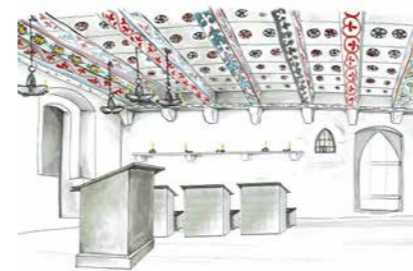


50 Years IODP: Secrets of the Deep | Internationality of Science: Be Open-Minded and Embrace the Unfamiliar | 100 Years of Bauhaus: Survival Network | Animal Experimentation: All the Arguments For and Against | Jewish Everyday Life in the Middle Ages: The Cupboard in the East Wall | In Memoriam Wolfgang Frühwald



Cover: JAMSTEC

Enabling collaborative deep sea re-  
search: Scientists use state-of-the-art  
research vessels, such as the Japanese  
ship Chikyu above, to drill deep into  
the ocean floor.



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Peter Strohschneider

# Be Open-Minded and Embrace the Unfamiliar

*Cross-border cooperation seems essential to good research. But what is it actually founded upon? In a polycentric scientific world, do we need to rethink the concepts of freedom and responsibility? And how can we protect them against current threats? Reflections on the internationality of sciences and the humanities in a global era*

Over 20 years ago, an article appeared in the German weekly newspaper *Die Zeit* discussing the “secondary effects of globalisation” on the “politics of freedom”. The author was Ralf Dahrendorf, who in addition to many other roles served as European Commissioner for Research, Education and Science from 1972 to 1974 and after whom, more recently, the German Federal Ministry of Education and Research named a prize for outstanding achievements in European research projects. The most threatening of such effects of globalisation, in his view, were an “endangerment to social cohesion”, a shift from “solidarity” to “competition”, and an undermining of the “institutions of democracy through inconsequential communication between atomised individuals” under the conditions of the “anarchy of the internet”, which might promote “authoritarian rather than democratic constitutions”. These words, written in 1997 at what Dahrendorf referred to as “the threshold of an authoritarian century”, appear remarkably prescient, with virtually all western industrialised and scientific knowledge societies now confronted with the development of massive social divisions.

But what do Dahrendorf’s reflections have to say about international research cooperation in a research system that is itself becoming increasingly global? Must the freedom and responsibility of research also be rethought globally? Or, to put the question more directly: What is the relationship between the regulation of research conditions by individual states and global research networking? Or between the claim of the sciences

to autonomy on the one hand, and increasing uninhibitedness on the other, as recently became all too clear by Chinese scientist He Jiankui’s assertion of having created the first genetically edited babies?

We must call to mind that internationality in the sciences and humanities is not a descriptive category, but rather a valued principle: good research is international. And not merely in the sense that scientific knowledge is not tied to one national culture. Internationality is also a positive value in relation to the social aspect of research: international research cooperation is good. That is why its funding is anchored in the DFG’s statutes and why the DFG is active in international organisations such as the Global Research Council. Internationality is regarded so positively that when it comes to designing and promoting science and research policy, we often treat it not as a means to an end, but as the desired result itself. Examples include cooperation across national borders and on cross-border research topics such as migration or biodiversity; cooperation between the best experts in a particular field of research; the transnational operation of major research infrastructure; the diversity of cultures represented in a research working group.

Internationality is such a positive value in research that it is easy to overlook the complex ambivalences and risks associated with it in the era of globalisation. But we also need to talk about these risks if we are to take internationality seriously. Authoritarian forms of government appear to be on the rise across the world, and the realignment of global spheres of influence is well under way. Research and technology are also being used as political tools in this process.



Illustration: DfG / Aussehofer

Science diplomacy is merely one side, the positive side of the coin; international research collaboration can promote solidarity between nations. But at the same time, international science is, to employ Dahrendorf’s opposites, a means of competing for power, influence and location advantages. And this is not merely a matter of symbolic demonstrations of power or scientific competition of ideas. International competition between research locations is also decided by research funding and technical infrastructure, by salary amounts, and by the particular regulation of research freedom, research objectives and scientific responsibility. This can give rise to a competition in outbidding one another, for example in relation to computing capacity or salaries, which may also be combined with undercutting each other, for example in relation to ethical research standards. This is also the portent of the genetically manipulated Chinese twins: reckless, globally unrestricted research competition, in which the winners are those who practise the most irresponsible ethics dumping. And this threat is present not only at the international level, but also at the European and national level: there is also a clear decline in research ethics frameworks within the mem-

ber states of the European Union, for example in the area of embryo research.

It is not always easy to differentiate between the justified, productive overstepping of boundaries of knowledge and national research systems and overstepped ethical and political risk-taking. We may echo Vannevar Bush in speaking of endless frontiers, of science without borders, but research does not just overcome boundaries. Responsible research is also subject to boundaries that it must not overstep. And research can, in turn, be put to use as a means to establish and impose political, technical, economic boundaries.

Nevertheless, there must also be a place for research that is not immediately tied to the wielding of political, social and economic power, but first and foremost to theoretical curiosity and human knowledge of the world. And it is the task of the DFG to secure such a place. The sciences and humanities in general, and research in particular, are a category of distance. In order to perform effectively, they require cultural and intellectual distance. They are interested in the unknown, the unfamiliar, that which they find bewildering. And the pursuit of knowledge does not

# Bridges to Bilateral Dialogue

Science diplomacy: promoting international solidarity through research cooperation

Research collaborations, selected and approved according to strict quality criteria, can and should be viewed and continued separately from politically difficult relationships. This maintains a dialogue between societies that can then be used to improve political relations when the time is right. The DFG is actively involved in science diplomacy.

For the EU, China, for example, is no longer simply a strategic partner, but also a systemic competitor. But regardless of this new perspective, thanks to the relationship of trust between China's NSFC and the DFG, relations in the area of basic research are developing steadily with continually increasing funding. One prominent example is the Sino-German Center

for Research Promotion (SGC) founded jointly in 2000.

Turning to the example of Russia, in 2014 the EU imposed sanctions on the Russian Federation in response to the crisis in Ukraine. In spite of very difficult political and diplomatic relations, with the help of the DFG office in Moscow it was possible to keep Russian-German scientific relations stable and sig-

nificantly increase the number of jointly funded projects. In addition to proven formats such as the German-Russian Week of the Young Researcher, in 2018 the partnership with Moscow State University (MSU) was stepped up.

Taking Japan as a final example, here the humanities and social sciences are experiencing ever increasing pressure to justify their existence, since the government prioritises output-oriented research. Through its Tokyo office, the



Illustration: Borse and Meinhard Wissenschaftskommunikation

DFG is attempting to highlight alternative options and offering the humanities in Japan a highly visible platform through a series of jointly organised symposia.

As well as helping to maintain international cooperation, scientific collaborations can actively promote them. A good example is Iran, where, following the lifting of EU sanctions at the beginning of 2016, the DFG was able to strengthen initial scientific contacts and initiate a series of joint research projects.

stop at national borders: international science, as a matter of principle, is foreign friendly; it embraces the unfamiliar.

And that is why the internationalisation of research must also concern itself with the foreign and the unfamiliar; with differences in intellectual styles, questions and problems, traditions of knowledge, histories of institutions and research practices – in a word, with otherness. Such “foreign-friendliness” presupposes a globally oriented open-mindedness that is willing to be irritated, that actively seeks productive irritation – this is the year of Alexander von Humboldt, after all – is fundamental to research. And this open-mindedness is what is behind the notion of international science. Thus understood, internationality is more than the collaborative sharing of tasks across the boundaries of legal, power or financial systems. Responsibility and freedom are required to provide a stable basis for scientific inquiry.

Without freedom, the intellectual capabilities of science and academia are inconceivable, nor are they conceivable without the knowledge that is truly new in the sense that it does not confirm our expectations, but disrupts them. Without freedom, there could be no question of the diverse functions of impacts, be they direct or indirect, manifest or latent, short-, medium- or long-term – impacts that we owe to modern science's power of cognition, without which we could not navigate the hypercomplexity of our world. Without the sciences and humanities, what would we know about the probability of extreme summers, the incidence of congenital

diseases, the history of our planet or the functioning of echo chambers?

Academic freedom is of such fundamental importance that one could be inclined to take it for granted. However, to do so would be imprudent. For this freedom rests on a normative foundation that is by no means universally acknowledged; instead, it must be strived for or defended and its practical applications adapted and affirmed.

This year we have special cause to remember that foundation. On 23 May, Germany's constitution, which includes the all-important section Article 5 paragraph 3, will celebrate its 70th birthday: “Arts and sciences, research and teaching shall be free. The freedom of teaching shall not release any person from allegiance to the constitution.” This privilege of freedom does not conceive of research as a tool, as a means to other ends, but as an expression of the human condition, and it is bound by the constitution: academic and scientific freedom must also fulfil ethical standards.

Not only is it important to call this to mind on commemorative occasions – in fact, we must remember this for reasons that are regrettably very relevant today. Because we cannot ignore or remain indifferent to the fact that the freedom, open-mindedness and responsibility of the sciences and humanities are under increasing pressure throughout the world. That is because they constitute a challenge to anti-pluralistic, populist na-

tionalist, authoritarian or autocratic claims to power and truth that are gaining influence in many places in the world. The power of enquiry and questioning, critical reflection, disruption and expansion of established knowledge and epistemics typical of the sciences and humanities endangers those hermetic social and knowledge regimes on which populists and autocrats rely for their success.

The threat to the freedom, responsibility and open-mindedness of academic research (and its productive power) is almost as great where – sometimes in combination with populism and autocracy – research is increasingly viewed merely as an instrument, at best a predictable solution to problems which have long been known, a view that on occasion merely conceals itself behind the constraints of fiscal policy and the pressure of tight budgets.

The research policies of many nations, not just, say, the US, the new Brazilian administration or Japan, give rise to such criticism, and influence our international cooperation options. Even with respect to the EU, and despite positive developments in the European Research Area, it is necessary to point out that strong, effective research systems must not be structured as a centralist hierarchy, but as a pluralistic heterarchy. They eliminate monocultures, whether they are structural or thematic. They avoid the reduction of their research-driven impacts to delivering solutions that we already expect. They enable flexibility, not according to budgets, but as a constitutionally guaranteed freedom.

Shaping Europeanisation, internationalisation and globalisation means standing up for the freedom of science and research, ensuring their ethical accountability, and rendering the diversity of knowledge cultures, research styles and funding systems productive. The flexibility of funding and funding policy necessary to do so is greater in Germany than in most nations in the world and more reliable than in many scientific institutions with which we cooperate internationally. Nevertheless, we are not immune to frustrations or setbacks to our collaborations on every continent. Sometimes we struggle with the sheer impenetrability of red tape, occasionally political interests stand in our way, and sometimes we may have encountered difficulties with new authoritarian claims of imperialism.

Be that as it may: how we deal with this social and political, intellectual and ethical venture of responsible-minded freedom in a global scientific world that is becoming polycentric; how the harmful “secondary effects of globalisation” on the international (research) “politics of freedom” can be contained; and how Dahrendorf's prognosis of an “authoritarian century” can be proven false are questions that require rigorous discussion. And they will be hard to answer definitively.

