



Cover: Andrea Behrends

An improvised classroom with oil barrel seating at the relocated village of Djermaya in Chad. Oil production is drastically changing everyday life and the natural environment of the region.

Social Upheaval: No Boon At All | Research Policy: True Impact | sDiv: Incubator for New Ideas | Small Glaciers: Individualists in the Fight for Survival | Neuropsychology: On the Narrative Self | Anti-authoritarian Movement: Lost Illusions | Sheet-bulk Metal Forming: Top Form | Freshwater Ecology: Adaptable Immigrants

Commentary

Peter Strohschneider

True Impact

Why focussing on anticipated short-term benefits is seldom useful in research policy 2

In Focus

Marten Winter, Volker Hahn, Rebecca Thier-Lange, Christian Wirth

Incubator for New Ideas

The sDiv at the German Centre for Integrative Biodiversity Research 4

Natural Sciences

Wilfried Hagg

Individualists in the Fight for Survival

Small Alpine glaciers and their importance as climate indicators 6

Life Sciences

Nikolai Axmacher

On the Narrative Self

Using neuropsychology to understand the way we think, feel and act 12

Humanities and Social Sciences

Andrea Behrends

No Boon At All

Traditional agricultural production, modern oil extraction and social upheaval 16

Interview

Rembert Unterstell

Lost Illusions

Anti-authoritarian education movement: An Interview with Meike Baader 21

Engineering Sciences

Marion Merklein

Top Form

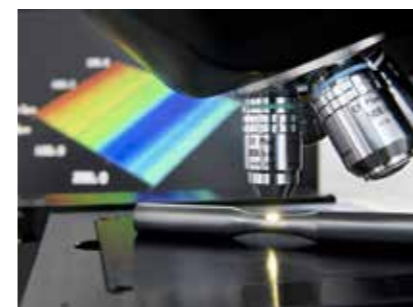
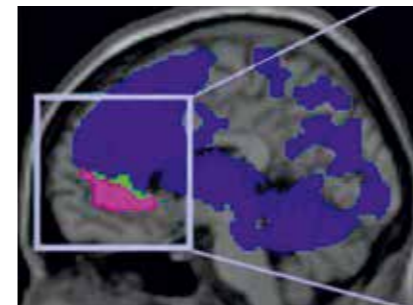
How sheet-bulk metal forming is being used to create integral components 24

Life Sciences

Carola Winkelmann

Adaptable Immigrants

Killer shrimp and its different strategies for survival 28



Peter Strohschneider

True Impact

Throughout the world, the ideologeme of effectiveness in science policy and research funding is touching the very foundations of modern societies in a way similar to populism. But research can only have true impact when anticipated short-term benefits are not allowed to become the general criterion for funding decisions.

As the new year begins, I would like to reflect on a controversial notion that occupied much of the science policy discourse last year: the impact of research. To some, this may seem ivory towerish, given the problems and concerns we are facing today. You might ask: Wouldn't it be nice if there were no bigger issues to worry about? Doesn't almost the whole world, not just research, seem to be headed for serious trouble? Isn't the democratic constitutional state under threat from autocratic and populist desires for power? Aren't we debating no less than open society and its – our – liberal ways of living?

This does, in fact, appear to be the case – and what's more, we may be not at the end, but only at the beginning of these dramatic changes with their plentiful cause for concern. However, the two things have more to do with each other than you might think. The instrumentalism of an economic and reductionist discourse of research, constrained by the imperative of "Impact!", is shaking the pillars of pluralistic society and scholarship in a similar fashion to mushrooming populisms with their manifest aversion to expertise and reflexivity.

The research policy watchword "impact" functions just like the populist rhetoric along the lines of "There's no law against saying that!". It seems to presuppose a vehement, methodical argument in favour of research with no useful purpose; as if truth and impact were opposites. This is nonsense. No one can seriously object if good research has real impact, when it richly yields societal impact in as many ways as possible – be it social, economic or cultural. It would likewise be foolish to oppose this, as this would play straight into the hands of populist opposition to research.

Impact – yes or no? This is not the question. The question is whether it is advisable and conducive to the societal benefit of research when decisions about its funding and institutionalisation are generally made on the basis of whether it can claim to produce direct impact in the near future.

A trend in this unhelpful direction was noticeable throughout 2016. In the UK, the government's impact imperative pushed humanities and social sciences research into a severe legitimacy and funding crisis even before Brexit shifted the coordinates for UK research. The funding policy of the European Commission shows a degree of regression from a broad approach that systematically integrates knowledge-driven research to a reductionist concept which, at best, poorly distinguishes between research funding and obsolete forms of industrial subsidisation. And in the USA, the sparse statements of the new president also point to a research funding approach geared entirely towards short-term economic relevance – and hard times for knowledge-driven research, the social sciences, and even the geosciences, lately denounced to the status of soft sciences (as this might be a way of allowing global change research to dwindle away).

The unsuitability of the reduced instrumentalism of such simplistic notions of impact as a general criterion for research funding is obvious. The weakness of the concept is plain to see: the very use of impact as a positive value category implies a clear distinction between positive and negative, desirable and undesirable effects of research. Here the ideologeme already runs into massive problems of definition, leading us, for example, into the dual-use problem.



Just as relevant is the question of how the future impact of future research should be measured now, especially when indicators of employment and economic growth are not available, or are unsuitable, as useful key figures. Then there is the question of how quickly research must prove useful – or how slowly the impact is allowed to develop. There is no indicator model which provides an easy answer to these or the many associated questions – for the simple reason that questions of indicators are ultimately questions of power. Might that which is supported as effective in one political context be regarded as ineffective, undesirable and therefore undeserving of funding in another?

No less fundamental than these weaknesses is the readily understood fact that a simple focus on impact can scarcely do justice to the very internal logic and meaning of research, especially knowledge-driven research. It neither allows the necessary leeway for the unplannable and unanticipated, without which there cannot truly be any novelty of scientific knowledge, nor recognises the possibility of legitimate failure. Above all, however, it triggers a bidding war of ever new promises, ever bolder assurances of scientific solutions to problems, a spiral of demand and promise

which does not enhance the legitimacy of science and society's trust in research, but rather seriously undermines it.

The unthinking compulsion to sell research impact in advance is harmful. And it is harmful in a way not dissimilar to populism: in both cases, science and the humanities and their pluralism are notionally and conceptually negated; in both cases, they are prevented from having true impact. So if everything depends on the proper unfolding of research and thus the opportunities open to it for effectiveness and impact, this must not be made the criterion for funding decisions as a universal compulsion.

So far, German research has remained largely unscathed by the type of impact ideology criticised here. Yet even in Germany, the funding and management of research on the basis of quantitative figures has become more commonplace; conference rooms and journals have been filled with critical discussion of this "indicator-based research" in recent months.

Nevertheless, the checks and balances of organised research and what is, in this respect, on the whole an astute science and funding policy ensure the productive complementarity of those forms of research organisation and funding which legitimately make assumptions of social, economic and cultural relevance a key decision-making criterion and those which – like the DFG – take into account only the quality of research, regardless of impact.

The extent to which German science policy and research funding represent an enviously admired exception compared with many parts of the world is demonstrated by the Excellence Strategy, which was launched in 2016. This programme will provide billions of euros in additional long-term support to top-level university research, with exceptional flexibility in a competitive, open-topic format and with funding decisions based on scientific judgement. In relation to last year's disturbing events and alarming developments, it provides an optimistic counterpoint.

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

Marten Winter, Volker Hahn, Rebecca Thier-Lange, Christian Wirth

Incubator for New Ideas

Beating a path through the complexity jungle: the German Centre for Integrative Biodiversity Research's synthesis centre is piecing together existing knowledge to gain new insights.

Nature is simply much too complex." This is the first, and perhaps the last, answer to the question as to why biodiversity research has produced so few universally valid and globally applicable in-

sights. But how can the study of the diversity of life be taken a substantial step forward? When scientists and politicians began discussing this question 25 years ago, they were starting from a complex position:

biodiversity research was becoming increasingly interdisciplinary and the scales being studied ranged from the microscopic to the global and from milliseconds to millions of years. New technologies were pro-

ducing enormous quantities of data ("big data"), most of it unevaluated, while the huge number of publications made it extremely difficult to form a meaningful overall picture of a given topic. Hopes rested on "synthesis": in other words, instead of collecting new data, analysing and synthesising existing knowledge, data, theories and hypotheses to produce new insights.

An opportunity to do exactly that was provided by iDiv, the German Centre for Integrative Biodiversity Research Halle-Jena-Leipzig, a DFG Research Centre set up in 2012 consisting of a consortium of eleven research institutions in three federal states. The sDiv synthesis centre, a unit within iDiv, is an essential component of this centre and comprises three central instruments: meetings of international working groups and interaction with renowned visiting researchers, sabbaticals, and synthesis projects carried out by resident sDiv postdocs.

This integration of a "centre within a centre" is the essential characteristic that sets sDiv apart from other, isolated synthesis centres. The idea is to create scope for the exchange of ideas between sDiv visiting researchers and iDiv researchers – hence the rule that every sDiv project must include at least one iDiv scientist. So far, approximately 700 researchers from 38 countries have participated in 56 sDiv working group meetings. And the concept is bearing fruit in the form of successful applications for third-party funding and close to 100 scientific publications.

One example of synthesis in practice is sChange, an sDiv working group which deals with the complex process of the change

The German Centre for Integrative Biodiversity Research (iDiv) Halle-Jena-Leipzig was established in 2012 as a DFG Research Centre. In the space of four years it has developed into an internationally visible research institution. iDiv has two missions: to create a scientific foundation for the sustainable management of biodiversity and to establish integrative biodiversity research as a new discipline. In the research team's own view, the unique features of iDiv are theory formation and synthesis across all areas of research, the close interlinking of the sDiv synthesis centre with the active research environment and a network of more than 100 established experts, the iDiv members. iDiv has a global network and offers numerous platforms for biodiversity research. The partners in the consortium provide reciprocal support: three universities (Halle-Wittenberg, Jena, Leipzig), the Helmholtz Centre for Environmental Research and seven non-university research institutions (three Max Planck and four Leibniz institutes). **RU**

in biodiversity (www.idiv.de/schange). Locally we can see both losses and gains, while globally we are losing species. But what is the situation in between, and why? Questions can be answered by pooling or "synthesising" data from different geographical scales and groups of species and analysing it using methods from different research disciplines. This is a characteristic approach of a synthesis working group.

What else makes the sDiv synthesis centre attractive to researchers? It provides an opportunity to work focussed without distractions. But legal requirements and administrative frameworks aren't always adapted to the demands of modern science in Germany. So the iDiv administrative team works closely with the University of Leipzig, for example to find solutions to travel expenses regulations. These solutions could serve as examples of good practice for modern and effective research management in Germany beyond sDiv and iDiv.

