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HUMANS

When humans write and talk about humans, you notice right away: It's their favorite topic. It is not only that everyone (usually) is closest to themselves. As a species, Homo sapiens also attaches distinct importance to themselves. Aristotle was concerned about the order of things and ranked the human being – as the seemingly most complicated one – at the "very top." The book of Genesis in the Bible seems to take this up, calling the human being in a way the final point or "pride of creation" who should "rule" over Earth and all living beings. An impressive story, but it did not stand the test of time. The theory of evolution changed the pyramid into a far-branched tree and the human being to a little branch among many others. What has remained is that humans are not so easy to understand, especially to themselves. Or, as Marie von Ebner-Eschenbach said, "The simplest human is still a very complicated being."

This and the ongoing interest of humans in themselves ensure that many sciences also deal with him, her, or us, again and again and from every conceivable angle. Medicine and linguistics, educational research and psychology, history and sociology – many disciplines revolve around human(kind) and their actions. Therefore, it is hardly difficult to take a small exemplary human research journey through the University of Potsdam with this issue of "Portal Wissen." We begin with a visit to the BabyLAB, where you can rewardingly watch even the youngest children learn languages. An economist points out that differences between men and women on their paychecks are anything but acceptable, and a start-up team showed us an app that can help you do something against dementia before it's too late.

Besides, it should have been clear long ago: If we want to understand ourselves, we must always look at what is surrounding us. This means the social interactions that challenge and shape us on both a small and large scale. That's why we talked to historians who are investigating corruption in the ancient world. But it also includes the environment, both living and non-living, on which we leave our mark and which, in turn, constantly influences us. A specialist in ancient DNA, for example, is investigating whether even Neanderthals left an ecological footprint, while an ecologist is searching for the consequences of climate change for biodiversity in Africa. And a media scientist has spent years analyzing how various images can help communicate scientific findings on climate change in such a way that they are understood.

We have not forgotten that the coronavirus continues to influence both our lives and research: A psychologist is working with partners throughout Germany to study how children and young people with chronic diseases get through the pandemic.

In addition, we naturally do not leave aside the diversity of research – created by humans – at the University of Potsdam: We introduce one of Germany's best gravitational wave researcher and talk about the role of mathematics in earthquake research. Last but not least, we had the work of the new research center for digital data law explained to us.

Enjoy the read!

MATTHIAS ZIMMERMANN

Illustration: Töpfer, Andreas

Illustration: Topfer, Andreas

INSTRUCTIVE BABBLE OF VOICES INSIDE THE POTSDAM BABYLAB

Lab Visit (instead of) Self-Experimentation

Little Mathilde is the star of the day: Laboratory coordinator Tom Fritzsche welcomes her and her mother. Afterwards, Dr. Alan Langus, a member of the research group, takes them to the children's waiting room where they have some time to rest. The photographer prepares his camera and takes some test shots. A flash lights up the room. Mathilde's mom helps her 14-month-old daughter out of her overalls and fixes her hair. Four adults, a babble of voices. All speaking differently – with their own unique phonetic characteristics. Sentences, words, sounds are buzzing around Mathilde. Aroused and curious, she looks around, unaware that she is giving her afternoon for the good of science.

Today, Mathilde is a test subject and thus contributes to the research of the BabyLAB on the Golm Campus. For over 20 years, the lab has been conducting experiments to investigate children's language acquisition. In their current project, the group led by Prof. Dr. Barbara Höhle investigates the influence of language variability on word acquisition in infants. "One might think understanding language is easy. But for children, it's a very different story," Höhle says. Experiments for projects of the Collaborative Research Center "Limits of Variability in Language" are regularly conducted here.

For Mathilde and her mom, it is not the first and certainly not the last visit to the BabyLAB. They already know the lab environment very well: the poster in the corridor with all team members

THE PROJECT

Project **"C03: Effects of variable input on word learning and word recognition in infants"** is part of the Collaborative Research Center (SFB) 1287 "Limits of Variability in Language".

Duration: 2017–2025
Funding: German Research Foundation (DFG)
Participants: Prof. Dr. Barbara Höhle, Prof. Dr. Adamantios Gafos, Dr. Alan Langus, Marc Hullebus

https://www.uni-potsdam.de/en/sfb1287/projects/cluster-c/project-c03

Photos: Hopfgarten, Tobias (2)

Mathilde during an experiment in the BabyLAB

Prof. Barbara Höhle

smiling, the waiting room with a playing rug, the funny paper giraffe and birds on the door and, of course, the room where the experiments take place. Just last week they participated in another study. The young mother enjoys supporting the language lab with her child. "On the way here, we met an acquaintance of mine who had recently become a mom herself. Immediately, I 'advertised' for the BabyLAB," says Mathilde's mother, who is a graduate of the University of Potsdam. While mother and daughter are getting ready, Fritzsche briefly explains the experiment without giving away too much.

Later in the corridor, Langus explains: "We don't want to influence parents in any way. That's why 'explanations' of the experiments are only given afterwards." Parents who live in Potsdam have often heard of the Golm BabyLAB – as soon as a baby is born, the BabyLAB sends them a letter. And the lab is well received in the city. As a result, new test subjects are rolling in constantly and provide the team with data for their research. Langus will evaluate the data later with the team. As a rule, an experiment does not last longer than ten minutes. "If a child becomes restless or starts to cry, we will stop the experiment, of course," Langus underlines.

All set? In the experimental room, chairs, a table and a monitor are ready. Mathilde sits down on her mother's lap. In addition to a FFP2 mask, her mother now has to wear glasses with patches on them, so that she cannot see anything and won't influence Mathilde. Fritzsche goes to a computer hidden behind a screen. From there he watches the experiment, which is also captured on video for later reference. Initially, before the first sound is played, Mathilde is fascinated by her mom's new accessory, which means that now not only her mouth and nose are covered, but her eyes as well! But as soon as the first sound is heard, Mathilde looks at the screen and listens attentively. The first part of the experiment begins.

"Buk, buk, buk...," different female and male voices alternate. It's always the same word, yet it sounds very different. Then a bright red object appears on the monitor. A vase with holes, perhaps, shown from different angles. Little Mathilde gazes at it spellbound and watches the unusual "TV program". And suddenly it goes "puk, puk, puk...". The new word differs only slightly from the one heard before. "Puk" comes with a new object resembling a green donut with colorful cube-shaped sprinkles. Fritzsche watches Mathilde through the camera and releases the pressed key whenever her attention decreases. The voices sometimes sound high-pitched, sometimes short, then elongated, or sonorous. Hard work for Mathilde's ears and brain.

Photo: Kaczynski, Ernst

Infants find it particularly difficult to make out minimal phonetic differences. "Buk" and "puk" are similar, except for the first sound: However, when pronouncing the consonants b and p, you will find that your lips actually move in much the same way. The only difference is the voicing, i.e. the point at which the vocal cords start to vibrate when the sound is produced. In this experiment, the researchers use this tricky listening task. "In the first part, called the learning or the habituation phase, we measure how long the children look at the monitor. This phase is stopped when the children's attention drops below a certain level," Höhle explains. A drop in attention indicates that the children have grasped the connection between the image and the word. However, this part of the word learning experiment is just the preparation for the ensuing second phase.

"Puk, puk, puk...". Oops, what's that? Now the sound comes with the red object and not the "green donut". That's strange! Mathilde looks at the object longer than before. Laboratory manager Fritzsche takes the time by pressing a button. "Whether the child looks at the object longer will only be established later on the basis of the recorded time," Fritzsche explains. "Usually, I don't know what's being shown, so I'm just as 'blind' as the parents." In this test experiment, however, he immediately sees that Mathilde reacted exactly as anticipated.

While in phase one it was clear which object was "puk" and which one "buk", Mathilde's longer attention span now indicates that the incorrect assignment surprises her. And this is what the researchers are most interested in. Höhle explains: "The second phase is the actual experiment: In one run, the child hears the same combination of image and word as in the learning phase. In the next run, the combination is mixed up. In this way, we test what the child has learned in the first phase."

"Mathilde did a great job," Fritzsche says and shows another experiment from the same study. Again, the test subjects are shown fantasy objects

Laboratory coordinator Tom Fritzsche conducting the experiment

Photo: Hopfgarten, Tobias

while hearing “buk” and “puk”. But this time, the words are spoken by a female voice only, so the sound is less varied. The results indicate that the children do not pay attention for as long when a word comes with the “wrong” object.

“In the experiment with one female voice only, it is more difficult for the children to grasp the subtle phonetic variations,” Höhle says. To be able to distinguish between B and P – voiced and voiceless consonants – three features come into play: the time between opening the lips and the point at which the vocal cords start to vibrate, but also the so-called formants, i.e. concentrated acoustic energy released when certain sounds are spoken. People articulate syllables differently, and yet listeners are able to tell a B from a P when they hear them. Why this is so, researchers have found out with the help of another project: If one characteristic deviates from the typical values, it will be compensated by the other two. “In the current project, we are interested in the relations between these characteristics. We assume them to be stable. For us, this also explains why a variety of speakers helps. It makes children aware of relations between the different characteristics,” Höhle states. In this way, children learn to analyze the variable pronunciation while listening, and to clearly distinguish between sounds despite acoustic variation. The experiments in this research have demonstrated that Mathilde and the other children remembered the made-up words better when presented by different speakers. Höhle can well imagine that these findings could also be used in speech therapy one day.

At the end, Fritzsche explains the experiment in detail. There is some paperwork to do, and Mathilde’s mother signs a document confirming the receipt of her compensation from the BabyLAB. After the little test subject is allowed to “sign” as well, on an empty sheet of paper, she is handed over a little present for her cooperation: a white T-shirt with “junior professor” printed on it in blue letters. This is how Fritzsche thanks the two for coming. To be a junior professor of language acquisition one day, if only one could tell at the age of 14 months …

LUISA AGROFYLAX
TRANSLATION: MONIKA WILKE

THE RESEARCHERS

Prof. Dr. Barbara Höhle studied linguistics, psychology and social sciences at Technische Universität Berlin. She has been Professor of Psycholinguistics at the University of Potsdam since 2004. In January 2021, she took over the office of Vice President for Research, Early Career Researchers and Equal Opportunities.

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Born in Estonia, **Dr. Alan Langus** studied cognitive science and psychology in Bremen and Amsterdam. He has been a research assistant at the Department of Linguistics at the University of Potsdam since July 2016.

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GGEAN

Illustration: Topfer, Andreas

DpESR

Economist Katharina Wrohlich About Inequalities in the Labor Market

The gender pay gap, i.e. the income difference between women and men, is still at 18% in Germany. Although there are now gender quotas on supervisory and management boards, women continue to be outnumbered in top positions. Katharina Wrohlich is Professor of Public Finance, Gender and Family Economics at the University of Potsdam and Head of the Gender Economics Research Group at the German Institute for Economic Research (DIW). The economist researches gender equality in the German labor market.

You recently showed in a study that starting a family continues to be a critical turning point for women's employment biographies. Why is that – and does this not apply to men?

In fact, no. Especially if we look at how average gross hourly earnings in Germany develop during the time of gainful employment. Between the age of 20 and 30, hourly wages rise for both women and men. Although there is already a gender pay gap during this period, it is well below 10%. But for women, this wage growth comes to an abrupt end after 30. For men it increases at a constant rate until it reaches its maximum at the age of 47, but women retain the average wage they had at 30 until the end of their working lives. In their late 40s, women's pay gap is over 30%. When I present this in my lectures, the consternation is great, especially among female students.

These are really shocking figures. How do they come about?

Especially in West Germany, and to a lesser extent in East Germany too, the extremely unequal division of gainful employment and care work begins when starting a family. Women and men now mostly work full-time until the age of 30, but with the first child many women switch to part-time work. On the one hand, this makes it possible to a certain extent to reconcile work and family life and to integrate into the labor market. On the other hand, the hourly wage is lower, so that long phases of part-time work result in wage reductions. Hence the development of wages and of working hours are interrelated. In West Germany, the majority of women work part-time after starting a family, not just for a few years, but until the end of their working lives. This in turn is due to the unequal division of gainful employment and care work, the "gender care gap."

DIW

Founded in 1925, the **German Institute for Economic Research** is one of the leading economic research institutes in Germany. The institute analyzes the economic and social aspects of topical issues, formulating and disseminating policy advice based on its research findings. A member of the Leibniz Association, DIW Berlin is independent and primarily publicly funded.

www.diw.de

The differences between East and West are very striking: the gender pay gap in 2020 was 6% in the eastern federal states and 20% in the West.

Yes, there are big differences between the East and West. Social norms are the reason. In recent years, the social model in western Germany has merely evolved from the 1- to the 1.5-earners model. But an increasingly large proportion of families in eastern Germany are also living this way.

Do couples decide to have the mother take a career break for financial reasons?

Both financial disadvantages and perceptions of motherhood play a role here. For couples under 30, the difference in hourly wages is not yet so big that it would be logical to choose this division. A study on the occasion of German reunification showed that there is a relatively high acceptance of mothers working in general, but not of mothers of young children working full-time.

In addition to such social norms, there are also financial reasons: A mother usually stays at home for one or two years after the birth of her first child. Then comes the second child and she is not employed for three or four years. Then she continues part-time for five or six years. During this time, the man's salary has increased, while the woman's salary has remained constant. So, it seems logical that the woman with the lower salary continues to downshift. Last but not least, the state's tax and social security system makes it overall very attractive financially for the woman to continue working part-time, especially in mini-jobs. The state subsidizes this model.