Prof. Dr. Peter Strohschneider  
is the President of the DFG.



Patrick Rössler, Magdalena Droste and Anke Blümm

# Survival Network

Founded 100 years ago, the Bauhaus was Germany's most successful cultural export of the 20th century. New research reveals how the communicative links between members of the Bauhaus enabled the institution to continue functioning after its closure in 1933 as an early form of "virtual community". The study steps away from a more conventional stylistic examination to take a fresh look at the movement.



*Bauhaus teachers on the roof of the studio building in Dessau. Opened in Weimar in 1919, the school had to relocate to Dessau in 1925 under pressure from right-wing politicians and was based there until 1932.*

For fourteen years, throughout the Weimar Republic, the Bauhaus embodied the hopes and the tragedy of Germany's first democracy. Established in 1919 as a reform project which not only removed the boundaries between fine arts and applied arts but also pursued new approaches in education, it also had to yield to a range of reactionary forces in the German Reich. In 1933, following the school's relocation from Weimar to Dessau and then to Berlin, as in so many areas of public life, there was no more room for progressive artistic ideas.

After the Bauhaus closed, its last members were widely dispersed: many were later persecuted for their involvement in communist, socialist or social democratic activities, some murdered because of their Jewish origin in the fascist machinery of destruction, others achieving success in the National Socialist state and a number being trapped in the straitjacket of "inner emigration".

Tempting as it may be to ascribe a uniform "style" to "the Bauhaus", typically involving flat roofs, steel

tube furniture, and accessories influenced by New Objectivity, it is nonetheless inaccurate to assume that there was only ever one "Bauhaus". Even during its existence as an institution, it combined such different concepts as the fantastical worlds of Paul Klee and the technical rationalism of László Moholy-Nagy. It was also home to the esoteric Mazdaznan religion and a communist student group, KOSTUFRA; argued about the appropriate ratio between artisanship and industry; and became an arena for the rancorous debates between left and right in the unstable young democracy.

The dissolution of an institution that brought together all these disparate elements left behind an array of groupings among the school's graduates, former teaching staff and friends of the Bauhaus: circles which may have originated in the school but which subsequently evolved along very different lines.

The simple question of who counts as a member of the Bauhaus is in fact anything but trivial. The 1,400 or so people typically regarded as *Bauhäusler* include, naturally enough,

the directors and teachers, but also prominent students from Wilhelm Wagenfeld to Marcel Breuer, who in some cases did some teaching at the school later in their careers. Then there were the numerous students whose names are known from the records, only a minority of whom actually graduated with a journeyman's certificate or a diploma. It is surprising, however, that more than half of these individuals spent only a relatively short time at the Bauhaus; with two semesters or less under their belts, they are – with only a few exceptions – marginal figures in the school's history.

Using this corpus of data, it is possible to begin to identify the actors, ideas and dynamics that shaped this institution as "the Bauhaus". What is noticeable is that, for some, the Bauhaus continued to exist as a variety of communicative networks, whether closer-knit or looser, larger or smaller, clearly or less clearly delineated. This could be thought of as a kind of "virtual continuation" in which the former institution evolved into what would today be called a "community". These groupings often sur-



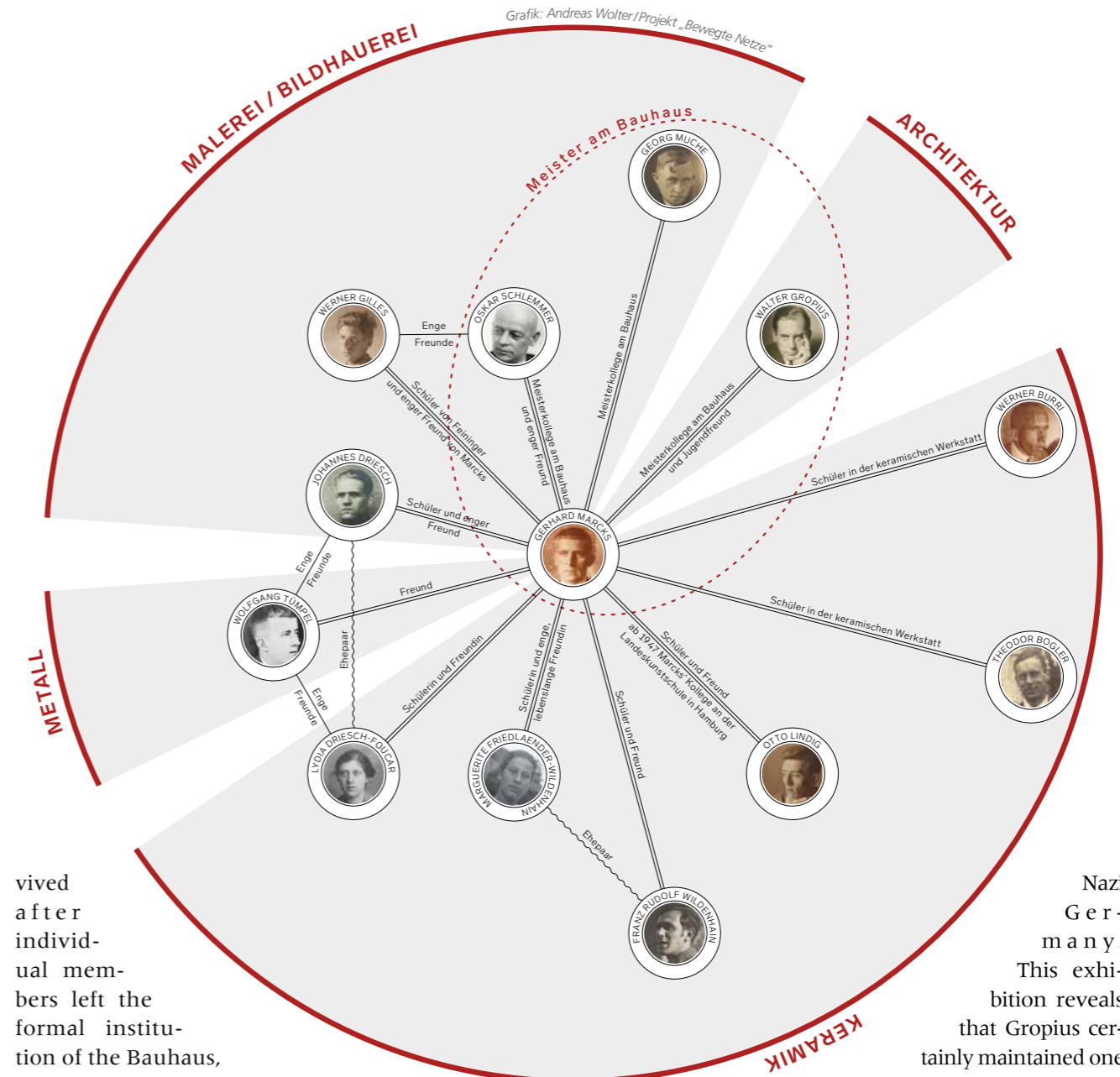
Left: Steel tube chair B3 ("Wassily"), designed by Marcel Breuer, c. 1926.

Right: Double teapot, designed by Gerhard Marcks and Theodor Bogler, 1921.

Right-hand page: The network of relationships surrounding Bauhaus teacher Gerhard Marcks.



Illustration: © for G. Marcks: VG Bild-Kunst, for T. Bogler: Vereinigung der Benediktiner zu Maria Laach e.V.



vived after individual members left the formal institution of the Bauhaus, usually through letters and personal meetings, or exhibitions and joint publications.

In 2000, historian of philosophy Randall Collins divided networks into three basic relationship models: the competitive relationship, the master-pupil relationship and the formation of groups of equals. Examples of each type can be identified within individual networks which had their roots in the Bauhaus but which subse-

quently grew and disintegrated in different ways.

For example, it is possible to describe the network of Bauhaus founding director Walter Gropius in the USA by looking at the 1938 Bauhaus exhibition in New York, which was the focal point of intersection for former Bauhaus members who had emigrated from

Nazi Germany. This exhibition reveals that Gropius certainly maintained one of the biggest networks, but ultimately the selection of works is dominated by his own small circle: Herbert Bayer, Marcel Breuer, Josef Albers, László Moholy-Nagy and Xanti Schawinsky.

This group also defines the image of the school in the first and most important retrospective since its closure. Not only did the catalogue remain the only standard work on the Bauhaus for over two decades, the data also reveals for



the first time that the exhibition actually toured many US cities up until 1941, meaning that it was much more widely received in US society than was previously assumed.

A look in the other direction geographically (and ideologically) takes us inevitably to the “Bauhaus Brigade” led by second director Hannes Meyer, the successor to Walter Gropius. Recent finds in Russian archives reveal that, beginning in 1930, Meyer worked

with a group of architecture graduates in the workers’ and peasants’ state, which at that time was much admired by many left-wing activists who believed in a socialist future. Indeed, more former *Bauhäusler* were involved in redevelopment work in the Soviet state than was previously assumed, and the places of their influence have been identified as extending far beyond the capital Moscow.

A differentiated reconstruction and representation of their individ-

ual fates indicates that some quickly left the Soviet Union again – with the help of their still-intact network contacts – while others fell victim to the horrors of Stalin’s reign of terror. Hannes Meyer himself plays a rather doubtful role in all this, going from being the central figure of this formation to an increasingly marginal one, in some cases willing to abandon former companions.

For Bauhaus teacher Gerhard Marcks, the 1930s were a very different story. Even during the Weimar period, which lasted until 1925, Marcks and his circle represented a different kind of Bauhaus to that which is generally known. With his emphasis on an artisanal ethos and an interest in classical tradition, Marcks attracted a stable group of pupils with whom he not only maintained a close relationship after leaving the school, but also remained friends into the Nazi period and beyond. As non-emigrants, Marcks and his group represent a type of former Bauhaus member that sought to withdraw as far as possible from the political sphere. The return to artisanry as the starting point for art was the common denominator of the network and continued to serve as its underpinning idea until the 1980s. An exhibition entitled “Wege aus dem Bauhaus – Gerhard Marcks and his Friends) in 2017/2018 showed this by means of works, letters and documents relating to Marcks’ circle of friends. The exhibition was initiated and curated by the DFG research project in partner-

László Moholy-Nagy: Cover of a lifestyle magazine for which he designed the relaunch, “die neue linie” (May 1931).



Illustration: Personal Archive Rössler



Students in the weaving class at the window of the Bauhaus canteen (from left: unknown, Liesel Henneberger, Margarete Dambeck, Margret Leischner), c. 1927–1929.

ship with Klassik Stiftung Weimar and the Gerhard Marcks House in Bremen.

Networks can be formed not just of people, but also areas of activity, such as commercial art. The progressive forces within the National Socialist regime adapted the effective language of form of the Bauhaus as part of a functional eclecticism. In Berlin, the Dorland advertising studio managed until 1938 by Herbert Bayer, once instructor at the advertising workshop during the Dessau period, represented a central meeting point for former Bauhaus members, for whom it provided a continual flow of work.