Synthesis centres are scientific infrastructures, incubators for new ideas – in a sense they are think tanks and places of inherent horizon scanning. sDiv is part of the International Synthesis Consortium (www.synthesis-consortium.org).

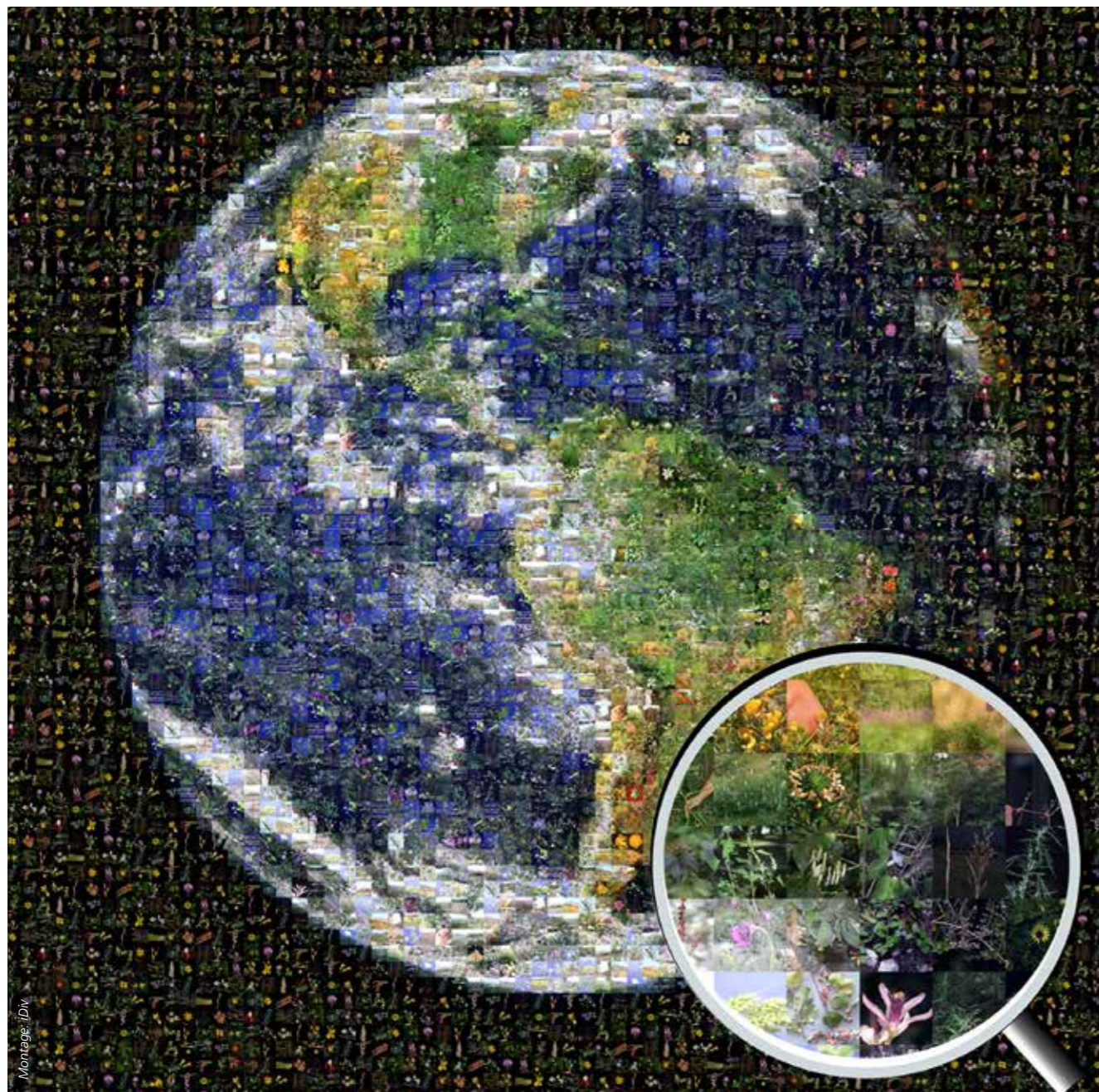
The idea of synthesis centres isn't limited to the natural sciences: in years to come, synthesis units could become a feature of other centres of excellence. This would require funding mechanisms that support challenging synthesis work. In biodiversity research, scientific synthesis is what makes it possible to penetrate the fog of complexity and find patterns, answers and solutions to some of the major problems and questions facing science and society.

Dr. Marten Winter is the Scientific Coordinator of sDiv, the synthesis centre of iDiv.

Dr. Volker Hahn manages press and public relations for iDiv.

Dr. Rebecca Thier-Lange is the Scientific Coordinator of iDiv.

Prof. Dr. Christian Wirth is the Managing Director of iDiv and Professor of Special Botany and Functional Biodiversity at the University of Leipzig.



Wilfried Hagg

Individualists in the Fight for Survival

Small Alpine glaciers may seem less than spectacular, but just like their larger cousins, they are important climate indicators. Geographers are combining historical and current data in complex computer models to better recognise both dangers and opportunities for nature and tourism.

Glaciers are important climate indicators because they react to the smallest fluctuations in air temperature and precipitation

by growing or shrinking. Because these changes are so easy to see and readily understandable even to the untrained eye, comparative

photographs of glaciers have provided a symbolic measure of climate change for many years. Like the pictures seen in the media of

polar bears on ever smaller ice floes, mountain glaciers are heralds of climate change.

The reason glaciers are such useful indicators is that they filter out short-term weather fluctuations and react over a time scale that reveals longer-term trends, which are relevant to climate studies. They also supply information from high altitudes where little data is collected. By observing their past size, revealed by the accumulations of debris known as

moraines, we can also draw conclusions about the climate in times past.

Since the 1980s, air temperatures have been increasing throughout the Alps and the glaciers have been shrinking, but neither climate trends nor glacial changes are uniform across the whole of the Alps. On the northern periphery, temperatures have risen most noticeably in the summer and winter precipitation shows no significant trend, while

in Lombardy, temperatures are increasing the least and snowfall in the west of the region has a marked negative trend. Most glaciers in this region of northern Italy are retreating, but in recent years, in contrast to other Alpine regions, some increases in size have also been recorded. This situation is due to very heavy winter snowfall and demonstrates that neither the glaciers nor their climatic drivers exhibit a homogeneous pattern of behaviour.

Glacial melt in the Bavarian Alps: the Schneeferner on the Zugspitzplatt in photographs from 1942 (left, photo: Johann Hagg) and 2011 (right, photo: Wilfried Hagg). (Collage: Herling)

1942



2011



Illustration: Wilfried Hagg



Illustration: Wilfried Hagg

Above left: Taking measurements on the Blaueis, the northernmost glacier in the Alps, with a laser tachymeter. Above right: GPS surveying of a melt stake and (below) performing a radar survey of the Lupo Glacier.



Illustration: Riccardo Scotti



Illustration: Wilfried Hagg

Group photo taken during fieldwork on the Lupo Glacier: author Wilfried Hagg (centre) with volunteers from the Servizio Glaciologico Lombardo.

Analysing glacier fluctuations and understanding their climatic causes is the main aim of a Heisenberg project currently underway. The project is mainly concerned with small glaciers – although, or perhaps because, the scientific observation of glaciers since the end of the 19th century has traditionally focussed on relatively large examples (such as the Mer de Glace, the Miage, the Rhône Glacier and the Vernagtferner). Small glaciers react astonishingly quickly to changes in the atmosphere, a rapidity which can be explained by their location in the mountains. Their entire surface is often either above or below the snow line – the altitude at which there is a balance between snowfall and snow melt over the course of a year.

Their rapid growth or shrinkage is due to the fact that changes in mass must “migrate” through the whole glacier with the flow of ice to cause the tongue to advance or retreat. As a result, small glaciers react quickly and fairly uniformly to climate fluctuations while large valley glaciers are often so slow to respond that their appearance lags decades behind climate trends.

The sheer number of small glaciers also makes them more important than is often assumed. In Tyrol, according to the Austrian glacier register, almost 90 percent of glaciers have an area of less than one square kilometre yet together make up more than a third of the total glaciated area. As the overall area of glaciers shrinks, the rela-

tive proportion of small glaciers is continually increasing. In the Ötztal and the Zillertal, the number of glaciers measuring less than 0.1 square kilometres almost doubled in 30 years (between 1969 and 1998). In addition to their function as climate indicators, small glaciers have great socioeconomic importance in relation to hydropower, as a natural hazard and for tourism.

For this reason, changes in the mass of small glaciers are compared in a cross-section across the Alps from Bavaria to Lombardy. The analysis of meteorological time series then allows the relationship between climate and glacier to be interpreted in individual regions. In the Bavarian Alps, where there are still five glaciers with a total area of



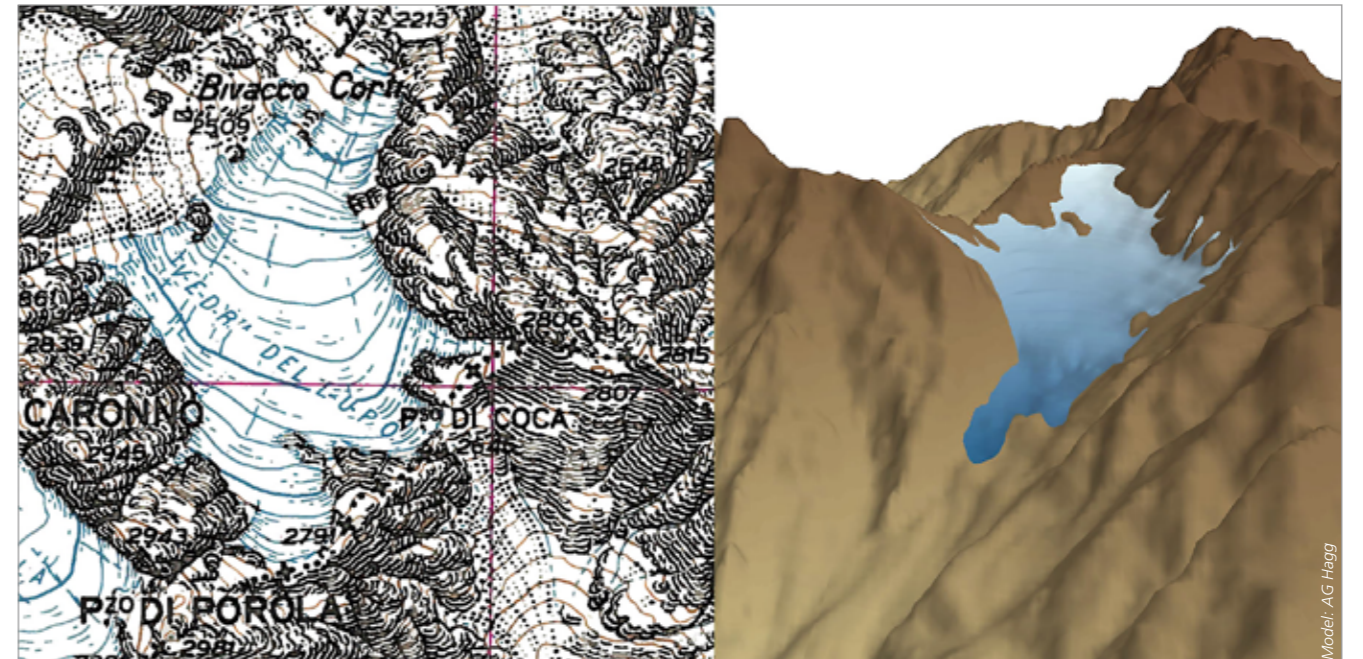
Illustrations: Roberto Carnassa

Alpe Lendine, Splügental (1710 m a.s.l.), in February 2014 (left) and in November 2010 (below). Recently, exceptionally high winter snowfall has actually caused glaciers in Lombardy to grow.

