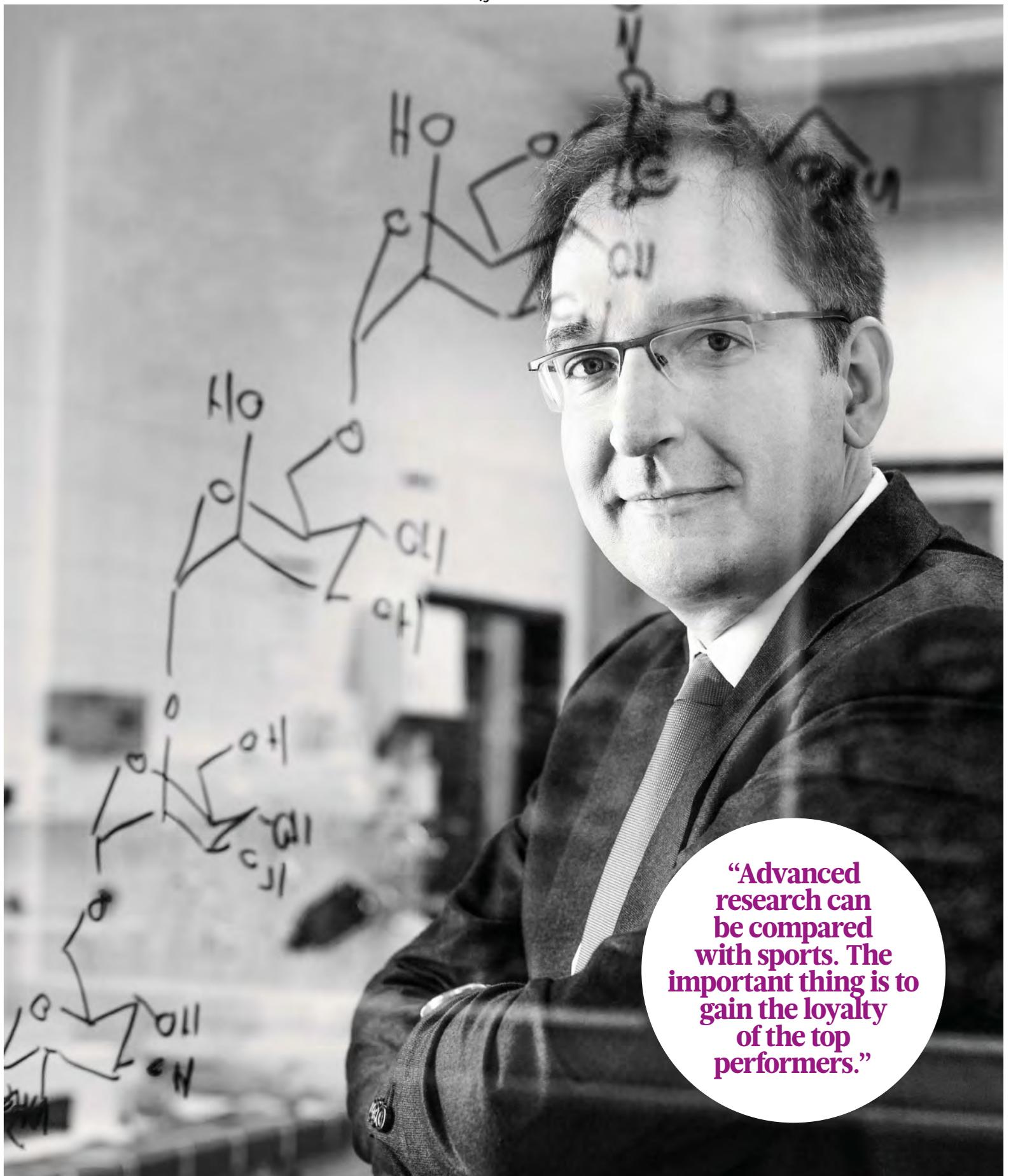
and carried out thousands of experiments in order to serve dishes in completely new physical states (such as "melon caviar"). "El Bulli," which initially faced ridicule, soon became the most influ-

ential restaurant in the world. It closed in 2011 because Adrià was tired of all the hype. He now devotes himself to his "Bullilab," where he works together with botanists, historians, and art historians to do

research in "creatividad," "innovacion," and the history of cooking. It looks as though Adrià is beginning to develop his next major interest—before taking pleasure in deconstructing it.



"Research is always connected with a great deal of curiosity and with passion"



“Advanced research can be compared with sports. The important thing is to gain the loyalty of the top performers.”

The discoverer

→ Peter Seeberger has found a way to produce antimalarial drugs cheaply and locally in Africa.

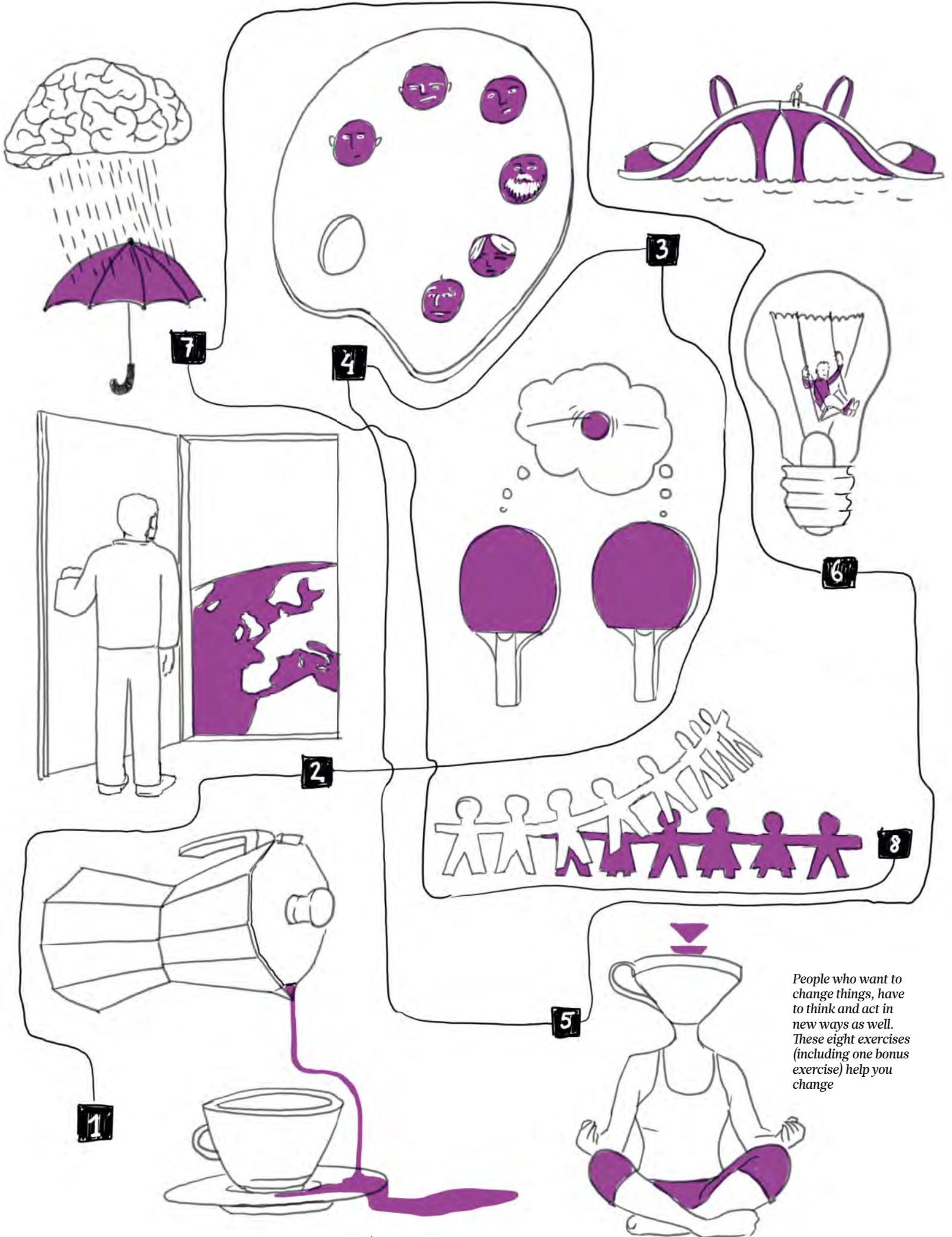
Seeberger is a genuinely creative major figure in biochemistry. The current reason for that is artemisinin, which is derived from the flowers and leaves of the sweet wormwood plant and is an effective

drug against malaria. Approximately 500 million people contract malaria annually all over the world. Seeberger, who is the Director of the Max Planck Institute of Colloids and Interfaces in Potsdam,

has developed a process for producing artemisinin cheaply and locally (the formula for this compound is pictured in the photo above). “Emerging nations will be able to produce their medicines themselves,”

says Seeberger, who has already built a prototype of a bioreactor together with a team of 85 scientists from 15 countries. At the moment they are planning an initial production plant for Vietnam. The

49-year-old Seeberger has registered 15 further patents in his special research field (photosynthesis), including one for a vaccine against hospital pathogens that is almost ready for the market.



People who want to change things, have to think and act in new ways as well. These eight exercises (including one bonus exercise) help you change

EIGHT CREATIVITY BOOSTERS

Switch off, power up or flip out? Make another pot of coffee, jog in the park or take the dog for a walk? Meetings, mind maps or brainstorming? Bestselling author Bas Kast has traveled through the wild world of creativity, and tried out everything he came across. On the following pages, he presents the eight best creativity strategies he found

➔ On the one hand, there are creative people such as artists, geniuses, advertisers, and designers wearing thick, black horn-rimmed glasses. On the other, there is everyone else: us.

This conception is as widespread as it is completely wrong. Creativity is contained in every brain, you just need to know how to extract it. But how is this done? To find an answer to this question, I read innumerable studies and spent two years visiting research labs, talking with scientists (mostly cognitive psychologists and neuroscientists), and taking part in experiments. I wanted to discover first-hand what works and what doesn't.

So, what works? The eight best creativity strategies (as well as one bonus technique) are described below.

1 LUNACY MAKES YOU SMART: CONFUSE YOUR SENSES

I put on data goggles in the virtual reality lab at the University of Nijmegen. The goggles transported me into a very detailed simulation of the university cafeteria. The three-dimensional image responded to every movement of my head, no matter how small. I took part in a test, where one half of the participants experienced weird things in the virtual cafeteria. For example, if a bottle was knocked over, it didn't fall to the floor, but instead rose into the air. Or a suitcase appeared on a table, from where it disappeared again if you tried to get near it. Moreover, you could run through the room as though you were taking huge steps.

The other half of the people taking part in this test experienced a completely normal cafeteria. After the test was over, all of the subjects were asked the same question: What makes noise? The participants whose brains had been stimulated by the bizarre cafeteria gave more answers to this question and their ideas demonstrated greater mental agility. The examples they gave were not limited to cars, buses, and airplanes, but also included insects, flowing water, and clanging pots and pans. "The

people's minds had become more flexible," says Simone Ritter, who managed the study. The unusual cafeteria experience had unleashed their imaginations.

But what does this mean in practice? It means that you regularly have to break out of your daily routine if you want to stimulate your brain and get your creative juices flowing. You could drive a different route to work, for example. Or read a newspaper that you wouldn't otherwise look at. You could also dine at an exotic restaurant in order to shock your taste buds. Be open to new and unusual experiences.

2 TRY OUT SOMETHING NEW MORE OFTEN: GO ABROAD

If you go abroad, you are almost automatically confronted with something new all the time. You merely have to go out your door to experience things that will stimulate your perceptions and your thoughts. For example, people who have lived long periods abroad do better in a variety of creativity tests. A study conducted by the researcher Adam Galinsky from New York's Columbia University showed that the likelihood that someone can solve a popular cognitive performance test known as the "candle problem" (see the following page) rises with the number of months that this person has spent abroad.

3 TALK DIFFERENTLY, THINK DIFFERENTLY: LEARN A FOREIGN LANGUAGE

One of the advantages of going abroad is that you can learn a foreign language. Knowing another language increases your mental flexibility. According to the linguist Lera Boroditsky from Stanford University, this is demonstrated, for example, by the following question: What adjectives come to mind when you hear the word "bridge"? People whose native language is German tend to reply with words such as beautiful, elegant, delicate, peace- ➔

"Your mind becomes more flexible if you break out of your routine"

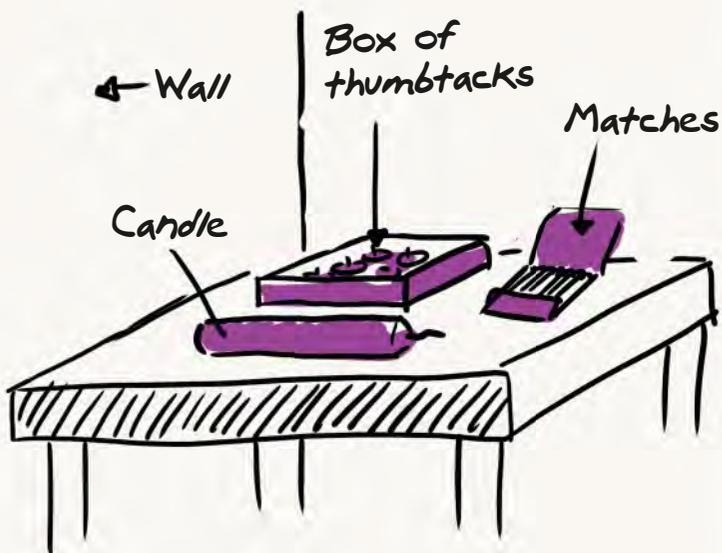
Simone Ritter,
social psychologist
at the University of
Nijmegen

Thinking outside the Box for Beginners

We are used to demonstrating our skills and performance by means of perseverance and logic. However, it is precisely these attributes that prevent people from solving these tasks. Divest yourself of a linear mindset, think outside the box, and lead your thoughts in a circle. The more relaxed and playfully you do this creativity test, the faster you will find the right solution. So get to work with renewed vigor and a fair dose of naivety. You'll be surprised at yourself!

TASK 1: THE CANDLE PROBLEM

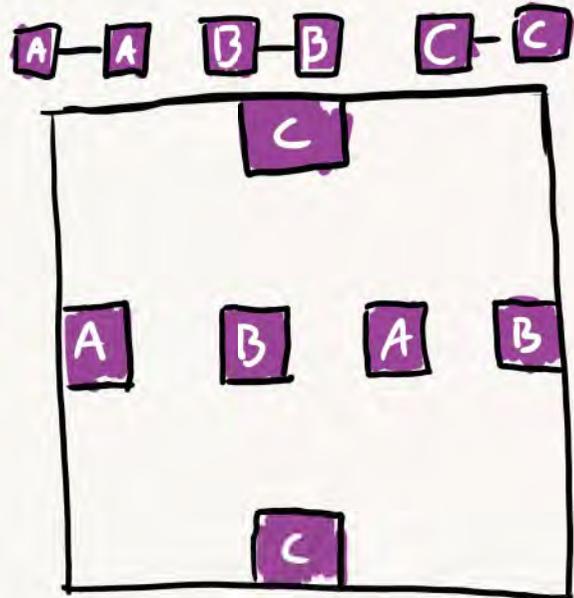
In front of you are a candle, a box of thumbtacks, and some matches. Your task is to attach the candle to the wall in such a way that no wax can drip onto the floor when the candle is lighted



Who's better? The longer people have lived abroad, the greater the likelihood that they can solve the task

TASK 2: THE ABC TEST

Your task is to draw lines to connect A with A, B with B, and C with C within the rectangle and without causing any of the lines to cross.



Who's better? Who's better? Here's a tip for once: If you start by connecting the As and the Bs, you will come up with the solution sooner

TASK 3: THE WORD ASSOCIATION TEST

Each of the following groups of three words has a fourth word that can be connected to the other three in some way. What is the fourth word in each case?

Deal, hair, county...

Third, tea, time...