In a similar vein, Moholy-Nagy successfully built up a typography design studio for magazines and advertising; but in the mid- and late 1930s respectively, both men emigrated to the USA, where they joined the network surrounding Walter Gropius. Some of the commercial artists who remained in Germany achieved considerable success – partly by adapting to the political situation – while others struggled to make ends meet.

But Germany did not offer an acceptable living environment for

all the school’s graduates. To begin with, many Bauhaus members, particularly Jews, emigrated to the Netherlands because it was easy to reach and did not require any major cultural adaptation. The country’s relatively small size was conducive to the establishment of a diverse range of workshops, studios and activities of former *Bauhäusler* throughout the Netherlands.

The members all knew one another, and even if they were not always in close contact, the records show that in times of need the network could be successfully activated. However, with the German occupation the country became a trap for some Jewish Bauhaus members and those involved with the Resistance, ending for some in imprisonment and death.

This examination of five differently structured formations has proved not just innovative, but also productive for Bauhaus research. By incorporating the study of communicative networks, the purely aesthetic approach to Bauhaus scholarship which has traditionally dominated gains an important set of methodological tools that moves away from the

one-dimensional representation of a continually self-perpetuating and self-referential “Bauhaus style”.



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<https://forschungsstelle.bauhaus.community>







**Animal experimentation:** How can scientific and ethical demands be better harmonised? What opportunities are offered by alternatives to animal experimentation and what are their limitations? And how can this controversial topic be better integrated in the dialogue between science and society? Perspectives and insights on our focal topic

## “All the Arguments For and Against”

The new chair of the DFG Senate Commission on Animal Protection and Experimentation, Brigitte Vollmar, on achieving a balance between scientific interests and animal welfare

*german research: Professor Vollmar, can you tell us a little about your institute, the Institute of Experimental Surgery, in the somewhat peripheral locality of Rostock?*

Vollmar: The institute carries out both basic and applied research. We combine pathophysiology, the science of how disease occurs, with the search for new treatments. In our surgical work, we use various animal models, from small to large animals. As far as Rostock is concerned, there are few other places in Germany that allow studies in experimental surgery to be conducted in such a concentrated, networked way.

*In spite of your intensive research work, a year ago you accepted an invitation to chair the Senate Commission on Animal Protection and Experimentation. Why?*

When I was asked, I didn't need long to think about it. It links in to my clinical surgical background, my knowledge of medicine and healthcare, and the fact that I've been conducting my own animal research for 30 years. I'm familiar with all the arguments for and against, all the opportunities and risks of animal experimentation. I have also established a central experimental animal centre in two locations [Homburg/Saar and

Rostock], including quality management certification. With this expertise, I feel well equipped for the role. Above all, I can appreciate the rationale for the Senate Commission. It's a necessary body for all fundamental questions relating to animal experimentation. I'm delighted to be able to contribute to that.

*What did you focus on during the first year?*

As expected, the core task was to deal with the legal framework. Presenting the viewpoints of the research community and contributing scientific expertise to legisla-



Illustration: Fotolia / BillionPhotos.com

### Brigitte Vollmar

is the director of the Rudolf Zenker Institute of Experimental Surgery and leads the Central Experimental Animal Centre and Multimodal Small Animal Imaging service facilities at the University of Rostock. Born in 1961, she studied medicine at LMU Munich and completed her habilitation at Saarland University before accepting a professorship in Rostock in 2002. In addition to her disciplinary work, she is actively involved in several specialist committees and research panels. She previously served on a DFG review board and is a member of the Senate and Grants Committee for Research Training Groups and the DFG Senate Commission on Key Questions in Clinical Research. Since 2018, she has served as chair of the Permanent Senate Commission on Animal Protection and Experimentation.



Illustration: U Rostock

Vollmar's main research interests are experimental surgery, regenerative medicine and new treatment concepts such as tissue-engineered organs. She studies the molecular mechanisms of organ damage and organ repair, particularly in the liver, pancreas and brain.

tive processes is a challenge at both national and European level. One issue is how to make sure that the needs and concerns of research are adequately represented.

*Recently the Commission issued a statement on approval procedures for animal experiments. What prompted this?*

It was in response to the new EU directive, the amendment of the Animal Welfare Act in 2013 and actual practice in the approval of animal experiments. It was recognised that there are considerable legal uncertainties, resulting in different procedures among different licensing authorities. The time taken to issue a licence varies significantly from one federal state to another. This has a range of consequences, including situations that actually impede research. In the statement, as well as reviewing the current situation we also suggested solutions that we could present to the various parties involved – ministries and public authorities, uni-

versities and research institutions, and researchers themselves.

*What are you calling for in terms of policy?*

One thing we're calling for is the harmonisation of animal welfare law at federal state level. Current law stipulates how long it should take to get approval for a project. So we're calling for the legally defined processes to be upheld. The Senate Commission is also calling for the research community to take responsibility for the efficient and professional handling of approval procedures.

*Animal experimentation is a controversial topic in the public sphere, and not just among animal rights activists. In your opinion, why is animal research necessary?*

We believe animal research is essential to progress in biomedical research and will remain so for the foreseeable future. The idea that we could completely abandon

it fails to acknowledge the facts of the situation and does not take into account the fact that research is done for the benefit and well-being of people and animals. In the long term, without basic research we would be looking at inadequate patient care because we would no longer have any guarantee of scientific progress. Whenever possible, we can and should opt for methods that do not involve animal experimentation. But with alternative methods we need to ensure that the results obtained are similarly useful and meaningful.

*How would you respond to critics who say that the findings from animal models can't be transferred to humans?*

It's true that an animal experiment today will not necessarily lead to the medical advancements of tomorrow. But it does generate useful knowledge which can be put to good use in the future. We can see this from the history of the Nobel Prizes. Discovering and describing





something is one thing; actually exploiting that knowledge is another. There might be decades in between the two processes.

#### What are the possibilities and limitations of alternative methods?

Different alternative methods have different potentials and limitations, as with any other method; it's not specific to this area. In vitro analysis, which isn't new but is very promising, has now been identified as an alternative method. Every time, researchers have to select the most suitable methods to answer a research question from a wide range of possibilities. Often it's necessary to combine different methods, in which case animal experimentation plays an important role.

#### How can animal protection and animal welfare be safeguarded in the long term?

The 3Rs – replace, reduce, refine – are crucial. They also represent a legal obligation and a framework for action. There are good reasons why researchers have to take the 3Rs into account when planning a piece of research. The importance of the 3Rs could be embedded much more in the scientific community and among the general public. Ethical considerations relating to different legally protected interests must always be taken into account and weighed up with regard to benefit, knowledge gain and the stress caused to experimental animals. It is the Senate Commission's view that the stress experienced by animals should be minimised wherever possible. It is also important to maximise the data generated through the research design. Nothing is worse than using an animal for badly designed research.

*If we accept the claim that the DFG primarily supports mainstream topics and projects, won't that automatically make things more difficult for alternative methods?*

The DFG does not specify research topics; proposals are submitted on a bottom-up basis. The review process is strictly geared towards scientific quality criteria. This is a tremendous asset in research and its funding. The breadth of topics

### “The 3Rs – Replace, Reduce, Refine – are crucial”

covered is very wide, and so is the range of methods used. In the life sciences, around a third of project proposals request funds for experimental animals. These projects are not normally based on animal experiments alone, but on a combination of methods. So almost incidentally, the DFG does fund a lot of research that contributes to the development, establishment and refinement of methods that don't involve animals. It's just that these projects aren't specifically labelled as being about replacement or alternative methods. There is also a whole range of group research projects specifically addressing 3R-related topics, for example assessing the stress experienced by laboratory animals or improving tissue models.

*2.8 million laboratory animals were used in Germany in 2016, 40 percent of them for basic research and the rest for applied research. Is that justifiable? Yes, those figures are correct. But bear in mind that many more ani-*

mals are used for food and other human purposes. It's important that basic research feeds into applied research and vice versa. This should be distinguished from the recurring tests performed on animals in pharmaceutical research.

*In 2016, a committee in the Netherlands drew up a scenario for a complete withdrawal from animal experimentation. Shouldn't we follow this example?*

I don't believe this is realistic; in fact I think it could be dangerous. And I think it's inappropriate to suggest that such a thing could be possible. The experience in the Netherlands shows that some of the proposals were untenable. When you read the paper in detail you also see that the withdrawal from animal experiments was only being considered for a narrow area, but is considered unrealistic in basic research.

*What would you like to see in animal experimentation in Germany?*

I'd like us to achieve greater acceptance of animal experimentation. This is one of the commission's essential tasks. Matter-of-fact, non-emotional and compact information can help, even in controversial debates. There have undoubtedly also been some failings here on the part of the scientific community. But I would also like to see greater and wholehearted support for alternative methods. No researcher wants to cause animals to suffer. For those animal experiments that are unavoidable, I want them to be even better and kinder on the animals.

**Interview by Dr. Rembert Unterstell in Rostock.**

## Alternative Culture Techniques

### 3D tissue models: RTG in Würzburg studies molecular mechanisms of infection without animal experiments

Infection models are fundamental to understanding pathogens and the progress of disease. In view of the fact that the widely used cell cultures and animal models for human pathogens are artificial systems, a Research Training Group at the University of Würzburg is attempting to develop alternative infection mod-

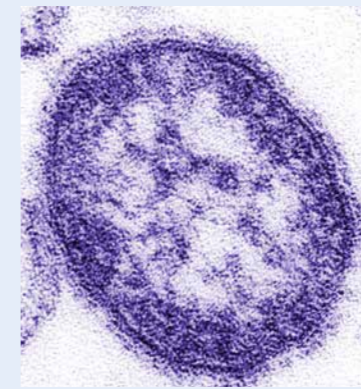


Illustration: Wiki Commons/Cynthia S. Goldsmith

els for pathogens (image: a measles virus under the microscope). The models are to be based on new 3D tissue culture techniques and thus replace animal experiments. The interdisciplinary Research Training Group 2157, “3D Tissue Models for Studying Microbial Infections by Human Pathogens”,

intends to develop methods and strategies for investigating key mechanisms of infection. These methods and strategies will be very similar to natural conditions or reflect these natural conditions in their key components.

The researchers are studying host-microorganism interactions with three-dimensional engineered human tissue models. The team anticipates that the use of next-generation analytical technologies will allow new insights into the process of infection and the underlying molecular mechanisms.

[www.uni-wuerzburg.de/grk2157/grk-2157](http://www.uni-wuerzburg.de/grk2157/grk-2157)



The project in the DFG database GEPRIS: [gepris.dfg.de/gepris/projekt/270563345?language=en](http://gepris.dfg.de/gepris/projekt/270563345?language=en)

## Measuring Stress and Pain

### Research Unit studies stress in experimental animals using science-based parameters

Since 2017, the DFG has been supporting Research Unit 2591, “Severity Assessment in Animal Based Research”. The group brings together eight research institutions in Germany and Switzerland, which, in 15 projects, are investigating the stress experienced by animals in animal experiments. “At the moment we don't have sufficient science-based parameters and methods with which to measure impacts such as the stress and pain animals are exposed to in an experiment. This is of relevance both ethically and in terms of the quality of experimental data. We want to change that,” says Prof. Dr. André Bleich, director of Laboratory Animal Science at Hannover

Medical School and spokesperson for the Research Unit.