How exactly do policies encourage an unequal division of labor within couples?

The tax splitting of married couples, for example, treats spouses equally if they have a joint taxable income. Therefore, it makes no difference whether


Prof. Katharina Wrohlich

40,000 euros are earned by one person or by two people working full-time. The underlying principle is that the man is responsible for supporting the whole family. In addition, mini-jobs have been heavily promoted since the Hartz reforms: An average family initially loses net income if the woman's gainful employment extends beyond the mini-job. Why should the large group of people of prime working age have their social security contributions subsidized? The situation is similar when it comes to health insurance, where, for example, spouses in marginal employment are co-insured free of charge.

One might ask innocently: What is the problem with the single-earner model in marriage? It offers women security, doesn't it?

One of my colleagues at the DIW used to say, "Being a wife is a risky job!" Every third marriage in Germany is divorced. For years, the wife did not work at all, or worked part-time or in a mini-job; the aforementioned wage growth did not happen, and now her standard of living is decreasing massively. Her eligibility for social security, such as unemployment benefits or pensions, is much lower. But this is not just about the risk of divorce: The sole earner may also become ill or unemployed, for example.

When it comes to the earnings gap, Germany compares poorly to other countries with similar female employment rates. Why is that?

Germany ranks almost last in an EU comparison. Romania and Italy rank near the top, which is perhaps surprising at first. However, when making such comparisons, one should not only look at the earnings gap but also consider the female employment rate, which is very heterogeneous across the EU: In countries where only about half of women are gainfully employed, such as Italy or Romania, it is the women with higher earnings who work. But even among countries with the same labor force participation rate, Germany, together with Austria, by the way, has the largest gap. This is due to the high proportion of part-time work. Iceland and the Scandinavian countries not only have a higher female employment rate than Germany but also smaller gaps.

What do these countries do better?

The Nordic countries have had more consistent gender equality policies for decades. One example is good quality childcare for all age groups. Quality is very important because without it parents will not take up the offer. Good childcare is also important in terms of social policy because it can lead to more equal opportunities in education. But the tax system plays a role, too: In Sweden, for example, there is consistently individualized taxation. Another example is parental allowance, which has existed in Sweden and Norway since the early 1990s and which Germany has adopted from there.

Speaking of parental allowance: In order for a couple to receive 14 months of parental allowance, one partner must apply for at least two months of parental allowance. In practice, many fathers limit themselves to these two months. Why aren't these partner months extended?

The regulations on parental allowance are now 15 years old. The fact that there was a time without this benefit has almost been forgotten. If policy makers were now to stipulate that a couple would only receive 14 months of parental allowance if these were shared equally, this would be met with resistance. Many would perceive this as a cutback. It would actually make sense to extend the partner months – tellingly called "fathers' months" in common parlance – so that care work could be shared more equally.

However, the coalition agreement does not envisage any far-reaching reforms to parental benefits or even to spousal tax splitting. There is even a plan to raise the mini-job limit. In other areas, such as reproductive rights or foreign policy, the current government has set out many concrete plans with regard to equal rights policy. But when it comes to combating economic inequality between women and men,

Photo: Scholz, Sandra

the coalition agreement is somewhat disappointing. Starting a family remains a critical life phase for the time being.

Preschool teacher, geriatric nurse, housekeeper – lower-paid occupations are more often pursued by women. Why is that?

High gender segregation is indeed another reason for the gender pay gap in Germany. "Traditionally female jobs," that is, jobs in which more than 70% of employees are female, are paid worse on average. But this is not my area of research, although the topic is very interesting.

Regarding care work, you also looked at gender relations during the pandemic. What are your conclusions?

Before Corona, there was a very uneven distribution of unpaid care work. When daycare centers and schools closed from one day to the next, this massively increased the amount of care work in many families. Many feared a backlash, meaning that women would completely take over childcare and household responsibilities. Others saw an opportunity for fathers, who worked from home, to participate more. We analyzed data from the first lockdown in spring 2020 and the second hard lockdown in January and February 2021. They confirm neither hypothesis. Parents who had shared care work equally before continued to do this; if mothers were more likely to be responsible before, this remained the same way during the pandemic. Despite the enormous stress and shock, not much has changed. This shows how deeply rooted role models and the resulting division of tasks are.

The proportion of women on top management boards of companies has been rising since the relevant statutory regulations were introduced. Do you think they are effective?

Since 2015, there has been a gender quota for supervisory boards in companies that are listed on the stock exchange and have equal codetermination. This means that half of the supervisory board members are female employees. This group includes about 100 companies, which must now fill 30% of the positions with women. At the DIW, we have been publishing figures on the proportion of women on the executive and supervisory boards of the 500 largest companies in Germany for over 15 years in the "DIW Women Managers Barometer" and we see that the quota for supervisory boards has made a difference. The Dax 40 companies even exceed the mandatory quota of 30%. It's a different story for board members, however. For a long time, it was said that a quota here would interfere too much with entrepreneurial freedom. Finally, however, the grand coalition reached an agreement and passed a law that must be implemented from August 2022 on. A board of four or more members must include at least one woman. But here, the group of affected companies is even smaller. However, the effect of the announcement alone was enormous: We have never seen such a high increase in the proportion of women on the boards of affected companies as between 2021 and 2022.

Photo: AdobeStock/SFIO CRACHO

What are the benefits of gender quota?

First of all, it is about the purpose itself, i.e. reducing inequality in high decision-making positions. But beyond that, it is hoped that the visibility of these women will change gender stereotypes in society as a whole. In my current favorite research project, I am analyzing data from employees in Germany together with colleagues from Freie Universität Berlin and the University of Bielefeld. These employees were surveyed every few years. We found that when the gender of their supervisors changed during this time, gender biases, i.e. perceptions of gender shaped by stereotypes, also changed significantly. So even deeply ingrained attitudes can change via daily workplace interactions. That's a strong argument for quotas. No one sees them as a particularly elegant instrument, but such effects give reason to hope that at some point we will no longer need them.

How can such often unconscious attitudes be examined?

When people are asked whether women and men should earn the same for the same work, the answer is almost always "Yes, of course." That's why the aforementioned study used vignettes to capture the unconscious stereotypes or "unconscious biases." A vignette is basically a description of a hypothetical person. Respondents were presented with ten combinations of characteristics, for example: Ms. XY is X years old and works in profession XY. She performs the following service and has been employed there for X years. She earns X euros per month. The respondents were asked to indicate whether the wage was fair for the person in question. The result: lower wages are considered fairer for women than for men, namely by 3%. This is despite the fact that 90% of respondents oppose wage gaps. This unconscious bias exists for both women and men and increases sharply with respondents' age. But it also rises with the age of the vignette person: For 30-year-old vignettes, it was zero percent; for 50-year-olds, it rose to over 6%. This is particularly fascinating because it reflects the evolution of actual wages over the course of a life. But we also observed that these biases disappear when, let's say, you get a new female boss instead of a male one. Next, I would like to investigate what role parenthood plays in determining what wage is perceived as fair.

THE RESEARCHER

Prof. Dr. Katharina Wrohlich studied political economics in Vienna and Washington. She is Professor of Public Finance, Gender, and Family Economics at the university of Potsdam and head of the Gender Economics Research Group at DIW Berlin.

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You have been at DIW since 2002 and at the University of Potsdam since 2021. Does your work at one institution stimulate your work at the other?

I really enjoy teaching at the University of Potsdam. I sometimes invite colleagues from DIW to my courses, for example last semester for a discussion of German pension policy. The students like that. Even though teaching at the university is still relatively new for me, I have been involved in knowledge transfer at DIW for a long time: We publish our research results in the institute's weekly report and answer inquiries from the media every week, sometimes also from parliamentary groups, ministries, or interest groups. In my view, science communication is very important, and especially during the pandemic we have seen that it is increasingly important.

DR. JANA SCHOLZ

TRANSLATION: SUSANNE VOIGT

Photos: Scholz; Sandra (top); AdobeStock/Prostock-studio (bottom)

Photo: AdobeStock/Cristina Conti

Fighting Forgetfulness

Start-Up Company memodio Develops an App for Dementia Prevention

Anyone over 50 who forgets names, appointments, or words increasingly often should be concerned about their health. Memory disorders can be a sign of early dementia. Between 4 and 6 million people in Germany are currently affected. The disease is chronic and develops gradually into pronounced dementia. However, with diet, exercise, regular social contact, and exercises for the brain, there is a lot that can be done to slow down this process. The start-up company memodio is developing an app for affected persons to counter forgetting.

"No one develops dementia overnight," explains Dr. Doron Stein. Instead, forgetting comes gradually. At first, people over 50 notice slight cognitive disturbances. They forget things more often, have difficulty finding the right words, orienting themselves, or concentrating on something. In Germany, 4-6 million people are in this preliminary stage of dementia. This progresses slowly and eventually, after years, leads to full-blown dementia that hardly allows independent living. "The biggest problem is that these people are not being cared for because no therapy so far exists for pre-dementia," Stein says. "Pharmaceutical

THE PROJECT

About 1.6 million people in Germany suffer from dementia and gradually lose their mental abilities. At the beginning of the disease, short-term memory and retentiveness are particularly impaired. Up to six million people in Germany suffer from these early signs of the disease. Later, long-term memory, language, and orientation are affected, too. There are various causes for the disease. Alzheimer's disease, in which nerve cells in the brain are destroyed by incorrectly folded protein particles, is responsible for about 60% of all dementia cases. But vascular damage, high alcohol consumption, or brain injuries can also lead to the typical symptoms of dementia. Manifested dementia can be treated with physiotherapy, ergotherapy, or medication with anti-dementia drugs. For the preliminary stage of dementia – so-called pre-dementia – there are no approved drugs in Europe yet. However, a combination therapy of exercise, memory training, social participation, and a balanced diet can positively influence the course of the disease.

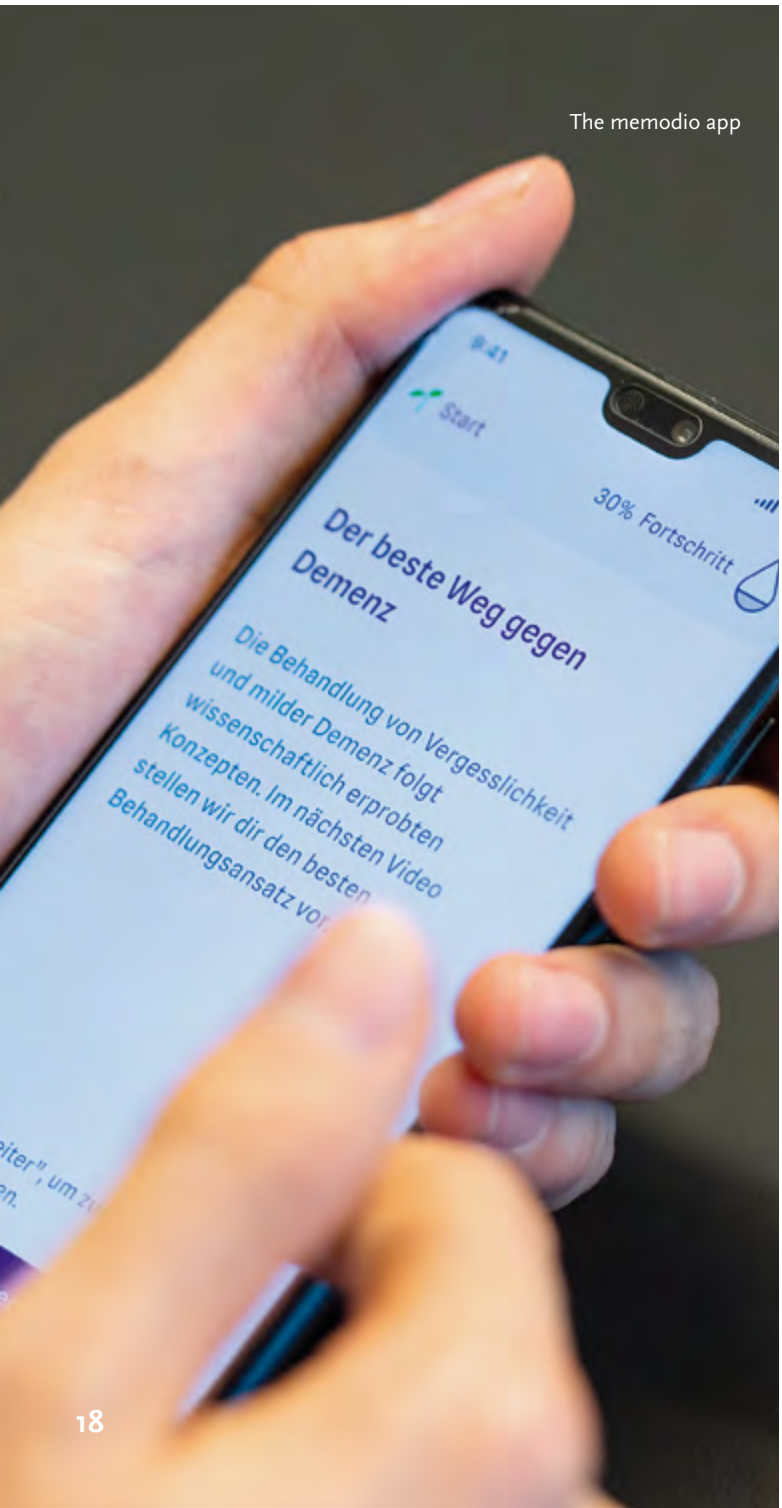
companies have been researching this for over 20 years, but so far largely unsuccessfully."