Travel, empty, floor...

Who's better? People who are tipsy! After drinking a vodka-cranberry cocktail, people are not only able to solve such word games but also find the fourth word faster.

TASK 4: THE LILY RIDDLE



The area covered by water lilies on a lake doubles in diameter every 24 hours. A single lily floats on the lake at the beginning of summer. The lake is completely covered 60 days later. On which day is half of the lake covered by water lilies?

Who's better? Tired people! Late risers are best in the morning, while early risers are best in the evening! The opposite tends to be true with mathematical equations

TASK 5: WHAT IS IT?

Here is a variant of the word association test, but one with more "narrative":

What is:

Greater than God?

Worse than the Devil?

Poor people have it.

Rich people need it.

You die if you eat it

(at least for too long).

Who's better? Tired people? Or exhausted ones? The less concentrated people are, the faster they solve this task

TASK 6: THE COIN TRIANGLE

This triangle points upward. Your task is to move three of the coins so that the triangle points downward.



Who's better? People who grew up bilingual solve this task more quickly. This doesn't apply to mathematical equations, but to solutions with a surprise factor

"Our languages channels our imagination"

Lera Boroditsky,
linguist and psychol-
ogist at Stanford
University

→ ful, pretty, slender ... a veritable list of stereotypically feminine associations. Spanish native speakers, on the other hand, mention words such as big, strong, dangerous, and long—all of them words that are stereotypically masculine. Where does this difference come from? The German word for bridge ("Brücke") is feminine, while the Spanish word ("puente") is masculine. As Boroditsky demonstrated, our language channels our imagination into a predefined direction. A word's grammatical gender influences the typically feminine or masculine associations that come to mind. However, these associations are more mixed in people who speak several languages.

4 CULTIVATE A DIVERSE RANGE OF ACQUAINTANCES

You can boost your creativity by cultivating relationships with people who think differently than you do. This is indicated, for example, by a study conducted by the sociologist Ronald Burt from the University of Chicago. Burt asked 670 managers at the U.S. electronics company Raytheon how processes in their area of responsibility could be improved. Hundreds of suggestions were received. Some of them were great, while others were pretty off the wall. Burt found out that the weakest suggestions came from managers who only talked to people from their own departments. By contrast, managers who regularly held discussions with colleagues from other departments tended to come up with the best ideas more often.

It's very likely that Burt's inspiration principle isn't restricted to managers or job-related matters. Social diversity, whether at work or in private, increases the range of experience and inspiration that we come into contact with. Diversity stimulates our brains and encourages us to think in new ways.

5 RELAX, LET GO, AND TAKE YOUR MIND FOR A WALK

People who are faced with a complex problem tend to make themselves another cup of coffee, sit down at their desks, and try as hard as possible to concentrate on the problem at hand. This is undoubtedly the right strategy to take in many cases.

However, certain problems and challenges don't get any easier if we concentrate more. In such cases, it's better if we let our minds go. The reason for this is that concentration causes our thoughts to be narrowed down to the (seeming) essentials. Concentration suppresses marginal ideas. However, the solutions for creative problems are often found among these apparently marginal ideas.

6 REGULARLY TAKE A BREAK FROM ROUTINE TASKS

We often associate creativity with spontaneity. The muse "kisses" us when she likes, not when we want her to. However, if you study the habits of famous artists, authors, directors, philosophers, and scientists, you will notice that few of them waited to be kissed by muses. Instead, most of them cultivated an almost ritualized work day. This routine was interrupted or followed by a relaxing break, which crucially was viewed as part →

TASK 7: THE NUMBER RIDDLE

We've saved up the most difficult riddle for last... You should expect it to take several minutes, even though children often solve it very quickly.

8809 = 6	5555 = 0
7111 = 0	8193 = 3
2172 = 0	8096 = 5
6666 = 4	1012 = 1
1111 = 0	7777 = 0
3213 = 0	9999 = 4
7662 = 2	7756 = 1
9313 = 1	6855 = 3
0000 = 4	9882 = 5
2222 = 0	5431 = 0
3333 = 0	2583 = ???

Who's better? Children, apparently. And relaxed adults. People who concentrate too much, generally concentrate on the wrong things



Und plötzlich macht es Klick! (Suddenly, it goes 'click') is the title of the book in which Bas Kast presents the creativity strategies in detail (S. Fischer, €19.95).



Bas Kast studied psychology and biology. He has worked as a journalist for *Geo*, *Nature*, and the newspaper *Der Tagesspiegel*. Kast has written a number of bestselling non-fiction books

→ of the work process. The novelist Charles Dickens, for example, went to his desk every morning at 9 o'clock sharp, and kept on writing until 2 p.m. He then took a three-hour walk during which he continued to develop his novels without being necessarily conscious of it.

7 BRAINSTORMING (MOSTLY) DOESN'T WORK

New inventions and discoveries are nowadays almost always the result of teamwork. This, of course, raises the question: How does a team generate new ideas? The standard reply is: By brainstorming! This is the case even though dozens of studies have shown how ineffective brainstorming sessions actually are. People generally have more and better ideas when they are alone rather than in meetings, where they might not even be able to get a word in edgewise.

8 AVOID STATUS THINKING WHEN DOING TEAMWORK

Whenever you conduct projects as a team (e.g. jointly manage interdisciplinary projects), it's very important that you create a relaxed atmosphere that promotes a feeling of openness and equality. Moderators can be of help here if communication falters. A research team demonstrated the benefits of equality in a study that was published in the magazine *Science*. At the beginning of the study, the nearly 700 subjects first had to complete an IQ test. This was followed by a variety of tasks that the subjects had to solve as part of a group. It turned out that while some groups performed very

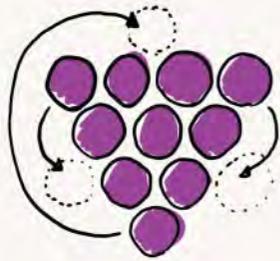
well, others did poorly, irrespective of the members' IQ. The crucial factor was how the group dynamics developed. In some groups (consisting solely of men), there was no discussion and a single member dominated the entire team. The more women were added to a group, the more lively the discussion became, causing performance to rise. The decisive factor wasn't the people's sex, but their interaction. The performance was good as soon as there was an open debate.

THE BUILDING ALSO PLAYS A ROLE

Here's the bonus factor: Physical proximity promotes dialogue, whereas long distances really kill off communication. If employees sit in separate offices, they should also have common rooms, where they are frequently drawn to and can engage in spontaneous discussions. Especially good in this regard are rooms containing ping pong tables and kitchenettes.

Even though we can use a variety of techniques to spark our imagination, we shouldn't demand too much of ourselves. Creativity is mostly a subject-specific skill rather than a general talent. In other words, we can't be creative in all areas. People who want to be creative have to learn to correctly judge their talents and systematically train them. That can't happen overnight. Creativity researchers often speak of a "ten-year rule." On average, people need around ten years of intensive training and practice before they achieve creative expertise in a particular field. This was already known to the inventor Thomas Alva Edison, who summed it up in his famous statement that "Genius is one percent inspiration and ninety-nine percent perspiration."

Task 7: The answer is: 2. The riddle isn't about the numbers as such, but about the closed loops within them. Each of these loops gets one point. The number 0 contains one closed loop and is therefore worth one point. Because 1 doesn't have a loop, it doesn't get any points. The same is true of the numbers 2 and 3. The number 4 doesn't appear in the riddle, because you can write it in different ways—with or without a closed loop. The number 5 doesn't get any points. The number 6 gets one point because it has a loop. The number 7 gets no points, while 8 gets two points and 9 one point.



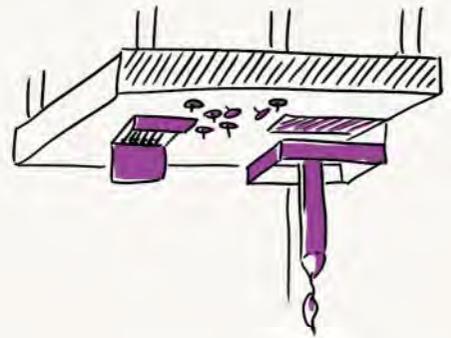
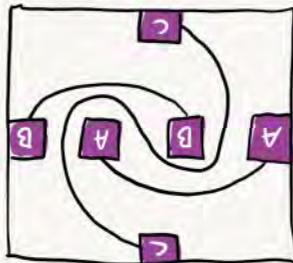
Task 6:

Task 5: The answer is: Nothing!

Task 4: On the 59th day. You have to begin with the end: Because the entire lake is completely covered on the 60th day, only half of it was covered on the previous day, because the lily-covered area doubles in diameter every 24 hours.

Task 3: fair party space

Task 2: This is a difficult riddle because people tend to connect the Cs with a straight line. We have trouble imagining that a curved line does the trick. The solution isn't obvious unless you begin by connecting the As and the Bs.



Task 1: The trick is to use the box of thumbtacks as a candle holder.

Hold on, not so fast! Did you really make an effort to solve the riddles? However, you shouldn't try too hard, but rather do them offhand. Here are the solutions if you've given up trying!

The Solutions to the Riddles

“We Are Continuously on a Mental Time Trip”

Why are human beings creative anyway?

Developmental psychologist Thomas Suddendorf researches the evolution of the human mind and thus also of human ingenuity.

Mr Suddendorf, what is creativity?

It's the ability to create something new that is considered to be valuable. Our imagination lets us think of scenarios that aren't yet possible. We are already being creative when we talk, because we are continuously generating new sentences. Even though some people seem to be more creative than others, all of us have a huge amount of mental power to develop ideas, stories, and solutions for problems.

Is creativity something one is born with or can one learn it?

All people have the basic ability to imagine and evaluate different scenarios. However, the way we use this ability is acquired. A key role here is played by people's imaginative playing in childhood.

You compared people with animals in your research. Are animals creative?

Large apes possess certain abilities to imagine alternative

situations, and they can intuitively solve problems. Many animals are also able to produce new things. Termites create mounds and beavers build dams. You could call this behavior creative. However, in most cases all of the members of these species—or at least all of the members of a particular sex—build these objects, and only these objects. They don't create the unlimited variety of designs that humans do. This indicates that there is indeed a difference.

What characterizes human creativity?

Our unlimited ability to imagine things and reflect on them—as well as our deep-seated need to talk about our mentally generated scenarios with other people. These characteristics play the main role.

So it has to do with our imagination and our urge to communicate things?

Yes, these two factors generate an almost unlimited wealth of possibilities. We can create infinitely many combinations of elements and continuously come up with new behaviors, tools, and sentences. Language enables us to learn from other people's

reactions, even if we have not experienced the same situations in real life. Our minds are continuously making “mental time trips.” We evaluate the consequences of possible actions without having to actually do them, and we are able to overcome obstacles in our minds.

Can't animals invent anything?

Yes, they can. Animals can invent new things as well. For example, chimpanzees in Côte d'Ivoire probably discovered how to use rocks as hammers and anvils to crack nuts as much as 4,000 years ago, and this behavior has been passed on. However, even our closest animal relatives have a limited range of responses, as the philosopher Kim Sterelny calls it. The term refers to the behavioral spectrum with which organisms can react to new situations. Some species react to threats, for example, in a very limited number of ways. A snail, for instance, protects itself by retracting into its shell. Other species have more options available. A monkey, for example, can make threats, hide, get assistance from its troop or flee to an inaccessible treetop. This spectrum is much larger and less



Thomas Suddendorf is Professor of Psychology at the University of Queensland in Brisbane, Australia. He has received numerous awards for his scientific work. In 2013 he published a popular science book titled *The Gap. The Science of What Separates Us from Other Animals*, which documents the current state of research about the things we share with other animals and the abilities that make us uniquely human—language, mental time travel, theory of mind, intelligence, culture, and morality.

fixed in the case of human beings.

We continuously look for new stimuli. Why are we so curious?

Animals also focus their attention on new information that is potentially relevant. However, our unique urge to share our thoughts and experiences with other people predisposes us to be extremely curious. The German word for curiosity, “Neugier,” even means a thirst or avidness for new things. Interestingly, our body also releases endorphins as soon as we understand something. The neuroscientist Irving Biederman

calls humans “infovores”—information devourers—in order to emphasize their inborn hunger for new information that can be interpreted.

Our curiosity, imagination, and desire to communicate with others make us creators?

Precisely. We can tell stories, envision future situations, think about explanations of circumstances, design new objects, and imagine an almost unlimited range of incidents. The key factor in all of this is the ability we call “recursion”—the creation of nested thoughts or images, in which basic elements such as people, objects or processes are combined to generate continuously new scenarios. Recursion, in turn, is one of the crucial factors for “reflection,” the ability to think about our own behavior. It therefore enables us to enjoy thinking about the nature of our own creativity and curiosity.

Interview: Ralf Grauel

In praise of boredom

Please Do—Nothi

Why is it such a pity that as soon as we run out of things to do we immediately head for the nearest display in order to check our e-mails, chat or post photos, simply because the world in its normal state can't measure up to the latest GoPro videos on YouTube? It's a pity because it results in our having fewer ideas. That's because creativity requires more than just input and hectic activity. People who want to be creative also need time out, idleness, and opportunities to do nothing

➔ The feeding frenzy began sometime in the late 1980s with the birth of a programming language that bore the nerdy name Hypertext Markup Language, or HTML for short. Sounds harmless, doesn't it? But if there was ever a Pandora's box, there's no doubt that it was HTML, which has spawned the greatest time-guzzler in history: the Internet.

For quite a while, nothing much happened. Only if you had very good ears, you might have heard the quiet humming and beeping of modems and research computers scattered all over the world as they stuttered through their first digital dialogs. But then... Soon enough, they hatched out of Pandora's box, one after the other and each one greedier than the last. First it was the browsers, then the search engines, and finally, in ever faster succession, Facebook, YouTube, Twitter, and a horde of voracious siblings ranging from Snapchat to WhatsApp.

That's how it all began.

Attack of the time-eaters

First, our leisure time was eaten up. Then our lunch breaks went, and after that the latest generation of video games appeared to eat up the time between our lunch breaks as well.

When the feast seemed to have passed its peak, smartphones crawled out of the box and attacked the last survivors, like piranhas gobbling up stray ducklings. And just a little while later, the rest of our free time was also gone: waiting time, dawdling time, traveling time, and the time it took for the red traffic light to change to green.

Of course these time-eaters didn't wolf down time itself—they consumed a very definite and special kind of time that was so useless, unproductive, and sometimes even burdensome that hardly anyone even misses it any more.

Boredom.

You do remember boredom, don't you? That gray, seemingly invincible wall made up of the hours lying between us and *Dallas*? Or that grinning gremlin who crept back and forth on the railroad platform during the moments between the scheduled departure of your train and its actual, much delayed departure? That boredom.

Today it's hard to find examples of it, except perhaps behind the gates of monasteries where the monks have

taken a vow of silence, or in the rooms of children who have failed three math tests in a row and are being punished with the removal of all their electronic devices.

Let's face it: Boredom is practically dead. It's been conquered, eliminated, and buried under 13 million WhatsApp messages, three million Facebook posts, and 300,000 Google queries—per minute. Every display is a gravestone, every WLAN a cemetery, every retweet, like, and link a death blow to the last unused, unproductive, and unexciting moments of our permanently networked lives.

Well, so what? Is it a problem if we take a look at YouTube, check into Facebook or quickly Google something as soon as we sense the fluttering approach of a few unfilled moments or hear the faintest murmur of minutes that can't be assigned to any emotional cost center? Were things really better during the summer breaks between TV seasons? If your answer is "yes," then why did we give our mothers reproachful looks as we whined, "Mom, we're so bored! We don't know what to play!"—as though we had already sensed that in the near but unreachable future there would be something that would give this miserably uneventful time some meaning, or at least breathe a few pixels into it?

Is it really so bad that children no longer count the raindrops on the windowpane or ride their bikes two hundred times around the tree in the yard?

It's not really bad, but it's rather a pity. For what happened back then after Mom, unmoved by our whining, snapped, "Then think of something to do!" and sent us back outside?