The researchers aim to make their assessments available not only to institutes and individual researchers, but also to public authorities and reviewers. To measure what animals experience during experiments, researchers can use infrared cameras to monitor an animal's activity and body temperature, for example. The heart rate and its intervals can also be measured by telemetry.

[www.mh-hannover.de/46.html?tx\\_ttnews%5Btt\\_news%5D=5089&cHash=f5f585edc2099800e26abf29805c97dc](http://www.mh-hannover.de/46.html?tx_ttnews%5Btt_news%5D=5089&cHash=f5f585edc2099800e26abf29805c97dc)



The project in the DFG database GEPRIS: [gepris.dfg.de/gepris/projekt/321137804?language=en](http://gepris.dfg.de/gepris/projekt/321137804?language=en)

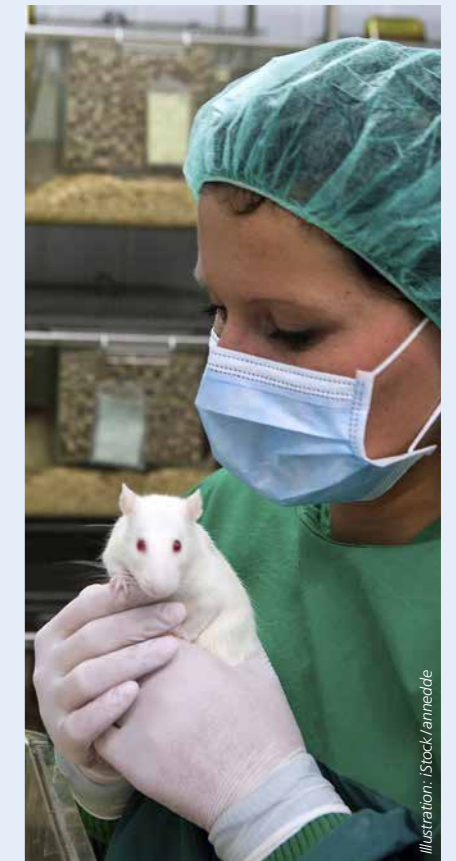


Illustration: iStock/anneidde





# Good Standards, Bad Standards

We put four questions to Sophie Helene Richter, Professor of Behavioural Biology and Animal Welfare in Münster, on the design, informative value and reproducibility of animal experiments

# 1

*german research: In your dissertation you tackled questions relating to the standardisation of animal experiments, which you are now continuing to study in a DFG project. What is your central observation?*

Richter: Standardisation is still a kind of dogma in animal-based research. Although the concept was originally formulated to control experimental conditions, today it is equated with the strict stand-

ardisation of the experimental conditions. Genotype, sex, age: everything is standardised with painstaking care. This is intended firstly to increase the likelihood of finding statistically significant effects and secondly to ensure a high level of reproducibility. But the problem is that increasing standardisation of the experimental conditions results in increasing demarcation from other experimental environments. So the more an experiment is standardised, the more difficult it becomes to reproduce the results under slightly different conditions. And this

is exactly what we see reflected in the literature: in spite of strict standardisation, we keep seeing different, sometimes completely contradictory results being published.



Illustration: Peter Grewer

# 2

*Taking an overall view, how could we improve the informative value and reproducibility of animal experiments?*

The standardisation fallacy clearly shows that a statistically significant effect isn't automatically biologically significant. For example, if we're interested in the efficacy of a new drug, we would hardly be convinced

if it produced the desired effect only in 12-week-old male mice kept in groups at a temperature of 22°C and an air humidity of 50 percent. In the best-case scenario, a biologically significant effect is independent of the specific experimental conditions and remains the same no matter how high or low the air humidity. But to achieve this non-dependence on the specific environment, it's necessary to make the study samples more representative and thus more "variable". It was this idea that we tested using the idea of "systematic heterogenisation". So instead of using just 12-week-old mice kept in cages with nesting material only, we used animals of different ages kept in different environmental conditions. What we found was that the systematic variation of just two environmental factors was sufficient to significantly improve the reproducibility of be-

havioural data. So variation shouldn't be regarded as a threat to an experiment, rather as an opportunity to make the results of animal experiments more informative and thus more reproducible.



Illustration: Charité Berlin / Sabine Gudath

**How can the scientific desire for knowledge give rise to prize-worthy alternatives to animal experiments?** Prof. Dr. Ellen Fritsche from the Leibniz Research Institute for Environmental Medicine at Heinrich Heine University Düsseldorf and PD Dr. Dr. Hamid Noori from the Max Planck Institute for Biological Cybernetics in Tübingen both made it happen. Fritsche developed organ-like cell cultures which can be used to test substance toxicity to brain development. Noori combined the results of thousands of neurobiological research projects on rats in publicly accessible databases. In recognition of their work, on 23 November they were presented with the Ursula M. Händel Animal Welfare Prize 2018 by DFG Vice President Prof. Dr. Katja Becker (left in photo). The prize was awarded in conjunction with the opening of the new research centre Charité 3R – Replace, Reduce and Refine, in the Friedrich Kopsch Lecture Hall at the Charité in Berlin.

# 3

*What needs to be done in terms of laboratory conditions from an animal welfare perspective?*

As a basic principle, promoting the wellbeing of experimental animals isn't just important from an animal welfare perspective, it's also essential to the scientific quality of research. If we make the cages bigger and more comfortable, we're improving the animal's

wellbeing but also enhancing the informative value of the research. So the aim must be to continue optimising conditions to allow animals to exhibit a natural repertoire of behaviours, satisfy species-specific needs and prevent boredom. Some of the questions we're addressing at the moment are things like: What are appropriate housing conditions for male mice? What conditions prevent the development of abnormal behaviours?

# 4

*What are the current and future challenges facing animal protection in basic research?*

Animal-based research has always existed in an area of tension between the human desire for knowledge on the one hand and the protection of animals on the other. So it demands a responsible weighing-up of the options, combined with the question

of whether it's possible to replace certain types of experiment and if so which, and how the number of animals can be reduced. Given that around 2.8 million animals are used for research every year in Germany, we also need to consider how we can minimise stress and prevent unnecessary impacts on their welfare. In addition to this, we need to optimise experimental approaches and continue improving the quality of animal research.

Interview by Dr. Rembert Unterstell.





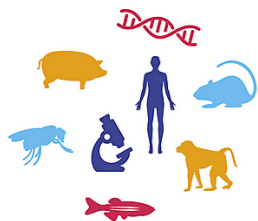
# Going Public

“Tierversuche verstehen”, an initiative of German research organisations, aims to actively and transparently inform the public about animal-based research

Two years ago, the information initiative “Tierversuche verstehen” (TVV, Understanding Animal Experimentation) took its first step towards public visibility by launching its own website. The initiative of the Alliance of Science Organisations in Germany is intended to provide comprehensive, up-to-date and factual information about animal experimentation at publicly funded research institutions and insights into the necessity for responsible animal-based research. The initiative defines “responsible”

the steering board and the agency tasked with implementation.

The TVV website includes background or “fact check” pages providing extensive information on basic issues, for example the ethical and legal frameworks relating to animal experiments. They present the scientific knowledge that has been gained as the result of experiments with animals. The background information pages also explain alternatives to animal experiments. This information is supplemented by regular editorial contributions, infographics



## Tierversuche verstehen

Eine Informationsinitiative der Wissenschaft

as a carefully considered balance between the protection and welfare of animals and the importance of scientific knowledge for humankind.

The initiative is closely linked to the goals and activities of the DFG Senate Commission on Animal Protection and Experimentation, which played a key role in developing the concept. Members of the Commission are also represented on the initiative’s steering board, which coordinates its activities and content. Financially, the DFG supports the position of a scientific officer who acts as the central link between

and interactive features. There is a dedicated YouTube channel with videos and animated explanatory videos dealing with topics such as the 3Rs and the care of laboratory animals. TVV can also be found on Twitter. Website users can sign up to receive a newsletter to keep up to date with developments and send queries to the editors through a contact form.

In addition to media work, the site offers teaching material for schools. One highlight of 2018 was the “Meet the Nobel Prize Winner” campaign, in which school pupils were invited to make their own short videos showing how they

engaged with the topic of animal experimentation in class. The winning teams from Dessau and Metten, chosen through an online vote, were given the chance to meet German-American biochemist and Nobel laureate Thomas Südhof from Stanford University, and put their questions to him.

Following the set-up phase, the TVV website has now established itself as a central information resource. It is also a resource for journalists and policymakers. For the scientific community, TVV is present at a number of conferences to provide information. The initiative has already formed official partnerships with ten scientific societies and organisations. At many research institutions, TVV is regarded as an important partner in providing even more active and transparent information about animal experiments and explaining the ethical standards and principles of responsible animal research.

Following a successful evaluation by the Alliance of Science Organisations in Germany, the steering board working in partnership with the agency has been given the go-ahead to implement further ideas and activities. This includes the production of new videos, the further development of professional networking and a second edition of the video competition “Meet the Nobel Prize Winner”; this time the prize up for grabs is an opportunity to meet Norwegian neuroscientist and Nobel laureate May-Britt Moser.

### Dr. Christoph Limbach

is a programme director in the Life Sciences 2 division at DFG Head Office and is responsible for the Senate Commission on Animal Protection and Experimentation.

[www.tierversuche-verstehen.de](http://www.tierversuche-verstehen.de)



# Katharina Anna Zweig Wins Communicator Award

Computer scientist to receive award for dedicated communication on development, use and social impact of algorithms / Award ceremony on 1 July in Rostock

Computer scientist Prof. Dr. Katharina Anna Zweig is the winner of this year’s Communicator Award, conferred by the DFG and the Donors’ Association. The researcher from the Technical University of Kaiserslautern is to be presented with the €50,000 prize for her dedicated and wide-ranging communication on the ethical, political and social implications of algorithms and their application.

In announcing their decision, the jury for the Communicator Award praised the critical aspect and network-based approach of Katharina Anna Zweig’s science communication. Through a well-designed communication strategy and a diverse range of formats and channels, Zweig has engaged very different audiences with this complex and socially very relevant topic. As well as giving people an insight into the way algorithms are developed and used, she has also stimulated a nuanced debate on their application. The jury noted how Zweig pursued her various activities with tremendous dedication to promote a dialogue in the media and among the general public on the digital transformation and its implications for society.

After studying biochemistry and bioinformatics in Tübingen and completing postdoctoral studies on the analysis of complex networks in Budapest and Heidelberg, in 2012 she was appointed head of

copyright reform in Europe. In her communication work, Zweig uses a combination of traditional and new media formats: interviews and articles in print media and on TV and radio; social media activity, especially on Twitter; lesson and teaching materials; and involvement in exhibitions (“Without Lock and Key – Opportunities and Risks of Big Data”, Kaiserslautern 2018). Together with journalists, she launched Algorithm Watch (<https://algorithmwatch.org>), a citizens’ initiative and platform designed to make the public aware of how algorithms work, encourage people to keep a watchful eye on them, and get involved in the appropriate regulation of algorithmic decision-making systems. The



Illustration: Felix Schmitt/felixschmitt.com

the Algorithm Accountability Lab in the Department of Computer Science at TU Kaiserslautern. Here she established Germany’s first course of study on “socioinformatics”, which examines the impacts of digitisation, specifically algorithms, on individuals, organisations and society as a whole.