0.7 square kilometres and a volume of 8.9 million cubic metres, extensive preliminary work has already been carried out. Historical glacier maps were digitised and compared and the changes that have taken place were identified by examining the 34 images. With the development of georadar it became possible to measure the thickness of the ice and now modern methods such as laser scanning and GPS are used to re-survey glacier surfaces. All the results were made available in the online database at www.bayerische-gletscher.de. The meteorological measurements of nearby stations were also analysed to discover more about the causes of glacier behaviour. One important finding is that glacier melt since the 1980s is primarily due to rising summer temperatures.

In Lombardy there are still extensive areas of glacial ice. The most recent survey in 2003 lists 334 glaciers with a total area of around 100 square kilometres. Two regions, the Splügenpass and the Bergamo Alps, were selected for the project because they are especially suitable for comparison with the Bavarian glaciers in terms of glacier size and topographical situation.

On two glaciers, deep soundings have already been carried out in the ice with the help of a radar device. These are the southern Suretta Glacier (Splügenpass) and the Lupo Glacier (Bergamo Alps), where in October 2014 longitudi-



Topographical map of the Lupo Glacier in the Bergamo Alps and 3D view of the terrain model derived from it.

nal and crosswise sections totaling more than 5 kilometres were surveyed and documented. It was revealed that although the Lupo Glacier is only slightly larger than the Suretta Glacier, with an area of 0.22 square kilometres compared with 0.19 square kilometres, it has a 54 percent greater volume of ice (3.3 million cubic metres). This is due to a basin-shaped depression known as a cirque, in which the ice reaches a thickness of over 40 metres. For both glaciers, historical topographical maps were digitised and compared with modern terrain models, clearly revealing the changes that have taken place.

It is essential to understand changes in ice volume over recent decades in order to prepare future scenarios of glacier development. An initial forecast indicates that these small glaciers could last another few decades. The lifetimes of glaciers and the likely volume

of meltwater are important information for water management. Glaciers have a balancing effect on water flow because they supply meltwater during hot and dry periods. They ensure a minimum amount of outflow, for example for energy generation, or serve as discharge systems for industrial cooling water and waste water. When large-scale "melt events" coincide with heavy rainfall in certain meteorological conditions, glaciers can increase the local flood risk. So a knowledge of likely glacier development can also be useful in applied hydrology and water use planning.

Small glaciers often owe their existence to particular topographical circumstances which in some cases enable them to survive at altitudes below the climatic snow line, in other words the averaged snow line in a region over a period of several years. These include, for example, very shaded, nar-

row rock recesses, coverage with an insulating layer of debris or a surround of high rock walls; this may also provide additional "feeding" by avalanches from higher altitudes. In a sense, these special conditions make alpine glaciers individualists in the fight for survival in the face of climate change. This is both the attraction and the challenge of glaciers as an object of research.



Prof. Dr. Wilfried Hagg is a Heisenberg fellow at the Università degli Studi di Milano-Bicocca.

Contact: Dipartimento di Scienze Geologiche e Geotecnologie, Piazza della Scienza 4, 20126 Milan, Italy

www.bayerische-gletscher.de



Model: AG Hagg

Nikolai Axmacher



The field of neuropsychanalysis uses innovative techniques to find out how unconscious neuropsychic processes control the way we think, feel and act. Studies of autobiographical memory, internal conflict processing and identity formation reveal the possibilities of combining approaches from the humanities and natural sciences.

Attempts to better understand human beings, their behaviour and their mental capabilities are always faced with obstacles. One of the biggest hurdles is the traditional separation of humanities and natural sciences. Yet success is more likely when we realise that in many cases, different disciplines are investigating the same topics and questions and that the

insights acquired in these different fields complement one another. While the special strength of theories in the social sciences and humanities (particularly psychoanalysis) lies in describing the complexity of human experience and action, studies in experimental psychology and the methods of contemporary cognitive neuroscience allow these theories to

be empirically tested. Researchers are seeking the “hidden determinants” which determine how we think, feel and act, often “behind our backs” – in other words without us being consciously aware of them. Recent research on memory, conflict processing and identity formation provides some examples of what this means – and reveals the potential offered by integrat-

ing research approaches from the humanities and natural sciences.

Autobiographical memory is central to the formation of a person’s identity – the “narrative self”. Sociological theories assume that autobiographical memory is social in a fundamental way: not only because the exchange of memories often takes place within social interactions and can serve to build and maintain social relationships, but more fundamentally in the sense that autobiographical memories are always constructs within a real or imagined social situation. Researchers such as social psychologist Harald Welzer thus assume that autobiographical memories are situation- and audience-specific constructs. They therefore deny the existence of one single overarching “true” autobiography.

This theory postulates that autobiographical memory recall has an intrinsically social character – which is paradoxically the more

pronounced the more strongly the recalled experiences relate to ourselves. Only when we recall events that are relevant to us does our memory have to be adapted to the specific social context, not when we recall personally irrelevant facts. In a recent study, we tested this hypothesis using neuroimaging methods. Volunteers first collected a list of memories of specific episodes, both autobiographical and non-autobiographical – for example their own first day at school and Harry Potter’s first day at school at “Hogwarts”; or a road accident they had experienced themselves and an accident that had happened to a protagonist in a film. While their brain activity was recorded by the scanner, they described these episodes using a special microphone. This happened either in a real interaction situation with an experimenter listening to these episodes while being filmed, her facial and gestural reactions being relayed to

the person in the scanner, or in a control situation without social feedback.

The researchers then analysed whether the recall of personal (as compared to fictitious) experiences activated the same brain regions that exhibited increased activity during recall with (as compared to without) a social interaction. The imaging results did not confirm this hypothesis: although both comparisons were associated with activation in adjacent regions in the medial prefrontal cortex (a region in the frontal lobe of the cerebral cortex), the activations overlapped no more than would be expected by chance.

Does this mean that the original hypothesis of an intrinsic social character of autobiographical memory is wrong? That conclusion would be premature. Like any empirical study, this one only contributed one piece of evidence

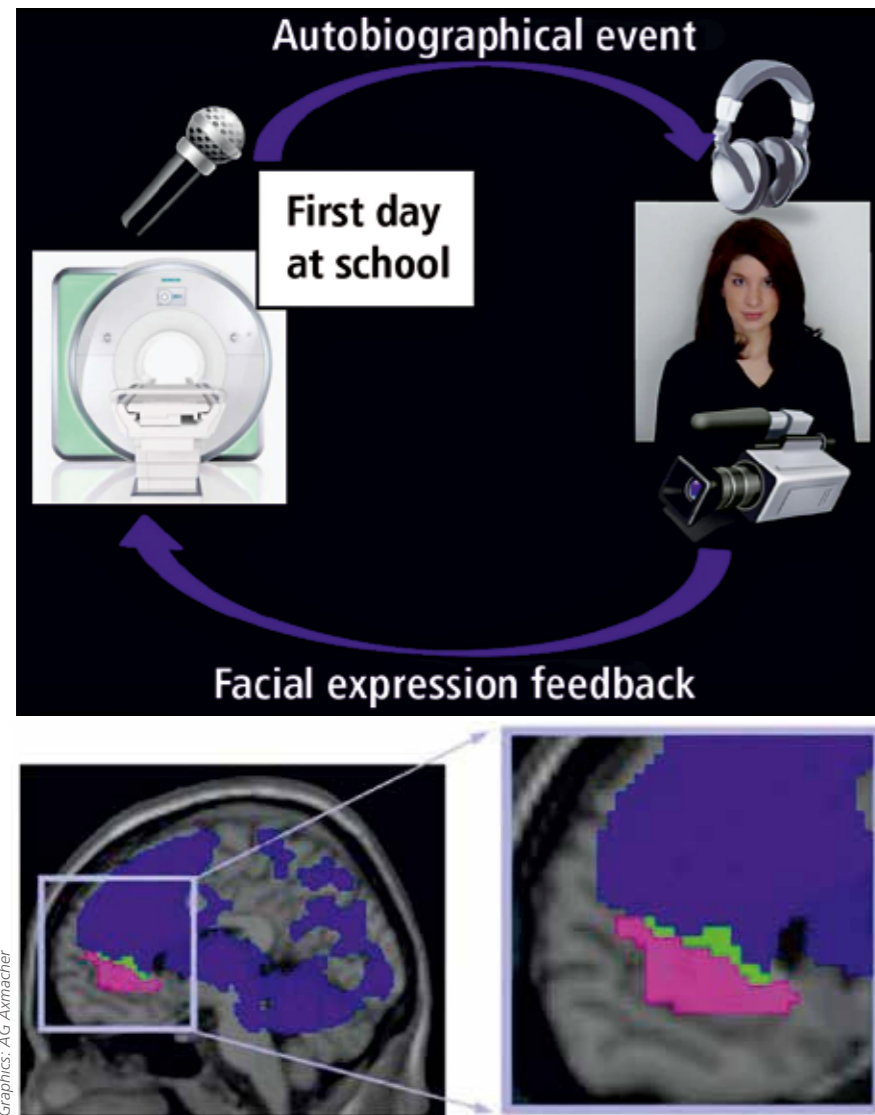
Two settings, two worlds of thought: a psychoanalysis session (left), in which the client confides in her analyst. Right: A situation in experimental psychology – the volunteer’s response patterns are electronically recorded and documented for research purposes.



towards an empirically based theory of autobiographical memory. These results must be replicated and further refined in follow-up studies. In particular, it remains unclear whether the volunteers actually described life events which are central to the constitution of their narrative selves – presumably, this was not the case. A much more

intimate relationship between the volunteer and the experimenter would probably be required in order for the volunteer to feel willing to describe key life events. This could possibly be achieved if such a study were carried out by psychotherapy clients and their therapists. Such a setting would also be an exciting way of investigating