We thought of something to do.

Get going. That's all

Daring experiments with explosives made of mustard, black powder, Coca-Cola, and Dad's Bunsen burner, which we stole from the garage. Bicycle tours far beyond the boundaries defined by our parents, from which we returned bruised but triumphant, carrying croaking frogs and a transistor radio without any speakers, our rear tire patched with Band-Aids and fresh chewing gum. And if the gas canister of the Bunsen burner was empty or it was too hot or too wet to go outdoors, we kids, half dead of boredom, simply thought up our own games. Today we could probably earn millions with an online

"Boredom is the magical breath we take before we come up with an idea"

ng



version of our “Hot Wheels Broad Jump Contest with or without Pushing,” but back then we simply came up with it in the yawning, burning-hot emptiness of a summer afternoon.

What can we learn from this? That boredom is not really all that boring, even though it might feel that way.

If we take a closer look, we’ll discover that boredom is actually the magical breath we take before we come up with a big (or small) idea—the open space in which something inside ourselves lets go and starts running, without a plan, a goal or a prior calculation of the costs and benefits and risks and opportunities. In other words, we just get going.

Finding without seeking

What happens next has been described in the ancient Indian fairy tale of the three Princes of Serendip, who have become scientific immortals through the “principle of serendipity” they exemplify. During their travels, the three princes found wealth, happiness, and wisdom by simply not looking for them.

Similarly, Alexander Fleming (penicillin), Christopher Columbus (America), and Marie Curie (radium) made their discoveries precisely because they were not seeking them. Or take August Kekulé, who in 1861 decoded the previously mysterious molecular structure of benzene literally in a dream. Dreaming may not be the most boring phase of a typical day, but it’s certainly one in which we cannot think any clear thoughts.

Not that we should have anything against concentrated thinking. Without it we wouldn’t have achievements such as Beethoven’s Fifth (Symphony) or Apple’s sixth (iPhone). But just like the contrast between going barefoot and wearing high heels, or between a kiss on the hand and a high five, boredom is the necessary contrast to all of our thinking, striving, and achieving.

That’s because these apparently empty moments, during which we might at some point notice the sticker on the back wall of the bus shelter or the girl we’ve actually already seen a thousand times—these are the moments that allow our creativity to unfold. They are the space in which ideas can evolve out of masses of knowledge, data, and brooding—finally, and sometimes unnoticed. They put us in a condition that hard-

Try to be efficiently creative while watching the clock; it’s guaranteed not to work. Really good ideas need time to develop—and often this makes them even more amazing.

ly exists any more, not even as something to smile at—a condition for which our ancestors had a wonderful word: idleness.

Before you Google it, I can tell you what it means: “a relaxed state of mind when one is free of obligations and is not doing anything in particular.” For a long time, idleness was considered the indispensable foundation of art and culture. In other words, an engine that’s idling is ideally prepared to start off.

Of course we should enjoy digitization for giving us an incredibly fast and direct connection between ourselves and literally the entire world. Never before have we had such immediate access to the collective knowledge of humankind, our distant loved ones, and funny videos starring cats.

And yet, we do need breaks.

How can we get them? We certainly won’t restore boredom to its proper place of honor by practicing digital abstinence or rationing our Internet time. It’s high time for a survey of experts, large-scale studies in social psychology, or at least extended research into the depths of the World Wide Web.

Alternatively, we could once again simply do nothing. Go on, try it!



Michael Mathias is an author and a creative director. He works as a story coach and a text trainer for companies such as Bosch, WDR, and Gruner + Jahr

THE ULTIMATE IN DRAMA!

German authors and dramatists responded to Evonik's invitation to attend the home games of the soccer team Borussia Dortmund for a year, and they subsequently recorded their observations in literary form. The resulting book of the soccer season has now been published. It's a declaration of love for a club and a sport that inspires people in other fields to make their own through passes

Since 2005 a German "national authors' team" has been regularly attending soccer matches. This team has been supported since 2008 by the cultural foundation of Germany's soccer league, the DFB. The team's captain is the dramatist Christoph Nußbaumer.

Which team do you really support?
Bayern München.

That's a surprise. How come?

I'm from Bavaria, so it's clear which team I support.

In your contribution to the book, you accompany the BVB fan Hase in the stadium.

He's a fictional figure based on a real person. When I moved to Berlin in the late 1990s, I shared an apartment with an ex-hippie called Halla. He was a dedicated BVB fan. He was a fairly quiet guy—but he could get really excited about Borussia Dortmund and rock music. He died in 2014, and I visited him in the hospice before

that happened. I knew that someday I would devote a story to him.

Your story takes place at the Ruhr derby, which BVB won 3-0.

It was a great game, and that's why I called my story "Der Befreiungsschlag" (The Liberating Blow). Looking back, this title was too optimistic. I had hoped it would be the start of a comeback or a kind of Lazarus effect.

If the 2014/15 season were a play, what would its genre be?

A drama in several acts, some tragic and some comic.

In the stadium, some 25,000 fans wearing the team's color stand together to form the "Yellow Wall." As a theater person, do you envy the team its loyal audience?

The "Yellow Wall" is legendary. But I'm not envious, because the focus here is completely different. However, a soccer game is also a ritualized activity. There are actors, the time and

place are limited, every game follows its own dramatic arc within a predefined framework—and it's unique. However, there are some key differences from theater. Soccer is generally watched from a partisan perspective, and that makes the experience extremely emotional.

Does that also apply to the theater?

Theater merely raises the question of partisanship. It asks you whom or what you support, and how you would decide if you were in the same situation as the figure on the stage. It asks critical questions about your position. In soccer the main thing is the final score, whereas in theater the main thing is how you get there.

Evonik also sponsors the Ruhr Festival, where your play *Von Affen und Engeln* (Of Apes and Angels) premiered last spring. Are soccer and cultural events compatible?

Both of them can use their resources to make



people enthusiastic or indignant, or to disappoint them. In any case, people are standing on stage and trying to connect with you.

At the premiere of your play, did you feel like a coach?

I felt more like a sports director who has created the fertile soil for the experience. After all, I can't intervene during the performance, as the coach does from the sidelines or in the locker room.

What role could BVB manager Thomas Tuchel take on in one of your plays?

The interesting question for me as an author is: Where's the conflict simmering inside him? He pretends to be an ascetic in order to get the best possible performance from the team. He's trying to be a model for them through his asceticism, telling them, "What I can do, you can do too." And that's where things get interesting. How does he compensate for this permanent need to set an example? How does he deal with success? What happens if his strategy fails?

How did you become the captain of this na-

Christoph Nußbaumer's play *Von Affen und Engeln* had its premiere in the spring of 2015. His writing for the Web column "Evonik Word Games" features the characters Auba, Reus, and Hase

tional authors' team?

Oh, I somehow slipped into the role. It helped that I used to be a very good soccer player.

Did you dream of a career in professional soccer yourself?

Maybe at the age of fourteen, but back then I didn't have the physical endurance I needed.

Interview:
Christoph Bauer

EXCERPT:

The Liberating Blow

1. Hase's fall

Hase hasn't been well for months now. And maybe, I thought, I can do him a favor by taking him along to a game. Hase is an art restorer. Nine months ago, while he was restoring frescoes in a church, he fell from the scaffolding. Ever since then, he's been acting strange. Sometimes he's shy and hesitant, which he never was before; worse yet, he's been struck speechless. Hase has forgotten how to speak. In the past three weeks he was definitely getting better. He could at least make himself understood and make a few noises—but that isn't much progress to speak of after such a terrible fall. In any case, whether he's acting strange or not, Hase has always been a BVB fan.

Hase's heart has belonged to the BVB team ever since the 1970s—that terrible dry spell, which provided very few uplifting days for a genuine fan. During this period, the master restorer at the workshop where Hase was an apprentice would often murmur to him, "Fate chastises the ones it loves" while Hase was cleaning up the workshop. Back when the BVB team was still wearing jerseys with three stripes on them, Hase went to a Ruhr derby match. Soon after that he moved to Berlin, and since then he hasn't gone to Dortmund very often to watch a Borussia match. All the same, you could say that in its own unpredictable way his life has almost always run parallel to the ups and downs of his favorite team's season.

2. Observations from Section 73

We're in Dortmund, and it's 3:30 p.m. The Ruhr derby is about to begin. It's the last day of February, and it's hotter than a construction site in Qatar in July. When you first enter the stadium, your breath catches, your eyes start tearing up, and your jaw drops. You hear songs from the old days, mixed with Led Zeppelin. The sound makes the blood dance in your veins. Nobody has come here to relax. Everyone's hoping for unexpected things to happen. Everyone wants to have a memorable experience. Scraps of conversation drift around the stands: invectives, prayers for success, entreaties, and laughter. "Micha, where's your brother? When is Hoeneß doing a Papillon?" Slogans that are calls to battle. Hymns from the Yellow Wall. Finally the opening whistle fills the air with an electric thrill; the concrete vibrates. The crowd becomes a single animal, a mob powered by beer. The stadium mutates into a boiling pot. And somewhere in Section 73 are Hase and I, two people out of 80,000. The two teams spend some minutes getting a sense of each other. Auba gets the first opportunity. The game soon becomes intense. Players who don't give their all are bombarded with curses.

The rivalry between the teams sparks disparate rhythms and chaotic efforts. Then order reigns again, over and over again. On the field and in the stands. The Yellow Wall pulls the whole stadium in its wake.

"If you don't jump around, you're a bastard." The spectators who are merely standing up are Schalke 04 fans. The marshals in red T-shirts at the edge of the crowd are doing something they're not allowed to do: Instead of watching the crowd, they're watching the game. They can't help it, they're only human beings. Who can blame them?

Hummels is leading the defense like an emperor from the 1970s. Reus should drink more schnapps, he's still missing too many goals. Sliding tackles, straining muscles. The more intense the battle on the turf gets, the louder is the noise from the stands. As the BVB players in their yellow-and-black jerseys grow more aggressive, the air in the stadium practically throws off sparks. The BVB steps on the gas, and the team keeps on fighting tirelessly. Schalke 04 can't take the initiative. But how long can BVB keep up the pace? At some point the blue jerseys of Schalke will strike back and take their revenge. There's no automatic reward for just a good try. Soccer is just like life: often unjust and merciless. Suddenly, unexpectedly, just when we thought the turbulent attack had played itself out, a ray of light came from somewhere—a goal that seemed to come out of thin air.

What a liberating blow! Casually, into the far corner.

Aubameyang, the good sprinter from Gabon, saved us.

But you don't have to hide yourself under a disguise, Auba. And certainly not as a superhero. Real heroes don't need to wear a costume, they wear yellow-and-black on their own turf.

Micki and Marco score two more goals. Pushiness made all the difference.

The fans were hugging each other in their rough and manly way: once, twice, three times.

The most beautiful pearl from the region lay in my arms: once, twice, three times.

At a quarter past five, the magical mood was over. We'll remember it for a long time to come.

3. A finale with Fred

After the derby, Hase acted even more strangely than before—which was no surprise—but he said, "What a game! That was awesome! Let's go have a drink!"

He was well on his way to becoming his old self again. After that we went to the domicile for a concert by Fred Frith. He drummed on his electric guitar, which glowed yellow, like a savanna landscape just before the long-awaited rain.

By Christoph Nußbaumer



The Book Reading the Game

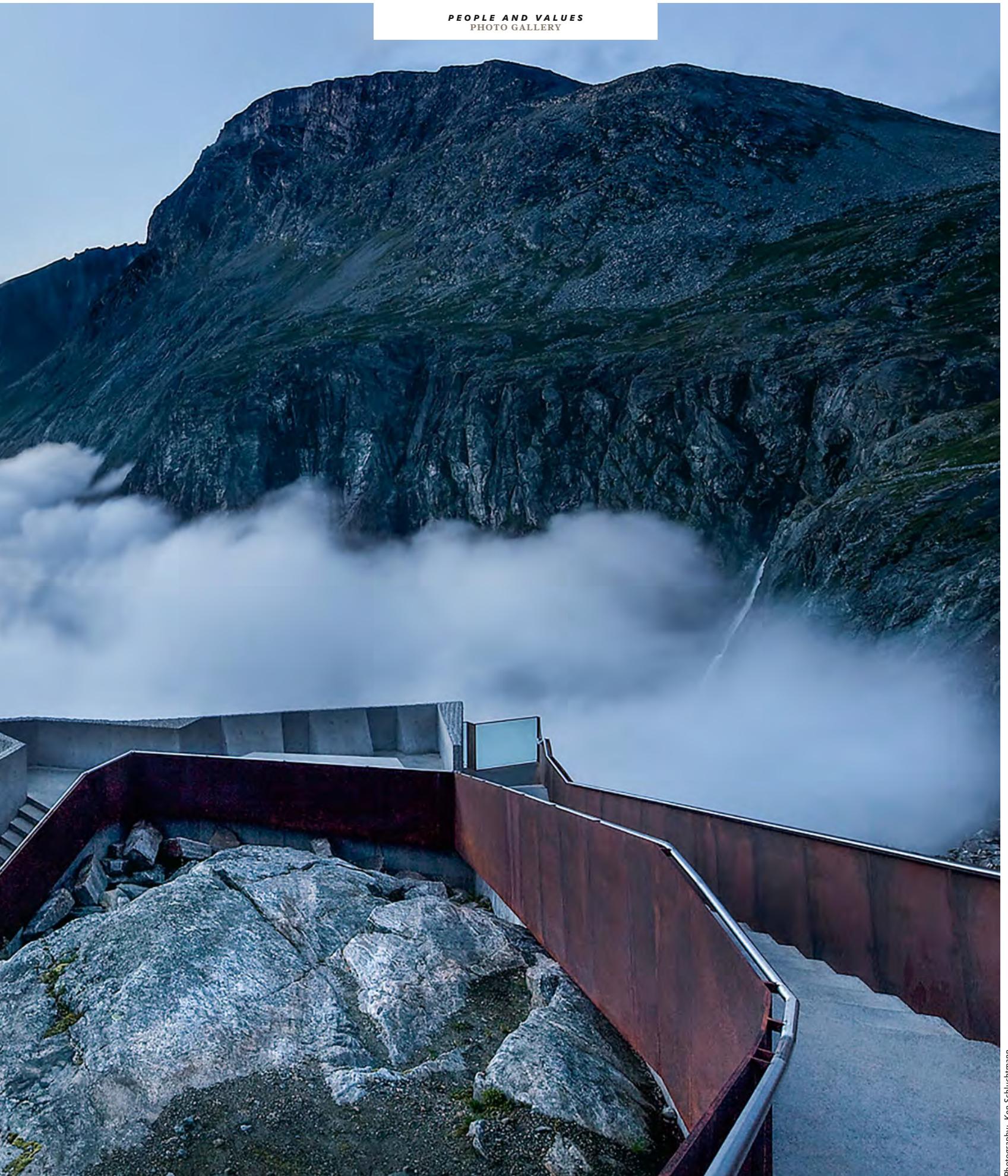
The ballplayers and wordsmiths

of the German national authors' team were invited by Evonik to accompany the Borussia Dortmund soccer team during its turbulent 2014/15 season. Authors such as Moritz Rinke, Thomas Brussig, and Albert Ostermaier traveled to every one of the team's home games. They recount their experiences in the book *Reading the Game: A Year in Black and Yellow*, edited by Moritz Rinke and published by Verlag Blumenbar (240 pages, €14.95)