Combined therapy for incipient dementia

When it comes to dementia research, the physician is up to date. In 2021, he published a white paper with current research findings on the care of early stages of Alzheimer's disease, which is the most important trigger for dementia. Scientific and medical literature shows: While there is no cure for gradual forgetfulness, there are certainly some measures that can slow the progressive decline in memory skills. Exercise, nutrition, memory training, social participation, and the management of risk factors are all weapons against dementia. In particular, the combination of all these measures showed its effectiveness in studies, while each one on its own hardly helped against early dementia.

So something can be done about mental decline in old age, but many people have no idea that their problems are an early form of dementia. Only a very small number of those affected are currently diagnosed correctly. "Many patients and even doctors blame it on increasing age, in which one simply deteriorates," Stein explains. The physician wants to change this state of affairs – with the help of an app.

Together with physician Felix Bicu, who is also a specialist for dementia, and software engineer Paul Zimmermann, he founded memodio, a company that develops a digital application for people with early dementia. "This could become such a big thing, we're doing this full-time now," the team of three, who already knew each other from a previous project, decided. "Full time" – for the founders that means that their working week usually has more than 60 hours. "Especially during the start-up phase, you sometimes have to get through two weeks of work in seven days," Zimmermann, who is feeding the medical knowledge of his founding partners into a software application, explains.



The memodio app

More than just memory training

For the programmer, this task involves some challenges: The target group has mild cognitive limitations, which he must take into account when designing the app. Seniors also generally have a very different perception and different needs than younger people. The founders are establishing these specific aspects with user-centered research, many surveys, and tests. The profiles are designed in such a way that they address individual health status and progress. The therapy plan evolves along with it. "You have to put yourself in the user's shoes in a completely different way and proceed differently than with an ordinary app," Zimmermann explains.

LOOKING FOR TEST PERSONS

For the development of the health app, the founders are looking for test persons. If you are older than 50, suffer from mild forgetfulness, and want to test the app, you can get on the waiting list at ✍ **https://memodio-app.com** or send an email to ✉ **info@memodio-app.com** anmelden.

Photo: Hopfgarten, Tobias

The result of the work so far is already impressive: In 2021, the team received an EXIST start-up grant for its business idea, with which the German Federal Ministry of Economics and Climate Protection supports technology-oriented and knowledge-based start-ups from the university and research landscape. It also won the Berlin-Brandenburg business plan competition. At the end of 2021, this was followed by the company's incorporation as a limited liability corporation (GmbH). A few months later, the team already has six employees in addition to the three founders, and a first prototype of the app is ready, which goes far beyond previously known applications for memory training.

"We're not just assembling any app but a medical product," Zimmermann emphasizes. Medical knowledge about pre-dementia is reflected in a comprehensive treatment plan tailored to patients. The health app educates users about the disease, helps manage risk factors such as poor hearing and vision, diabetes, obesity, and cardiovascular disease. Memory is trained with exercises for recollection abilities, reaction speed, and concentration. It also offers suggestions on how to change one's diet to one that promotes cognition, with low carbohydrates, lots of vegetables, fish, and white meat instead of red.

"There are some people in this target group who are socially quite isolated," Stein describes another important aspect of dementia care. Contacts with relatives or friends, taking a walk together, and conversations are a component of therapy that should not be underestimated. The app is intended to support the affected people in promoting these contacts and reducing inhibitions. For example, it contains instructions on how to find analog offers for meeting people on the internet. And finally, it also includes physical training that is adapted to the respective fitness level previously indicated by the user. The exercises help the brain stay fit and are intended to improve quality of life.

Daily exercises are best

If you want to stop your dementia, you have to keep at it regularly – "several times a week, preferably every day," Stein explains. The personalized therapy plan should be followed over several months and bring about lasting changes in one's own behavior. To make this work, the app contains lots of elements for motivation and a reward system, which, however, is still a "trade secret." With the help of detailed statistics, users can also keep track of their own progress.

The coming months are most probably another busy time for the team. Videos will be shot, the app's functions optimized and checked out by test subjects. The founders also plan to have their app certified as a medical product. The app should be available for download in early 2023. After that, a large study is planned to prove the medical benefits of the product with data. If that succeeds, the three will be at the threshold of the next big step: getting the app approved as a digital health app, which will allow it to be marketed on prescription. "Of course, this is an attractive goal for us, but it also involves high requirements and a lot of documentation," Stein explains. "But the effort will certainly be worth it."

HEIKE KAMPE
TRANSLATION: SUSANNE VOIGT

THE FOUNDERS

Dr. med. Doron B. Stein studied medicine and health economics at Heidelberg University. He worked as an assistant physician at the Charité Berlin and as a management consultant in the digital health sector.

Felix Bicu studied medicine and health economics at the University of Heidelberg and worked as a medical doctor in the field of nuclear medicine and dementia imaging. He also advises other start-ups on medical and financial issues.

Paul Zimmermann studied IT systems engineering at the Digital Engineering Faculty, jointly established by the Hasso Plattner Institute (HPI) and University of Potsdam, e-business at Copenhagen Business School and has already worked for several young software start-ups.

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EXIST FUNDING

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✍ www.uni-potsdam.de/de/potsdam-transfer

Photos: Hopfgarten, Tobias (top, bottom); memodio: Leo Seidel (center)

Illustration: Töpfer, Andreas

AlterEco

Tracing the Ecological Footprint of the Neanderthal

Humans live large. The rainforest, which is so important for the world, is dwindling, as are the polar caps and the permafrost. The goal, agreed upon in Paris only in 2015, of limiting global warming to 1.5 degrees by 2100 is becoming increasingly unrealistic. Scientific studies from a wide range of disciplines reveal every day just how large our ecological footprint really is. It is less well known that humans have been making serious and lasting changes to their environment not just since industrialization. A research project, of which the Potsdam expert on ancient DNA, Prof. Michael Hofreiter, is a part, aims to show how much the Neanderthals already affected the flora and fauna around them.

THE PROJECT

AlterEco – Understanding the Anthropocene: human alternation of ecosystems in our deep history

Participants: Prof. Dr. Sabine Gaudzinski-Windheuser & Dr. Lutz Kindler (Archeological Research Center and Museum for Human Behavioral Evolution in Neuwied (MONREPOS), lead); Prof. Dr. Michael Hofreiter (University of Potsdam), Prof. Dr. Thomas Tütken (Johannes Gutenberg-University Mainz), Prof. Dr. Wil Roebroeks (Leiden University)
Funding: Leibniz Association
Duration: Apr. 2021 – Dec. 2023

So, does the history of the Earth need to be rewritten? Did the Anthropocene – the age of humans – begin much earlier than previously thought? Not for Prof. Hofreiter. "It's distinctly anthropocentric that we need our own Earth epoch," he says and laughs. "I think it's quite possible that in 5-10 million years there will hardly be any traces of human existence left on Earth." However, if the research project is able to demonstrate that Neanderthals were already permanently changing their environment, it would nevertheless be scientifically remarkable. "The oldest evidence to date that humans used fire to change the landscape on a large scale comes from Australia and is about 50,000 to 60,000 years old," he explains. "In the Neumark region, we are now investigating finds that are over 120,000 years old."

In collaboration with the Archaeological Research Center and Museum for Human Behavioral Evolution in Neuwied (MONREPOS) and the universities in Mainz and Leiden, Hofreiter investigates traces of human influence on nature. Did Neanderthals change the biological diversity of the flora and fauna? Until now, it was assumed that humans began to have a lasting impact on the face of nature only when they settled down and cleared forests, created towns, and cultivated fields. The AlterEco team is of a different opinion: In their project outline, the researchers write "that human intervention in the landscape has a much greater temporal depth, and prehistoric hunter-gatherers were already changing their niches tens of thousands of years before the advent of agriculture, with significant impacts on ecosystems."

A unique open-air laboratory

In order to prove this, the researchers are studying the traces of plant and animal life during the Eemian, an interglacial period that began about 126,000 years ago and lasted about 11,000 years. These are preserved in a former lignite opencast mine in Saxony- Anhalt near Halle/Saale. "The Neumark-Nord site is unique," says Hofreiter. "On the one hand, the special geology has ensured that the remains of animals, plants, and traces of human influence have been very well preserved. There was an ice cap on top of the lignite for a long time. In addition, there were sandy sediments, which are less harmful to the DNA we are studying than, for example, acidic sediments." Moreover, he says, it was only the extensive opening of the area by opencast mining that exposed those layers in which the prehistoric remains have survived for more than a hundred thousand years, allowing the researchers to study them today. "Fortunately for us, archaeologist Dietrich Mania already secured many finds during lignite mining." The two lake basins Neumark-Nord 1 and Neumark-Nord 2 (NN1 and NN2) are now being opened

Uncovered remains of an elephant in Neumark-Nord, 1996

Excavation of a 125,000-year-old archaeological site in Neumark-Nord near Halle in summer 2007

Photos: Roebroeks, Will (left); Landesamt für Denkmalpflege und Archäologie Sachsen-Anhalt/Dietrich Mania (right)

Prof. Michael Hofreiter

up on a large scale – tens of thousands of plant and animal remains have been secured so far on a total of nearly 26 hectares. Among them are more than 200 animal species: from beetles to rudd and pike to hyenas, rhinos, and cave lions. Over 1,500 skeletal parts of about 70 European forest elephants were collected on NN1 alone. "These were huge animals with a shoulder height of up to four meters and a weight of 13 tons," says Prof. Hofreiter. Amongst them, traces of their human hunters emerge again and again: flint knives, tools for scraping and charcoal remains that indicate fire. Bones or skeletons of Neanderthals themselves, however, were not found.

The interdisciplinary research team has set out to investigate the finds with the help of various new methods: Prof. Tütken, a geoscientist from the University of Mainz, is looking at the food webs between herbivores and carnivores by analyzing stable isotopes. The bones of lions, bears, wolves, deer, rhinoceroses, and elephants, for example, are examined to determine to what extent stable compounds of carbon, nitrogen, and other elements have been preserved in them. This allows conclusions to be drawn about the animals' food, which in turn enables the reconstruction of food networks.

Prof. Roebroeks, an archeologist at Leiden University, will analyze the many scorch marks among the finds in Neumark-Nord. Did Neanderthals use fire, for example, to keep the area, which was completely covered by forest for a long time, open so that they could hunt better?

Prof. Gaudzinski-Windheuser and Dr. Kindler from MONREPOS are particularly interested in the fauna and elephant finds. "All excavated elephant bones have cut marks, which suggests that they were hunted," explains Hofreiter. The archaeozoological analysis of bone changes caused by humans and predators provides, among other details, information about the size of the populations that lived in the area.

Big animals, small remains

Michael Hofreiter is also taken with the large animals. He looks at the bones of aurochs, red and fallow deer, and elephants. Carnivores, on the other hand, are left out. "Since they are at the top of the food pyramid, we simply haven't found enough of their remains for a genetic analysis," he explains. With elephants, things are different. Hofreiter and his team have already collected samples from 40 animals. The deer bones, which are located at MONREPOS near Frankfurt, will be sampled soon. "Then it's time to put on a work coat and gloves, and a mask and get to the bones – with a Dremel," he explains. Of course, this is done in close coordination with the responsible archaeologists and curators so that the bones can still be exhibited later. Experience shows that the best-preserved ancient DNA is found in the thick bones. The better the sample, the more information you can extract from it later in the lab, Hofreiter says. "We don't need much," he says. "For one extraction, 50 milligrams are enough."

In the Potsdam laboratory, existing DNA residues are extracted and examined more closely – in large quantities. Next Generation Sequencing (NGS) is the name of the procedure that has revolutionized work with genetic material. In the laboratory of Hofreiter's research group, there is a black box that looks like a standard laser printer: a small sequencer. It "only" manages about 400 million sequences in one cycle. That's enough to keep the researchers busy for weeks. Their work consists primarily of analyzing the data

Photo: Hopfgarten, Tobias

Reconstructed section through the lake basin of Neumark-Nord

THE RESEARCHER

Prof. Dr. Michael Hofreiter studied biology in Munich. Since 2013, he has been Professor for General Zoology/Evolutionary Adaptive Genomics at the University of Potsdam.

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bioinformatically. "With NGS, we can sequence enormous amounts of DNA," Hofreiter says. "The method is also very well suited for ancient DNA, since it can also be used to analyze the often very short sections that have been preserved." From the individual analyses, Hofreiter and his team create a DNA library that they can use to compare animals. "For a population genetic comparison, we need the same DNA section from all individuals," he explains. The comparison is expected to provide answers to many questions: What were the dynamics of the populations? Was there an exchange

Photo: Hopfgarten, Tobias

Illustration: Landesamt für Denkmalpflege und Archäologie Sachsen-Anhalt/Karol Schauer (top)

or did they live "side by side"? Did genetic diversity decline because the animals were heavily hunted? "If we find enough genetic material, we can create a genome for each species," Hofreiter says. "Then we would be able to work out the long-term population dynamics, i.e. how large the populations were at what times."