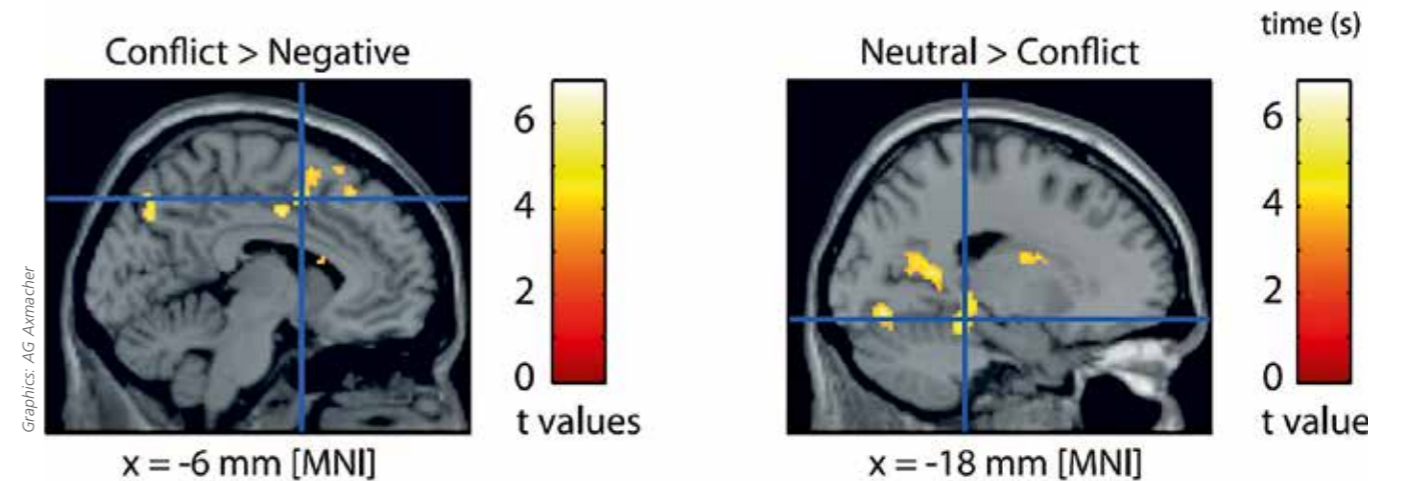
Studying autobiographical memory. Above: Volunteers recall autobiographical events, for example their first day at school. At the same time their brain activity is recorded by an MRI scanner. They receive either direct facial expression feedback or feedback from a computer video. The result: social interaction (below, purple) and the recall of autobiographical memories (pink) activate complementary brain regions which scarcely overlap (green).



disruptions in the formation of a stable identity. It would not only provide new knowledge about the human brain, but possibly also allow us to develop new models of the human psyche. The rest of this article focusses on such approaches in the new field of neuropsychanalysis, which aims to understand how the way we think, feel and act is determined by unconscious neuropsychic processes.

Internal mental conflicts are a central topic within psychoanalysis. In classical psychoanalytical theory, these conflicts relate to sexual desires which are incompatible with social norms and are therefore repressed, which causes them to become unconscious. In current psychoanalytical approaches, non-sexual conflicts are also taken into account, such as the conflict between the desire for autonomy and the desire for care and dependence, or conflicts of guilt and self-esteem. Repressing a desire does not only remove it from conscious access, however. Instead, the unconscious desires may now manifest in a pathological form, for example as neurotic or psychosomatic symptoms such as depressive moods or panic disorders. Repression therefore also affects memory: not only does it cause desires to become unconscious, it also causes experiences associated with these desires to no longer be recalled. The symptom occurs as a pathological trace of the memory in place of a conscious memory.

Repression is the central concept in psychoanalysis because it is the most important process involved in the formation of the “dynamic unconscious”. But is it possible to study repression em-



Interpretable brain activation patterns: when an individual freely associates to conflict-related statements, the conflict areas in the brain are activated; at the same time, the activity of memory areas decreases.

pirically? In fact, researchers have been attempting to do this for some time now with the aid of neuroimaging techniques. The main types of experiment used to study suppression are known as “directed forgetting” and “think/no-think”. Individual stimuli or associations of several stimuli are presented and volunteers are asked to deliberately suppress either the storage of these stimuli in memory (directed forgetting) or the recall of an associated stimulus (think/no-think).

These experiments have shown that memory is indeed reduced for the deliberately suppressed stimuli. Imaging results have further revealed that during the deliberate suppression of memory processes, regions associated with conscious memory – especially the hippocampus – are inhibited by areas responsible for the conscious control of actions, such as the lateral prefrontal cortex. But are these studies really investigating repression? There is reason for doubt. Repression is primarily an unconscious process which takes place outside the deliberate control of the individual. The brain does

not repress just any memories, but only those which are associated with a psychodynamic conflict; and repression implies resistance against the repressed memories becoming conscious – yet the paradigms described do not involve resistance.

At the neuronal level, too, we would expect to see a different activation pattern from that in voluntary memory suppression paradigms: the hippocampus should not be inhibited by voluntary control processes but rather by regions that are associated with conflict processing. In fact, in a series of studies using a different paradigm based on free association to potentially conflict-related words or sentences, we obtained this result several times. Associations to conflict topics were delayed and accompanied by markers of autonomic arousal such as an increase in skin conductance responses, which may reflect resistance. Associations to conflicts often could not be recalled, and an inhibition of the hippocampus occurred through the activation of the anterior cingulate cortex, a central region for conflict processing.

These results, too, should in no way be considered final. In fact, research in the new field of neuropsychanalysis is still in its infancy. But hopefully one thing has become clear: we should not be shy of breaking through traditional discipline boundaries and approaching questions that are traditionally investigated in one field using new methods from other fields. Human experience is rich and complex, and we can only understand it if we first liberate ourselves from self-imposed restrictions on our thinking.



Prof. Dr. Nikolai Axmacher
teaches neuropsychology at Ruhr-Universität Bochum.

Contact: Abteilung für Neuropsychologie,
Institut für Kognitive Neurowissenschaft,
Fakultät für Psychologie, Ruhr-Universität
Bochum, Universitätsstraße 150,
44801 Bochum, Germany

[www.ruhr-uni-bochum.de/
neuropsych/indexE.htm](http://www.ruhr-uni-bochum.de/neuropsych/indexE.htm)



Andrea Behrends

No Boon At All

Politicians in the central African Republic of Chad are hoping to benefit from an approach that combines traditional agricultural production with modern oil extraction. However, there is a high price to pay for oil production: contaminated soil, the erosion of land tenure rights and social upheaval. Social anthropologists see a country undergoing dramatic social and cultural change.

An encounter between old and new: a hut used as a school near the Djermaya refinery in Chad.

As the drilling locations are strictly off-limits, our interview with Jean, which is the name we will give this young oil engineer from Chad, is all the more valuable. He works for a French company which develops new sources of oil for the multinational oil giants ExxonMobil and Chevron. Jean lives for four weeks at a time in a caravan on the 100 square metre plot of whichever drilling station in the south of Chad he is working on, and then he takes four weeks leave.

He spends his free time in the capital, N'Djamena, which with over 1 million inhabitants is also the largest city in the country. He works here occasionally as a rap DJ and organises public events with other rappers whose words decry the low level of development in the country and the lack of social and political commitment on the part of its government. Perhaps this is how Jean is trying to come to terms with the dichotomy of the situation in which he has found himself since he started working in oil production. His interview with us anthropological researchers also arose from this feeling of unease.

According to statistics supplied by the American Energy Information Administration (EIA), as (merely) the 10th largest crude oil producer on the African continent Chad has produced just over 100,000 barrels per day since 2003 (a barrel is 159 litres). That makes an approximate total of 500 million barrels since production commenced, a volume still much smaller than the annual production of Nigeria, Africa's largest producer of crude oil. Allegedly there are still 1.5 billion barrels lying below the central African country, and this is the reason why Chad is one of

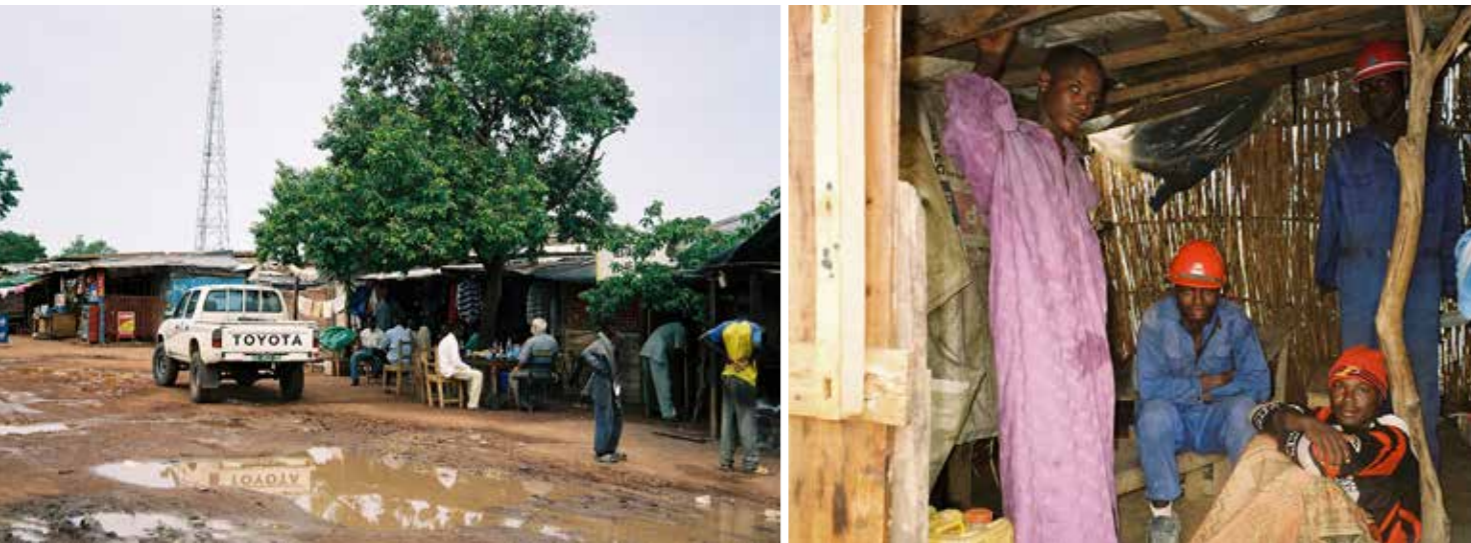
the countries that despite relatively small reserves, difficult access to deep oil sources and a lack of convenient routes to the sea, has risen to become one of the new African oil producers in recent years.