Many of Zweig’s research topics are highly relevant both socially and politically, for example in relation to debates surrounding fake news and the current dispute regarding

project and its initiators won the Theodor Heuss Medal in 2018.

The “Communicator Award – Science Award of the Donors’ Association” has been awarded every year since 2000 and is the most important prize for science communication awarded in Germany. The 2019 Communicator Award will be presented during the DFG’s annual meeting on 1 July 2019 in Rostock.

[www.dfg.de/en/funded\\_projects/prizewinners/communicator\\_award](http://www.dfg.de/en/funded_projects/prizewinners/communicator_award)



Jochen Erbacher

# Secrets of the Deep

The International Ocean Discovery Program, the world's largest research collaboration in the geosciences, is celebrating its 50th anniversary. With significant scientific and financial participation from Germany, the IODP expeditions and their core samples are providing fundamental insights into the Earth's structure and climate history.



*Scientists use research vessels to drill deep into the ocean floor. In heavy seas and with a lot of drift, this can be very challenging work. Shown here is the JOIDES Resolution, which has made a name for itself in deep-sea research. The first part of the name stands for Joint Oceanographic Institutions for Deep Earth Sampling.*



50 years ago, a new era in the scientific study of our planet began. It was the start of an international scientific collaboration in which researchers use challenging deep-sea drilling projects to reconstruct the formation and structure of the Earth and the associated climate history in a new way. The roots of the endeavour go back even further, to March 1961, when a prominent group of geologists, drilling engineers and crew – including the nature-loving US author John Steinbeck (*The Grapes of Wrath*) – set sail on board CUSS 1. Their visionary objective was to retrieve core samples from between the Earth's crust and the mantle. This boundary deep within the Earth lay a whole 8,000 metres beneath the ship's deck. By the end of the expedition, the team would have drilled through 183 metres of rock in 3,500 metres of water. It was a sensational achievement.

Steinbeck, who would later win the Nobel Prize in Literature, was so inspired by the expedition into the unknown that he pocketed a piece of basalt from the drilled core.

It wasn't until nine years after CUSS 1 that a second research drilling vessel left port in Galveston, Texas. The first expedition of the *Glomar Challenger* signalled the start of the active phase of the Deep Sea Drilling Project (DSDP). In 1969, the first German scientist took part in a DSDP expedition: micropalaeontologist Erlend Martini from Frankfurt's Goethe University. Germany joined DSDP in 1975, and the same year saw the first expedition under German leadership: one of the two expedition leaders was marine geologist and later DFG President Eugen Seibold (1918–2013).

In 1976, the DFG approved a Priority Programme to fund research within the framework of DSDP, and

since then it has funded a major proportion of the German contribution. Since the first DSDP expedition with the *Glomar Challenger*, the expeditions have been consecutively numbered. The third expedition, Leg 3, in the Atlantic confirmed the hypothesis that new oceanic crust was being formed along the mid-ocean ridge and that the continents were moving. Subsequent expeditions allowed scientists to demonstrate that the age of the oceanic crust increased with distance from the mid-ocean ridge. It was exciting proof of Alfred Wegner's theory of plate tectonics.

Since then, more than 350 expeditions have taken place as part of DSDP and three successor programmes. Thousands of researchers from more than 30 countries have worked on board or on shore in the laboratory, analysing the collected material and data. Researchers from Germany have been involved in the expeditions on more than 400 occasions. For many of them, taking part in a deep-sea drilling expedition has been an important part of their scientific careers. The research topics covered by the International Ocean Discovery Program (IODP) are as diverse as the range of disciplines relating to the solid Earth.

Alongside ice cores from the polar regions, the layered sediments of the ocean floor are the most important climate archive on the planet. For this reason, palaeo-environment research on the sediment cores, which may be up to 175 million years old, has been an important scientific focus of the programme for decades. In 2004, the first deep-sea drilling expedition ventured into the Arctic Ocean. Funded by the European consortium in the IODP, the European Consortium for Ocean

Research Drilling (ECORD), and working just 250 kilometres from the North Pole, the expedition produced some extremely informative cores. They enabled scientists to reconstruct the climate history of the Arctic over the last 56 million years.

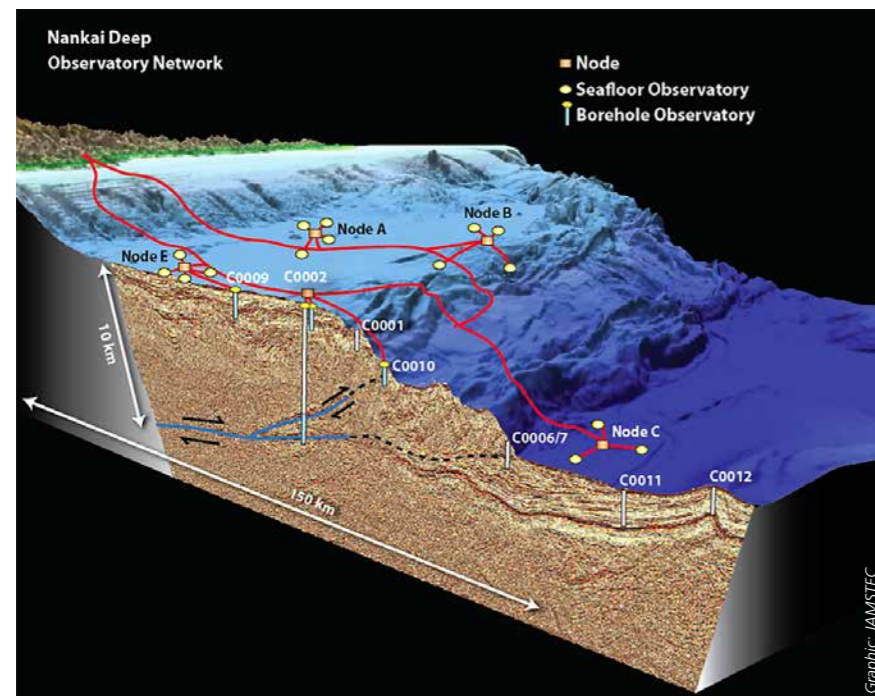
To cope with the sea ice, the drilling vessel was accompanied by two other icebreakers, including a Russian nuclear-powered icebreaker. The oldest drilled strata bore witness to something incredible: 55 million years ago, temperatures in the Arctic Ocean were as high as summer temperatures in the modern Mediterranean – the result of greenhouse-like global climate conditions. The next drilling campaign in the Arctic Ocean is scheduled for 2021, and is intended to provide more data on the palaeo-oceanography of the Arctic Ocean and its role in climate development.

Some of the most fascinating findings from the last 20 years in basic geosciences research include understanding the role and importance of microbe communities in geochemical processes and detailed insights into microbial life in the oceanic crust. Microbes are known to feed on the organic material found in deep-sea sediments, for example metabolising the metals in volcanic rock. This is just one example of the groundbreaking findings achieved in connection with drilling programmes.

Geomicrobiology is, in fact, an integral aspect of the IODP expeditions. One of the burning questions in this field relates to the physical

*Sea water repeatedly sprays out as the drill pipe beneath the drilling tower is pulled back to the JOIDES Resolution.*

*On expeditions with the research vessel Chikyu, geologists drilled measuring points (shown in yellow) along the Nankai Trough off the south coast of Japan.*





limits of life. Last year, IODP Expedition 370 focused on finding the upper temperature limit for microbial life in the oceanic crust. Off the coast of Japan, the Philippine Sea plate is sliding beneath the Eurasian plate. Immediately in front of this subduction zone, temperatures in the oceanic plate are high even at shallow depths. It's an ideal location to access "hot" strata by drilling.

The Japanese drilling vessel *Chikyu* has drilled into regions 7,000 metres beneath the vessel with a temperature of 130 degrees Celsius. Research being carried out by the working group of Bremen-based expedition leader Verena Heuer is expected to soon provide answers to the question of whether microorganisms live there, or at what temperatures above the total drilling depth life ceases to exist. However,

it is a difficult task, as the number of specialised, heat-loving single-celled organisms in the sediments is extremely small. The detection limit must therefore be extremely low. For the cores drilled by Expedition 370, it was just four cells per cubic centimetre. By comparison, Germany's forest floors are home to around 1 billion cells per cubic centimetre.

**O**n the active continental margin off Japan, a few hundred kilometres east of Expedition 370, the longest and probably most innovative IODP drilling campaign has been taking place for over ten years. Over this period, during the eleven expeditions with *Chikyu*, multiple holes were drilled along the Nankai Trough as well as a transect – a straight line of measuring and observation points. The purpose of this campaign is to

carry out 4D monitoring of seismic activity off Japan's Kii peninsula. Because it is situated in the area where multiple plates converge, the region has some of the highest seismic risks in the world.

The main borehole is already 3,000 metres deep and is to be deepened further as of the end of 2018. In spring 2019, the drill is expected to break through the crust-mantle boundary at a depth of 5,200 metres. The boreholes are already equipped with an array of measuring instruments connected to deep-sea cables, which continuously register pressure and temperature fluctuations and can monitor seismic activity. This means that the observation and interpretation of activity within this active continental margin in four dimensions will become a reality in the near future.