In the end, the results of all subprojects will be combined. To do this, the researchers are using software from conservation biology for running population viability simulations. "When we 'throw' the data together, it will show the impact Neanderthals really had on their environment," he says. "Maybe they didn't play that big a role despite intensive hunting and landscape change. Then again, perhaps they did." The hope is that "AlterEco" will reveal how long humans have been acting on and permanently changing the world. But it should already be clear that Neanderthals had a far smaller ecological footprint to account for than we do today.

MATTHIAS ZIMMERMANN
TRANSLATION: SUSANNE VOIGT

GIFT OR BRIBERY?

Corruption in the Ancient World, "Twisted Transfers" and What We Can Learn From Them Today

Illustration: Topfer, Andreas

When former German Federal President Christian Wulff was forced to resign in 2012 following allegations of corruption, the debate, as always in such cases, came to a boil: Are people with political responsibilities allowed to accept gifts? If so, from whom? Is anything expected in return? Where is the line to bribery? The German-British project "Twisted Transfers" tries to clarify this issue and looks far back into the past: to ancient Greek and Roman history.

Filippo Carlà-Uhink calls the term corruption "ambiguous," although its Latin origin – "corruptio" – unmistakably expresses what is meant: ruin, decay, decline! Not everything that is commonly perceived as corrupt, however, breaks applicable law. Actually, illegal actions are quite socially acceptable in certain circles. "Corruption can be assessed politically, morally, and legally. There is no uniform definition," says Carlà-Uhink, Professor of Ancient History at the University of Potsdam, who spent many years studying the interpretation of gifts in ancient times. A problem usually arises, whenever the giver and the receiver are not on the same level of power. In order to be able to accurately distinguish between gifts and corruption, he is currently spending more time on the analysis of such transfers, which are perceived as "wrong" or "twisted." He is not doing this work alone, but in a joint project with the University of Roehampton.

The German-British team approaches so-called "Twisted Transfers" by way of discursive constructions. This means disengaging from current and past understandings of law and examining how "corrupt behavior" was talked about in ancient political, cultural, and economic contexts. Which normative values shaped social life? What was considered the ideal of proper behavior? What was socially accepted and what was not? The field of research ranges from the courts in classical Athens to the ethics of Byzantine diplomacy, which can be extensively researched thanks to relatively extensive and well-preserved sources. In the end, outlined case studies are intended to help us understand why and how these transfers could be portrayed as "twisted" and thus as acts of corruption – and they are still portrayed that way today.

Prof. Carlà-Uhink gives an example: the criminal proceedings against Gaius Verres, who was governor of the province of Sicily from 73 to 71 BC. Taking advantage of his position of power, he forced the inhabitants of Sicily to give him gifts and sell works of art that they actually did not want to dispose of. At least that is what the indictment says, formulated by none other than Marcus Tullius Cicero. Verres stated in his defense that he had paid for the works of art. "A classic 'twisted transfer'," says Carlà-Uhink, whose project focuses on analyzing trial speeches. He is interested in how discourses about such twists developed or were deliberately used in court. The strategy of making twisted transfers appear as legitimate and normal forms of exchange, which was practiced even then, did not work in the case of Gaius Verres. Under the overwhelming amount of evidence, he surrendered his case prematurely and fled into exile. There, however, he did not live in poverty because instead of the 40 million sesterces demanded by Cicero, he had to pay only three million as compensation.

Only "small gifts" are permitted

Just as today, it was already forbidden for politicians in ancient Rome to accept gifts. Only small gifts were allowed, "but nobody had defined what 'small' meant," says Carlà-Uhink, explaining that public figures needed such "wiggle room" to present themselves as honest people. "If the law defines everything, you can't perform," the historian says, laughing. "The fact that it was all a matter of interpretation also helped in constructing concepts of the enemy," he says. "It's always the others who are corrupt. We make gifts, the others bribe!"

What we understand by corruption today was definitely seriously discussed at the time, says Niklas Engel, who is writing his doctorate in the project. "You can also call it a search for the ideal: What is a good, a proper transfer?" In his doctoral thesis, the historian focuses on the late Roman Republic and the early imperial period. He draws on the extensive collection of

THE RESEARCHERS

Prof. Dr. Filippo Carlà-Uhink studied classics and ancient history in Turin and received his doctorate in this subject from the University of Udine. After his habilitation at Technische Universität Dresden, he was appointed to the professorship of ancient history at the University of Potsdam in 2018.

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Niklas Engel studied history and Latin at the University of Potsdam and classics and ancient history at Humboldt-Universität Berlin. He is currently doing research as a research associate at the Department of History of the University of Potsdam.

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Photos: Hopfgarten, Tobias (2)

Prof. Filippo Carlà-Uhink

Niklas Engel

Cicero's and Plinius's letters, which provide profound and detailed insight into the everyday social and political life of their time. Engel compares descriptions of corruption and bribery in these letters with other historical sources to find out whether they correspond to a norm or are merely individually constructed. If these norms did exist, Engel wants to examine how they changed during the crisis-ridden transition from the late republic to the early imperial era. He is primarily interested in the question to what extent the structural conditions for the perception of corruption existed in ancient Rome and assess Roman society and its social complexity based on what may have been described as "corrupt."

"Which is not to say that the Romans did not have an understanding of corruption yet," says PhD student Engel. As a prominent example, he cites the scandal surrounding Publius Clodius in 62 B.C. Dressed in women's clothing, he had gained entry to an all-female cult celebration for the fertility goddess Bona Dea at the home of Caesar's wife, allegedly to meet with his mistress. The affair was discovered and Clodius was taken to court for adultery and religious sacrilege. When the acquittal was made, Cicero accused him of bribing the judges with gifts and buying the verdict with the arrangement of sexual services. "That could be deemed corruption even then," says Engel. "And did not remain without consequences," adds Prof. Carlà-Uhink. Two years later, a law was proposed to prohibit judges from accepting gifts.

From Enlightenment back to ancient historical sources

"We are much more formal today. There are clear laws according to which you are convicted if you have crossed a line," says Prof. Carlà-Uhink, not without pointing out the beginning of this development.

THE PROJECT

Twisted Transfers: Discursive Constructions of Corruption in Ancient Greece and Rome, Ancient History – Research Project at the University of Potsdam and the University of Roehampton

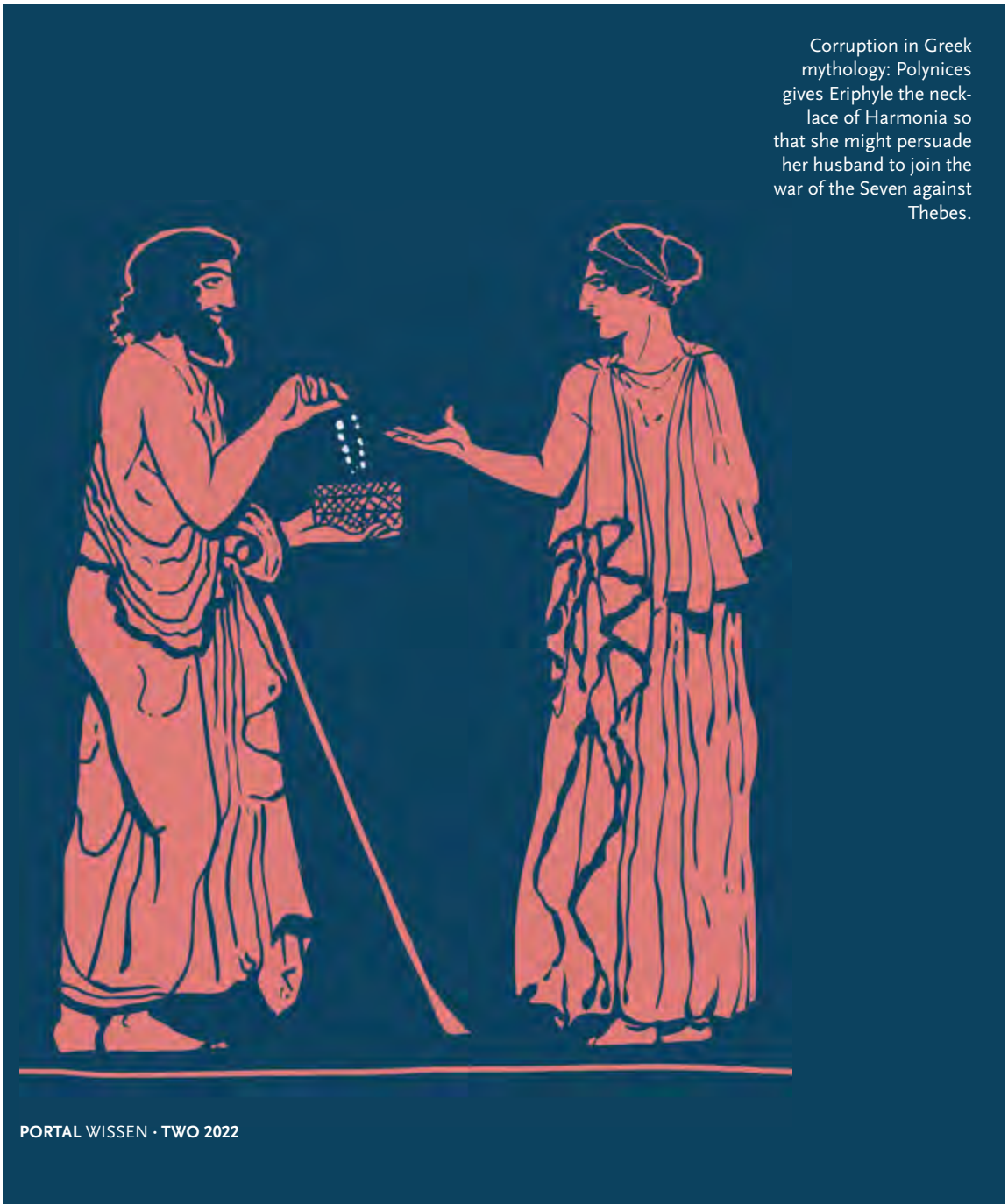
Duration: 2020–2023
Funding: As part of the DFG/AHRC-Program "UK-German Collaborative Research in the Humanities"

Photos: Hopfgarten, Tobias (2)

"Many terms we use today are based on the Enlightenment. Its representatives, however, didn't do any empirical research themselves but read the works of antiquity." The source material has therefore remained the same and with it the importance of ancient history for a better understanding of the present.

However, in order to bring completely different perspectives and thus additional inspiration into the research project, Carlà-Uhink and his colleague in Roehampton, Marta Garcia Morcillo, organize workshops with contributions from other fields: A British criminologist lectured on state capture, elected politicians who create laws to maintain their own power. An ethnologist from Basel reported on a long-term study of corruption in Africa, showing its dependence on economic and political change. A contemporary historian from Amsterdam spoke about corruption and how it was fought in the 20th century. "We not only read ancient sources and historical works, but always modern reports and literature from other subjects to discuss in the group what the reading does for our own research," Engel says. A total of eleven topics are being worked on in the project, which also deal with prostitution, tax and inheritance fraud – profound, complex, and highly explosive even after more than 2,000 years. The fact that it remains difficult to untangle twisted transfers and avoid hasty judgments is also evident in the case of Christian Wulff, who was acquitted in court of the accusation of accepting benefits in 2014.

ANTJE HORN-CONRAD
TRANSLATION: SUSANNE VOIGT



Corruption in Greek mythology: Polynices gives Eriphyle the necklace of Harmonia so that she might persuade her husband to join the war of the Seven against Thebes.

Illustration: Fetzer, Michael

Data collection with a field spectrometer

THE PROJECT

NamTip: Understanding and mastering desertification tipping points – a Namibian perspective

Participating institutions: the universities of Potsdam, Bonn, Tübingen, Cologne, UFZ – Helmholtz Center for Environmental Research, ISOE – Institute for Social-Ecological Research, University of Namibia, Namibia University of Science and Technology, Edu-Ventures Trust, Agri-Ecological Services, Namibia
Funding: Federal Ministry of Education and Research (BMBF) as part of the funding measure *Tipping Points, Dynamics and Interdependencies of Social-Ecological Systems – BioTip*, in connection with the FONA – framework program *Research for Sustainability*
Duration: Mar. 2019 – Feb. 2023

www.namtip.uni-bonn.de

Photos: Schwarz, Lisa

Understanding Tipping Points in Savannas

Ecologist Prof. Anja Linstädter Researches How Humans Affect the Development of African Savannas and Grassland

Prof. Anja Linstädter

Since September 2020, Anja Linstädter has been Professor for Biodiversity Research and Systematic Botany at the University of Potsdam and Director of the Botanical Garden. Together with her research group, the ecologist investigates mechanisms for the conservation of biodiversity and its damage due to global change. One focus of her current research is on drylands in southern Africa.

"Large parts of Africa are located in areas with long dry and one or two short rainy seasons per year. In these dry areas, a large number of people are still living as cattle breeders and small farmers. They are particularly affected by climate change and the consequences of desertification," says Prof. Linstädter. "If rangeland is heavily overgrazed, it can suddenly collapse or 'tip over,' for example as a result of a drought. Perennial forage grasses are often permanently lost, leaving behind barren ground." Desertification is a pressing problem in Namibia, one of the driest countries in the world. This is where the joint project "NamTip" comes in, investigating ecological desertification tipping points. An ecological tipping point is defined as a specific point in time at which the development of an ecosystem towards a new system state can no longer be stopped. "Because of the complex interactions of nature and society, these tipping points are not yet well understood – they often come as an unpleasant surprise. However, if we don't understand this phenomenon, we can't take appropriate measures to avoid it," Linstädter explains.