In order to export crude oil, a 1070 kilometre pipeline has been laid from the south of the country to the closest port in the Atlantic in south Cameroon – at a cost of 4.2 billion dollars. The oil project in Chad is therefore one of the most costly investments in a single sector on the African continent. Although the stated aim is for it to be held up as an example of the compatibility of a new economy and rural development, the reality is different.

Against this background anthropologists have been taking much more interest in oil production in Africa recently. Like Central Asia and Latin America, most African oil producers are newcomers to the oil market. This is due to improved technology and the high price on the world market for crude oil (although it has fallen dramatically recently). However, every incidence of drilling has a serious impact on the population. Nigeria is an example of the “resource curse” and the paradox that extremely high profits for individuals can go hand-in-hand with poverty for the many.

Or to put it more simply, as the state is no longer dependent on production in other economic sectors, political leaders develop a “rentier” mentality – money flows seemingly automatically into the state coffers and then frequently ends up in private accounts. However development in other economic sectors stagnates, social conflicts arise or become more acute. All this is accompanied by an in-





Left: A village has become established directly opposite the Komé 5 base, the ExxonMobil headquarters in the oil region. It is populated by migrants hoping for occasional work. They call the village "Atan", which means "waiting". Right: Workers in their cramped accommodation. They work in the oil refinery which was built by the Chinese in 2010 in Djerma which lies north of N'Djamena, the capital of Chad.

crease in state expenditure on the military in order to ensure internal security and to retain power. In attempting to understand these far-reaching changes, anthropological research starts where other disciplines find it difficult to gain access: at the everyday level of practice and with a longer-term perspective, regarding land use, for example.

Jean tells us something about this. He is a good friend of our colleague from Chad, the anthropologist Remadji Hoinathy PhD who recently wrote a book about the impact that oil has had in the south of his country. Jean started working in the oil extraction industry to finance his law degree. However, the oil company soon recognised

the potential of this level-headed and clearly very reliable man. After completing his studies, he took courses in the USA and today is responsible for adding the chemicals which are needed every time an oil well is drilled. In short, he has one of the most responsible roles in establishing an oil well.

"Special rigs drive the drills up to three kilometres into the earth before we lay the pipes for extracting the oil from the source", he explains. "I analyse the various layers in the ground and, depending on each one, add a different mixture of chemicals to the drill to facilitate the drilling process." A water well is set up next to each new drilling site to facilitate this purpose. A container measuring 3 x 50 x 50 meters is filled from this source

A view of one of the first installations for oil extraction in the vicinity of Doba. The soil in the foreground shows where earth and mud from the drilling, which can go down as far as three kilometres, is buried.



Illustrations: Behrends

with clean, drinking-quality water to which Jean adds the chemicals. He finds it depressing that people living in the vicinity of the oil well often have to walk to a site several kilometres away to fetch water which, to make matters worse, is often of a poorer quality. However, the legal regulations imposed by the drilling company do not allow the water from the well to be used in any other way. Once drilling is completed, the well must be filled in again.

Jean is even more saddened by the fact that his job is contributing directly to the pollution of the soil which, according to a well thought-out plan, is intended to carry on being used for farming. The idea of the planners and engineers working on the oil project in Chad was that the relatively small oil installations and the underground pipelines would take up comparatively little space above ground. Instead of a mass relocation of the people living around the oil extraction area, the farmers are supposed to be able to cultivate their fields after the wells have been set up. The oil company compensates the farmers for the loss of their



Above: A teacher with his class, not far from a refinery. Below: One of the many new petrol stations in Chad.

land, fields and, in particular, their trees from which they can harvest fruit, and of course for their houses which are destroyed in the construction of the well. Beyond this, it was assumed that oil and farming can co-exist. However, it is this assumption which has resulted in uncertainty and the rapidly changing lifestyle of

the communities in southern Chad, because in practice the restoration of the fields has not been a success.

In accordance with the environmental regulations imposed by the multinational oil company and the Chad government, the mud to which the chemicals have been added is supposed to be cleaned in three filtering processes even before drilling is complete. Water which can be re-used for chemical processing is returned to Jean's pond. Any remainder which cannot be reused is directed into a hole in the ground, also three metres deep and 20 x 30 metres in surface area. This is refilled in once drilling has been completed. The pH values of this unused water is measured at the end of the process – and if the alkaline reading is more than 7, a lengthy flushing process must be used to bring it down. Jean does not know if this flushing process can really lower the pH value.

What is certain is that there is great pressure for the work to con-



Illustrations: Behrends



First-hand information: interview with the elders of a village which was relocated when the refinery was built. They thank the researchers with a chicken.

tinue at the next drilling location. “ExxonMobil and Chevron are currently achieving three and a half to four wells each month. The aim is to create a well in six days.” With this level of pressure, his managers are keen to see him enter the required pH value without undue delay. “When I say ‘pH 10’, they shake their heads and urge me to enter pH 7, so that we can get away from the well as quickly as possible.” The oil companies have already set up over 1000 wells and every week there are more.

Most of the farmers are unaware that their soil is contaminated. All they notice is that the soil is no longer suitable for farming. Nevertheless, they plant the fields that were destroyed during the construction and then complain that their harvests are much smaller. They say that the soil has lost its fertility. This might be due to the relatively shallow fertile soil

surface having been turned over too much by the work on the oil well. However, this is not being investigated nor is the real impact of the contamination of the soil by the chemicals. Officially, these consequences do not exist.

There is another uncertainty surrounding the oil drilling: as the next source of oil could be found under any field, house or garden in the region, the oil companies must obtain access to an area which is much larger than that needed for the oil wells. To guarantee that this happens, the Chad government extended (practically overnight) “modern land tenure rights”, which previously had applied only in the towns, to the rural oil region. According to these rights, land which is not registered officially to an owner or which cannot be proven to have been used continuously for the last five years belongs to the state. As only a few of the farmers in the oil region can provide evidence of this nature, the peo-

ple have lost the right to decide how large areas of land are used. They are permitted to cultivate it, but only as tenants. They cannot sell, rent nor bequeath the land.

As the harvests are now failing, the concept of “land” has acquired a new meaning in this region: many farmers are now hoping for compensation from the oil companies. Where previously the land was managed communally, the compensation payments are given in response to individual land claims. This gives rise to conflicts over ownership and over the distribution of profits which are paid out to some farmers and not to others. Research shows that the people in the oil region are trying to access these payments in different ways: given the extremely inflated prices of food and higher demands for traditional marriage endowments, given the uncertainty surrounding the harvest yields and doubts about access to agricultural land, it is these payments which represent the new engine driving social relationships – how the dynamic of these serious consequences will develop for the communities of Chad is not clear.



Dr. Andrea Behrends is head of the “Oil and Social Change in Chad” collaborative research project. She publishes material on political anthropology in Africa.

Contact: Institut für Ethnologie und Philosophie, Reichardtstr. 11, 06114 Halle, Germany

www.spp1448.de/projects/oil-and-social-change/



Rembert Unterstell

Lost Illusions

In 1968, at the height of the German student movement, nothing seemed impossible, even in pedagogy. But in education, many of the dreams of liberalisation turned to dust. A conversation with Meike Baader, one of the first to study both sides of the story – a broad arc ranging from early years education in “Kinderläden” to contemporary sex education books and sexual abuse.



A historical visual document with symbolic value: the anti-authoritarian principle in practice at a Kinderladen in Kiel in 1970. The adults imposed (almost) no boundaries on the children.

To the “68ers”, the members of the student movement that had a profound effect on West German society, pedagogy was a means by which to change the individual and a compromised patriarchal society. It brought together wide-ranging anti-authoritarian ideas and liberal styles of education, as a result of which pedagogy became a defining element of the 1970s and 1980s.

But a series of public scandals has also revealed the excesses and the failings of this type of education. This in turn has uncovered unanswered questions and dark chapters in the

history of pedagogy, namely sexual abuse. The case of the Odenwaldschule, a private boarding school where there were allegedly numerous cases of sexual abuse, demonstrated that even in “progressive” educational institutions there existed the same inhuman abuse which for a long time was only associated with the repressive educational practice of church-run schools.

The scandal engendered an atmosphere in which asking questions was discouraged. Now, more than ever, answers are needed. It is on this very area that pedagogist Meike Baader,

whose broad area of research encompasses the pedagogical dimension of the ‘68, is trying to shed light. One key area of interest is the “Kinderladen” movement, the emergence of alternative early years education organised by parents, which Baader has examined “as a case study of the anti-authoritarian education movement”. She is currently engaged in studies on the aims and practice “of sexual liberation, liberal education, the paedophile movement, and educational and social sciences from the 1960s to the 1990s”.

Baader and her team use printed historical sources, archive material and interviews with contemporary witnesses. “Combining the analysis of documents, discourses and interviews has proved to be an effective approach,” she explains.

german research: What wouldn't we have today if the '68, as an event and as a symbol of social revolution, had never happened?

Baader: That's a huge question that deserves careful consideration. At the universities, it was the lesson that things can be changed through student protests, and therefore from the bottom – an insight that has entered into collective awareness. The '68 still arouses emotions in people even today and is characterised in terms of political camps – with changing definitions of belonging

PROFILE

Professor Dr. Meike Baader is a professor of general educational science at the University of Hildesheim Foundation. Born in 1959, she studied educational science and German literature. After acquiring further professional training she obtained her doctorate from Heidelberg



Illustration: Unterstell

University in 1994 (“The Romantic Idea of the Child and Childhood”). She then spent a number of years as a research assistant at the University of Potsdam. As a DFG research fellow, she completed her habilitation in 2002 with studies on the “Transformation of the Religious” using the example of progressive education. In 2007 she was appointed professor in Hildesheim, where she was involved in the establishment of the Centre of Excellence for Early Childhood in Lower Saxony. In addition to her teaching and research work, Baader is a DFG reviewer and currently the spokesperson for the Research Training Group “Gender and Education”.

and efforts to establish distance. The discipline of educational science was involved in the ‘68 as a movement that sought to introduce a new era in pedagogy. That’s why research in this area began so late.

In the cities and university towns, the “Kinderläden” were part of the changing face of pedagogy. What was the thinking behind them?

These initiatives had a lot to do with coming to terms with the National Socialist past. As a response to this, people wanted to bring up children to think critically, to be able to say no – an “education to maturity”, to use the words of Adorno. Also, preschool education was poorly developed in the 1960s; only 30 percent of children went to kindergarten. So the first “Kinderläden” were set up by parents. The name [literally “child shops”] derives from the fact that most of them were set up in empty shop premises.

So the aim was to replace a repressive education within the nuclear family with an anti-authoritarian one within a children’s collective?