*A historic moment: The Glomar Challenger, launched in 1970, marked the beginning of the active phase of the Deep Sea Drilling Project.*



Illustration: Archive IODP

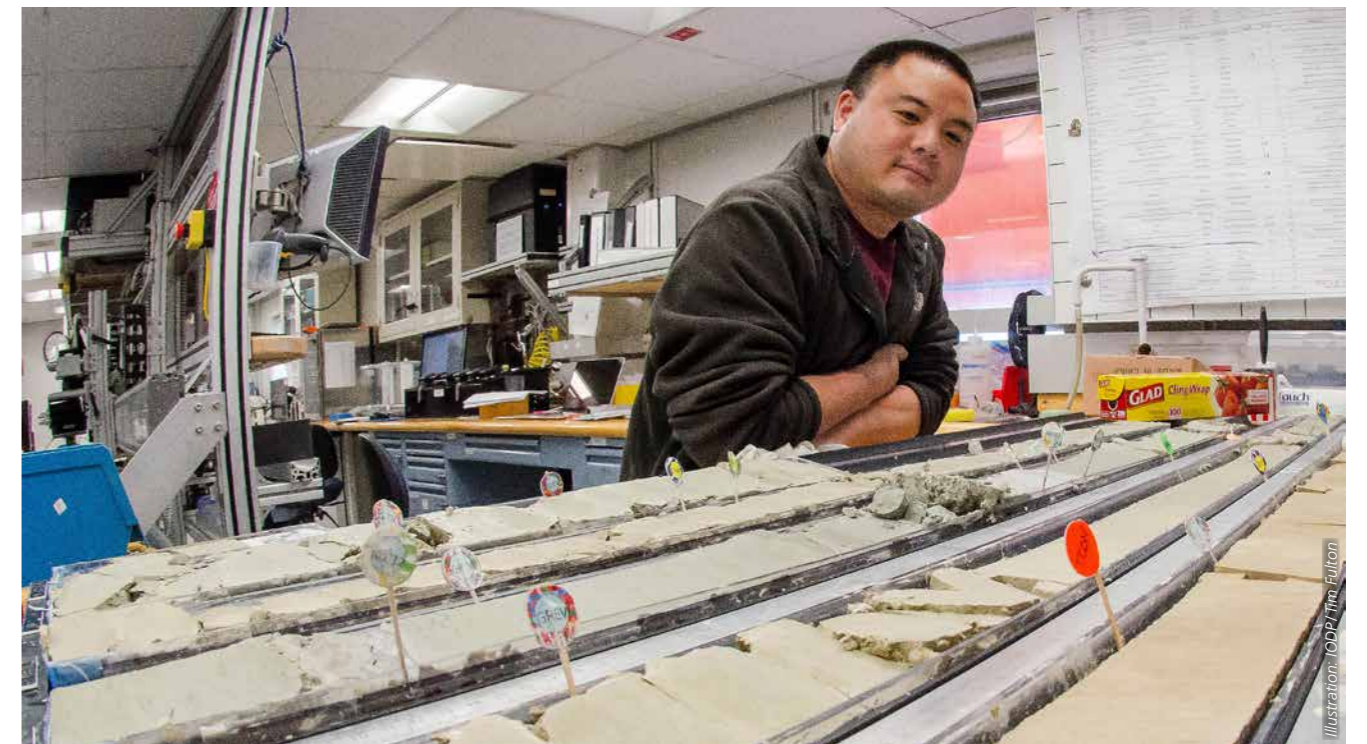


Illustration: IODP/Time Fulfiller

*Matt Ikari (MARUM, University of Bremen) examines new sediment cores on the sample table during IODP Expedition 375, off north-eastern New Zealand.*

Between now and 2023, the IODP scientists will focus on four main topics: Climate, Deep Life, Planetary Dynamics and Geohazards. Planning for the years after 2023 will get underway next year. In April 2019, around 300 researchers from 25 countries will meet in Vienna to start laying the groundwork for a new thematic orientation of international scientific deep-sea drilling. Even after 50 years, there are still vast areas of the sea floor waiting to be explored and key geological processes which are not yet understood. This work can only be carried out with international cooperation and funding. The DFG has been supporting this for the past five decades. The IODP and its three predecessor programmes are the longest and the largest collaborative projects in the geosciences in the world.

We still have not succeeded in reaching the boundary between the Earth's mantle and crust – the aim of *CUSS 1* in 1961. This boundary is defined as a seismic boundary, and in honour of its discoverer, Serbian geophysicist Andrija Mohorovičić, it is known as the Mohorovičić discontinuity or simply "Moho". However, with the help of the US drilling vessel *JOIDES Resolution*, deep-sea drilling expeditions have penetrated to the lower depths of the oceanic crust.

So with a little luck, the original goal of scientific deep-sea drilling will be achievable in the not too distant future. John Steinbeck (1902–1968) did not live to see it, and the strict procedures now in place on board to preserve samples would probably have made it difficult for him to "pilfer" a piece of the boundary material that is so important to our understanding of

the Earth's structure. But the expedition scientists will perhaps recall the words Steinbeck wrote in *Life* magazine on the first core brought up by *CUSS 1*: "On this first touching of a new world the way to discovery lies open."



**Prof. Dr. Jochen Erbacher**, Federal Institute for Geosciences and Natural Resources, is the coordinator of the DFG Priority Programme "International Ocean Discovery Program".

Contact: Bundesanstalt für Geowissenschaften und Rohstoffe (BGR), Koordinationsbüro IODP, Stilleweg 2, 30655 Hannover, Germany

[www.bgr.bund.de/IODP](http://www.bgr.bund.de/IODP)





## Rembert Unterstell



*The transition of a cancer-relevant ubiquitin ligase, HUWE1, between a closed, inactive state and an open, active state was recently described in the Sonja Lorenz lab. Here it is artistically depicted by doctoral student Katharina Beer.*

cepted that ubiquitination is at the basis of numerous human diseases, including cancer and Alzheimer's. For the past four years, Lorenz and her Emmy Noether-funded research group have been studying the molecular mechanisms of ubiquitination from a structural perspective – in other words, exploring how protein structure relates to function – in order to “gain a fundamental understanding of the astounding protein dynamics in the ubiquitin system”.

The underlying details are extremely difficult, though in principle possible to understand, as we learnt during our visit to the institute. Sonja Lorenz is generous with her time, explaining the biological concepts in her office with the aid of a handout, spending time with us at the computer screen, using 3D glasses to explain the atomic-level architectures of proteins, and giving us a guided tour of the labs used by her team.

Lorenz is broadly interested in the “phenomenon of cellular regulation”, and specifically in a class of enzymes known as ubiquitin ligases and the question of how their structures change as these proteins transition through the reaction cycle, “juggling” their protein binding partners in an efficient and productive fashion. “For the cell it’s very important to have the right proteins in the right place at the right time, decorated with the right type of ubiquitin modification,” says Lorenz. “I never fail to be astonished at how maximum specificity can arise in a system that

## The Secret Lives of Proteins

Sonja Lorenz studies a system that affects every cell in the body: the ubiquitin system. In the long term, her work could lead to improved therapeutic strategies / An encounter in Würzburg

Even those of us who didn’t always pay attention in chemistry and biology class at school probably remember that, without proteins, very little in the human body would work: metabolism, muscles, speaking and thinking are all driven by the action of proteins. These are essential biomolecules found in every cell in the body, giving them structure and organising their daily activities. There are at least 20,000 proteins in humans, and at least 500 of them – mostly target proteins for therapeutic applications – are being studied by researchers around the globe. But where do you start, and where do you stop?

Biochemist Dr. Sonja Lorenz, whom we visited at the Rudolf Vir-

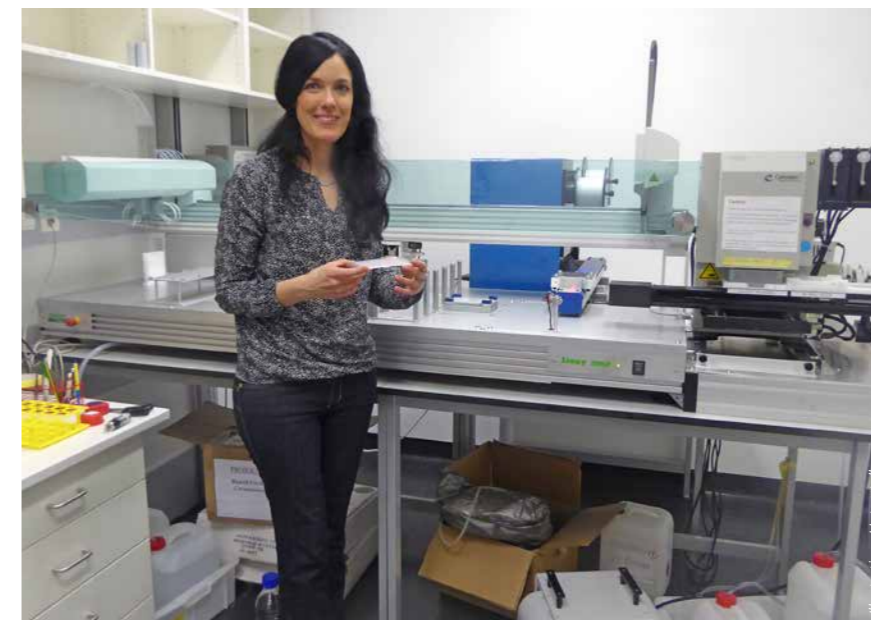
chow Center for Experimental Biomedicine in Würzburg, focuses on a small protein called ubiquitin. Ubiquitination, the molecular processes to which this protein is central, fascinates researchers worldwide because it is ubiquitous (found everywhere) in the body’s cells. It is also a jack-of-all-trades, explains Lorenz, who was accepted into the Young Investigator Program of the European Molecular Biology Organization (EMBO) last year.

Ubiquitin is indeed multi-skilled: it can be attached to other proteins in various forms, including chains, controls the transport of proteins to the correct location in the cell and sends signals that regulate cell division or cause cell death. It is therefore ac-

cepted that ubiquitination is at the basis of numerous human diseases, including cancer and Alzheimer's. For the past four years, Lorenz and her Emmy Noether-funded research group have been studying the molecular mechanisms of ubiquitination from a structural perspective – in other words, exploring how protein structure relates to function – in order to “gain a fundamental understanding of the astounding protein dynamics in the ubiquitin system”.

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The move back to Germany, and the transition from postdoc to group leader, was successful but not easy. Her Emmy Noether group in Würzburg started in 2014 in an environment which, like her previous career stages, she describes as “places with a special energy”, performance-focused in collaboration with similarly dedicated people, highly competitive yet with good teamwork. Sonja Lorenz is a fan of what you might call the college spirit. At Oxford, she was a keen player in the university tennis team.

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**Dr. Rembert Unterstell** is Publishing Executive Editor of *german research*.



Barbara Perlich and Julia Hurlbeck

# The Cupboard in the East Wall

The discovery of a private Jewish prayer room in Erfurt dating from the 13th century came as a complete surprise to building archaeologists and conservators. The first confirmed ensemble of this kind north of the Alps reveals a fascinating insight into everyday Jewish piety in the Middle Ages.

**S**alomon, iudeus de Werceborc, de curia quondam Riche iudee i sol" reads the tax list for the city of Erfurt in 1293: "Salomon, a Jew from Würzburg, pays for his property, which formerly belonged to the Jewess Riche, one shilling." A little later, we learn more about this Salomon of Würzburg: "Salman de Erbipoli de curia quodam Richen, iudea de Northusen, sita in platea iudeorum i. sol" – the

Jewish woman Riche came from Nordhausen and the property is situated in the *platea iudeorum*, the city's Jewish street.

The location of the medieval *platea iudeorum* is known, because it is now the *Rathausgasse* behind the neo-Gothic town hall. The modern building of Benediktsplatz 1, which is adjacent to the former *platea iudeorum*, reveals even at

first glance the centuries of building that have taken place. During the renovation and conversion of the building, which began in 1992, a painted wooden ceiling was discovered and dated to 1244. There was a very good chance that it would be possible to reconstruct a residential quarter from the High Middle Ages and find out who used to inhabit the buildings.

When the room was altered to serve as a prayer room, a new door, a light niche in the wall and a new ceiling were added. The niche could be covered by a grille to allow an oil lamp to burn unattended.



Illustrations: Barbara Perlich



Illustration: Elisabeth Nitz

Medieval buildings and lists of names – the tax lists contain the names of citizens liable to pay tax in topographical order.

Since the beginning of the research project "A medieval Jewish dwelling and trade complex in the city of Erfurt and its interior decoration system" in spring 2015, a team of building archaeologists, conservators, historians, art historians and scholars of Jewish studies have achieved exactly that – and made some astonishing discoveries.