Diversity of cultures and knowledge

The NamTip project has been bringing together experts from many fields since 2019. Besides German and Namibian researchers from the natural and social sciences, there are experts in rangeland management, politics, education, and communication, each providing a piece of the interdisciplinary puzzle. "Diversity plays a big role in our project," Linstädter says. "We complement each other and work on an equal footing with our local scientific colleagues." Namibian ecologists have a much better knowledge of biodiversity and long-term dynamics in the savannas. "In interviews with locals, we find that their knowledge is often complementary to our knowledge as ecologists," she says, adding, "This local knowledge is an invaluable resource for understanding ecological tipping points and conserving biodiversity." Taking this diverse know-how into consideration therefore forms an important pillar of the NamTip project.

A field experiment simulates desertification

To explore the ecological tipping points, the ecologists and soil scientists involved in the project also combine different research approaches: For example, a newly established field experiment is collecting data on the state of vegetation and soil. To do this, rangeland is being driven into desertification through a combination of experimental drought and overgrazing. "So, we can directly observe what resulting processes go on in the ecosystem," Linstädter says. "We suspect a domino effect – that there is not one big tipping point but rather a cascade of many small tipping points. In the first year of the experiment, we already observed

Drones used for research

Photos: Hopfgarten, Tobias (top); Männer, Florian (bottom)

that the perennial grasses suffer from drought especially when they are being heavily grazed at the same time." Overall, the savanna grass can cope very well with a single year of drought, not really a surprise, since such events are nothing unusual in an arid region. Continuous measurements of soil moisture to a depth of one meter have shown that in the first year of drought, there are apparently still water reserves in the deeper soil layers that the grass can access. However, due to climate change, severe and prolonged droughts – as simulated in the experiment – are becoming more likely. Linstädter believes that a combination of overgrazing and such severe droughts will exceed the natural resilience of the grass. "Subsequently, self-reinforcing processes such as changing microclimate and soil properties may cause the grass to permanently disappear."

"In the second project phase of NamTip, we will particularly focus on evaluating the results of our tipping point experiment – it gets really interesting when the ecosystem actually 'tips.' Based on this, we want to develop recommendations for action on how to prevent large-scale desertification. But experiments on the regeneration of already 'tipped' areas are also on the agenda," Linstädter says. In February 2022, a renewal proposal was submitted for this next phase of the NamTip project. But whether Linstädter and her research team will get the opportunity to reap the fruits of their work is itself currently "at a tipping point." In June, the BMBF cancelled the entire overarching funding measure. "A disaster," as the researcher explains. "This not only damages the reputation of ongoing projects among the many research and practice partners around the world. The German government is also foregoing the research phase with the highest expected scientific yield."

DR. STEFANIE MIKULLA
TRANSLATION: SUSANNE VOIGT

THE RESEARCHER

Prof. Dr. Anja Linstädter studied biology in Hamburg and did her doctorate in Cambridge and Cologne. Since 2020, she has been Professor for Biodiversity Research and Systematic Botany at the University of Potsdam and Director of the Potsdam Botanic Garden.

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Data collection in the marked area

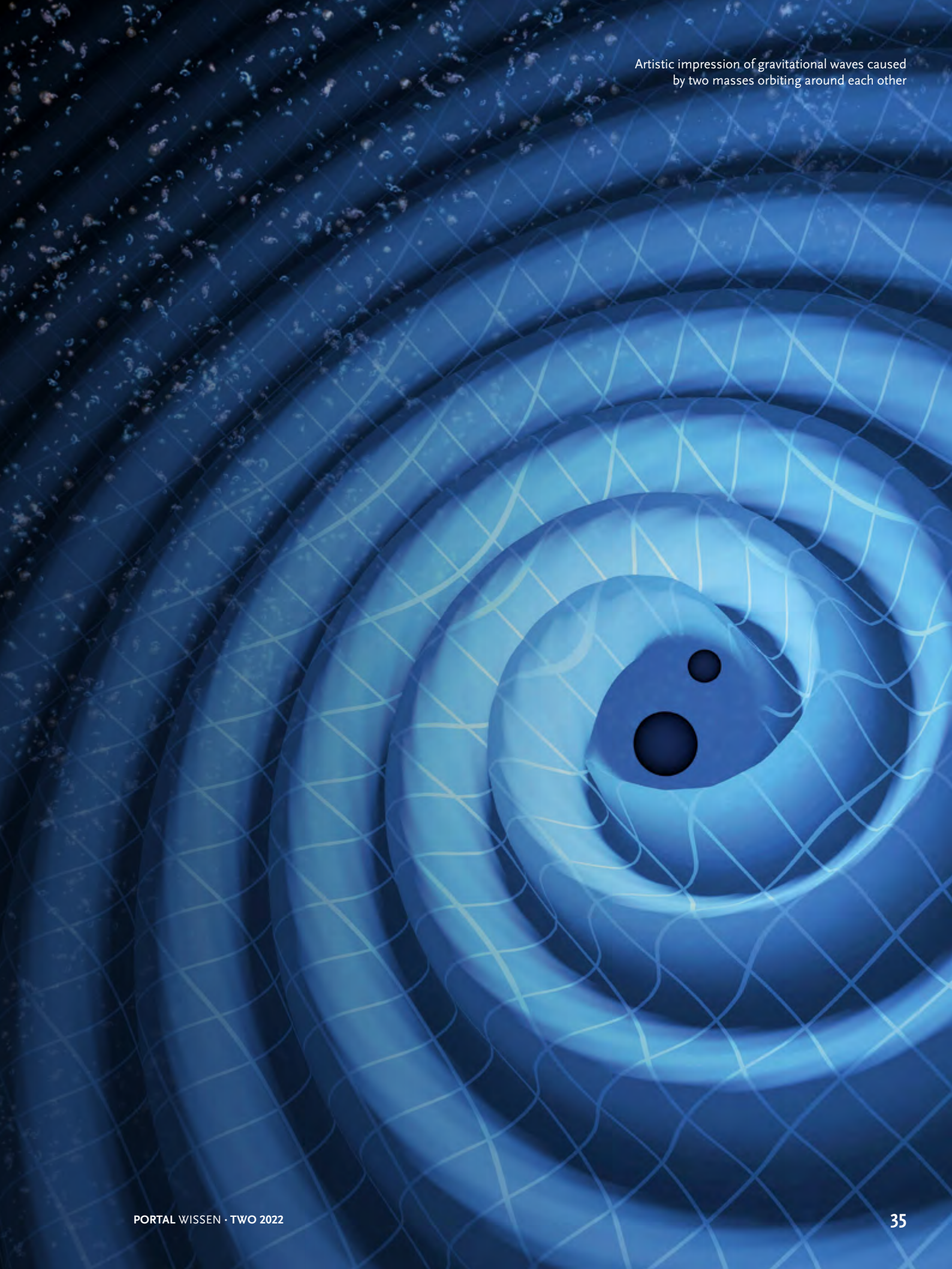
Mowing experiment

Einstein Put to the Test

Gravitational Wave Researcher Prof. Tim Dietrich Is Dealing With Heavy Weights in Space

Tim Dietrich is only 34 years young and has already had a remarkable scientific career: In 2017, PhD thesis with distinction at Friedrich Schiller University Jena, in 2018, Marie Skłodowska-Curie Fellowship at the National Institute for Subatomic Physics (NIKHEF) in Amsterdam, in 2019, Heinz Billing Prize for the Advancement of Scientific Computing, in 2020, appointment as Junior Professor at the University of Potsdam. In 2021, he received the Heinz Maier Leibnitz Prize of the German Research Foundation and was appointed Max Planck Fellow. As one of the world's leading young researchers in the field of relativistic astrophysics and numerical relativity, he has acquired an exceptionally high scientific reputation in his field within a very short time.

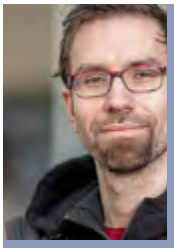
Image: Ligo/t. Pyle



Artistic impression of gravitational waves caused by two masses orbiting around each other

"We're looking at relativistic astrophysics," says Dietrich. "So, we're looking at objects in the universe that have to be described in terms of Einstein's theory of relativity, especially compact objects like neutron stars and black holes." Neutron stars and black holes can be formed from certain massive stars at the end of their life cycle, when there is no nuclear fusion anymore. Their extreme states of matter can be illustrated as follows: To make the Earth into a black hole, one would have to compress it to a diameter of about one centimeter. A single teaspoon full of neutron star material would have a mass of up to one billion tons.

If two of these super heavy-weight objects orbit each other, gravitational waves are emitted. They spread at the speed of light, compressing and stretching space-time and thus changing otherwise constant distances. Since these changes are extremely small, however, you need sophisticated laser experiments to measure them. This was first achieved in 2015, although gravitational waves had already been postulated by Albert Einstein in 1916. But back then, Einstein wasn't sure. In a lecture on gravitational waves at Princeton, he concluded by saying, "If you ask me whether there are gravitational waves or not, I must answer that I do not know. But it is a highly interesting problem."



THE RESEARCHER

Prof. Dr. Tim Dietrich studied physics at Martin Luther University Halle-Wittenberg and Friedrich Schiller University in Jena. Since February 2020, he has been Assistant Professor for Theoretical Astrophysics at the University of Potsdam and leader of the research group Multi-Messenger Astrophysics of Compact Binaries at the Albert Einstein Institute in Potsdam.

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Photos: Roese, Thomas (3)

Simulation of a neutron-star/black-hole coalescence in which the neutron star is tidally disrupted during the merging process.

Waves from a high-performance computer

To detect the gravitational waves, the researchers use laser interferometers. In these instruments, laser beams travel through kilometer-long tunnels and are reflected by mirrors and sent back to their starting point, whereby the light intensity is measured. If a gravitational wave passes, the distance between the mirrors changes by an extremely small amount and so does the intensity of the light beam. The measured signal contains information about the source, for example on the formation of a black hole. "In joint measurement campaigns, various gravitational wave detectors around the world receive signals from space," says Dietrich. The research teams of the LIGO detectors in the United States, Virgo in Italy, and KAGRA in Japan joined in 2019 to form an international network. In November 2021, they published the gravitational wave catalog of the past series of measurements, which ended in March 2020. "This catalog contains exciting data of merging black holes and neutron stars," Dietrich reports. After a break for maintenance, the next series of measurements is scheduled for March 2023.

For some years, the direct comparison of observations and computer simulations has been possible. "To describe the movement and collision of neutron stars, you have to solve the equations of the general theory of relativity," Dietrich explains. "To do this, we develop simple waveform models on high-performance computers that allow us to quickly and efficiently calculate gravitational wave signals of colliding neutron stars. These models can then be used to analyze the collected data from the detectors to better understand the collision process."

In 2020, the calculations in his working group amounted to about 130 million CPU hours, and they created a total of about 1 petabyte of data with their simulations – a sixteen-digit number! The computing power required for this is only available on computer clusters, i.e. many networked high-performance computers. "Among others, we use the SuperMUC-NG at the Leibniz Supercomputing Center in Garching near Munich and the supercomputer Hawk at the High Performance Computing Center HLRS in Stuttgart," Dietrich says.

What colliding neutron stars and gold particles have in common

In the coming years, gravitational wave astronomy will see a huge improvement. The Einstein telescope – a design concept for a European gravitational wave detector – is expected to launch the next generation of instruments, about ten times more sensitive than the previous one. Dietrich is involved in its development and, together with two colleagues, heads the Nuclear Physics Division of the Observational Science Board. They focus on how gravitational wave measurements can be used to obtain important information about the structure of ultra-dense matter. Dietrich only recently demonstrated with an international research team that nuclear physics is strongly linked to astronomy. "We noticed that the collision of two gold particles in a particle accelerator is similar to that of two neutron stars," he describes. "In both processes, it is possible to determine from data sets how pressure and density evolve during the collision."

In 2025, it will be announced where the state-of-the-art observatory will be built. Sardinia, the border region of Belgium, Germany, and the Netherlands (Euregio Meuse-Rhine) as well as Lusatia are under discussion as suitable locations. Regardless of where – the instrument will create a lot of future potential for Tim Dietrich to further advance his research.

DR. STEFANIE MIKULLA
TRANSLATION: SUSANNE VOIGT

Image: T. Dietrich (Potsdam University and Max Planck Institute for Gravitational Physics), N. Fischer, S. Ossokine, H. Pfeiffer (Max Planck Institute for Gravitational Physics), S.V.Chaurasia (Stockholm University), T. Vu

Words Have Power

How **Diplomats** Debate

Prof. Manfred Stede and Karolina Zaczynska Research the Trajectories of Conflicts in the UN Security Council

"We have made significant progress in the fifteen years since the Security Council passed its landmark resolution on women, peace and security," diplomat Carolyn Schwalger from New Zealand began her statement. The UN Security Council has been addressing the role of women in conflict and gender equality issues in its Women, Peace and Security agenda since 2000. The topic was also on the agenda on March 28, 2016. After her positive statement, Schwalger adds a "but." "However, practical implementation lags behind, particularly when it comes to women's participation in conflict prevention and resolution processes." It is passages like these that computational linguist Prof. Dr. Manfred Stede and his research assistant Karolina Zaczynska examine more closely. In their project, they are studying UN Security Council debates using computational linguistic techniques. The technology makes it possible to process large amounts of data and systematically explore diplomatic language.