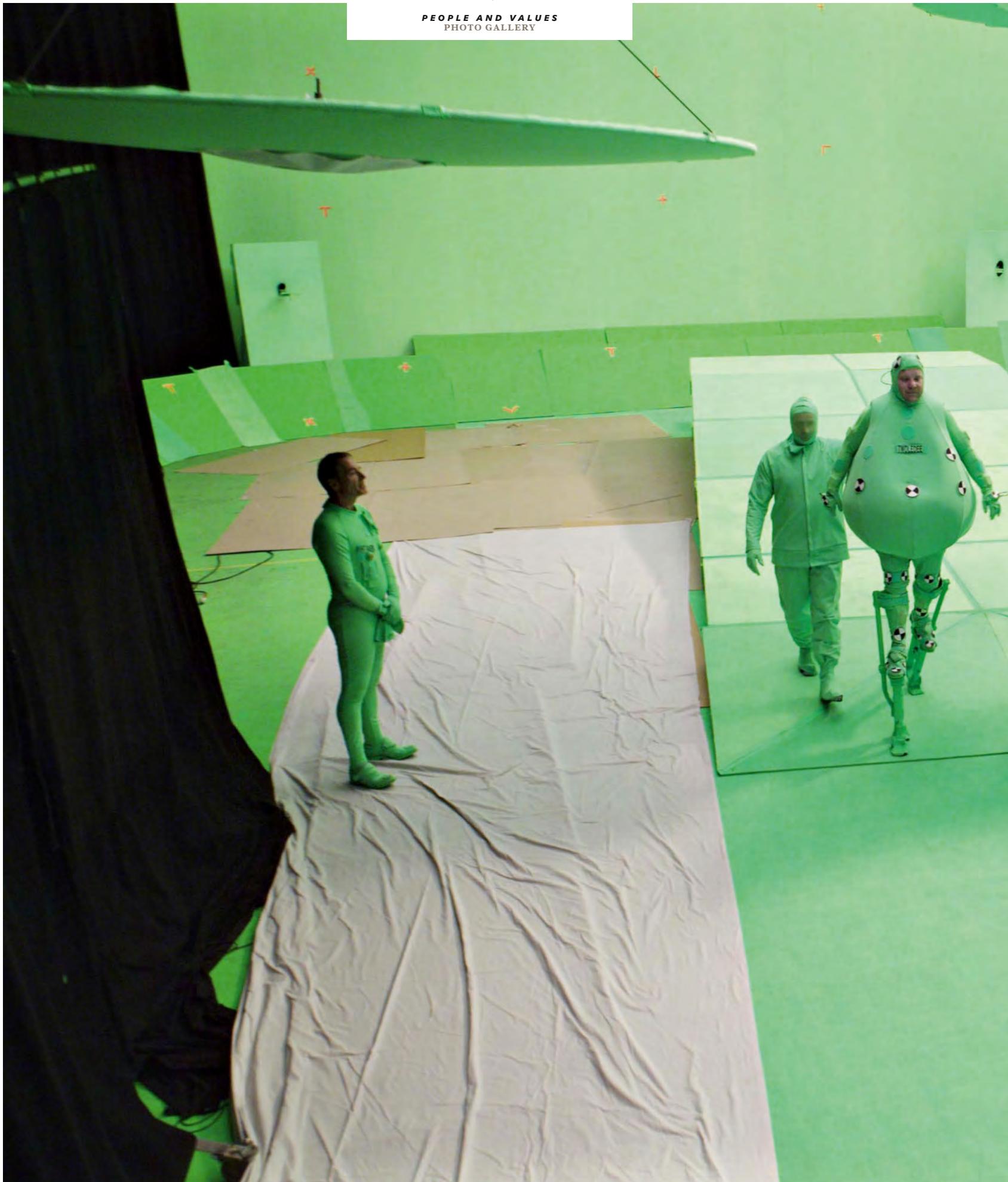
The New Vision

Ideas create spaces where previously there were none. We present four creative places and times which invite closer looks and new thinking, so that something new arises



Photography: Ken Schluchtmann

The viewing platform on the road over the Trollstigen—one of Norway’s greatest mountain passes—was designed by the architect Reiulf Rams-tad. It offers visitors a breathtaking view. Depending on the weather, they can gaze down at the road’s famous hairpin turns, or out across a sea of clouds. Architecture meets creation—with spectacular results. We know that creativity is often hard work. Ideas need stimulation—and quiet. That’s why we intuitively seek out places such as this, where we can look and see without interruption—and maybe come up with a creative idea



Fairy tales, myths, and stories such as Alice in Wonderland have been inspiring imaginations for generations. Today's new technologies enable them to be perfectly visualized. It's done using digitization and chroma key technology (sometimes called blue or green screen). Rough sets made from wood and papier-mâché are replaced with elaborate details and figures during postprocessing. For the actors, it takes some getting used to. We, the audience, sink wide-eyed into the dream worlds that entertain us—and inspire us anew



Photography: WALT DISNEY PICTURES / Kobal Collection / FOTOFINDER.COM, IMAGO





Confusing the senses—don't we need to turn the photo? It takes a second look to identify the black-costumed figures bearing choreographer Sasha Waltz's dancers along a wall. The venue is Berlin's Neues Museum, the current home of the famous bust of queen Nefertiti. Interpretation and reality, paramount exuberance confronted with ancient art. Sasha Waltz and her team study public spaces and reinterpret them anew in the project series "Dialogs." Setting free the magic of contradictions can also offer a source of creativity



"I make my world the way I like it," Pippi Longstockings' motto perfectly sums up the heart of the video game Minecraft, which has sold more than 56 million copies worldwide. The game's players use cubic blocks to create their own worlds, into which they can invite other players. Long derided as nerds, today's players are celebrated as members of the avant-garde, whose hobby promotes intelligence and creativity. Scientists call for games studies, and Bayreuth University already offers Germany's first masters' program in computer games



Photography: Minecraft

Facts + Figures

IDEAS

Who Invented It?



Spotify
In 2008, Daniel Ek (left) and Martin Lorentzon developed streaming service Spotify, which now has 75 million users.



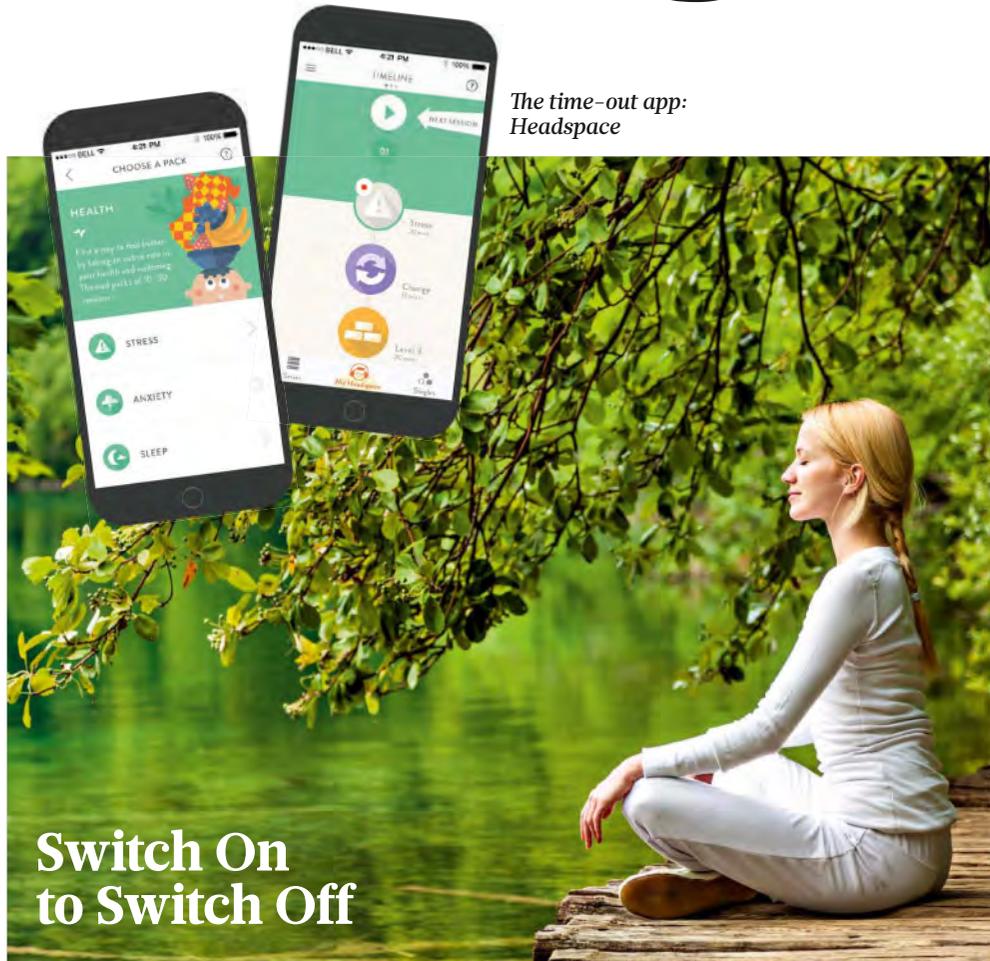
3D Printer
The U.S. inventor Chuck Hull applied for the first patent for “stereolithography” in 1986.



Selfie Stick
In the 1980s, Minolta engineer Hiroshi Ueda patented a self-timer stick for better family photos.



Scanner
Rudolf Hell presented his “Chromograph” scanner as early as 1963. Hell was also involved in the fax machine (1956) and phototypesetting (1965).



The time-out app: Headspace

Switch On to Switch Off

The smartphone, of all things, which many people consider the biggest sources of stress in modern life, can actually ease the burdens of an overstimulated brain. The “Headspace” app of meditation trainer Andy Puddicombe helps shut off the endless stream of thoughts and feelings for a few minutes and create some space for more relaxation, concentration, and creativity. It helps the brain to loosen up: to “rest and digest.” Ten minutes per day is supposed to be like fitness training for the brain.

When he was eleven years old, British-born Puddicombe went with his mother to a relaxation course—and it didn’t do anything at all for him. Things changed when he was 22 years old. Some close friends of his died, and he subsequently broke off his sports studies and entered a Buddhist monastery in the Himalayas. For years, he meditated up to 18 hours per day. In 2004, he returned to the West and began teaching meditation techniques. Four years later, he met Rich Pierson, the creative

director of an advertising agency. Pierson was looking for ways to make these techniques accessible to a broad audience. That’s how the idea arose for a meditation app.

The daily ten-minute time-out app has been downloaded by users in more than 150 countries. Actress Emma Watson says the app is “kind of genius,” and even the *New York Times* is enthusiastic: “Andy Puddicombe is doing for meditation what Jamie Oliver has done for food.” The object of this acclaim cultivates an attitude of modesty: “It isn’t primarily a business for us but a social mission to help create a happier, healthier world.”



Inventor of the meditation app: Andy Puddicombe

RANKING

Creative Cities

The three Ts: technology, talent, and tolerance are needed for cities to attract creative spirits. For the U.S. social scientist Richard Florida, cities are only successful when they combine underground culture with economic resources. In addition to Tel Aviv (p. 42), the following cities are always found in the top rankings.



Seattle
combines high quality of life with global brands that work from here, such as Microsoft, Amazon, and Boeing.



San Francisco
and the Bay Area with Silicon Valley in the south: short distances, tolerant Californians, and two of the best universities (UC Berkeley and Stanford University).



Cape Town
The city attracts creative minds from around the world. Especially when it’s winter in the north and the European ad industry produces its commercials here.



Munich
The Bavarian capital brings together ideas and economic activity. Excellent research institutes and universities play their part too.

CREATIVITY TECHNIQUES?

Thinking Hats

Inventor: Edward de Bono. Mixture of role play and discussion: participants don hats to take up different viewpoints. Advantage: the hat dictates the direction, and this makes it possible to uncover truly novel perspectives. Disadvantage: requires strong moderation and empathetic participants who play along.

Walt Disney Method

Inventor: Walt Disney. Role play with "dreamers," "realists," and "critics" for developing visions and strategies. Advantage: well-suited for large, complex subjects. Disadvantage: the outcome often simply follows the idea of the biggest rhetorical talent.

Mind Mapping

Inventor: Tony Buzon. Linking of ideas and thoughts to form a "mind map." Advantages: ideal for association and conceptual orientation. Disadvantage: outcomes vary from person to person, so little clarity is provided for groups.

World Cafe

Inventors: Juanita Brown and David Isaacs. Mass speed dating workshops for up to 2,000 participants. Advantages: very good for considering a topic from all sides with collective intelligence. Disadvantage: the openness leads to the risk of excessive "blabber".

Attention: business models! When is it best to use these famous methods of generating ideas? What are they good for? When do they fail? An overview

Brainstorming

Inventor: Alex Osborn. Advantage: Everyone is allowed to speak. Disadvantage: very time-consuming, everyone listens more than they speak, let alone think. Good for group dynamics. Unsuitable for developing ideas.

3 QUESTIONS FOR

Iordanis Savvopoulos "Africa Is Revolutionary"



1 What do companies need to be successful in Africa?

In Africa, decisions are often made and implemented very quickly. Impatience is very widespread, so we have to respond to local customer needs with-

2 What can western business-

men learn from the African way of doing business? out any delay. We have to set ourselves apart from our competitors through our creativity, continuous innovation, flexibility, and the speed with which we act.

men learn from the African way of doing business?

Businessmen in Africa like to take more risks than those in Europe. Everywhere you go, you see small entrepreneurs along the roads who are struggling to survive every day. That makes them stronger and more creative. Also, complicated, oversized products don't sell in Africa. The key to success is: "Less is more."

3 Is the African way more creative?

Yes. Processes in western companies are highly structured and often not very pragmatic. In Europe, development is evolutionary in many areas, but developments in Africa are revolutionary.

Iordanis Savvopoulos is Regional President Sub-Saharan Africa of Evonik Industries.

2

pizzas is the optimal team size, according to the study "Corporate Creativity": a team has become too large if it can eat its fill from two XL delivered pizzas (50 cm diameter)—meaning over seven persons is too many. As the size of the group increases, personal orientation and participation fall.



The coffee filter

Amalie Auguste Melitta Bentz, a housewife from Dresden, finally got tired of picking coffee grinds from her teeth, so she took a can, punched some holes in the bottom, and covered the holes from the inside with a piece of blotting paper that she cut out of her son's notebook. Her family and friends were thrilled with her invention and the grind-free coffee she was able to make with it. Melitta Bentz registered a patent for the filter in 1908—and then went on to establish a successful company with her husband.

Every industry and corporation started out small—often with an invention. The trick is to nurture ideas and keep others from copying them. However, it's also important to remain creative and shape your own development. So, what makes for a successful and innovative company, and why are such companies better than others? Holm Friebe went looking for the answers

AFTER THE IDEA

➔ A creative organization actually can't exist because creativity by definition involves something unplanned—a process of creative destruction that tries to anticipate the future. In other words, being ahead means being in a place no one yet knows anything about. Organizations, on the other hand, are all about routines, standards, and self-preservation.

Business as usual

The U.S. economist Clayton Christensen addressed this paradox in his book *The Innovator's Dilemma*. According to Christensen, the only way a large organization can resolve the paradox and enable radical transformation is to spin off truly independent units that operate like startups. Ideally, such units should also be physically separated from headquarters. While it's true that the expertise in place at large corporations is very valuable, it's also the case that such expertise reproduces its own blind spots, which are mainly the result of established and unquestioned truths that have always applied. Nespresso, a wholly owned subsidiary of Nestlé, offers a good example of what Christensen is suggesting. The company was spun off in 1986 as an organization that would develop and market single-serving coffee capsules on its own.