**B**ut let's begin at the beginning. In the year 1222 an entire area of Erfurt was destroyed by fire – not the first such catastrophe in the city's history. But by examining the masonry and surviving structures, four stone buildings in this area were dated to a time before the fire of 1222. The Romanesque-style buildings (known as *Kemenaten* from the Latin *caminata*, having a chimney) usually had a

more or less square ground plan and just one room per storey; they usually stood back somewhat from the street towards the rear of the plots.

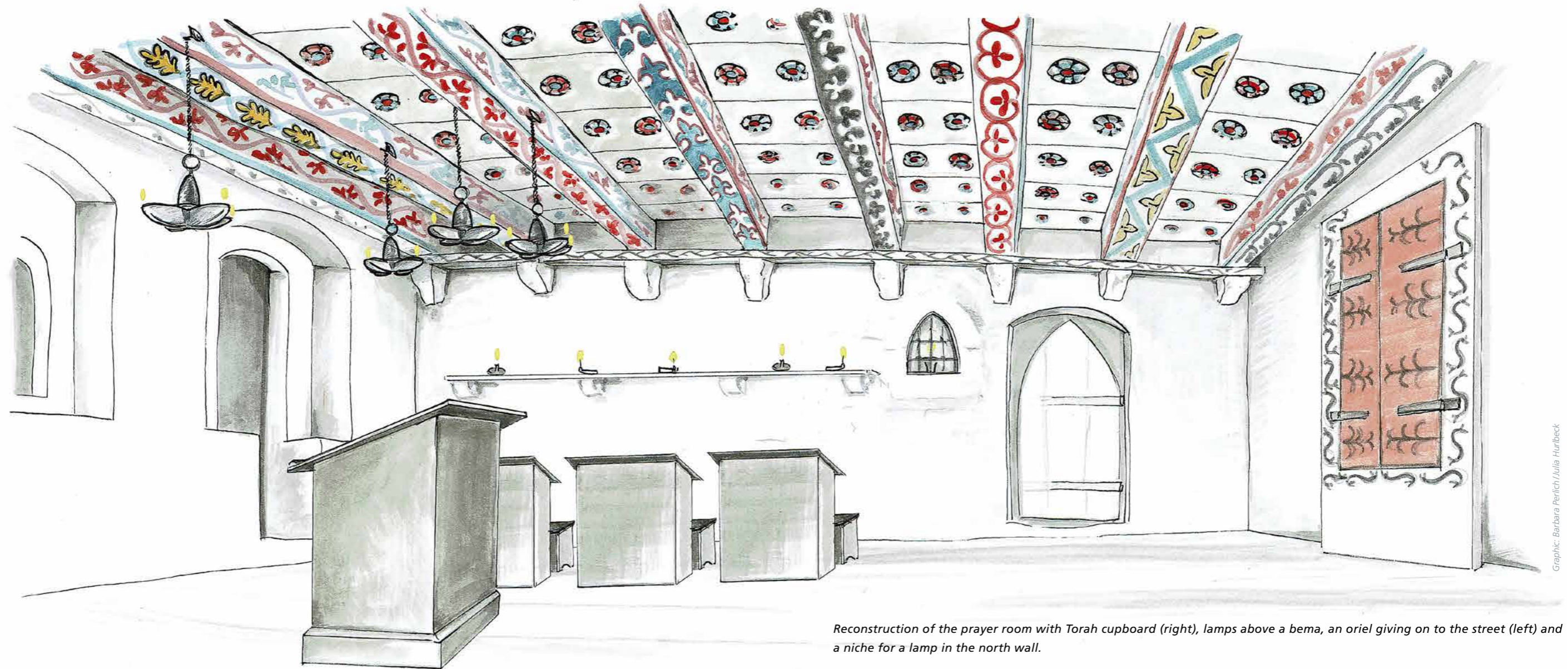
Immediately after the devastating fire of 1222, new building work began in this quarter and a fifth *Kemenate* was built, its foundations constructed from damaged stone from a demolished building. This new stone building corresponded to the "standard type" with a frontal timber structure and with all the entrances on one side of the building. With outer dimensions of around 8 x 8 metres, it was of the usual size for *Kemenaten* in Erfurt. It had one room per storey; the cellar and ground floor had beam ceilings, and the top storey a self-supporting ceiling. There was nothing about the room on the upper floor to set it

apart from other such rooms in *Kemenaten* dating from the 12th and 13th centuries. The room, which was not heated, was probably used as a bedchamber.

Then, in around 1244, twenty years after it was built, this inconspicuous room was completely altered. The original entrance to the room in the east wall was blocked off by a wooden cupboard. The presence of this object is revealed by holes on either side of the old door, where the framework of the cupboard was secured with metal bands. Because the cupboard in the east wall made the original door unusable, a new one had to be added in the north wall.

The previous ceiling structure was replaced by a completely new beam ceiling. The beams and planks of the old ceiling were not reused;





Reconstruction of the prayer room with Torah cupboard (right), lamps above a bema, an oriel giving on to the street (left) and a niche for a lamp in the north wall.

Graphic: Barbara Perlich/Julia Hurlbeck

instead the required timber was felled and installed between 1242 and 1244. Soon after being put in place, the new ceiling was painted and decorated with plant motifs, tendrils and flowers.

Along the room's east-west axis, opposite the cupboard in the east wall, six large studs were driven into the ceiling. We know from their position on the sides of the beams that they could not have been used to suspend something between the studs: instead they were for hanging individual objects, probably lamps.

An arched niche was built into the north wall to provide an additional source of light; an indentation running around the edge shows that the niche could be barred, most likely with a grille. Clearly an oil lamp used to burn here, often unattended, as revealed by the traces of oil running down the wall. Similar traces of lamp oil can be found beneath horizontal indentations on the room's north and south walls. Evidently there were wall-mounted shelves here with lamps standing on them.

Also in 1244, the northerly of the two window niches looking out on to the *platea iudeorum* was enlarged down to the floor level of the upper storey. The enlarged niche went through the whole thickness of the wall and led out on to an oriel (no longer extant) supported by corbels, which remain clearly visible on the outside of the wall.

These discoveries – the cupboard in the east wall, the elaborately painted ceiling, the lights suspended along the same axis as the cupboard,

the (unattended) light in a niche, an oriel window on to the street, and lamps on a wall shelf – all suggest that in 1244 a private Jewish prayer room was constructed here. The strongest evidence of this is the cupboard in the east wall. In the mid-13th century, cupboards were not commonly used pieces of furniture: everyday items were stored in chests and consumable items in barrels or sacks. In this period, we only know cupboards from monasteries and as places to keep sacred relics – as well as places to store Torah scrolls.

It was obviously important to whomever altered the room not only to install a cupboard but also to position it centrally against the east wall. There would have been plenty of space to put it elsewhere: beside the east door, against the north or south wall, or between the windows in the west wall. The clear decision to place the cupboard in the east can only be explained if it functioned as a Torah shrine, which must be on the wall that faces Jerusalem.

Other finds also suggested the room's former function as a Jewish

prayer room. It is safe to assume that the studs opposite the Torah shrine held up six lamps which illuminated the scroll while it was being read on a lectern. Additional light for reading and study may have been provided by the lamps set on the shelves along the north and south walls. In the covered niche, an oil lamp probably gave continuous light, for example on the Sabbath, with a grille providing protection for the unattended lamp at night. This light could possibly be interpreted as the *ner tamid*, the





Lamps could be hung from the studs in the beams opposite the Torah cupboard (see illustration page 30/31).

Eternal Light, representing the menorah in the temple.

At first, there was no explanation of the oriel window looking out on to the *platea iudeorum*, either in a Jewish or in a non-Jewish context. It clearly was not a toilet, but it was obviously important to the householder to be able to step outside the room. We can reconstruct the 13th-century buildings opposite the *Kemenate* with a fair degree of confidence: they were no lower than the neo-Gothic town hall of today and were in fact much closer to the *Kemenate*. From the very small, late Romanesque windows of our room, it was impossible to see the sky. A small oriel could have made it possible to step outside the room. The fact that the oriel was built during the alterations in 1244 may indicate that the house's Jewish inhabitants wanted to be able to see the sky to observe the first three stars in the evening sky that signal the start and end of the Sabbath.

The painted ceiling provides only modest evidence that the room served as a Jewish prayer room. The motifs chosen are not specifically Jewish and the decoration features no Hebrew letters or similar symbols. However, the use of decoration suggests that the room had a certain representative importance, as we find for example in the private chapels in patrician houses. The fact that the decoration is limited to motifs of plants and does not include animals, people or mythical creatures, as found in the next oldest examples of painted ceilings in urban buildings in the early 14th century, does not necessarily mean that this was a Jewish prayer room, but would certainly be fully compatible with such an interpretation.

We know from written documents and accounts that private Jewish prayer rooms existed in the medieval period. But as currently the only known example, with

material remains still present, this room in Erfurt is immensely important to our understanding of everyday Jewish piety in the Middle Ages.



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[www.fh-erfurt.de/kr/en/projekte/wandmalerei-und-architekturfassung/steinsaal-erfurt-steinernes-haus/?tx\\_wtgallery\\_pi1%5Bshow%5D=60391354](http://www.fh-erfurt.de/kr/en/projekte/wandmalerei-und-architekturfassung/steinsaal-erfurt-steinernes-haus/?tx_wtgallery_pi1%5Bshow%5D=60391354)



Marco Finetti

## A Finely Honed Intellectuality and Moral Authority

Wolfgang Frühwald, DFG President (1992–1997), died in January at the age of 83

In all the years since his time as President, Wolfgang Frühwald was rarely seen at the DFG or its large receptions and award ceremonies, and in recent years scarcely at all. His sometimes unstable health may have been one reason for this, but so was the modesty that was always one of his characteristics and which perhaps inhibited him from travelling to Bonn, Berlin or other important venues of German science policy and research funding.

There was also, of course, the fact that the unity of earlier times suffered a blow when, at the start of the new millennium, the controversy surrounding human embryonic stem cell research and its funding almost resulted in a rupture between the former President and “his” DFG. Frühwald had strongly criticised the pro-stem cell approach of his successor, geneticist Ernst-Ludwig Winnacker (and his predecessor, zoologist Hubert Markl, by then President of the Max Planck Society), which he regarded as “argued purely from a biological, medical and legal standpoint”, and countered it with a decidedly “philosophical and ethical voice”. Although peace was later made, the air was never completely cleared.