"Peace and security" cannot be taken for granted; they require communication. That's why the diplomats of the Security Council confer almost daily. All meetings are documented, and their transcripts are available to the public. They constitute a treasure trove of data for scholars. "Two years ago, the proceedings of UNSC meetings were made available for the first time as a machine-readable text corpus," says Stede. "That made it possible to study them with computational linguistic methods." The idea of analyzing the extensive English-language material was born out of Stede's long-standing collaboration with political scientist Dr. Ronny Patz. The aim is for political science to be able to process the prepared data more easily. "We want to make the tedious process of reading PDF files easier," he says. The Potsdam researchers are also cooperating with two colleagues from the University of Dundee in Scotland.

THE PROJECT

Trajectories of Conflict: The Dynamics of Argumentation in the UN Security Council

Participating researchers: Prof. Dr. Manfred Stede, Karolina Zaczynska, Prof. Dr. Chris Reed (University of Dundee), Dr. Alexandru Marcoci (University of Dundee), Dr. Ronny Patz (external consultant, Hertie School Berlin)
Duration: 2021–2024
Funding: German Research Foundation (DFG), Arts and Humanities Research Council (AHRC)

http://angcl.ling.uni-potsdam.de/projects/trajectories.html

THE RESEARCHERS

Prof. Dr. Manfred Stede studied computer science and linguistics at Technische Universität Berlin; in 1996 he earned his PhD in computer science at the University of Toronto. Since 2001 he has been Professor of Applied Computational Linguistics at the University of Potsdam.

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Karolina Zaczynska studied computer linguistics and Polish studies at Justus Liebig University in Giessen. She researches at the German Research Center for Artificial Intelligence in Berlin; since 2021, she has been doing her doctorate at the University of Potsdam.

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Refined annotations

For computational linguistics, Prof. Stede admits, "There have hardly been any studies on diplomatic language so far." Conflicts as such are not new territory in his field: Scholars can work out unambiguous expressions of opinion and situations of dispute quite reliably in other text types. But the polite language of diplomacy makes it difficult to work with machines. According to Stede, drawing on existing conflict research tools is not enough. The researchers therefore need to develop an extended system for their text annotations, which make machine processing of diplomatic language possible. That is what they are currently working on. Using many examples and counter-examples, they are writing detailed guidelines on which words or phrases are used to indicate conflict. They have to pay equal attention to a nuanced "we should" and a clear "we are against." Once the refined guidelines have been tested after several rounds of editing, student assistants make the first annotations in the selected records by marking the passages that are linguistically relevant to the conflicts.

The computer uses this manually processed data to independently analyze and label additional material and to reliably recognize patterns. The team then evaluates these patterns. In particular, they want to investigate the theory that diplomatic conflicts are primarily resolved via justifying argumentation patterns. "The various parties justify their voting behavior – what they do and what they don't do. That can be linguistically distinguished quite clearly." Other types of argumentation, such as proving the truth of a particular statement, tend to be phrased differently.

Understanding the course of conflicts

With the help of a text corpus of nearly one million words, which consists of proceedings from over 25 years, the researchers can examine more than just individual moments of conflict. They want to trace the trajectories of issues over the years. "This way, we can explain whether arguments have changed in their clarity or in the given justifications," Zaczynska explains. The participants hope to provide added value for conflict research.

The researchers look at different types of conflicts in the project: Indirect ones, where only the disputed issue is addressed, as well as direct disputes, when

Session of the UN Security Council on April 2, 2019

Karolina Zaczynska and Prof. Manfred Stede

one state addresses another. "The way conflicts are expressed depends a lot on the subject matter. For example, if there is a military dispute, we expect more direct responses," says Zaczynska.

The researchers began the annotation work with the women, peace, and security agenda – one of the three thematic areas they are focusing on. They will also analyze debates on climate change and the Ukraine conflict, which has been ongoing since 2014. But which of the many transcripts are relevant to their research? To find out, the team is drawing on metadata already noted in the UNSC proceedings. Thanks to the additional information, they know which diplomat from which country spoke about which topic. Unfortunately, the metadata do not reveal the nature of the speeches: For UNSC meetings, speeches are first prepared and read out loud, but it gets particularly interesting for the team when a country takes the floor spontaneously. Whether these types of speeches can be automatically distinguished from one another is also to be clarified from a computer linguistic perspective in the project.

Analyzing monologs and dialogs

In the subsequent project phase, the annotation data will be evaluated using the Rhetorical Structure Theory. "This theory assumes that a coherent text can be represented through a tree structure. The result of an RST analysis is meant to reconstruct the author's intention from the reader's point of view," explains computational linguist Zaczynska. The text sections are determined according to their function and related to each other. The theory specifies certain relations between text sections. This results in tree diagrams with hierarchical structures. The "but" of diplomat Carolyn Schwalger, for example, is a qualification to the statement made before. Statistics are then generated from the tree diagrams. By using these, the researchers can see, for example, how often and how extensively reasons are given.

The Rhetorical Structure Theory is particularly suitable for speeches by individual speakers, which the Potsdam researchers have specialized in. If the discussion partners are engaged in a dialogue, the researchers from Dundee use another theory called Inference Anchoring Theory (IAT) to examine the material of the UNSC sessions. They are focusing on how inferences emerge when, for example, speakers follow certain rules in dialogue. Dialogues and discourse represent a particularly challenging area within language analysis and modeling. IAT is a theory that supports the analysis of so-called illocutionary acts for discourse. An illocutionary act is a technical term in pragmatics and refers to the actions performed through speech such as those of asserting, challenging, arguing, promising, asking, etc. For this purpose, IAT incorporates the contextual information offered by dialogical information into the annotations of speech acts.

Added value for many disciplines

Even though the project was launched with the aim of providing a tool for political science, other disciplines and institutions will also be able to benefit from the results. "The social sciences are happy to have reliable data," Prof. Stede knows. In addition, the Potsdam part of the research group is in contact with the German United Nations Association. "They are very interested in having the language of the UN analyzed on a large scale," he says. It is conceivable that this will provide insights into Germany's role during a membership in the United Nations Security Council. Until then, the researchers are doing important basic groundwork with their project for a holistic understanding of diplomatic language.

LUISA AGROFYLAX
TRANSLATION: SUSANNE VOIGT

Photo: Roese, Thomas

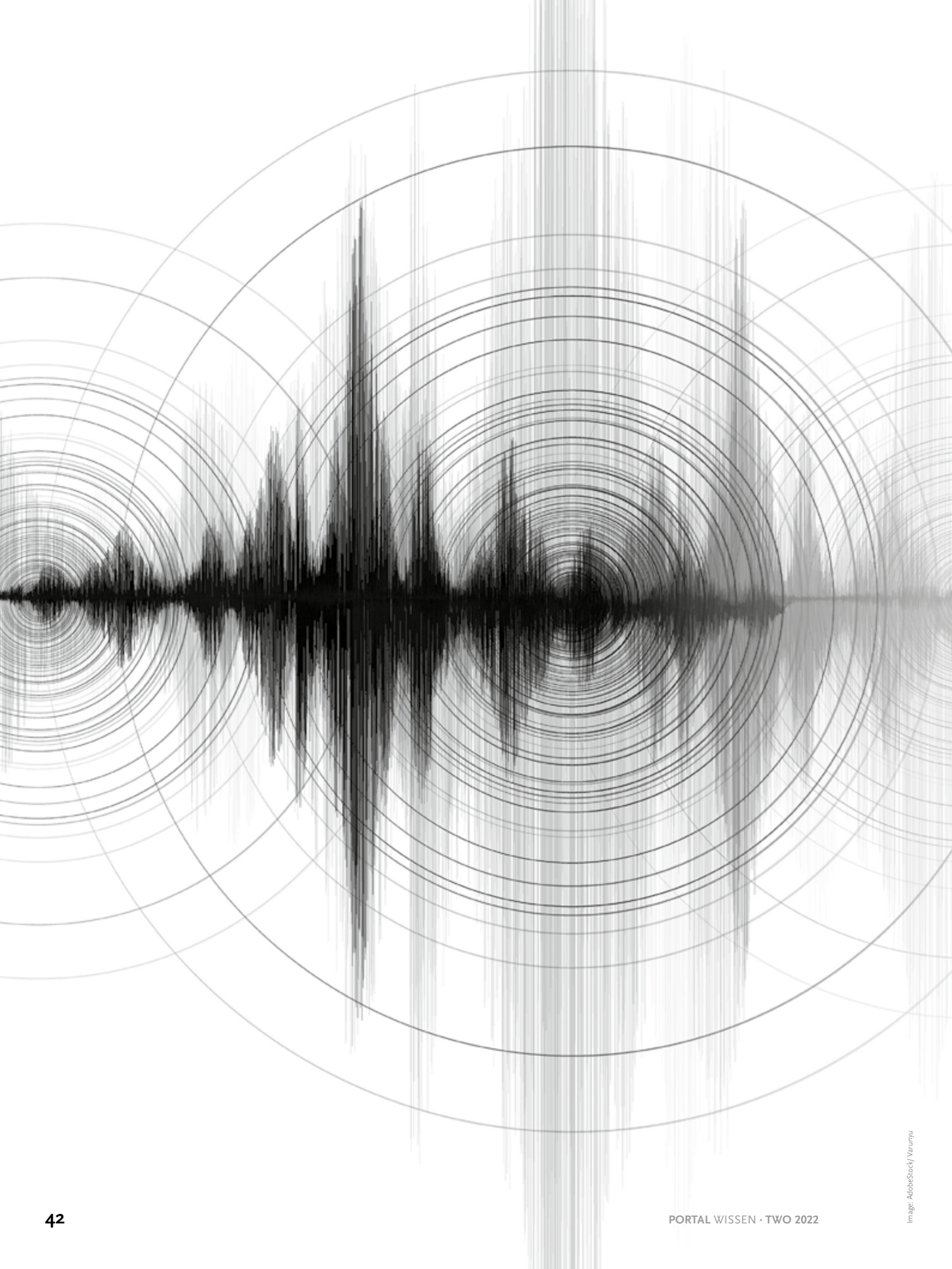

Image: AdobeStock/ Varunyu

COMPUTING EARTHQUAKES

Mathematician Prof. Gert Zöller Develops Probability Models for Earthquakes and Other Disasters

The province of Groningen in the Netherlands is not generally considered a seismic hotspot. Nevertheless, an earthquake measuring 3.6 on the Richter magnitude scale occurred here in 2012. The affected community of Huizinge was more than alarmed. The damage to buildings was unmistakable. This was followed by growing mistrust and indignation towards the political decision-makers, but also towards the scientific community. For too long, they had ignored the recurring tremors associated with the extraction of natural gas.

Groningen is situated above one of the largest gas fields in the world. The highly coveted fuel has been mined here for about 60 years. In the region, which was once seismically inconspicuous, the ground has now been shaking for over 30 years. Although often barely noticeable it still quakes up to 70 times a year. Each quake caused wider cracks in walls until entire buildings became uninhabitable. Although there had been continuous seismic measurements for some time, scientific knowledge for actually assessing the hazardous situation was lacking.

Feeding models

SECURE, a joint project funded by the Federal Ministry of Education and Research, in which the German Research Center for Geosciences (GFZ) and the University of Potsdam also participated, has investigated over the past few years how the stability of barrier rocks changes under varying pressure and stress conditions. Has it been weakened by developing cracks? What role do other, natural fault systems play? The goal was to develop prediction and characterization tools for the sustainable use of gas storage facilities, hydrocarbon and geothermal reservoirs.

Prof. Zöller from the University of Potsdam contributed innovative modeling techniques here. The Professor of Applied Mathematics created seismicity models that have their origin in probability theory. In the project, they were first "fed" with the empirical data of registered earthquakes: When did such a tremor occur at which location? What was the magnitude? About 60 years of gas production in Groningen had provided some material, which could be found in various data sets. Zöller also fed the production volumes into his model, i.e. how much gas was produced in which month and year. In addition, he entered geophysical measurement data, for example of changing pressure and stress conditions. Statistics, geology, and geophysics interacted here to be able to make more accurate statements about the probability of seismic hazards.

Applying mathematics

Prof. Zöller continues to work on the Groningen case even after the completion of the joint project. He just took part in a workshop in Amsterdam, which discussed better ways of assessing existing risks. "After all, natural gas is still to be extracted in the north of the Netherlands until 2023. But even after that, earthquakes will continue to occur," knows the mathematician, who has been working on geophysical problems since his doctorate. "I always wanted to do something applied, preferably in the environmental sciences. That's also a matter of idealism for me." With the University of Potsdam and the GFZ, he found the perfect research environment and vast amounts of data for his modeling as a doctoral student in Potsdam. His topic at that time was an earthquake that had occurred in 1988 in the Caucasus, in Spitak, Georgia. To this day, Prof. Zöller cooperates closely with colleagues at the GFZ. "We are particularly interested in strong earthquakes because they cause great damage," Zöller says, recalling the mega-earthquake in Fukushima. "For such events, the data base is small because strong quakes occur only rarely." Researchers then have to develop parameters from additional assumptions that consider the missing knowledge. This results in so-called probabilistic models, which contain a number of random variables that lead to different scenarios and are described with probabilities. "Even though this is always wanted, this does not allow for the pre-

Prof. Gert Zöller

Photo: Hopfgarten, Tobias

diction of concrete events," he explains. Rather, he says, the aim is to describe when an earthquake is likely to occur in which area and with what magnitude. This, in turn, can be used by the municipalities in the regions at risk to initiate appropriate measures: building earthquake-resistant structures, increasing disaster protection, relocating the population, or even adjusting insurance policies.