A more optimistic view regarding the possibilities of generating innovations in-house is taken by Roger Martin, who served for many years as the Dean of the Rotman School of Management. Martin was one of the developers of the concept of "design strategy." This basically involves a peace offering for two groups with opposing views on how innovation comes about. One group believes innovations have to be developed analytically and "managed" in accordance with scientific principles, while the oth-

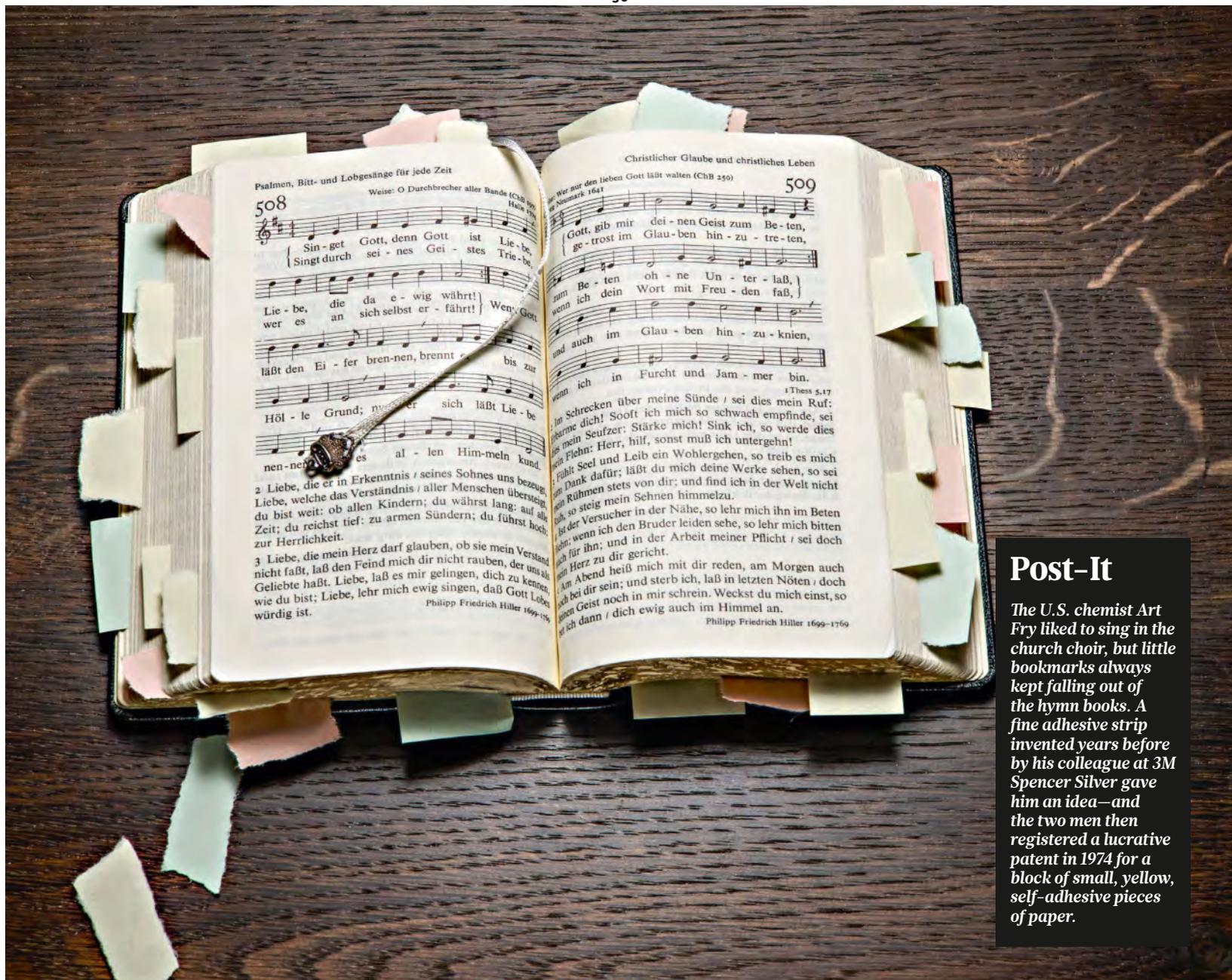
er places its faith in the power of intuition. Martin's approach combines the best of both worlds—the curiosity of tinkerers ("exploration") and the scalability potential and sales power of a major corporation ("exploitation"). Martin knows that it is precisely this combination that can turn companies into perfect players in the competition to win the favor of customers and set the pace of innovation.

According to Martin, the traditional knowledge funnel at research and development departments works as follows: The original "mysteries" ("what type of fast-food restaurant might a California family like to have, now that their lifestyle is increasingly centered around the automobile?") are transformed into a "heuristic," or well founded, assumption ("okay—a drive-in establishment with a relatively simple selection of hamburgers"). This assumption is then combined with other conclusions to create an "algorithm" ("the beef patties for a Big Mac need to be fried for 90 seconds on each side").

Exploration or exploitation?

This "McDonald's scenario" offers an easy to understand example of the process, and also of the potential pitfalls involved. For one thing, it's not enough to simply run everything through the funnel one time and then just stick to the algorithm, while making only minor improvements to it. Such an approach, which is geared toward exploitation rather than exploration, invariably leads to an ossified business model—and easy prey for the competition.

The trick here is to have the entire organization repeatedly reutilize the knowledge funnel and return to the original question (or a new "mystery") over and over again. In this way, new algorithms for the daily business can be created using up-to-date assumptions and ➔



Post-It

The U.S. chemist Art Fry liked to sing in the church choir, but little bookmarks always kept falling out of the hymn books. A fine adhesive strip invented years before by his colleague at 3M Spencer Silver gave him an idea—and the two men then registered a lucrative patent in 1974 for a block of small, yellow, self-adhesive pieces of paper.

→ derivations. Maintaining this type of freedom for explorative and intuitive decision making (which is a given at startups) presents a challenge to large established organizations.

In order to protect the “islands of exploration,” “one must have detailed knowledge of how individual creativity functions. After all, ultimately it is the individuals in an organization who are creative, not the organization itself.

Innovation for simple minds

People who read Mickey Mouse comic books view the process of innovation as follows: An engineer (ideally Gyro Gearloose) has a flash of inspiration. A light bulb turns on above his head (like in the comic) and he discovers from out of nowhere the technology the world has been waiting for.

Such divine inspirations and brilliant ideas don’t simply come to a group of randomly selected individuals, however. Instead, as the Protestant ethic has always held, they are the just rewards for hard work. As in art, the recipe for revolutionary innovation is one percent inspiration and 99 percent perspiration.

Obviously, it was just a coincidence that Charles Goodyear dripped rubber together with sulfur onto a hot stove in 1839, and thus invented the process of vulcanization.

“Chance only favors the prepared mind”

Louis Pasteur
Inventor of the pasteurization process for preserving food.

Nevertheless, Goodyear made his discovery after spending years experimenting with rubber in many different ways. Naturally, it was a case of spontaneous inspiration that led Art Fry in 1974 to remember a very bad superglue that a colleague had invented years before—and then to use this glue for his “Post-its.” Louis Pasteur, the inventor of the pasteurization process for preserving food, hit the nail on the head when he said: “Chance only favors the prepared mind.”

In this sense, the common statement that “Thomas Edison invented the light bulb in 1897” is actually an unacceptable simplification, if not an outright false claim. As innovation researcher Andrew Hargadon from the University of California pointed out in 2013 in his lecture “Long Fuse, Big Bang: Thomas Edison, Electricity, and the Locus of Innovation,” the fact is that the more closely you look at such things, the less heroic the stories appear to be. The “great men of history” were often people who simply brought an already ripe idea to fruition. Hargadon refers to this as the “great man theory”: A long fuse burns through and this is followed by a big explosion, whereby a person who happens to be standing around gets all the credit. What Edison did, according to Hargadon, was nothing more than to integrate inventions and innovations from the previous 70 years to create a system that along with →

Velcro

Swiss hunter Georges de Mestral used to always have to remove burs from his dog's fur after a hunt. The difficulty of removing the burs made him curious, so he studied them under a microscope and discovered they had elastic barbed hooks that didn't break when removed. This gave him the idea of creating a fastener based on the same principle. He then registered a patent for his invention in 1941.



→ the light bulb also included electricity in homes and neighborhood block power stations. If there was one thing that Edison did invent on his own, then it was the modern research and development lab in which theoreticians, practical scientists, technicians, and engineers from various disciplines work together.

Buildings in which new things are created

Which brings us to the following question: How can spaces be arranged in a manner that promotes rather than discourages innovation? The standard answers for today's companies are innovation centers and so-called creative spaces. A lot of care is put into these structures, which tend to set themselves apart from the rest of the work environment through their special designs and colors. Still, no one has yet been able to definitively prove that such efforts actually result in more innovative thinking.

It might even be the case that the opposite is true in that people become aware of the purpose of this environment and suddenly can't come up with any new ideas. The American author Stewart Brand thinks that this may in fact be true and therefore presents the exact opposite argument in his book *How Buildings Learn*. Brand believes in using improvised, unspectacular, and completely "under-designed" spaces that therefore fade into the background, thereby ensuring that nothing disrupts the free circulation of ideas. The Hewlett-Packard Garage in Silicon Valley was certainly not an ergonomically optimized research location. Nevertheless, it became the birthplace

of the computer. In addition, Steve Wozniak and Steve Jobs put together their first Apple computer in a garage.

Brand's greatest example, however, is "Building 20" at the Massachusetts Institute of Technology (MIT). The building was set up as a temporary lab for physicists during World War II. Due to a lack of space on the MIT campus, the building continued to be used up until the late 1990s, despite its many architectural flaws. It eventually achieved legendary status as one of the most innovative locations of the 20th century. Noam Chomsky developed his linguistic models here, and Building 20 is also where the Bose sound system was developed and the first video game was invented. The provisional nature of the building led those who used it to treat it with little respect. For example, walls were torn down or shifted without authorization. While building the first atomic clock, the physicist Jerrold Zacharias had two sub-ceilings removed in order to accommodate a metal cylinder three stories high. The close quarters, convoluted corridors, and illogical numbering system for the rooms meant that scientists repeatedly ran into each other. They would then get talking, and in this manner inspire one another to new heights of innovation.

Legendary research units at many U.S. companies have since followed this blueprint for locking a bunch of ingenious freaks into a room and leaving them undisturbed to do their innovative work. Bell Labs, for example, which was established by the Bell Telephone Company (later AT&T), was responsible for the invention of the fax machine, the transistor, photovoltaics, and the UNIX op-

"Nothing is more powerful than an idea whose time has come"

Victor Hugo

The great writer is referring here to the connection between innovations and the state of historical development.

32,000

patents

were registered in Germany in 2014—which is tops in Europe, ahead of France, Switzerland, and the Netherlands. Germany is also third worldwide for registered patents. The USA is first, followed by Japan.

250

new patents

were registered by Evonik (from Germany) in 2014, which is the equivalent of five per week. That puts Evonik in 10th place for patents in Germany (Siemens is first). Evonik holds more than 25,000 patents and over 7,000 registered trademarks.

€4,000,000,000

is the amount Evonik plans to invest in research and development over the next ten years. In 2014, R&D expenditure at Evonik increased by five percent as compared to the prior year. Some 2,600 Evonik employees currently conduct research at 35 locations worldwide.

Popsicle

Frank Epperson was 11 years old in 1905 when he accidentally left a glass of powdered soda and water with a mixing stick in it on his porch on a cold night. Everything was frozen the next day and Epperson was left with a sweet tasting flavored icicle in his hand. He patented his "frozen ice on a stick" 18 years later.



erating system, among other things. Bell Labs also played an important role in the development of laser technology, and scientists there discovered the cosmic microwave background radiation as well, which led to seven Nobel Prizes.

Dark corners where innovations unfurl

Innovations are shy by nature. They avoid the limelight of great expectations for quick results and instead thrive in dark corners in the background. Steven Johnson, author of *Where Good Ideas Come From: The Natural History of Innovation*, writes: “Part of the secret behind truly great ideas involves the creation of an environment in which individual idea fragments mature over time and are able to develop.” Johnson is concerned that today’s innovation management methods end up stifling exactly the thing they’re trying to achieve at all costs.

In the end, the key is to take to heart the lyrics of the old George and Ira Gershwin song “It Ain’t Necessarily So.” In other words, you have to accept the fact that the official version of the future at a company doesn’t always necessarily have to be the right one, and also understand that inspired individuals with their disruptive intuition can move an entire organization in a completely new direction. Many of the most successful innovations have been guerrilla projects born of pure idealism that were sometimes implemented in violation of official company policy. Or they were simply a product of someone’s conviction that the company they work for should understand and appreciate their own superior knowledge.

McDonald’s general policy is to regulate every aspect of its franchise holders’ operations. However, McDonald’s would be less successful today if it weren’t for the clever violations of such rules, as well as gray zones and guerrilla innovations. For example, the Filet-O-Fish was invented by a franchise owner in a heavily Catholic neighborhood in Cincinnati who had difficulty selling hamburgers on Fridays. The McCafé was developed by an Australian franchise owner who was tired of seeing mothers bring in their teenage daughters for a hamburger but not eat anything themselves. She therefore started serving cupcakes and high quality coffee. These days, McCafé is a global engine of growth for the corporation. One could therefore argue that a new and more open attitude about innovation has given McDonalds a major lift.

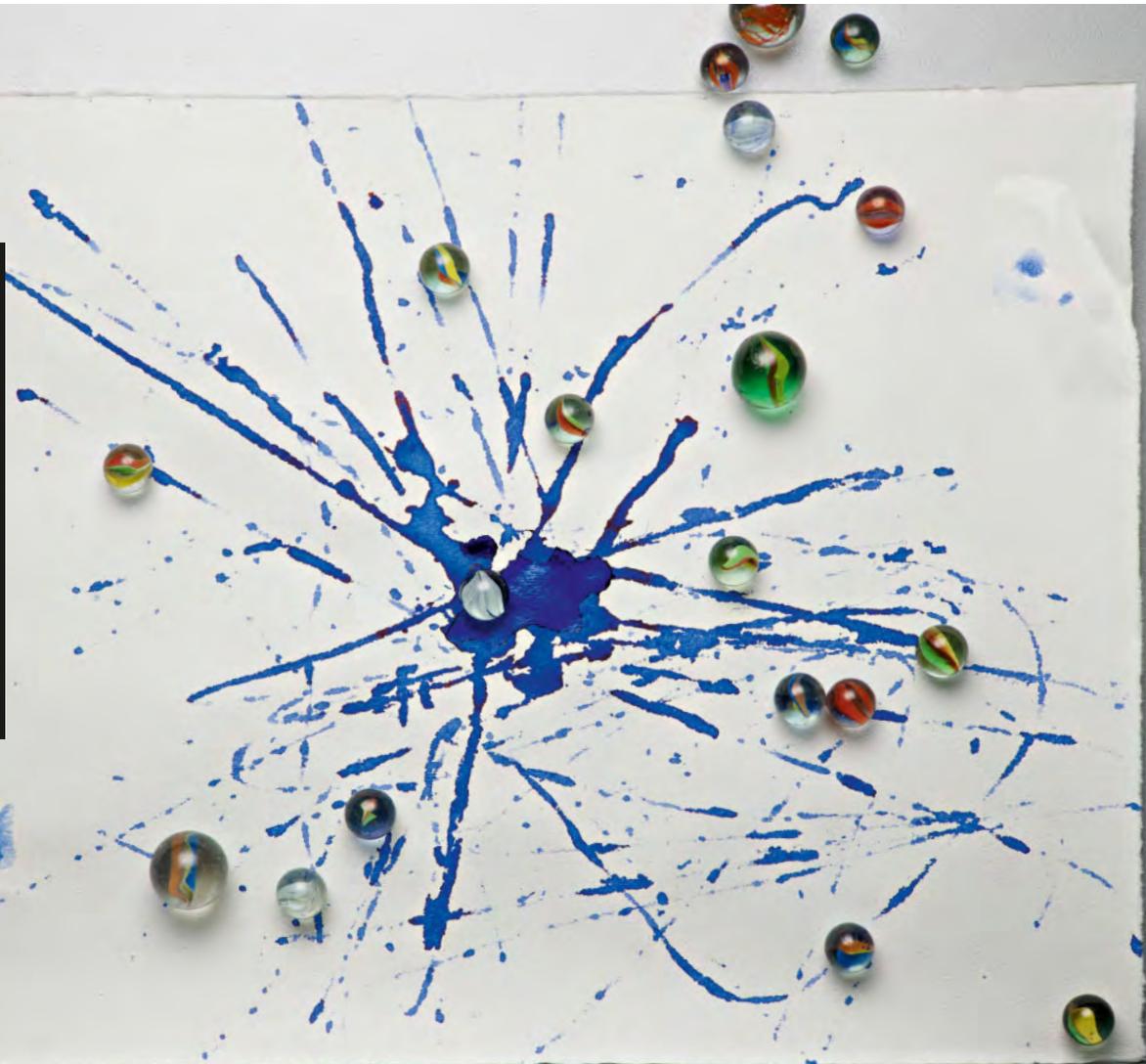
The attitude toward innovation at Nestlé also wasn’t exactly positive when the Nespresso concept was being developed, according to Eric Favre, the engineer who had been working since 1976 on the idea of pressing steam through a small coffee capsule: “They actually forbid me from working further on the invention.” By 1986, he had had enough and he therefore sent a resignation e-mail to the company’s CEO, Helmut Maucher, in which he explained that Nestlé was great at popularizing inventions but incapable of implementing new ideas. Maucher asked him to stay at the last minute and made him head of Nestlé Nespresso S.A. Such are the moments that determine whether a company can deal with and integrate creative disruptions, or whether it will remain stuck in “business as usual.”