Over time a range of initiatives, some of them very different, came together under the same heading. In Berlin there were over 300 Kinderläden, which described themselves differently (reaches for a diagram): “non-authoritarian”, “anti-authoritarian”, “proletarian”, “socialist”, “liberal” ... There were lots of different ideas, even fundamental disagreements as to the right way to do things. But what they all had in common was parents who took the initiative with respect to their children’s education.

You’ve spent a long time analysing the pedagogical dimension of the ‘68 movement. What new insight from your research has particularly surprised you?

For one thing, the realisation as to how heterogeneous the movement was. From today’s standpoint, it’s surprising how seriously and with what depth of theoretical underpinning people approached pedagogical issues. There were great hopes of pedagogy as a force that could change the face of society. For another thing, there was a lot of everyday mundanity, even in the Kinderläden.

During that period there were youth revolts all over Europe. What was particular about the events in Germany?

Because of the background of the fascist past, there was a very strong focus on education. On the theoretical side, it was important that the Frankfurt School with Adorno reconstructed the “authoritarian character” and identified it as “fascistoid”.

In a Freudian sense, the “authoritarian character” is associated with repressed drives. How did people regard the infantile sexuality first described by Freud?

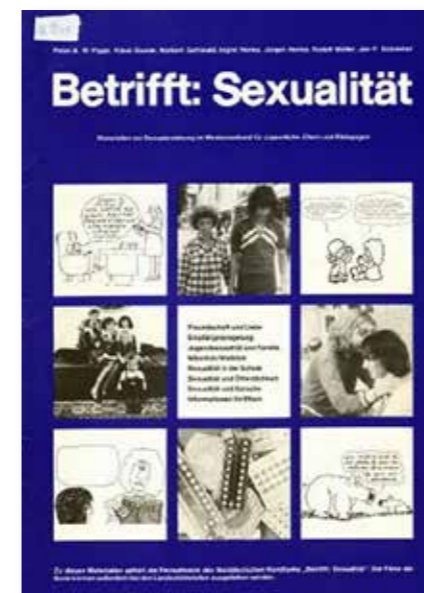
The tabooing of sexuality and prudish sex education were criticised. The first sex education lessons were introduced in 1968 by the KMK [assembly of the ministers of education of the German states] under health minister Käthe Strobel. Ideas about sexual liberation also extended into the Kinderläden. The liberation of infantile sexuality became a topic of discussion. In the Kinderläden, children were allowed to run around naked and even childish games of “doctor” were accepted. The book *Show Me!*, a sex education book intended specifically for children with photographs and text by Will McBride (1974), much praised at the time but now notorious, also circulated in the Kinderläden; today the book has been taken off the market.

Your team studies discourses of childhood and sexuality against the

background of educational and sexual liberation. What attitudes to paedosexuality existed at the time?

These have been reconstructed by Franz Walter in terms of the party and political history of the Greens [*Die Grünen und die Pädosexualität*, Vandenhoeck & Ruprecht, 2015]. This is a scholarly answer to the debate that emerged in 2013 surrounding Green politician Daniel Cohn-Bendit, who was confronted with quotations from his book *Der große Basar* (1975) and the conjecture that he condoned sex between adults and children and therefore supported paedophile positions of the time.

In our material on the Kinderladen movement we have not found any evidence of physical assaults, but we have come across positions that called for the age of consent between adults and children – which in 1973 was set at 18 for homosexual contacts and at 14 for heterosexual contact – to be abolished. It is striking that often no distinction was made between child and adult sexuality, or that the boundary was consciously or unconsciously blurred.



Once famous, now infamous: the sex education book “Show Me!”, first published in 1974, of which there were several editions until 1995. Below: “Betrifft: Sexualität” – contemporary materials for a new approach to sexual education and pedagogy.

Were such attitudes widespread?

It’s still difficult to assess that. The question is: was there such a thing as a paedophile movement in Germany and were there organised networks of individuals who attempted in a planned process to enter pedagogical institutions or undermine child protection? There is some evidence that this was indeed the case.

There have been cases of sexual abuse in both Christian children’s homes and progressive boarding schools. To what extent have the necessary questions been answered?

There is enormous public attention to this issue. We need further research into sexual abuse in pedagogical contexts, for example in peer groups. There are certainly methodological problems here. This issue must be part of training in youth work and education in a non-school context and in the training of teachers and volunteers. Pedagogical institutions should be expected to develop their own child protection concepts. Awareness of the issue must be maintained inside organisations.

If there are blind spots in the retrospective view of liberal education, then in contemporary language, must pedagogy contribute to the process of remembering and grieving?

Most certainly yes: pedagogical institutions must work through their past and take responsibility for it.

What were the long-term consequences of demands for liberal education?

The Kinderladen movement called for rights and codetermina-



tion for children and demanded children’s rights. At the time, this was a new idea. In 1973 corporal punishment in pedagogical institutions was banned. In the 1980s, the concept of “parental authority” in German family law was replaced with “parental care”. In 2000 the right to a violence-free upbringing was introduced.

Slides from the ‘68 era show the “new human” – the flower dreams have faded. Did this generation fail because of an illusionary image of humanity? To borrow the words of Kant, man is a creature “made of warped wood”.

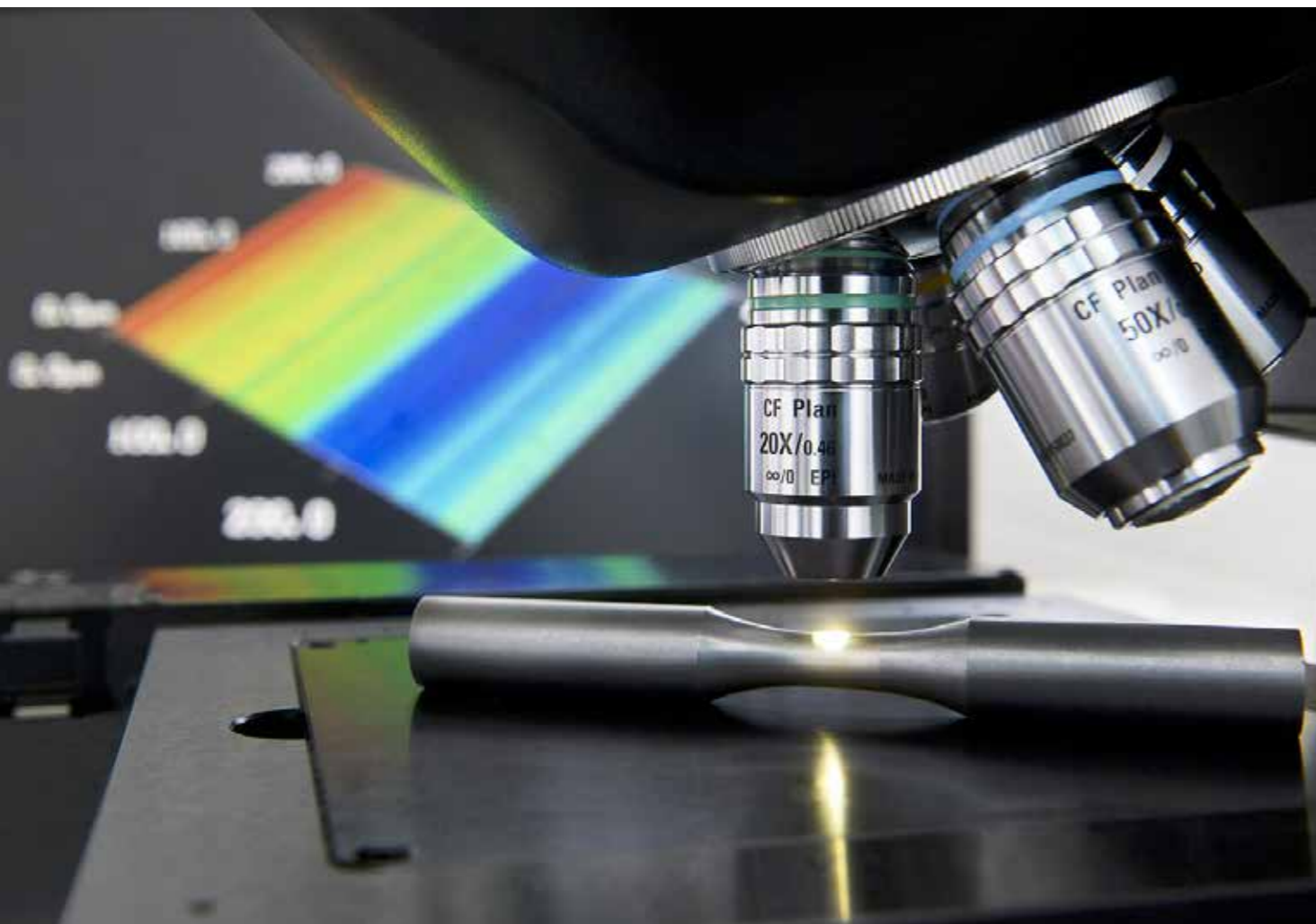
Yes, to some extent that is certainly true. There was an entirely exaggerated, very romantic picture of childhood, which nonetheless did not protect children from being used as instruments for the new society. There was also a very truncated understanding of socialisation, optimistic ideas about what could be achieved through pedagogical work in an institution.

What can we learn from the ‘68?

There is one lesson we can certainly learn: scepticism regarding exaggerated or idealised expectations of pedagogy; that is always advisable.

Interview: Dr. Rembert Unterstell,
Publishing Executive Editor of *german research*.

Marion Merklein



Top Form

Integral components are becoming increasingly important, and not just in the automotive industry. Sheet-bulk metal forming is an innovative technique for manufacturing these lightweight base bodies with highly resilient multifunctional elements.

It might be compared with high-performance sports: to achieve top form, you need the right knowledge and efficient training methods. This is just as true in production engineering as it is in sports. The discipline of forming technology calls for high-performance processes for light-

weight construction, motivated by new requirements relating to process time, the use of materials or component loading capacity. Sheet-bulk metal forming is a highly productive process which offers a promising approach to pushing back the boundaries of manufacturing technology while

exploiting the advantages of conventional techniques. It's a field full of possibilities.

In Collaborative Research Centre/Transregio 73, a total of 13 chairs at the Friedrich Alexander University of Erlangen-Nürnberg, Technical University of Dortmund and Leibniz University Hannover

are investigating the fundamental development and further development of sheet-bulk metal forming. To continue the sports analogy, the aim of the group projects is to get top athletes made of sheet steel on to the starting line. But instead of an athlete's body, they need a lightweight base body with highly resilient functional elements. To cover the entire process chain, interactions between forming processes, semi-finished (prefabricated) parts and surfaces are being investigated and basic knowledge about tool design is being developed across a total of 19 projects. The aim of the research alliance, as in centres of excellence for sport, is to drive forward development in all relevant areas.