Wolfgang Frühwald died on 18 January 2019 at the age of 83. Reading the obituaries, or speaking to his friends and colleagues, you realise that they did not always see him pri-

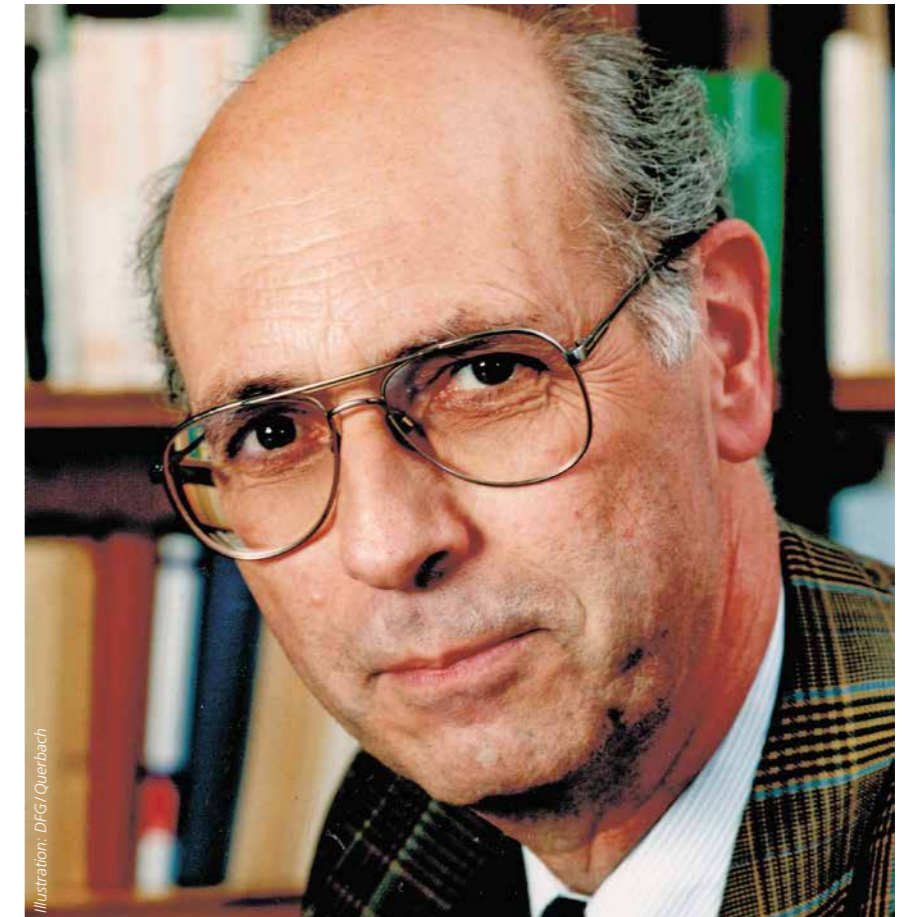


Illustration: DFG/Quebach

marily as President of the DFG (the role with which people he met later in life tend to associate him). Not that he did not achieve great things in that role and make a lasting impression, or that the years of his presidency did not produce many opportunities and indeed imperatives for this.

But many people remember Frühwald – born on 2 August 1935 in Augsburg to a family of railway

workers – more vividly in a different role: that of an outstanding scholar and gifted teacher in early modern and modern German literature. For over 35 years of his university career, he helped many representatives of his discipline to attain the level of a professorship or chair. He inspired whole cohorts of future feature writers, teachers and cultural practitioners of all kinds with



the beauty of German Romanticism and the Biedermeier period, even at a time when nothing could have seemed less contemporary and even on occasion the “Marxist groups” thronged the lecture theatre, where he confronted them with sometimes strong and sometimes mild irony, as one listener now recalls.

Frühwald studied German literature, history, geography and philosophy at LMU Munich, where in 1961 he earned his doctorate in early modern German literature and in 1969 completed his habilitation with the help of a DFG fellowship – the first of many associations with the organisation. He quickly established an international name for himself, especially through his studies of Clemens Brentano and Adalbert Stifter and the editions of the works and letters of both authors which he edited. But his output was not limited to this: he also had a great interest in the left-wing revolutionary Ernst Toller and more generally in the authors of the German-speaking emigration after 1933.

In 1974, Frühwald took up a chair at LMU, which he held until his retirement in 2003. Prior to this, his early career took him far and wide throughout Germany. In Munich in the late 1960s, in Bochum, Erlangen-Nuremberg and Münster, and most notably, starting in 1970, as a young professor at the even younger University of Trier-Kaiserslautern, he came into contact with productive efforts at reform which he would later draw on as dean and vice-rector of LMU and also in the German Council of Science and Humanities.

His time in Trier also marked the beginning of his involvement in academic self-governance and specifically in the DFG, an involve-



*Integration as a heartfelt concern: Wolfgang Frühwald's presidency of the DFG saw the first annual meeting in the former East Germany – held in Halle (Saale) in 1994.*

ment that quickly grew. Starting in 1972, he held responsibility for DFG research funding for German language and literature, for which a dedicated Senate Commission had been set up. Between 1976 and 1984 he served as an elected specialist reviewer, from 1980 to 1984 he chaired the committee for linguistics and literature, and as of 1986 he represented his discipline in the Senate and the Joint Committee.

So Wolfgang Frühwald was indeed perhaps “better prepared than any of his predecessors” – as Nina Grunenberg wrote in *Die Zeit* – when in July 1991 he was elected the seventh President of the DFG since it was re-established in 1951, succeeding Hubert Markl.

What characterised the second period in office of zoologist Markl also characterised Frühwald's first, namely the German reunification. For the country's largest research funding organisation this meant a rapid rise in the number of funding proposals, and not just from the former East Germany, quickly prompting the new President to campaign

for a significantly larger budget. He issued clear warnings about the potential decline in the quality of scholarship and research and made intelligent use of good connections extending into the Chancellery in Bonn – sometimes successfully, sometimes not.

The further integration of East German research in the DFG was one of Frühwald's most important concerns, driven for example by the “innovation centres” and symbolised by the first DFG annual meeting in the new federal states in Halle in 1994, when Frühwald was re-elected for a second term of office.

The next three years brought a series of new challenges and areas of activity for the DFG and its President, some key issues of this second term of office being the new major instrumentation initiatives, humanities centres and the beginning of the digitalisation of scientific libraries. In the international arena, Frühwald promoted not only European research cooperation but also trilateral German-Israeli-Palestinian cooperation and the

advancement of scientific relations between Germany and China.

These were also the years that presented perhaps the greatest tests: when the largest case of falsification to date in German research came to light, a case involving DFG-funded research, the President was visibly shocked. And when the first study on the history of the funding organisation under National Socialism, personally commissioned by him, yielded far less welcome results than expected, Frühwald's disappointment was written on his face when the book was presented to the press.

But both Frühwald and the DFG were able to gain something positive from these two things: the falsification case led to the Recommendations for Safeguarding Good Scientific Practice, still a benchmark today, while the National Socialist past has since been meticulously re-examined and reclaimed by an independent research group in more than 20 studies.

The greatest demands on the DFG and its President came about

through the rapid scientific advances of those years, particularly in biology, genetics and medicine, which repeatedly raised the question of the associated possibilities and, perhaps even more significantly, the boundaries. The DFG responded by setting up a Senate Commission on Genetic Research and issuing a number of statements on bioethics, including a clear rejection of human cloning – and here, too, Frühwald adopted an unbending stance that was born from deeply held ethical convictions but also perhaps demonstrated a degree of rigidity and obduracy.

When the DFG President stepped down from office at the end of 1997, the former Federal Chancellor Helmut Kohl emphasised how Frühwald had “achieved great things at a central interface of research, politics and society in a period of dramatic change”. Frühwald then initially returned to LMU to pursue his studies of Goethe, but soon became involved once again in the research system. In 1999, he was one of the founders of the International Uni-

versity Bremen, now Jacobs University. In the same year, he was elected President of the Alexander von Humboldt Foundation, where until 2007 he advocated for internationally open and tolerant research.

The recipient of many honorary doctorates and awards, and highly respected both nationally and internationally, Wolfgang Frühwald subsequently lived until his death with his wife in his home town, the place where he had always felt most content, and where he was buried in a ceremony attended by family and friends.

Reacting to the news of Frühwald's death, current DFG President Peter Strohschneider said: “In years of particularly open social and scientific structures, with finely honed intellectuality and conceptual creativity, with a particular emphasis on ethics and a considerable measure of authority, and with his gift of openness towards others, Wolfgang Frühwald shaped the destiny of the DFG, and with it that of research in Germany.

His conviction that the foundation of all research work is the actual researcher, his urgent appeals for the accountability of research and all those involved in this work, and his constant reminder to carefully differentiate between what can be done and what should be done can still be applied as guidelines for responsible research, even today, as research is infiltrating new areas of knowledge at increasing speed and on an ever greater scale, with all the associated opportunities and risks.”

#### Marco Finetti

began writing about the DFG and Wolfgang Frühwald as a journalist in 1992. Having joined the DFG in 2007, he is now its press spokesperson and the editor-in-chief of *german research*.

*Bidding farewell with the Federal Chancellor: Wolfgang Frühwald and his wife Viktoria with Chancellor Helmut Kohl, Frühwald's successor Ernst-Ludwig Winnacker (right) and the then DFG Secretary General Reinhard Grunwald (left) at La Redoute in Bonn, late 1997.*





## The Deutsche Forschungsgemeinschaft

The Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) is the largest research funding organisation and the central self-governing organisation for research in Germany. Its mission, as defined in its statutes, is to promote “all branches of science and the humanities”.

With an annual budget of around €3.2 billion, the DFG funds and coordinates approximately 32,000 research projects in its various programmes. These projects are carried out by both individual researchers and groups of researchers based at universities and non-university research institutions. The focus in all disciplines is on basic research.

Researchers at universities and research institutions in Germany are eligible to apply for DFG funding. Research proposals are evaluated by reviewers in line with the criteria of scientific quality and originality, and then assessed by review boards, which are elected for a four-year period by the German research community.

The DFG places special emphasis on early career support, gender equality and scientific relations with other countries. It also funds and initiates measures to develop and expand scientific library services, data centres and the use of major instrumentation in research. Another of the DFG's core tasks is to advise parliaments and public interest institutions on scientific matters. Together with the German Council of Science and Humanities, the DFG is also responsible for implementing the Excellence Strategy to promote top-level research at German universities.

The DFG currently has 96 member organisations, primarily comprised of universities, non-university research organisations such as the Max Planck Society, the Leibniz Association and the Fraunhofer-Gesellschaft, the Helmholtz Association of German Research Centres, and academies of sciences and humanities. The majority of the DFG's budget is provided by the federal and state governments, and it also receives funds from the Stifterverband.

For more information, visit [www.dfg.de/en](http://www.dfg.de/en)

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In cooperation with Wissenschaftszentrum Bonn, the DFG is presenting the photo exhibition “Black Matters – Urban Photography”, ending on 21 June 2019. The photographs by Wilfried Raussert, Professor of the Literature and Culture of North America at the University of Bielefeld and a literary scholar and cultural scientist funded by the DFG, stem from his many years of academic interest in cultures of African origin and their cultural production in the New World. They are closely linked to an attempt to give the viewer an understanding of American cultures in all their interconnections, using street art, murals and graffiti as examples. To this end, Prof. Raussert engages in a dialogue between science, art and political activism. The photographs were taken in American cities such as Guadalajara and Mexico City, San Juan, Toronto and Ottawa, Los Angeles, San Francisco, New Orleans and New York. The particular emphasis: the dialogue between science and art gives rise to a “putting into motion” of everyday urban culture that has its own special aesthetic qualities. [www.dfg.de/ausstellungen](http://www.dfg.de/ausstellungen)