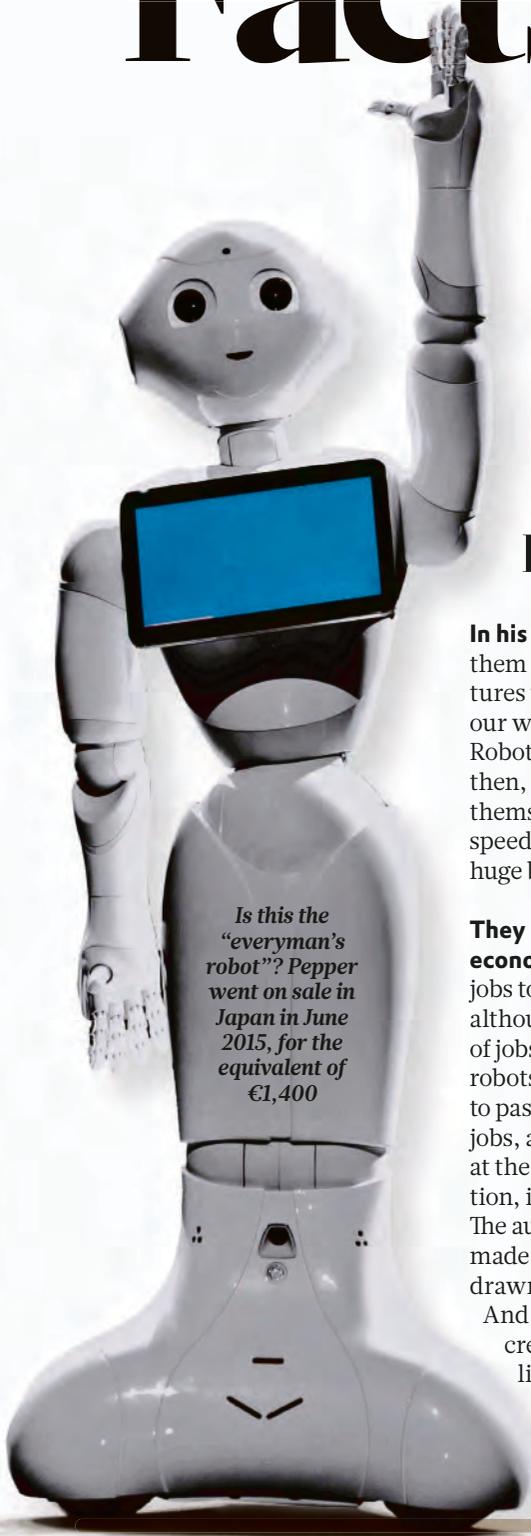
Holm Friebe is the Managing Director of Zentrale Intelligenz Agentur, as well as an author and a lecturer on design theory

Ballpoint pen

The Hungarian journalist László Bíró was tired of using pens that dripped ink—so he put a small ball at the end of a pen that would evenly distribute the ink that came out of a tube. Supposedly, he got the idea while watching his daughter play with marbles.



Facts + Figures



Is this the "everyman's robot"? Pepper went on sale in Japan in June 2015, for the equivalent of €1,400

A New Generation of Robots Is Reaching Out to Us. But Will It Take Away Our Jobs?

In his play *R.U.R.*, Karel Čapek called them "robots"—almost-human creatures that were bred in tanks and did our work for us. That was 95 years ago. Robots have come a long way since then, and made a successful career for themselves. In manufacturing, their speed, precision, and efficiency are a huge boost to growth in all industries.

They are changing sectors of the economy. And they are destroying jobs too. But only existing jobs. In fact, although the media reckon with a loss of jobs with each new generation of robots, these predictions seldom come to pass. That's because new industries, jobs, and even professions are created at the same time—through automation, innovation, and mechanization. The automobile and computer have made collector's items out of horse-drawn carriages and typewriters. And at the same time, they have created industries that provide livelihoods for millions of people around the world. According to estimates of a British market

research institute, the use of industrial robots could lead to the creation of more than two million new jobs worldwide by 2020.

Next up are the household robots. First and foremost **Asimo** (top) and **Pepper** (left), the new hit from Japan. In June, a thousand units were sold within minutes. Not long ago, Sony stopped producing the **Aibo** (bottom). A new model is likely to follow. Who knows, maybe robotic lawn mowers will be the next big Christmas gift? In any case, it's clear that it's still impossible to predict all the areas in which our new friends may be put to work. And it's even more difficult to predict the jobs and opportunities they'll give rise to.



use robots

1
They work precisely and need relatively few breaks.

2
They do unpleasant jobs like vacuuming.

3
Whether on Mars or in the deep sea, they make headway.

4
They understand what we want, thanks to voice recognition.

5
And they respond to our wishes, thanks to their digital connectivity.

TECHNOLOGY PARKS

The Incubator

The wooden building was only supposed to accommodate the physicists temporarily. Ultimately, however, "Building 20" became a birthplace of discoveries and historic moments for 55 years, making it the mother of all

incubators—and a model for all technology parks and startup centers. Nobel laureates, physicists, acousticians (Amar Bose), and linguists (Noam Chomsky) all worked here in its confined spaces. Erected in 1944 on the grounds of



the Massachusetts Institute of Technology (MIT), it soon became its creative center. The researcher Jerome Y. Lettvin once quipped: "You might regard it as the womb of the Institute. It is kind of messy, but by God it is procreative!" When the building was torn down in 1998, a time capsule was filled with mementos contributed by students

and professors (photo left). The opening date is 2053, 55 years later. When that time comes, the recipe for the success of Building 20 will likely still be good: variable structures that can be changed by users, and a layout that encourages repeated contact among the occupants. We'll look forward to the next contact in 38 years, when the time capsule is opened.

44

percent of all entrepreneurs don't wait for an exciting business idea of their own but instead **take up external proposals**. That's a smart decision, according to the KfW Start-up Monitor: when it comes to implementation, outside ideas are more often successful than one's own flashes of inspiration.

3 QUESTIONS FOR

Myrijam Stoetzer
"I Want
to Understand
Things"



1 Ms. Stoetzer, did friends start treating you differently after you won a top award in the research competition "Jugend Forscht"?

No, thank goodness! A lot of students in my class shared my excitement and gave me encouragement. They were really happy for me: just like I'm happy for them when they win a basketball game. A lot of adults were happy too, and they're tremendously proud.

2 How did you become an inventor?

Ever since I was five, I've wanted to become a researcher: to know and understand how things work. And I still do. A lot of small ideas that I come up with by myself or with friends and family suddenly turn into a project that I can tinker on.

3 Where do crucial ideas come from?

There are many possibilities: sometimes I find myself in a dead end, no matter how hard I try. If I look at the problem again a little while later, I've meanwhile learned some new things, developed a new perspective, and I see the original problem in a different light. Or, somewhere in the world, someone has posted an idea that takes me further in my work. So a project comes about and develops with great ideas and contributions from other people too. Sometimes I'll get an important idea if I do something completely different for a while, like go for a walk along the Rhine.

Myrijam Stoetzer, 14, won the national award for the category "World of Work" in the "Jugend Forscht" competition. Together with 15-year-old Paul Foltin, the Duisburg native built a wheelchair that can be controlled by eye movements.

The piano still needs people—but lamus (right) composes music by itself



ARTIFICIAL ART

As we gradually become accustomed to robots and artificial intelligence, researchers are developing algorithms that paint, write, and compose. These are examples of artificial creativity—but is that even possible?

lamus' works have been recorded by the London Philharmonic Orchestra—a dream for contemporary composers. But lamus doesn't care about that. It isn't even aware of it—and it doesn't even know what a dream is. It can compose, however. It needs only eight minutes per piece, whether it be a cantata or country music; a minuet or merengue. A jack of all trades without the prima donna attitude: lamus is a computer. The author of more than a billion pieces so far, he keeps right on composing music in the Spanish city of Málaga.

Computers can do more than compose; they are also writing news items about sports and the stock market. At the Inter-

net site of magazine *Forbes*, analysts' forecasts for quarterly earnings are written up by Narrative Science, a startup that uses sophisticated software to turn data into readable text. And the news agency AP uses software of competitor Automated Insights to turn quarterly earnings figures into normal news stories in seconds.

Computers also paint: for years, Simon Colton at Imperial College in London has been writing software for his "Painting Fool" program, which comes up with its own ideas for pictures and then paints them. Is the Painting Fool creative? Colton refuses to say. Computer scientist Oliver Deussen, on the other hand, provides an answer. His painting

fool is called e-David and was developed at the University of Konstanz. "No matter what we do, a computer can't become a person," says Deussen. "It will only have a very limited understanding of what it's doing—without any intention."

Intention is the crucial point: underlying any act of creativity is an intention, such as the intention to find solutions to a problem. "A machine does what it's told in the program we give it," says the creativity expert Joachim Funke. "Intention is something fundamentally human." Creative accomplishments arise when people fashion their environment, change it in a certain direction. And machines are not yet capable of that.

Why Is Tel Aviv Such a Creative Place?

Immigrants:

Here you can find people from Africa, America, the Arab countries, Asia, Australia, and Europe. Those willing to risk a new start in a foreign country won't shy away from challenges later, either.

Difficult conditions:

Israel has few natural resources. It therefore relies on advanced technology as an engine of economic growth.

"Start-up nation":

Saul Singer and Dan Senor published the book *Start-up Nation: The Story of Israel's Economic Miracle* in 2009. The title has become synonymous with the Israeli economy. The bestseller describes "what we can learn from the world's most innovative nation."

Oasis of tolerance:

Tel Aviv is not only a city of aspirations; it's also a place of refuge. It's a tolerant city that takes in people who would otherwise face a hostile environment.

Chutzpah (audacity):

Improvisation is an essential component of Israeli culture, one that's particularly noticeable in a young city like Tel Aviv, which is only a little more than a hundred years old.

Support:

Failure is OK: Those who have gone bankrupt with a startup can still get a loan from most banks relatively easily. Tel Aviv also operates a free urban WiFi network, and Internet access is free in practically every cafe.

Mandatory military service:

Young Israeli soldiers (men and women) learn how to take on responsibility at a relatively young age. Many of those who establish startups have a military background and run tightly knit organizations that have clear goals.



Street art is actually illegal in Tel Aviv. Or so they say



From the desert: A vegetable stand in Tel Aviv

BROADBAND





True to its name: A coworking space called WeWork.



Freshly squeezed: Time for a break!



People in Tel Aviv are proud of their tolerance

AND BEACH

**Startups beneath palm trees; high-tech and street art.
Tel Aviv is the most creative city in the world**



A suit and a bathing suit are often only a few meters apart in Tel Aviv. Virtually no other startup center is as laid back as this city

➔ The wall stretches up for two-and-a-half meters. Instead of a ladder there's only a ramshackle wooden pallet leaning up against the wall. The pallet leads down to the catacombs below the world's most interesting bus station. Here you will find a fallout shelter, a bat cave, two churches, a goldfish pond, street art studios, and a Yiddish library with 50,000 books. Up above are buses—and above and below are people who come and go, explore, look around in amazement, talk, create, and study.

When Tel Aviv was named the “World’s Smartest City” last year, the jury that made the selection was thinking more about the city’s digital interaction with its citizens, the citywide WiFi network, innovative apps etc. The UNESCO officials who added Tel Aviv to their list of creative cities in 2014 probably weren’t thinking about the bus station, either. Nevertheless, those who wish to understand just how creative Tel Aviv is should start looking here.

The chaos of the bus station reveals what sets this city apart: improvisation, industry, art, research, creativity, and high-tech—all in extremely close quarters. Welcome to the world capital of creativity—to a melting pot, laboratory, and startup center all in one.

Israel boasts more new startups relative to the population than any other country in the world. A total of 1,000 new startups were established here last year alone, which equates to twice as many per capita as in Germany. “Two new companies are created for every one that goes under,” *The Economist* magazine in the UK reports admiringly.

Tel Aviv isn’t just a home for startups, however, as IT giants have also built high-tech temples among the palm trees and beaches. Apple established its first research center outside the U.S. in the northern part of Tel Aviv, and Microsoft and Intel did the same. ICQ, Pentium M, and the USB flashdrive are all Israeli inventions.

There are 87 Israeli companies listed on the NASDAQ tech index; only China has more besides the USA, and China has more than one billion people. Israel, by comparison, has only eight million. “Silicon Wadi” is the name that’s been given to a stretch of coastline on the Mediterranean Sea—and Tel Aviv is its center of gravity. So, why is Tel Aviv such a hotspot for innovation? “We’re not afraid of failure,” says entrepreneur Sharonna Cohen. “Failure isn’t a flaw; it’s an experience.”

Improvisation in the desert

If not for the will to make the impossible possible Tel Aviv never would have been founded in 1909—and Israel would never have become a country nearly 40 years later. David Ben-Gurion, the founder of the state of Israel, wanted “to make the desert bloom.” In the beginning, there was only the will to do so, and this was followed by the necessity of making a dry landscape fertile. Seawater desalination was the first advanced technology developed here—and it’s still exported around the world today. Israel is a country that exists despite the resistance it faces in many forms, and this fact has shaped the mentality of its citizens. Life here is never calm; it’s always a struggle.

The immigrants who come here are well aware of this. They have left their old lives behind and overcome their fears of the new and unknown. Such an attitude is quite useful when creating innovations, especially startups. After they arrive, the immigrants learn another Israeli virtue—to make the most out of what you have.

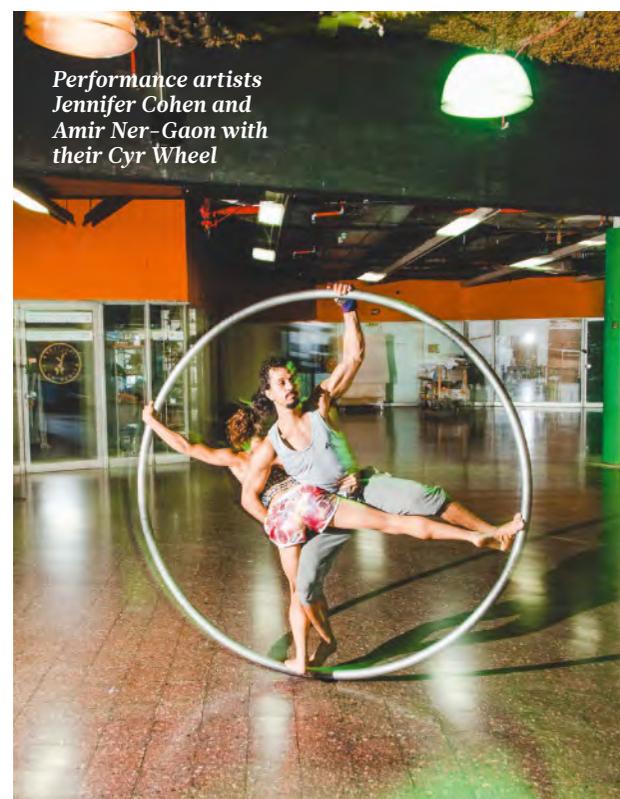
It’s also very helpful to have two top universities whose IT departments are among the best in the world only 90 minutes away by car. Indeed, education is of vital importance in Israel because the country continually ➔



Amir Gelman used to be a basketball coach; today he advises startups

“Jewish mothers want their kids to be better than the neighbor’s children”

Amir Gelman, a startup consultant at “The Junction,” about the factors that motivate young Israelis



Performance artists Jennifer Cohen and Amir Ner-Gaon with their Cyr Wheel

Photography: Yuli Gorodinsky

Interview: “We’re Not All That Smart”



Zohar Sharon is the Chief Knowledge Officer of Tel Aviv, where he is also responsible for the digital dialogue between residents

Tel Aviv was named the World’s Smartest City in 2014. How did it attain that honor?