Components manufactured with sheet-bulk metal forming exhibit a high degree of functional-

ity and integration density, making them the all-round athletes of the manufacturing world. The various functional elements and surfaces perform numerous jobs. The ideal approach is not to find isolated solutions but to identify suitable requirements and peripheral conditions by considering the interactions between individual disciplines. This demands in-depth knowledge and understanding of the connections between applied processes and the resulting products. Only then can sheet-bulk metal forming achieve maximum performance.

One core area of research is the manufacturing of multifunctional components in a single forming step. This involves the forming of different functional elements such as tothing, lugs or

carriers on a base body with a single stroke of the forming press. For example, a 3-dimensional bowl-shaped base body can be formed from a flat sheet by deep-drawing and in the same stroke the functional elements can be added to the base body by compression. The various functional elements place different, sometimes opposing, demands on the process. Tothing, for example, requires the transfer of high moments, which requires a thicker starting sheet compared to the base body. Different requirements therefore apply depending on the individual component to be manufactured.

It is also important to consider the component properties in terms of the loading the component will be subjected to when in use. The example of a synchroniser ring, a traditional product of sheet-bulk



Left: In sheet-bulk metal forming it is important to be able to characterise the surfaces of tool steels. Above: Tool components and a multifunctional component.



Above: Concentrated work on a flexible rolling system. Below: During rolling, the rotating workpiece is machined such that the material undergoes “process-adapted distribution”. Tool inserts allow a wide range of geometries to be created.

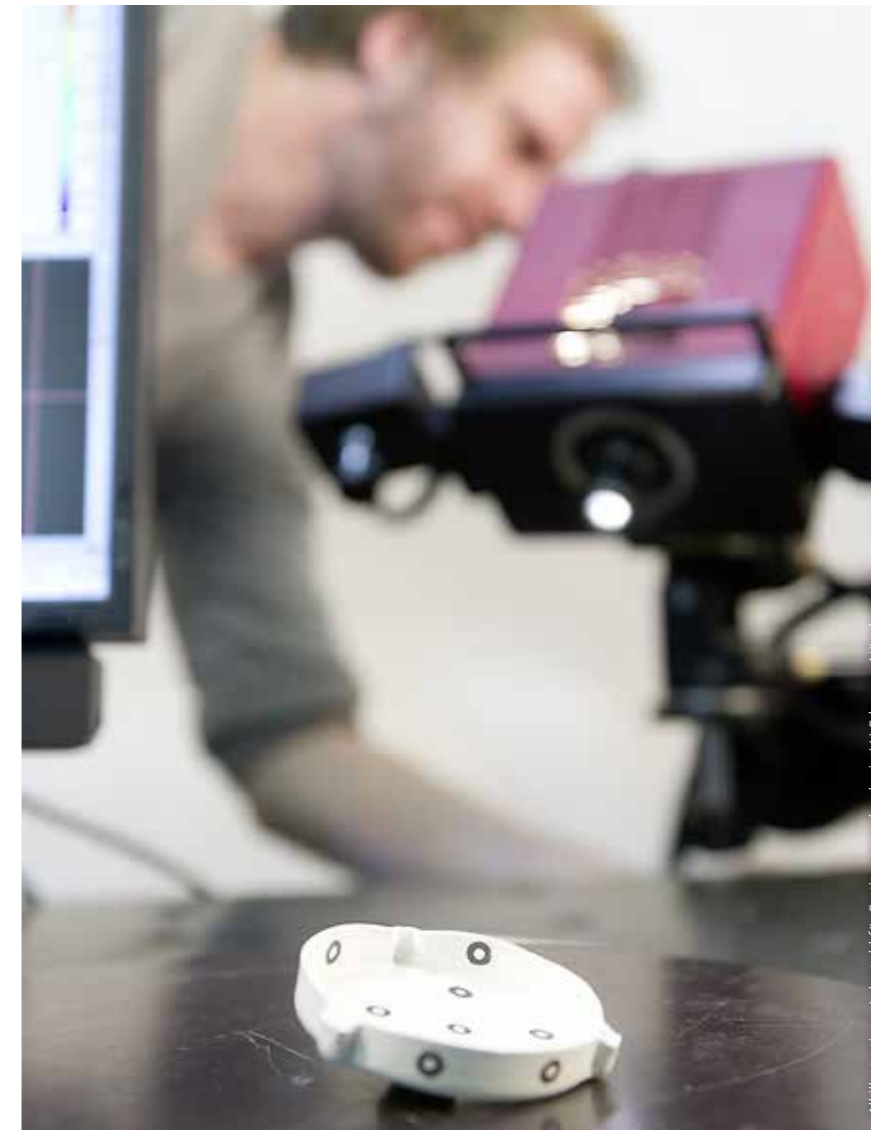


metal forming, reveals the requirements imposed on this category of component: if the specific load is increased, for example due to the downsizing of combustion engines, then high wear resistance and fatigue strength is needed. This makes it necessary to use high-strength sheet materials.

There are still many unresolved questions. For example, different forming limits need to be defined depending on the type of element to be produced. In the case of thick-walled tooting, non-homogeneous thickening and mould filling of the teeth impairs component quality. In the case of a carrier, on the other hand, excessive thinning of the sheet may lead to premature component failure. New methods designed to improve the control of the material flow offer potential to push back the process limits. This can be achieved with the use of so-called tailored blanks adapted to a specific process, in keeping with the principles of lightweight construction.

To achieve more precise thickness distributions on flat sheet blanks by forming, an entirely new area of research, special processes and machines have been developed. This involved adapting the conventional bulk metal forming techniques of tumbling and flexible rolling to the requirements of sheet-bulk metal forming. In the first technique, material is gradually forced into the desired areas through the tumbling motion of a die component with relatively low force. This method can increase the sheet thickness by up to 50 percent compared with the starting material.

In flexible rolling, the rotating workpiece is machined by radially moved rollers and the material is



A bulk-formed component is scanned and then entered into the digital circuit.

workpiece surface, for example, can function as lubricant reservoirs which gradually release lubricant during the forming process. This results in better surface slip and therefore better material flow.

To inhibit the flow of material, the surface of the workpiece or mould can be roughened. Sandblasting creates a fissured surface with lots of peaks, which catch on the friction partner during forming and slow the material flow. These methods help to improve mould filling with the use of lower forming forces. We can see, then, how components can only achieve “top form” with the right equipment.

Over the next few years, research into sheet-bulk metal forming will continue with the help of a tough training plan, discipline, patience and stamina. The aim is to continuously push back the limits – because the goals are ambitious ones. As in top-level sport, the maxim “faster, higher, further”, part of the Olympic spirit, applies.

distributed in a process-adapted pattern. Inserts inside the tool allow very different geometries to be created. To return to our original metaphor, tailored blanks represent the essential basic training an athlete must undergo to achieve maximum performance. This is of course the first and absolutely essential prerequisite to achieve top form later on.

Just as success in competitive sport is determined by more than physical fitness alone, the

equipment used in sheet-bulk metal forming also contributes to the final result. The surface structure of workpieces and tools can be understood as the equipment. By modifying these surfaces we can manipulate the friction conditions to positively influence the material flow and improve the forming possibilities.

Whether a stimulated or inhibited flow of material is desired depends on whether a surface with high or low friction is envisaged. Depressions impressed into the



Prof. Dr.-Ing. Marion Merklein

holds the Chair of Manufacturing Technology at the Friedrich Alexander University of Erlangen-Nürnberg.

Contact: Lehrstuhl für Fertigungstechnologie, Friedrich-Alexander-Universität Erlangen-Nürnberg, Egerlandstraße 13, 91058 Erlangen, Germany

www.lft.fau.de/index.php/en



Carola Winkelmann



A killer shrimp, an omnivore, devours a water louse.

among animal and plant species: predators and prey interact, competitors use the same food sources or habitats and grazers need sufficient quantities of algae. Aquatic species have adapted to each other throughout evolution: prey can avoid their predators to a certain extent and competitors have developed strategies which allow them to share resources.

However, what happens when a new species invades a community or is even deliberately introduced? Lake Victoria in Eastern Africa is a good example of this. The “Victoria perch” is a delicacy and grows to up to 2 meters. Another name for it is “Nile perch” which gives a more accurate idea of its origin. It was introduced to Lake Victoria for commercial purposes and within five years it had wiped out almost all of the native fish species. Most of the 400 endemic species which were found only in Lake Victoria are now lost for ever.

This enormous loss of diversity is a clear indicator of the impact that alien species can have. And that’s not all: the disappearance of the native fish species has resulted in a fundamental change to the ecosystem of Lake Victoria. There has been a recent increase in foul-smelling algae blooms; areas of the lake bed are completely devoid of oxygen and fish kills have been observed with growing frequency. This is an ecological disaster which gives rise to the question of how a single fish species can have such far-reaching consequences for the functioning of an ecosystem.

Invasive or introduced species disrupt the relationships in the food web because the native species are unable to adapt quickly to the new competitors or predators. An invasive predator might have hunting strategies which are new to the native prey species which it sooner or later eliminates. Lower population densities or the complete loss of a species in a habitat destroys the food web and inflicts changes with serious consequences on the nutrient cycles and energy flows in the ecosystem.

The example of Lake Victoria shows that the elimination of one fish species by the Nile perch has resulted in higher numbers of tiny invertebrate predators in the lake zooplankton. The vanished fish species was specialised in feeding on these invertebrates. Now present in much greater numbers, these predators reduced their own prey (other small crustaceans floating in the water) so intensely that they were no longer able to keep their food, microscopically small algae – phytoplankton – under control. The fast-growing algae are no longer eaten and sink to the bed of the lake where they consume oxygen as they are decomposed. The consequent oxygen deficit is probably the cause of the fish die-off.

Could newly arrived species have a similarly drastic impact on the food webs in our rivers and streams? Or is it perhaps the case that some ecosystems are more sensitive to immigrant species than others? These questions are the focus of the researchers working on an Emmy Noether Project at the University of Koblenz-Landau who, with the support of their colleagues at the Federal Institute of Hydrology in Koblenz and the

Adaptable Immigrants

Freshwater ecology in the Elbe and the Rhine: *Dikerogammarus villosus*, the “killer shrimp”, appears to have a number of different strategies for survival. It is able to change its hunting and feeding behaviour to suit its surroundings and the environmental conditions.

As a result of our growing environmental awareness, much has been done over recent decades to protect our freshwater ecosystems. The general public is familiar with pollution by toxic chemicals

or sewage. Indeed, it has been a popular topic for saloon bar debate, but is now largely declining. However, there is growing evidence that the sensitive food webs of the Rhine, the Main and the Danube

can be destroyed not only by environmental pollution but also by newly arrived species.

This is linked to the fact that large rivers are the most important migration routes for alien water

organisms. Particularly since the opening of the Main-Danube canal which connects the previously separate catchment areas of the Danube and the Rhine, freshwater ecologists have seen increasing numbers of non-native small crustaceans, mussels and fish. Scientists at the University of Koblenz-Landau are therefore investigating the mechanisms and ecological consequences of alien species in European rivers.