Unlike such natural disasters, the tremors in Groningen are human-made – in this case through natural gas production, elsewhere through the use of geothermal energy. "In Basel there was a magnitude 3.4 quake in 2006 immediately after a well had been drilled, and the project was eventually shut down," Zöller reports. He explains that in some regions of the US, more earthquakes are triggered by fracking and geothermal energy these days than by natural seismic processes. "We need to know how to deal with this in the future," he says, describing one of the main reasons for working on the models, without hiding his lack of tolerance for the environmental hazards of fracking. As if humanity didn't have enough to deal with when it comes to natural earthquakes, like the last one in Afghanistan in June 2022.

Tracing magma

Or with volcanic eruptions. Currently, Zöller is contributing his mathematical expertise to the DFG-funded MagmaPropagator project of the University of Potsdam and the GFZ. The goal of the research, led by Dr. Eleonora Rivalta, is to develop a physics-based tool that can predict scenarios for the location and timing of a fissure opening following the subsurface propagation of magma. Magma, after all, does not always take the central vent of a volcano, but moves along winding paths beneath the surface to eventually escape through a new fissure. Such eruptive fissures exist in many densely populated areas, such as the Campi Flegrei near Naples. But frequent fissure eruptions also occur at Mount Etna in Sicily and Piton de la Fournaise in La Reunion. Since all three regions have been closely observed over decades, extensive measurement data are available and are now being incorporated into the models. In addition, there is data from laboratory experiments and numerical simulations. "Such probability models can be applied to other natural disasters, too," Zöller is certain. So his cooperation is always needed wherever risks have to be assessed and risk levels evaluated. At the University of Potsdam, for example, this includes the "NatRiskChange" research training group, as well as other projects that deal with the complex problems of climate change and its dramatic consequences.

THE RESEARCHER

Apl. Prof. Dr. Gert Zöller studied physics in Bonn and earned his doctorate and habilitation at the University of Potsdam, where he has been Associate Professor of Applied Mathematics since 2018.

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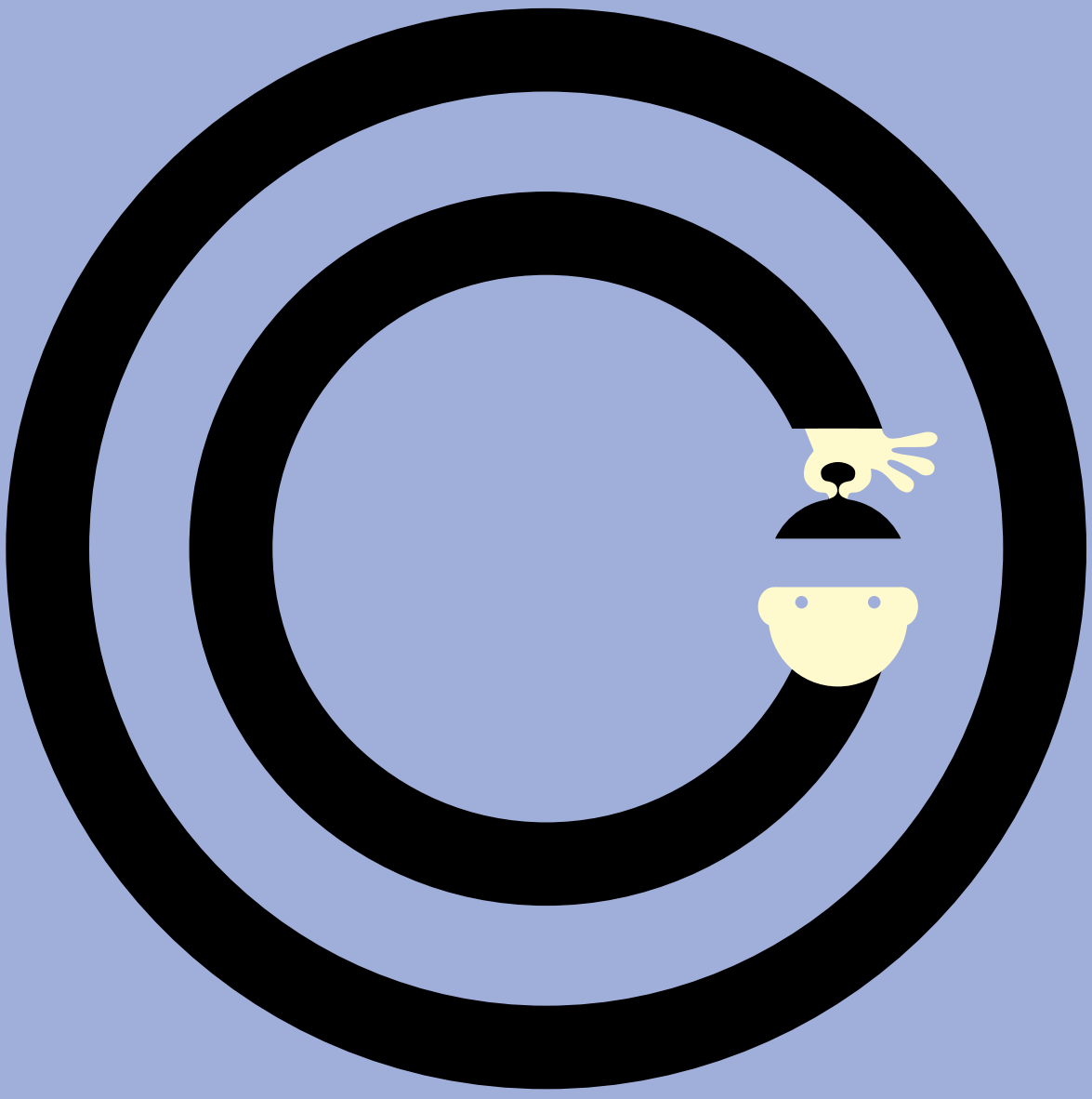

DRIVING FORCE AND CENTERPIECE OF COMPETITION

A New Research Unit Is Dealing With Legal Issues Concerning Digital Data in Business

Illustration: Topfer, Andreas

Large amounts of data are generated in the course of digitization that promise economic success. They have long been considered the core of the digital economy. But how should we handle them from a legal perspective? Who has access to data generated in the manufacturing or optimization process of products? And how can we limit the market power of companies that "sit on" the data they collect? The Research Unit "Intellectual Property – Digitization – Competition" at the Faculty of Law deals with such questions. It investigates current legal issues of information technology, intellectual property, and competition. It was founded by Christian Czychowski, Honorary Professor at the Faculty of Law and attorney at law, Tobias Lettl, Professor of Civil Law, Trade and Commercial Law, and Björn Steinrötter, Junior Professor of IT Law and Media Law. The aim of the three legal scholars is to bring clarity to the rather confusing and young field of data business law.

A tractor drives across a field – and collects data. Does the soil need to be irrigated? When is the best time to sow seeds? Where should one use fertilizer? With the help of sensors, agricultural machinery can now record a wide range of parameters, the analysis of which can help farmers increase their yields or farm more sustainably. So-called smart farming is an example of a data-driven economy, but its legal basis is still vague. Does the farmer actually have access to the data that the tractor collects? Or is it only available to the manufacturer? Can a third party who wants to build an irrigation system for the respective field use the data?

Czychowski, Lettl, and Steinrötter deal with problems like these in their new research unit. So far, there has been no law on the legal nature of data, but there is a jumble of different regulations, some of which overlap and contradict each other. "The legislator has basically not regulated the handling of raw data yet," Steinrötter says. As immaterial objects, there is no data ownership for them in Germany. Nor are they considered intellectual property like a piece of music or a novel. And yet, according to Czychowski, there is "an exuberant flood of regulations" that can take effect when it comes to data, such as the General Data Protection Regulation (GDPR), which relates to the protection of the privacy of individuals, or the directives on the protection of business secrets and copyright protection of databases, antitrust law and, above all, the so-called Data Act, which the European Commission is currently getting off the ground. "There is a pluralism of legal sources that is just madness," Steinrötter says. That's exactly why the three lawyers want to pool their expertise. "We have an incredibly difficult field to plow. But together you're less alone, and this is also true for research."

Data as information carrier

A major problem in the discussion is that data in the legal sense was not even defined until recently. "In the GDPR, data and information are mistakenly equated," he says. A few months ago, however, the European Commission presented its first draft of the Data Act: This is intended to regulate the handling of non-personal data in the European Union. For the first time, it contains a definition that, according to Steinrötter, is "very well done." According to this definition, digital data is binary-coded information. The key thing here is that data is not defined as the information itself but only as its carrier. "To put it in another way, data is the syntax and information is the semantics."

"The Data Act is indeed extremely relevant," says Czychowski, who is among the few who have already studied data licensing agreements from a scientific perspective. The goal of the proposed act is to establish a general right of access to a wide range of data: Users should be allowed, for example, to get access to the data they generate. This sounds quite plausible at first but "has led to an incredibly heated discussion in German industry," he says. "This would mean, for example, that a driver of a car would be entitled to demand the usage data of the right outside rearview mirror from the car manufacturer." Getting hold of such data, however, would involve effort and costs, especially since it is usually raw data that is unchecked, unprocessed, and uncompressed and which can be erroneous. Moreover, when it comes to personal data generated in business, it is unclear in certain cases to what extent the Data Act or the GDPR or even both pieces of legislation apply side by side, says Steinrötter. "It's up to the courts and researchers to cut through this Gordian knot."

Since the end of 2021, Christian Czychowski, Tobias Lettl, and Björn Steinrötter have been working together at the **Research Unit "Intellectual Property – Digitization – Competition".** In accordance with research-based teaching, the scientific work on the data economy and data law is also to be included in teaching. For this purpose, an elective program for in-depth studies with the same name is to be established for the study of law. The lawyers are also in contact with colleagues from the Institute of Computer Science and the Digital Engineering Faculty. With the annual conference "Potsdam Talks on Data Economy," the research unit is creating an international forum for exchange on data law. During the first event in February 2022, speakers from around the world presented the legal nature of data in China, Japan, and the US.

www.uni-potsdam.de/de/geidigwett

Prof. Björn Steinrötter

Prof. Tobias Lettl

Hon.-Prof. Christian Czychowski

Data, added value, and monopolies

"Ownership, digitization, and competition are three concepts that cannot be considered in isolation from each other," says Lettl. "They get their special zest when they overlap." The European Commission and the German Federal Cartel Office are currently asserting themselves as global pioneers in dealing with digital companies. The European Commission, for example, recently presented a draft law on digital markets that would regulate the monopoly position of digital companies at the European level. The German Federal Cartel Office is also increasingly concerned with the data power of companies. A 2021 amendment to the Act against Restraints of Competition addresses online platforms and their handling of users' personal data – such as Facebook.

Already in 2019, there were major proceedings by the Federal Cartel Office against the company because it had merged its collected data with that of the group's subsidiaries Instagram and WhatsApp without obtaining the consent of the users. "This is now a huge case at the Federal Court of Justice. Facebook is claiming sole access to the personal data," Lettl explains. "From a competition point of view, this is problematic because no other company has collected such a vast

Photos: Scholz, Sandra (3)

amount of data and it would be of the greatest interest to other economic operators." According to Lettl, it is particularly data that creates economic power, which must be limited. "Otherwise, internet companies could do whatever they want. The key question here is how to limit their economic power – and whether legal regulations are still sufficient."

Christian Czychowski emphasizes the great value of data today. "People keep saying that data is the oil of the 21st century. From my point of view, this is an unfortunate phrase, but it shows how important data has become – whether in terms of monopolies, global economic development, or the protection of ideas." The three researchers are of the opinion that sharing data is beneficial to competition. But in practice, data is rarely given away voluntarily. "The farmer who owns the field probably has no access at all to the data his tractor is collecting," Lettl explains. "And neither does a third-party supplier who might want to develop software for an irrigation system and can't do this because the tractor manufacturer won't release the data." According to Lettl, regulations on the use of data are needed to be able to use innovations to a wider extent, promote competition and thus have more good products on the market. The German antitrust law is a first step here, and at the EU level, the Data Act is expected to establish a general right of access. However, there are still many imponderables.

Data in the "Age of Access"

Data exchange between companies is still not widespread, even though they could benefit from it. "The small and medium-sized companies fear competitive disadvantages just as much as the large corporations," says Steinrötter. Google, for example, would certainly be reluctant to disclose its machine learning training data because other providers could use it to feed their own search engines. After all, the more data a company has collected, the more it yields as a commodity. But sharing data is important for economic progress, Lettl says. "Monopolies prevent competition and development. The more companies are allowed to access specific data in their work, the more competition it creates." This, in turn, drives innovation. A change of mindset is necessary Czychowski says, for companies to be willing to make data accessible. Sticking to the illusion of data ownership is outdated. "We no longer live in the allocation age, but in the 'Age of Access.' Data sharing promotes innovation and thus serves the common good."

DR. JANA SCHOLZ
TRANSLATION: SUSANNE VOIGT

Image: AdobeStock/Ar_TH

Photo: AdobeStock/Gargonia

CHRONICALLY ILL

How Do You Get Through the Corona Pandemic?