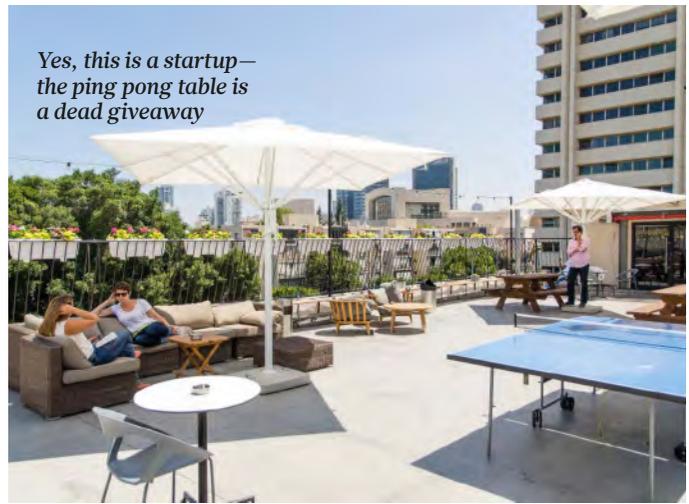
I don’t believe that we’re exceptionally smart, but we have established structures that allow residents to make better use of the opportunities the city offers. Conversely, we benefit from the people who live here, and that’s pretty unique.

Can you explain what you mean?

Basically, it starts with the fact that the city sends out its bills online and also processes applications electronically. More importantly, all the public data we collect and store is available to everyone as raw data. This data can take many forms—it could be information on the locations of bike rental stations, bomb shelters, or sunshades for the beach, for example.

What happens to all this data?

We’ve now held two competitions for the best city apps. Moovit is one of the apps created in this manner—it’s a realtime public transit app, and it’s now marketed all over the world. Another app guides you to the nearest bomb shelter, which is pretty important in Israel.



Yes, this is a startup—the ping pong table is a dead giveaway



Hidden image with Yonatan Mishal: The graffiti here “adds up” to a bus



Sharonna Cohen established the “Dreame.me” startup. She plans to reach the break-even point next year.



Hair greener than the vegetables: Tel Aviv is a colorful city.



Matkot on the beach: Sort of Israel’s national sport



Journalist Saul Singer has helped Israel “reinvent itself” as a startup nation

Interview

“We import problems and export solutions”

Saul Singer co-wrote the bestseller *Start-up Nation: The Story of Israel's Economic Miracle*. He reveals what one can learn from the world's most innovative country

Why is Tel Aviv such a creative city?

First of all, it's a mistake to believe that innovation has anything to do with ideas. There are no more ideas here than anywhere else. You need two things to transform an idea into a functioning startup: a willingness to take risks and perseverance—and we've got more than enough of both here.

What are the strengths and weaknesses of Tel Aviv today? Or, to put it another way: What can the city learn from others?

Israel is kind of like a problem-solving factory. People in Tel Aviv especially are very good at solving problems. What we're not so good at is identifying problems. Our interna-

tional focus helps us here. Israel is small, which is why we always need to think globally—much more than Silicon Valley needs to, since companies there have the huge American market right in their backyard, so to speak.

Are you saying that Israel can import problems from abroad in the future and then export the solutions it comes up with?

Yes, that's what co-innovation is. For example, we could work with Brazilian or Chinese companies to solve problems from those countries. Israel would benefit greatly from that because the rest of the world is not only a larger market than Israel; it's also growing more rapidly and has “better problems.”

“The bus station was opened up to artists in order to bring some life into it”

Yonatan Mishal, a photographer in Tel Aviv who exhibits his work in the bus station

→ reshapes its future using the knowledge it acquires. Israelis don't have more ideas than other people, says the journalist Saul Singer (see interview on the left). However, they pursue their ideas with greater gusto and perseverance—in order to make the most out of what they have.

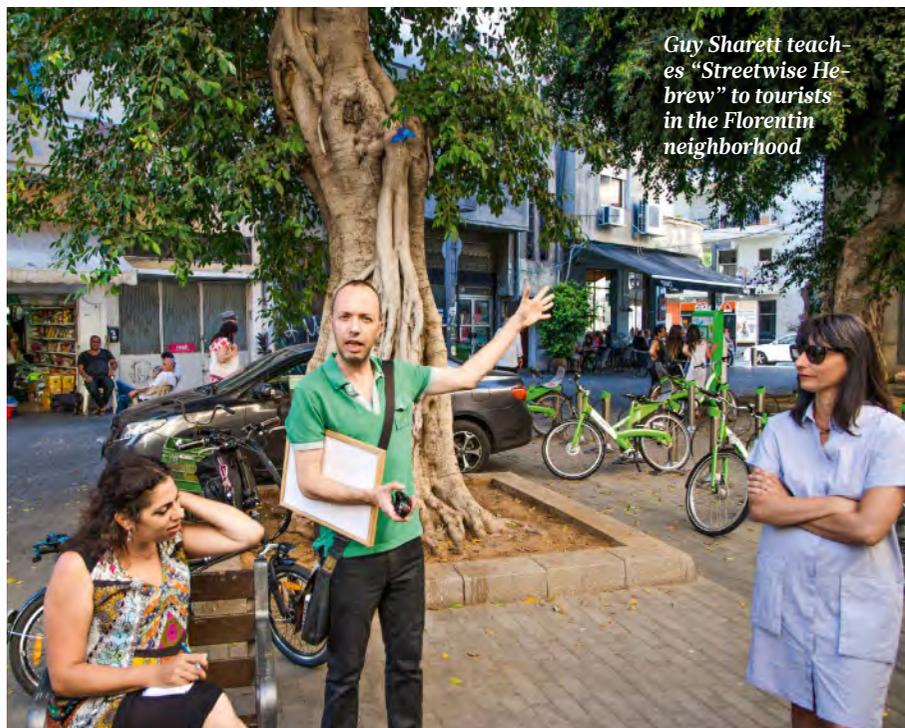
This is very apparent at the bus station, a giant multi-story complex with space for 1,500 stores. Around half of the space remained unoccupied for years after the bus station opened in 1993. “So someone came up with the idea of opening up the station to artists in order to bring some life into it,” says Yonatan Mishal, a photographer who exhibits at the station. Urban planners also moved into empty stores, as did gardeners and circus performers—people like Jennifer Cohen and Amir Ner-Gaon, who perform on a Cyr Wheel, which is a large metal hoop. The two jam themselves into the 15-kg ring and then start spinning away. Gidi Gilam has his studio right next door—a hodgepodge that includes old chairs stacked on one shelf and false teeth piled up on another. “I like to collect things,” he says, almost as an apology. “I put everything I find on the street into my bicycle basket.”

Gilam has no plans to get himself listed on the NASDAQ. He's actually a street artist, but his goal is also to constantly improve and never give up. Still, he can imagine starting a whole new career, a whole new life.

The courage to go for it

This is what Sharonna Cohen did. She's now on her second breakfast (an iced coffee) just a bagel-to-go away from the chaotic charm of the bus station—in the kitchen of WeWork, a bright coworking office building in the center of town. She had a lot of ideas after she returned home from the UK three years ago, but she didn't have much courage. As she describes it, she “lived too long among people who carry their doubts around with them like other people carry a wallet.” After a few months back in Tel Aviv, 27-year-old Cohen founded a startup: “Dreame.me” is a portal where users can post their dreams and daydreams. In return, they are given a work of art that represents the dream and which can be printed on bags, pillows, or posters.

People between the ages of 20 and 40 use WeWork. Most of them are entrepreneurs like Cohen. There's a ping



Guy Sharett teaches “Streetwise Hebrew” to tourists in the Florentin neighborhood



Office, studio, hodgepodge? Street artist Gidi Gilam lives in the bus station



More Bauhaus than anywhere else—and a UNESCO World Heritage Site



Jews with yarmulkes are actually a rare sight in secular Tel Aviv

pong table on the building's rooftop and, as is the case in many coworking spaces, there's also free beer.

However, freebies and ping pong alone cannot explain the creativity and success here. Amir Gelman can cite several other reasons; in fact, it's his job to explain them. Gelman, 28, advises and supports startups for "The Junction" startup platform. "Well, there's the proverbial Jewish mother, for example," he says with a grin. "She always pushes us and wants us to be better than the neighbor's children." The military experience and the responsibility young people are given in the army also play a role. After Israelis finish high school, they have to serve three years in the army. Israel is also the only country in the world where women are subject to conscription as well, although they only serve two years.

Cafes that stay open on the Sabbath

Part of Gelman's job is to choose the most promising startup founders from among dozens of applicants. "We don't select ideas; we select people," he explains. The Meerkat live stream app was developed by Gelman's protégés, for example. When Gelman looks through the resumes he receives, he invariably stumbles upon two names over and over again: Tel Aviv University and the Technion institute in nearby Haifa. The latter is also known as the MIT of Israel. Both universities are tops when it comes to information technology. That's not surprising, given the fact that two-thirds of the Israeli government's funding for research and development (four percent of the total budget) ends up in the Tel Aviv metropolitan area. Venture capital investment is higher here per capita than anywhere else in the world. When the working day is done, many people head over to the Flo-

rentin hipster neighborhood. The area used to be home to orthodox Greek Jews. Then the secular middle class moved in—people like Sharonna Cohen and Amir Gelman. There's a great zest for life here, and unlike the case in the rest of the country, the cafes even stay open on the Sabbath. Florentin is sometimes referred to as the "Lower East Side of Manhattan on steroids," or "Kreuzberg with a beach." Guy Sharett doesn't live here, but he does drop by a lot. A white folder under his arm reveals his educator side: Sharett works for Google in the morning; in the afternoon, he's a combination language teacher and tourist guide. He's about to take a group of tourists and recent immigrants on a graffiti tour that also includes instruction in "Streetwise Hebrew" using street art.

Creativity in Florentin is written and drawn on the walls of the neighborhood. The Hebrew language itself is also a startup of sorts. For centuries, it was used more or less for religious services only. Theodor Herzl, the founder of modern Zionism, once joked that you couldn't even buy a train ticket with Hebrew. Today, 130 years after the establishment of Modern Hebrew, you can do that—and more. Every immigrant, whether from Afghanistan, the USA, or Spain, also brings words from their native language with them: "Tov, yalla, bye," Israelis say when they separate ("good, let's go, bye") It's three words in three languages: Hebrew, Arabic, and English.

Sharett points to giant eggplants painted on building facades and then moves on to tiny galleries barely larger than a phone booth. No one ridicules such creative startups. After all, the idea of establishing a Jewish State and speaking Hebrew every day was once considered an impossibility. Then someone came along and said: We can do it! The rest is history.

"Hebrew is also a melting pot"

Guy Sharett is a tourist guide and language teacher with expertise in "Streetwise Hebrew"



Jan Ludwig is a freelance journalist based in Tel Aviv, where he reports on the Middle East for the newspapers *FAZ* and *Die Zeit* and the magazines *Dummy* and *Flute*



After 30 years as a researcher, Friedrich Georg Schmidt is the kind of person who is known by his initials. He's simply FGS

HERE THEY DO WHATEVER THEY WANT

Good ideas need fertile soil and time to grow.
Evonik Industries offers both of these things at Creavis in Marl.
It's a place where new ideas, innovations, and the
people who come up with them have enough space to spread out

➔ Albert Einstein was once asked whether he uses a notebook to keep track of his ideas. Einstein was taken aback. He replied that this wasn't necessary, as he didn't have all that many ideas.

Without implying a connection between Evonik Industries and the genius of a century, we can still conclude that things do run differently at Evonik. Last year the Group's employees submitted almost 7,000 suggestions for improvements. On average, that's about 28 ideas per workday that are meant to make our operations more efficient, safer, or simply better. In 2014 alone, that saved the Group over €7 million. Even more valuable are the ideas that become patents. Here too, there's a high productivity rate: an average of one patent per workday.

As a specialty chemicals company, Evonik depends on innovations and ideas—and on employees who think ahead and outside the box. But how can this be organized?

Friedrich Georg Schmidt has an inkling of how it's done. After 30 years of doing research at Evonik, he's become the kind of person who is known by his initials. He's FGS, and he was there at the foundation of Creavis, Evonik's unit for strategic innovation. Today he's there again with his own research project. He's also writing a book about how ideas germinate and thrive. His basic thesis is: "Ideas need the right climate!"

Creavis is like a greenhouse where Evonik creates this kind of climate. It's a place for conceiving and cultivating ideas that are still too bold or too outrageous for daily business operations. Creavis is regarded as the entry point for young scientists coming from universities, other companies, and startups. Evonik's units also temporarily send researchers and developers to Creavis so that they can focus on developing their ideas. Creavis is subdivided into units that are researching completely new technologies and ➔

**"If ideas
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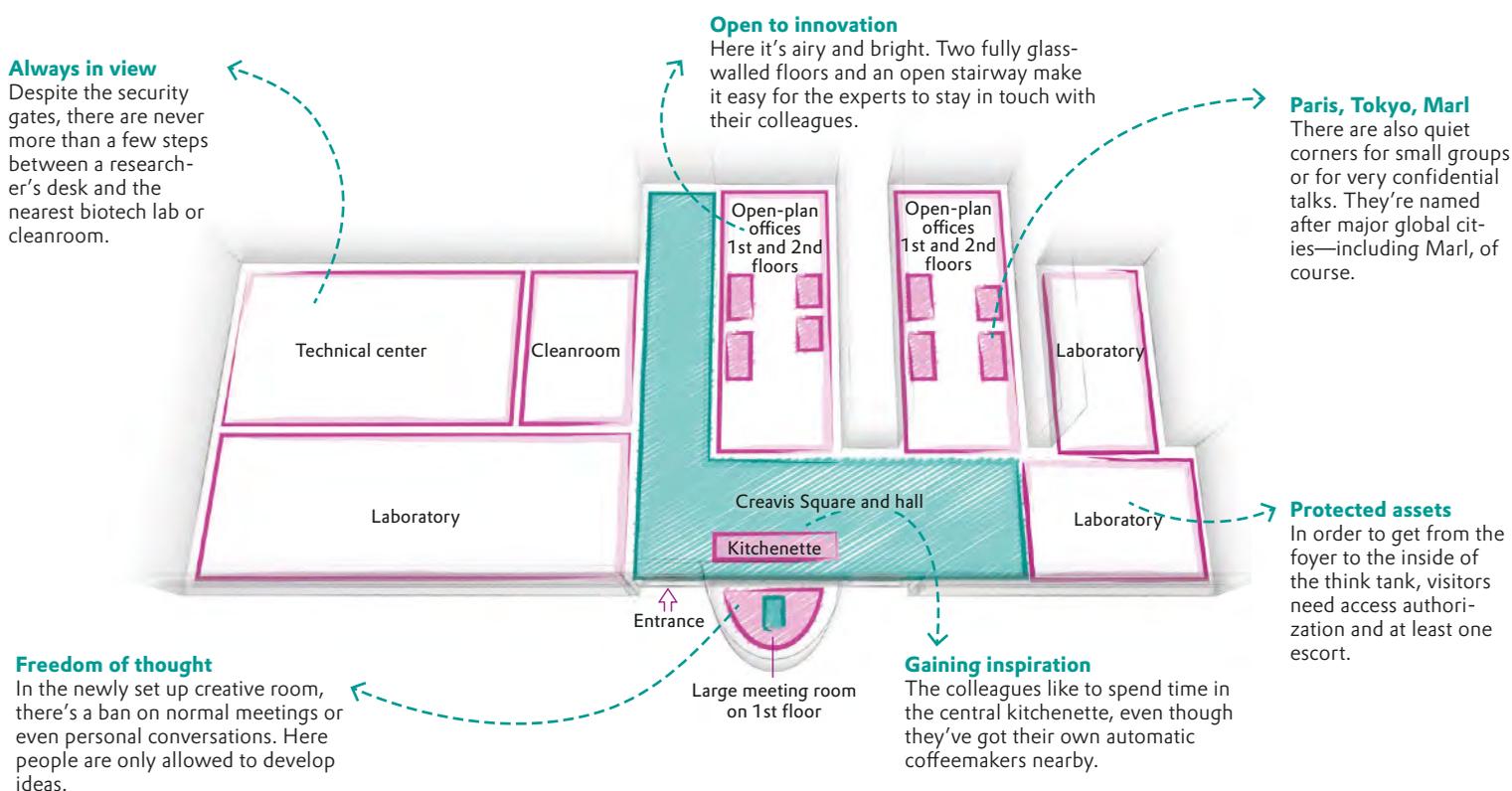
**Friedrich Georg
Schmidt**
a researcher at
Evonik



*A greenhouse
for ideas:
the Creavis
headquarters
in Marl*

A Blueprint for Creativity

The layout at Creavis promotes communication and sharing



→ other units that refine existing areas of technology and select new areas of business where a search for new ideas could be useful. Besides its headquarters in Marl, Creavis has two specialized laboratories, one for biotechnology (in China) and one for new medical applications (in the USA). With its broad glass facades, the headquarters building does indeed resemble a futuristic greenhouse. About 160 researchers and business developers are working inside it. Every one of their desks is at most a few steps away from the nearest biotech lab or cleanroom.