Our rivers are characterised by a complex network of relationships

Federal Waterways and Shipping Administration, are examining the mechanisms and consequences of the invasion of *Dikerogammarus villosus* – the killer shrimp. This crustacean invaded in the Rhine via the Main-Danube Canal in the 1990s and rapidly spread throughout Europe.

It is omnivorous and can prey on other species as well as feed on algae and leaves. In laboratory experiments it has been seen to exhibit a stronger predatory behaviour than its native relative. Various researchers, including animal ecologists from the Federal Institute of Hydrology, have found that with the invasion of the killer shrimp other invertebrate species declined

Left: Floating flumes (mesocosms) are deposited in the river with the help of the Federal Waterways and Shipping Administration. Right: Baskets filled with substrate are placed in the floating flumes – they will form a habitat for the invertebrates during the experiments.



Illustration: Carola Winkelmann

or disappeared completely. These observations can provide important information about the ecological impact of this invasive species. However, they cannot prove that the killer shrimp has really triggered these changes as there are many other factors affecting rivers and streams.

To examine these relationships more closely, the researchers at the University of Koblenz-Landau are conducting “mesocosm experiments” in the Elbe and the Rhine. These experiments involve deliberately altering small sections of the ecosystem, called mesocosms. In this case, the number of killer shrimp is artificially reduced in some mesocosms and increased in others. By comparing the species they find, they hope to gain new knowledge of the effect of the invasive species on the ecosystem. The investigation goes beyond looking at whether the number of individuals in the various species changes: it analyses the physiological condi-

tion of possible competitors or prey of the killer shrimp. Furthermore, the researchers are looking at the architecture of the food webs and the function of the killer shrimp in these webs.

To do this, they have to preserve individual invertebrates on site in liquid nitrogen to look at their physiological condition and the chemical composition of their tissue. In the laboratory, the concentration of various energy storage compounds is examined to see whether the organisms have stored large amounts of energy or are suffering from malnutrition. Stable isotope composition and stomach content analysis can show what the killer shrimps have been eating in their natural environment.

Initial results have shown that in the Elbe, the killer shrimp is probably not a “real” predator, but feeds primarily on plant remains. This is contrary to previous assumptions based on laboratory experiments and could show that



Illustration: Claudia Hellmann

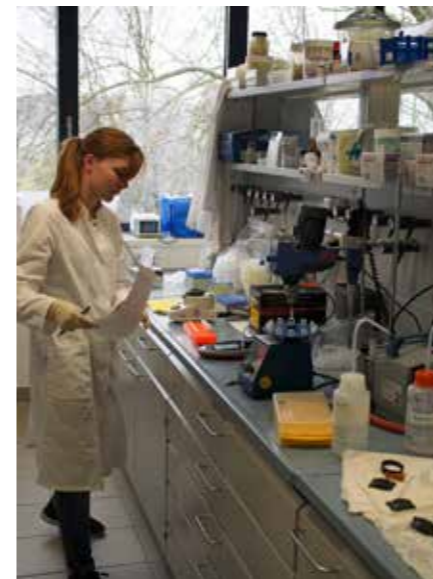


Illustration: Carola Winkelmann

Left: To determine their nutritional status and role in the food web, the invasive killer shrimps are analysed in a laboratory. Centre and right: The animals are preserved in Eppendorf tubes and then undergo very close examination.

these immigrants have a very wide range of behaviours. The animals might therefore sustain themselves from very different sources depending on the surroundings and environmental conditions. This assumption is supported by the observation that in the Rhine, the killer shrimp eats another invasive shrimp (*Echinogammarus ischnus*) as well as plant remains. It should therefore be classified as an omnivore in the Rhine.

The question of why the feeding habits of the killer shrimp should be different in the two rivers remains unanswered until now. The impact of this immigrant species seems, at least in the Elbe, to be much less drastic than previously assumed. The experiments conducted so far have failed to establish whether the killer shrimp has

had a directly adverse effect on native species. However, that does not necessarily mean that it does not present a problem for our freshwater environments. The results of an eight-week experiment cannot be applied easily to what happens throughout the whole ecosystem. It might be that there were very sensitive species in the Rhine and the Elbe which disappeared long ago and which are therefore not affected by the immigrants. It is also conceivable that the killer shrimp behaves differently in the mesocosms than when it is “in the wild”. The results must therefore be interpreted carefully.

Further experiments will show whether the arrival of the alien species has had negative effects on the Rhine, as previous observations indicate that the killer shrimps have behaved in a much more predatory fashion there. If it is not possible to determine any negative impact on the Rhine, there will be a detailed analysis of the changes previously observed in the composition of species there and in the Elbe. The objective is find out whether

there are differences between the experiments and the real situation and whether perhaps other environmental factors present at the same time as the arrival of the immigrant species have played a part. With such a complex network of relationships subject to direct and indirect influences, there are rarely any easy answers.



Dr. Carola Winkelmann

is a research assistant at the Institute for Integrated Natural Sciences at the University of Koblenz-Landau and head of the “Mechanisms and Consequences of the Immigration of Aquatic Organisms in European Rivers” Emmy Noether Group.

Contact: Institut für Integrierte Naturwissenschaften, Universität Koblenz-Landau, Universitätsstraße 1, 56070 Koblenz, Germany

www.uni-koblenz-landau.de/en/campus-koblenz/fb3/natural-sciences/biology/rg-applied-stream-ecology/research/emmy-en?set_language=en



The Deutsche Forschungsgemeinschaft

The Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) is the central self-governing organisation responsible for promoting research in Germany. According to its statutes, the DFG serves all branches of science and the humanities. The DFG supports and coordinates research projects in all scientific disciplines, in particular in the areas of basic and applied research. Particular attention is paid to promoting early career researchers. Scientists and academics who work at a university or research institution in Germany are eligible to apply for DFG funding. Proposals will be peer reviewed. The final assessment will be carried out by review boards, the members of which are elected by researchers in Germany in their individual subject areas every four years.

The DFG distinguishes between the following programmes for research funding: In the *Individual Grants Programme*, any researcher can apply for financial assistance for an individual research project. *Priority Programmes* allow researchers from various research institutions and laboratories to cooperate within the framework of a set topic or project for a defined period of time, each working at his/her respective research institution. A *Research Unit* is a longer-term collaboration between several researchers who generally work together on a research topic at a single location. In *Central Research Facilities* there is a particular concentration of personnel and equipment that is required to provide scientific and technical services.

Collaborative Research Centres are long-term university research centres in which scientists and academics pursue ambitious joint interdisciplinary research undertakings. They are generally established for a period of twelve years. In addition to the classic Collaborative Research Centres, which are concentrated at one location and open to all subject areas, the DFG also offers several programme variations. *CRC/Transregios* allow various locations to cooperate on one topical focus. *Humanities Centres for Advanced Studies* are designed to support the transition in the humanities to an integrated cultural studies paradigm. *Transfer Projects* serve to transfer the findings of basic research produced by Collaborative Research Centres into the realm of practical application by promoting cooperation between research institutes and users.

DFG Research Centres are an important strategic funding instrument. They concentrate scientific research competence in particularly innovative fields and create temporary, internationally visible research priorities at research universities.

Research Training Groups are university training programmes established for a specific time period to support early career researchers by actively involving them in research work. This focuses on a coherent, topically defined, research and qualification programme. Research Training Groups are designed to promote the early independence of doctoral researchers and intensify international exchange. They are open to international participants. In *International Research Training Groups*, a jointly structured doctoral programme is offered by German and foreign universities. Other funding opportunities for qualified early career researchers are offered by the *Heisenberg Programme* and the *Emmy Noether Programme*. In so-called *Reinhard Koselleck Projects*, the DFG supports especially innovative research undertakings by outstanding scientists and academics.

The *Excellence Initiative* aims to promote top-level research and improve the quality of German universities and research institutions in the long term. Funding is provided for graduate schools, clusters of excellence and institutional strategies.

The DFG also funds and initiates measures to promote scientific libraries, equips computer centres with computing hardware, provides instrumentation for research purposes and conducts peer reviews on proposals for scientific instrumentation. On an international level, the DFG has assumed the role of Scientific Representative to international organisations, coordinates and funds the German contribution towards large-scale international research programmes, and supports international scientific relations.

Another important role of the DFG is to provide policy advice to parliaments and public authorities on scientific issues. A large number of expert commissions and committees provide the scientific background for the passing of new legislation, primarily in the areas of environmental protection and health care.

The legal status of the DFG is that of an association under private law. Its member organisations include research universities, major non-university research institutions, such as the Max Planck Society, the Fraunhofer-Gesellschaft and the Leibniz Association, the Academies of Sciences and Humanities and a number of scientific associations. In order to meet its responsibilities, the DFG receives funding from the German federal government and the federal states, as well as an annual contribution from the Donors' Association for the Promotion of Sciences and Humanities in Germany.



Successful collaboration between Germany and Latin America: The ten-year partnership between FAPESP, the São Paulo Research Foundation, and the DFG was celebrated on 1 December 2016. For this occasion, DFG Vice President Frank Allgöwer (at lectern) delivered a Leibniz Lecture in which he emphasised the outstanding and exemplary relationship between the two funding organisations. He also noted that the two organisations are linked by very similar funding objectives and principles. "We have a guiding principle in common," said Allgöwer, explaining that the decisive factor in project funding is "scientific quality and nothing else. Another aspect is the shared belief that scientific progress can be made, and insights gained, only through a certain freedom of research." At the ceremony in São Paulo, there were also words of welcome and thanks from (L to R in our photo) the Scientific Director of FAPESP, Carlos Henrique de Brito Cruz, the Consul General of the Federal Republic of Germany, Axel Zeidler, the Vice President of FAPESP, Eduardo Moacyr Krieger, and the Head of the DFG Office Latin America, Kathrin Winkler.



Impressum

german research is published by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation); Publisher: WILEY-VCH Verlag GmbH & Co. KGaA, P.O. Box 10 11 61, 69541 Weinheim, Germany; For the annual subscription rate please refer to the Wiley Online Library: <http://olabout.wiley.com/WileyCDA/Section/id-404508.html> Address of editorial staff: DFG, Press and Public Relations, Kennedyallee 40, 53175 Bonn, Germany; postmaster@dfg.de; www.dfg.de

Editor-in-chief: Marco Finetti (responsible for content)
Publishing Executive Editor: Dr. Rembert Unterstell
Copy Editors: Stephanie Henseler, Inken Kiupel
Translation: oneword GmbH, Böblingen

Printed by: Bonner Universitäts-Buchdruckerei (BUB);
Printed on Inapa Oxygen silk, coated, 100% recycled, FSC certified paper with a semi-matt surface.

ISSN 0172-1518