Imagine you are ill, have been ill all your life. And then comes Corona. While everyone is talking about vulnerable groups, you are one of them. What does that do to you? How do you protect yourself? How do you live with the risk, which is much higher for you than for most others? Professor Petra Warschburger wanted to know that. The counseling psychologist has long conducted research on children and adolescents living with chronic diseases. She is particularly interested in what is giving them trouble. Or whether they find their own ways of coping with the permanent stress that their conditions impose on them. Corona might have become a burning glass for them, intensifying this stress. But it is also possible that they are coping better with the constant threat of an unknown virus than many others who have yet to experience what it is like to have a disease that determines their daily lives. Prof. Warschburger has initiated a DFG project together with other researchers and experts from clinical practice to investigate how children and adolescents with chronic conditions and their families get through the pandemic. After all, there were no bailout funds, special programs, or corona bonuses for them.

In the spring of 2020, life in Germany suddenly came to a standstill. In the absence of a vaccine against the coronavirus, people first put on masks, then changed to home office work. Daycare centers and schools were closed. Cultural institutions and sports clubs also shut down, and even medical services were

THE PROJECT

Kick Covid – A prospective analysis of the long-term impact of the COVID-19 pandemic on well-being and health care among children with a high-risk chronic condition and their families

Participating institutions: University of Potsdam, Ulm University, German Rheumatism Research Centre Berlin, Universitätsklinikum Gießen, Charité Universitätsmedizin Berlin
Funding: German Research Foundation (DFG)
Duration: May 2021 – April 2024

www.kick-covid.de

Prof. Petra Warschburger

reduced to the bare minimum. Outpatient clinics were closed, appointments and operations, which could be postponed, were canceled. This became a problem especially for those who needed regular medical care or checkups. “There are many physicians in our research consortium who provide daily medical care to children and adolescents with chronic conditions,” Warschburger says. “During this time, they realized that their patients’ health care was at risk.” They took action and set up phone and video consultations, provided emergency care where needed. Together with their colleagues in research, they launched a project to scientifically analyze these extraordinary circumstances and draw the necessary conclusions.

Does the pandemic increase mental stress?

“We wanted to take a closer look at the impact of the Corona pandemic and everything it implied for children with chronic conditions,” Warschburger explains. Indeed, such people have a higher risk of a more severe course of Covid19. “It is a reasonable assumption that it might be hard to handle he additional risk, this additional stressor, and that it might have an impact on the mental state and well-being,” she says. A comparative study will show whether that's really the case: In this study, children and adolescents with chronic illnesses as well as their parents will be interviewed about how well the medical care for them works in the exceptional situation, how they perceive the risk of coronavirus infection, and how that affects their well-being. “Of course, everyone was affected by the stress caused by the corona pandemic,” Warschburger says, but we know that people with chronic diseases are a particularly vulnerable group.” So, it stands to reason that the pandemic has an aggravating effect on them – not only in terms of their disease,

WE ARE LOOKING FOR PARTICIPANTS

Do you want to share your experiences and participate in the study? All parents with a child up to the age of 21 years can participate, regardless of whether their child has a chronic disease or not.

https://umfragenup.uni-potsdam.de/kick-covid-gesund

but also the stressful concomitant circumstances that additionally affect their well-being.

The study focuses on groups with different diseases: obesity, type 1 diabetes ,and rheumatic diseases. “We don’t just want to have a look at one large group to see who is coping or not coping but to draw comparisons between the disorders.” Do people with different chronic conditions perceive risks and impairments in a similar way? Do they get different medical care? Are there different strategies for dealing with the pandemic?

To answer these questions, the researchers and practitioners of the consortium have launched a large-scale survey. It is an advantage that the network includes numerous care centers for people with chronic diseases: A total of more than 200,000 people are recorded in the respective three patient registers. Through these registers, children and adolescents as well as their parents can be recruited for the study. “The invitation is made at a low threshold during the check-up appointments – with only a few additional questions that we were able to add to the normal surveys,” she says. How do the children and adolescents assess their own risk of a corona infection? What is their care situation? Are there hospitalizations, days absent from school, and missed office hours? What about video consultations and substitute services? Finally, everyone is invited to participate in an in-depth interview. The aim is to interview about 400 people and their families, says Warschburger. Parents and children will each answer their own questions: To what degree is family life affected by the restrictions?

Photos: Roese, Thomas (2)

How do their relationships with parents, friends, and their environment change? Stress, behavioral problems, loneliness or a possible change in the way they deal with the chronic disease. All these factors are relevant. The researchers are particularly interested in what mechanisms the children and adolescents develop or may already be using in dealing with the Corona pandemic. "We know from previous studies in our network that children and adolescents with chronic conditions have or develop special resources that make it easier for them to deal with the disease but also with other problems," she says. These "healing" resources include optimism, self-efficacy, i.e. the conviction that they can master difficult situations, social resources such as a supportive environment, the experience of meaningfulness, empathy, and self-worth.

Do people with a chronic condition see their risks more realistically?

While the extensive surveys are still in progress, the first approximately 1,500 data sets from the brief survey are currently analyzed. Thanks to the patient registers, the information that was collected during the pandemic could be compared with older data sets of the respondents. In this way, it is possible to identify not only changes in their chronic conditions. It also reveals the state of their mental well-being – and the role Corona plays. It is already apparent that children and adolescents living with a chronic disease are more realistic than others. "What they 'lack' is the so-called optimistic bias," Prof. Warschburger explains. Most people tend to assess their own risk of a coronavirus infection lower compared to their peers, for example. This might not apply to individuals with a chronic disease. "They're more realistic about it, more experienced." Studies on the mental stress of children and adolescents during the pandemic have shown that stressors such as anxiety, depression, and feelings of isolation have increased. However, the first evaluations show that this increase is not as high among those with chronic diseases. Even before the pandemic, they were under more psycho-social stress than their peers without chronic conditions.

But not just absolute numbers or trends are important to Warschburger and her research team. "There will be families that have come closer together, others will be groaning under the additional stress," she says. "We want to find out as much as possible about what has particularly distressed or helped them." The in-depth surveys, which will also be repeated after about one year to track long-term developments, will provide information. If it turns out, for example, that the school closures particularly distressed the children and adolescents, such measures should only be considered if nothing else works. If the improvised video consultations prove to be a helpful tool, such things could possibly be established in medical care. "We hope that in the end, we will not only know more about the effects the exceptional situation of the pandemic has had on the children and adolescents," Warschburger says, "but we also want to gather a wide range of details that we can use to improve their care and treatment in the long run."

MATTHIAS ZIMMERMANN
TRANSLATION: SUSANNE VOIGT

THE RESEARCHER

Prof. Petra Warschburger studied psychology at Trier University. Since 2003, she has been Professor of Counseling Psychology at the University of Potsdam.

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Illustration: Töpfer, Andreas

HUMOR SOMETIMES HELPS

LOOKING FOR NEW
PATHS IN THE DISCUSSION
OF CLIMATE CHANGE

What is going wrong in climate communication? Culture and media scientist Birgit Schneider and media and science researcher Alexander Schindler interviewed researchers of different disciplines and countries to find answers to this question.

"We can't see the climate," says Prof. Birgit Schneider. Temperatures, wind, air pressure, and humidity – all that remains invisible. Greenhouse gases, whose rising concentrations are driving climate change, also act invisibly. Weather stations have been providing information on rainfall, temperatures and other weather data since the early 19th century and have provided new insights into weather patterns and their development over time. Science makes climate developments visible in mostly sober graphs, bar charts, and isobaric maps. This also makes the changes of recent decades visible – the increasing heat waves, rising sea levels, and warming oceans.

The scientific facts about climate change have long been on the table. It is primarily a natural-science problem, driven by the laws of physics. But Schneider, who is a cultural and media scientist, approaches this topic from an additional perspective. She asks, "How is climate change communicated? And what does that do to people, to their feelings and their actions?"

"We know everything but do so little"

In her research project "Climate Images," she has studied this for more than ten years. She looked at scientific images, films, artistic works, and computer games from the early 19th century to the present, historically classifying and analyzing the material. "Many images from the world of science are very sober, abstract, and aesthetically poor," she explains. What happens when these images leave science and enter politics, culture, and society? Do they lead to climate change being perceived as a threat and do they, thus, inspire the right decisions?

Prof. Schneider doubts that current communication formats can do just that. "Although we know everything, we do so little. Climate science has done its job in recent decades, clearly identifying causes and consequences. But still, all that knowledge has not yet led to effective actions," she explains. What's more, the topic now triggers a defensive reflex in many people. They feel overwhelmed and often helpless by the flood of information and the complexity of the issue. "When you feel helpless, you stop talking about the subject. We can't afford that," Schneider says.

So how could we counteract this helplessness and find other forms of communication? What could be done differently and better than before? Prof. Schneider and her colleague Alexander Schindler talked to scientists from the fields of anthropology, medicine, phenomenology, philosophy of science, complexity

Alexander Schindler

Photo: Hopfgarten, Tobias

THE PLATFORM

Re-imagine-climate.com is an online platform presenting impulse texts and interviews by academics from various research fields on climate change communication. The videos and texts clarify problems of previous communication and encourage us to rethink strategies.

The project is supported by klimafakten.de as a media partner. It receives financial support from the Fritz Thyssen Foundation as the conclusion of the research project "Climate Images".

www.re-imagine-climate.com
www.youtube.com/channel/UCzoYkMsHAbtRq_t6yyVQqYg

research, geography, literature and communication studies, and rhetoric in video interviews. Both are convinced that, in addition to the natural sciences, the subject is also overdue for an examination by the humanities and social sciences.

A cartoon can communicate a complex problem in a simple way

The years of research in the "Climate Images" project were initially supposed to culminate in a major conference in Potsdam with all the researchers who were involved in the project. But it came to nothing because of the Corona pandemic. Schneider and Schindler created the platform re-imagine-climate.com to share the knowledge they had gained and make it accessible to others. Now you can find nine video interviews and impulse texts by the researchers there, presenting ideas for a somewhat different climate change communication. Indian anthropologist Dr. Rita Brara, who conducts research at the University of Delhi, collects and analyzes cartoons about climate change, for example. "You can use them to communicate complex problems in a very simple way," she explains. "For example, when you see reindeer bathing in the sun in a cartoon, you immediately get the message: something is wrong here, things are not the way they should be."

Prof. Schneider agrees that humor is a legitimate and often neglected tool in climate change communication. After all, humor, irony, or comic effects can help to process emotions such as anger, sadness, or fear, which the topic triggers in many people, and to make progress in the debate. "When I started my research on this topic in 2009, it was difficult to find any interlocutors at all," Schneider recounts. "But that has changed a lot since then. Climate psychology has become an important field of research."

Personal stories instead of abstract facts

Climate change is a global problem. Temperatures and sea levels are rising worldwide, weather events and habitats are changing. The consequences for individual people around the globe are quite different though. These local perspectives – Schneider, Schindler and the interviewed research partners agree – have so far been given far too little attention. The individual experiences, the personal stories of the people and their deprivations are hardly noticed. Yet it is precisely these experiences that can pave the way for a dialog not exclusively based on scientific facts. "For each local community, you have to find their own stories and narratives to get into a conversation," Schindler explains. "And for that, you have to listen to people first."

Prof. Birgit Schneider

Rita Brara did this in her Indian homeland. "In Asia, people experience climate change very directly," she says. "Their skin burns, their eyes are red; there are plants, animals, and diseases that didn't exist before. Glaciers are melting in the Himalayas and the drinking water supply is in jeopardy." In contrast to this there are experiences from countries like Germany: "Climate change is still perceived here primarily as a crisis of nature," Schneider explains. "As a threat to biodiversity or the forests. Only in recent years is it gradually becoming clear that we are also directly affected – houses are destroyed by floods, harvests are reduced by droughts."

From a lone fighter to a worldwide movement

The year 2018 marked a turning point for climate change communication. A 15-year-old Swedish girl sat down in front of the Swedish Parliament in Stock-

Photo: Hopfgarten, Tobias

THE RESEARCHERS

Prof. Birgit Schneider studied arts and media studies as well as media arts and philosophy in Karlsruhe, London, and Berlin. In 2009, she came to the University of Potsdam with a Dilthey Fellowship and conducted research on climate change communication in the project "Climate Images". Since 2016, she has been teaching as Professor of Knowledge Cultures and Media Environments at the Institute of Arts and Media at the University of Potsdam.

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Alexander Schindler is a media and science researcher and studied social and business communication at the Berlin University of the Arts and philosophy of science at Technische Universität Berlin. He is doing his doctorate in Potsdam and works at the intersections of media studies, philosophy, and the sociology of knowledge.

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holm with a poster she had painted herself. "School strike for climate" was written on the poster, which Greta Thunberg used to protest every Friday from then on, igniting a worldwide movement. "Many people only understood then what this actually is – the climate crisis," Schneider says. Fridays for Future is an example of how climate change can also be told from a very personal perspective, mobilizing many people on many levels. "Since then, more people have become aware of the issue. It has been covered even more in films and articles, and is also taken more seriously by politicians," Schneider says.

Prof. Schneider will continue to be dealing with climate change even after she finishes "Climate Images". "It's a topic that I cannot get out of my mind." Because how climate change can be told and thought of differently will continue to be an explosive and pressing question in the near future. "It's an issue for society as a whole and belongs into clubs, theaters, town halls – in all areas of our daily lives and at all levels. That's the work that needs to be done now." How to do that? Schneider is currently writing a book about it. "The Beginning of a New World. How to Talk About Climate Change Without Falling Silent" is scheduled for release in 2023.

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