They're working, among other things, on bacteria that consume exhaust gases, printable IT components, and membrane modules—technologies that in ten or 15 years might change the world, or at least the Group's business operations. There's a high density of brand-new PhDs and a large proportion of women. Many disciplines are represented, and they are constantly combined into new clusters, either for specific topics or within "project houses."

Three years in the "fast breeder"

In the project houses, researchers from various organizational units come together for about three years in order to take a specific combination of ideas to market maturity. There have already been 11 such "fast breeders." The two newest ones are working on new medical technology and new lightweight construction materials, which are also known as composites. It's the last of these projects that has brought Schmidt, who is now 58, back to Creavis. He's working on a new class of materials that makes crosslinked plastics reinforced with carbon fiber or glass fiber as easily malleable as sheet metal. The auto industry is dreaming of such materials—and it's not the only one. "Unfortunately, it's not enough to simply find the right people, lock them

"Fall down, get back up, do it better! That's also a part of creative work."

Michael Korell,
researcher at Evonik

up together, and hope that something useful will ultimately emerge," Schmidt says. Creativity also requires certain guidelines and challenging targets, he adds. "Our work involves a huge financial risk, but the opportunities are also huge," says the President of Creavis, Stefan Buchholz. "That's why we clearly expect our projects to succeed, and why we have people who critically monitor activities to make sure we always have an eye on the market." At Creavis, people don't just spew out ideas. There are rules about the areas where people should look for new ideas, how these ideas should be narrowed down, and how their market value should be assessed.

But there's still lots of leeway, so here too creativity beats its own path. At the lightweight construction project in the Composites project house, the Gordian knot was cut only after Schmidt and his doctoral candidate Marcel Inhestern started chatting with colleagues from a neighboring area during a coffee break. They discovered that they had been thinking in the wrong direction for the past nine months. A few more days of work gave them their breakthrough.

In return, Schmidt's team has helped other departments by running a few test series for them after hours. They call these sidelines "submarine projects." Everyone here has at least one such project slumbering in a desk drawer. Controllers and managers might disapprove, but for genuine tinkerers such projects are indispensable. "A creative organization has to live with uncertainty," says Schmidt. "Without a bold acceptance of uncertainty, genuinely new ideas don't have a chance to grow."

Michael Korell agrees. Like Schmidt, he gave up his position as the director of research in another Group unit in order to pursue an idea of his own that came to him as he was sitting on his sofa at home. "I was reading a profession-



Michael Korell used to be a director of research who managed other researchers. Today he is pursuing his own idea at Creavis

al journal and I became fixated on a structural formula,” he recalls. It was a formula for polymer storage batteries. “This was something I knew nothing about. But this molecule contained things that Evonik can do very well.”

Batteries made of plastic, printed wafer-thin, flexible, and environmentally friendly—this was the idea for which Korell won first place in an in-house ideas competition and collected almost €500,000 worth of seed money. Then came the big setback: The batteries didn’t even have enough capacity to power smartphones. Korell slid into what he calls “a real identity crisis.” He had turned his back on a classic management career for the sake of an idea that had suddenly reached the end of the road. “The time I had spent in the USA really helped me then,” he says today. “The slogan ‘Fall down, get back up, do it better!’ is also a part of creative work.”

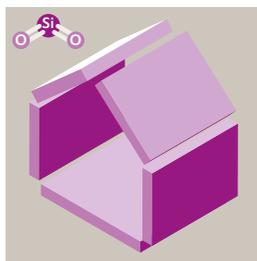
Korell is now developing his material for the Internet of Things—for example, for wireless radio sensors that are worn on the body to record the wearer’s vital functions. That’s why Evonik sent him to work at Creavis. This glass box brimming with exciting ideas at the edge of the chemistry park is exactly the right place for his idea. It’s a place where the work schedule, and the workers themselves, are a bit different. Where the path from the first sketch on the drawing board to the laboratory trial is unusually short, and the path from this idea to a finished product is nonetheless allowed to be quite a bit longer. ●



Tom Rademacher Freelance journalist
Tom Rademacher secretly believes that creativity is infectious. That’s why he especially enjoys working with researchers

Couldn’t You Also...?

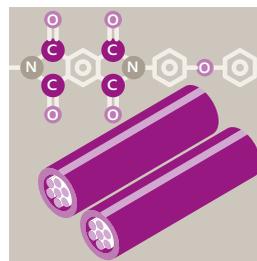
Yes, you could. Chemists are always finding new ways to do things. Three examples show what surprising careers innovations experience at Evonik



Silicas (CALOSTAT®) From tires to house walls

➔ Normally silicas do their work in tires, but today they also insulate house walls

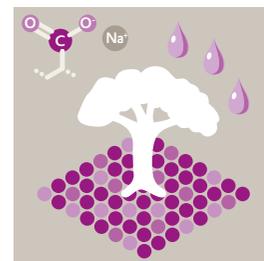
The particles in a single gram of the pyrogenic silica sold by Evonik have a total surface area of 200 square meters. That gives this product fantastic properties. These silicas were discovered in the 1940s and initially used as a substitute for soot in car tires. Since that time, they have entered almost every area of daily life as an auxiliary material under the name AEROSIL. For example, they improve the flow of paprika powder, help toothpaste clean your teeth, and prevent batteries from leaking. Since 2012 they have also been available pressed into specially developed insulating elements sold under the name CALOSTAT, which insulate newly constructed and renovated buildings effectively without being too thick.



Hollow-fiber membranes (SEPURAN®) From dust to biogas

➔ This membrane can separate streams of different gases

“We can do it better!” That’s how it all started with SEPURAN. Evonik has been producing this plastic for a long time, for example for filter mats that trap dust in cement plants. When Evonik developers rediscovered this polyimide material in a gas separation membrane used in-house, they realized they could do things better. The material had not been optimized for this job. The Evonik chemists therefore worked out their own variant of this material for separating gases. They successfully created a technology that can separate mixed streams of different gases on the basis of the different sizes of their molecules. Since then, Evonik has been marketing this hollow-fiber membrane called SEPURAN for efficiently processing biogas and, more recently, for extracting nitrogen gas from compressed air and concentrating helium and hydrogen.



Superabsorbers (STOCKOSORB®) From diapers to deserts

➔ Superabsorbers store water. This is appreciated by baby bottoms and farmers in arid regions

In the 1980s, absorbent polymers known as superabsorbers sparked a revolution on diaper-changing tables. They gradually replaced the cellulose that was previously used in diapers and brought welcome relief to sore baby bottoms. Evonik began its research in this area in the 1970s and opened its first large production plant for superabsorbers in 1986. Today a few grams of this material per diaper are enough to securely hold up to 400 milliliters of fluid. As a result, today’s diapers are thinner and stay dry longer than ever before. But superabsorbers from Evonik have long been effective in other fields as well—literally. As an additive in soil, they store water that can then be continuously released to plants. This makes frequent watering unnecessary and helps to safeguard harvests in regions that are plagued by drought.

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ISOPHORONE

Evonik is a pioneer in the field of isophorone chemistry and is still the only company in the world to cover the entire isophorone value chain. The VESTA brand family includes: isophorone, diamines, diisocyanates, and polyisocyanates. They are used, among other things, in coatings, in flooring, and increasingly in composites. Evonik produces isophorone in Germany, the USA, and, since last year, in China.

Isophorone is a largely colorless liquid that is used, among other things, in the coating, printing ink, and adhesive industries, due to its outstanding solvent properties. It is used in a wide variety of applications, including as a starting material for disinfectants and vitamin E. Secondary products of isophorone are used in car headlights to ensure high temperature resistance and a special look.

Applications:

- Plant protection products
- Sunscreens
- Solvents for printing inks
- Headlights

Isophorone diamine (IPD) is used in a wide variety of applications as a crosslinker or hardening agent. As a rule, the addition of even tiny amounts of this material has a big impact. IPD is used in marine coatings as well as in other coatings such as those applied to bridges and factory floors, i.e. areas that have to be particularly protected against corrosion or mechanical stress. IPD is also used in high-quality composite materials, such as those used in wind turbine rotor blades or lightweight automotive components, where it ensures the necessary temperature resistance, mechanical properties, and suitability for the processing technology used.

Applications:

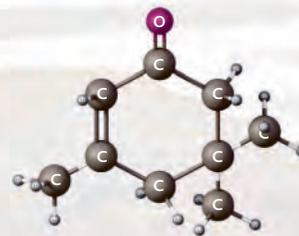
- Wind turbine rotor blades
- Floor coatings
- Marine coatings
- Composite materials for pipes

Isophorone diisocyanate (IPDI) is the next stage of refinement—one that fulfills all of the preconditions for the production of lightweight and weather-resistant polyurethane. In cars, IPDI is used in "spray skins," for example. Spray skins include coatings for the dashboard and other plastic parts. In addition to high resistance, such components now need to look and feel good, properties that IPDI noticeably improves.

Applications:

- Urethane acrylates and polyurethane emulsions for coatings and adhesives
- Elastomers for sealants and in the automotive sector

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Isophorone (3,5,5-trimethyl-2-cyclohexene-1-one) is used as a solvent and as an intermediate for synthesis purposes. Isophorone also occurs naturally in cranberries

The secondary products of IPDI are referred to as **derivatives**. These are crosslinkers for various types of polyurethane coating—either powder, water-based or solvent-based. IPDI derivatives make such coatings very resistant to weathering and chemicals. Powder coatings are especially efficient to apply and give bicycle frames, for example, a high-quality appearance. Such coatings are also used to decorate window profiles with a special production process (transfer printing).

Applications:

- Coil coatings
- Can coatings
- Automotive refinishing coatings
- Powder coatings



You can find additional milestones of chemistry at: [geschichte.evonik.de/sites/geschichte/en/inventars](https://www.geschichte.evonik.de/sites/geschichte/en/inventars)

History

1962

Acetone chemistry at the Hibernia nitrogen plant in Herne, Germany is launched in 1962, when the first isophorone facility is put into operation.

1988

Production capacity is more than doubled in Herne in 1988, when the second isophorone production line is put into operation.

1992

In 1992 Evonik expands isophorone production beyond Germany for the first time by installing its third isophorone production line at the plant in Mobile, Alabama (USA). The facility in Mobile mainly serves customers in North and South America.

2007

The fourth production line (located in Herne) goes into operation in 2007. This facility has more than six times the capacity of the first production line.

2014

The fifth production facility goes into operation in Shanghai (China). It focuses on the Asian market.

“Good Names Polarize”

What should we name our new creation? Manfred Gotta, 68, is often asked to help people make this momentous decision. The inventiveness of Germany’s most successful name-maker has already brought fame to about 500 products and companies, ranging from Twingo to Kelts and Evonik

Mr. Gotta, did you ever have one of your brilliant ideas when you were in the shower?

That happens sometimes. But this kind of initial spontaneous idea rarely makes the final cut. I usually realize that others have already had this idea, so I have to dive deeper into the situation.

How do you do that?

I like to get to know my customers very well and immerse myself in the culture of a company. So I begin by simply listening.

In the case of Evonik, you renamed a part of the company that was originally called RAG. How does one do that?

You have to be open, interested and honest. During my first visit to the company I talked to a wide range of its employees. Such impressions flow into my project report. Only if the second conversation is positive do I accept the commission. That’s because I know that for a naming project to succeed, the chemistry has to be right. After all, it involves a lot of gut feeling.

How do you arrive at a name?

You make a selection so that you have between five and ten suggestions on the shortlist. These suggestions are then tested in groups. The rule of thumb is that the name that everyone can immediately agree on is the first one to go. That’s because a good name should always polarize opinions.

The name Evonik includes the word “evolvere,” which means “evolve or develop,” but it’s a purely made-up name. Why?

I invent artificial names almost exclusively. They give me the greatest possible freedom to create an original name that can be understood all over the world. In my opinion,

Manfred Gotta, owner of the company Gotta Brands, is one of the best-known name-makers in Europe

“Evonik” is perceived as a very distinctive name that is not typically German.

Doesn’t a company’s name have to refer to its product?

This is one of the biggest mistakes people make when they’re naming a company. It tends to limit one’s creativity. It’s much more important to make sure the name reflects the soul of a product or a company. Do you know Tiony?

No, what is it?

Now you’re reacting like the audience at my presentations. The chamber in your brain is empty, and I can fill it by explaining to you that Tiony is the name of a new two-tone diamond. I just invented it, but if the name sounds pleasant and convincing to you, my work has been successful.

Spiegel magazine called your work “a combination of craftsmanship and ingenuity.” Do you agree with this assessment?

I’m proud of my creations, but there’s no big secret behind them. At some point I realized that I have a talent for inventing new concepts. I already had it when I was still working as an employee in advertising agencies. When I was 38 years old I established my own company. My first client was Opel, for which I invented the name Vectra—the first artificial name for a car model. Today this is standard procedure.

How do you maintain the secrecy that is so tremendously important for your job?

I’ve kept all my secrets for 30 years now, because I’m an autonomous one-man operation. I’m the only person with comprehensive knowledge about what I do, and I’m the only one who has my clients’ trust. My freelance employees don’t even know what clients they’re working for.

Have you ever felt that you’ve finally found the secret of success?

No. If you get that feeling, it’s time for you to break the apparent rule. Only people who swim against the tide attract attention.

Interview:
Uwe Killing

Manfred Gotta broke off his study of business management in order to work as an advertising copywriter. In 1986 he established his own name-creation company. Gotta has invented brand names including Megaperls, Xetra, Congstar, Smart, Panamera, Vectra, and Evonik



EVONIK

Edition Knowledge N°5

Water just runs off the lotus leaf. How does this work? Why doesn't the gecko fall off the wall, and why can water bugs fly? The plant and animal kingdoms are full of secrets. Whoever decodes them can apply nature's creativity to new inventions. We call this bionics—the attempt to transfer natural phenomena into new applications and products.



WE CAN LEARN ALL THIS FROM NATURE





HERE
WE
ARE.

VESTAMIN® increases the strength of rotor blades for wind turbines.

Rotor blades defy the wind and weather. On pages 52 and 53, you can find out how the isophorone in VESTAMIN gives the blades the strength they need.