

ISSUE 19 | 2015

JUNGE  
AKADEMIE  
 MAGAZIN  
ENGLISH EDITION

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DOSSIER

Chance – and where it strikes

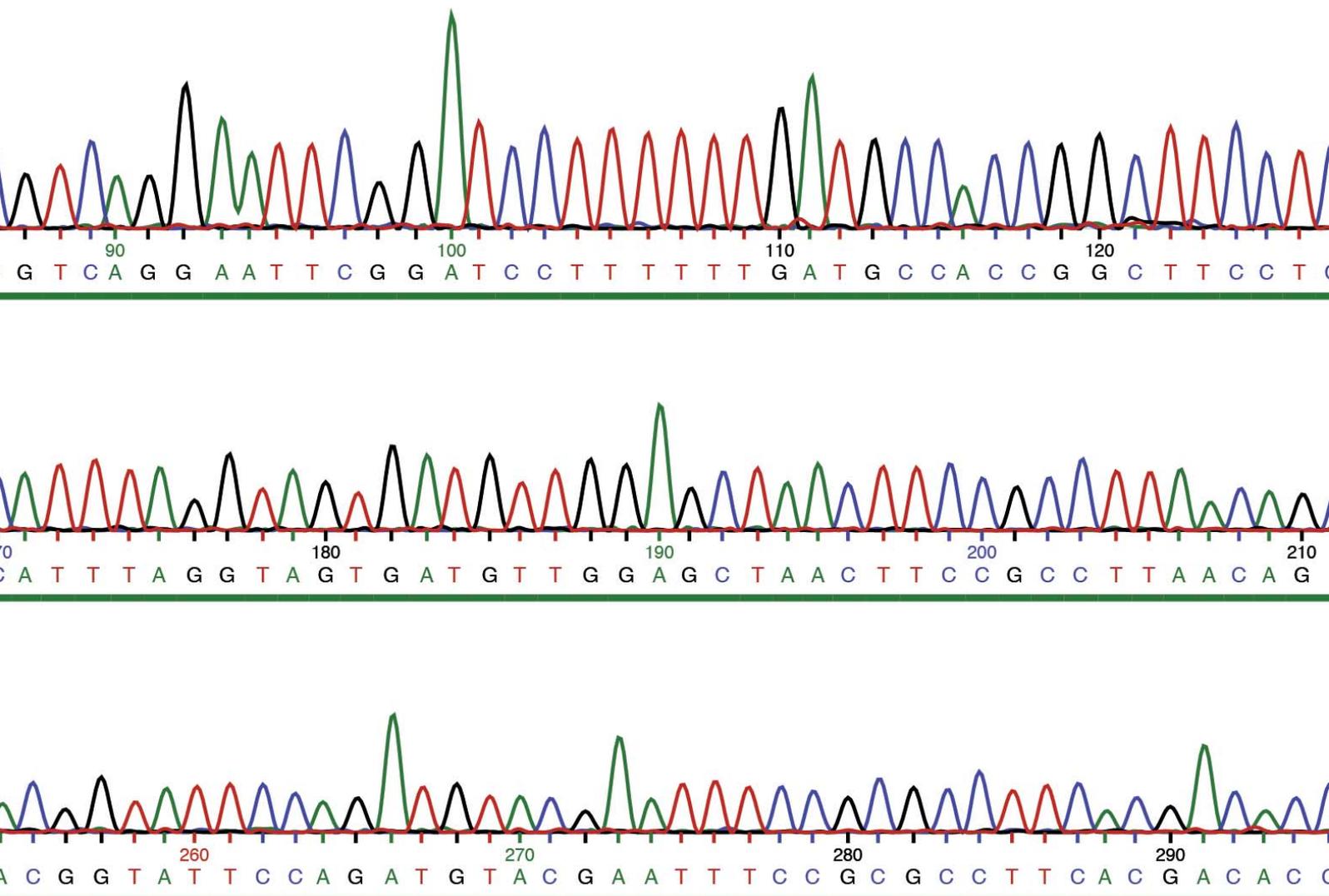
PROJECTS

Peer Review – a simulation game in the pursuit of knowledge

COMMENTARY

German funding policy – heading for randomness?

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## THE JUNGE AKADEMIE

The *Junge Akademie* (JA) was founded in 2000 as a joint project of the Berlin-Brandenburg Academy of Sciences and Humanities (*Berlin-Brandenburgische Akademie der Wissenschaften – BBAW*) and the German National Academy of Sciences Leopoldina (*Deutsche Akademie der Naturforscher Leopoldina*). It is the world's first academy of young academics. The *Junge Akademie* is co-owned by both academies, the BBAW and the *Leopoldina*. Since 2011 it has been firmly anchored administratively in the *Leopoldina's* budget and funded by the Federal Ministry of Education and Research (*Bundesministerium für Bildung und Forschung*) and the *Länder* Berlin, Brandenburg and Sachsen-Anhalt. Its fifty members, young academics from German-speaking countries, engage in interdisciplinary discourse and are active at the intersection of academia and society.

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*It may delight us or fill us with horror; it is a banal, everyday occurrence but by no means uncontroversial in itself: chance*

#### Publisher

The *Junge Akademie (JA)*  
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Academy of Sciences and  
Humanities and the German  
National Academy of  
Sciences Leopoldina

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#### Design

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#### Print

Medialis Offsetdruck GmbH

#### Circulation

500 copies

#### May 2015

© The *Junge Akademie*

ISSN 1863-0367

www.diejungeakademie.de/en

# EDITOR'S LETTER

Have you ever thought of turning poetry into DNA? And then letting it mutate?

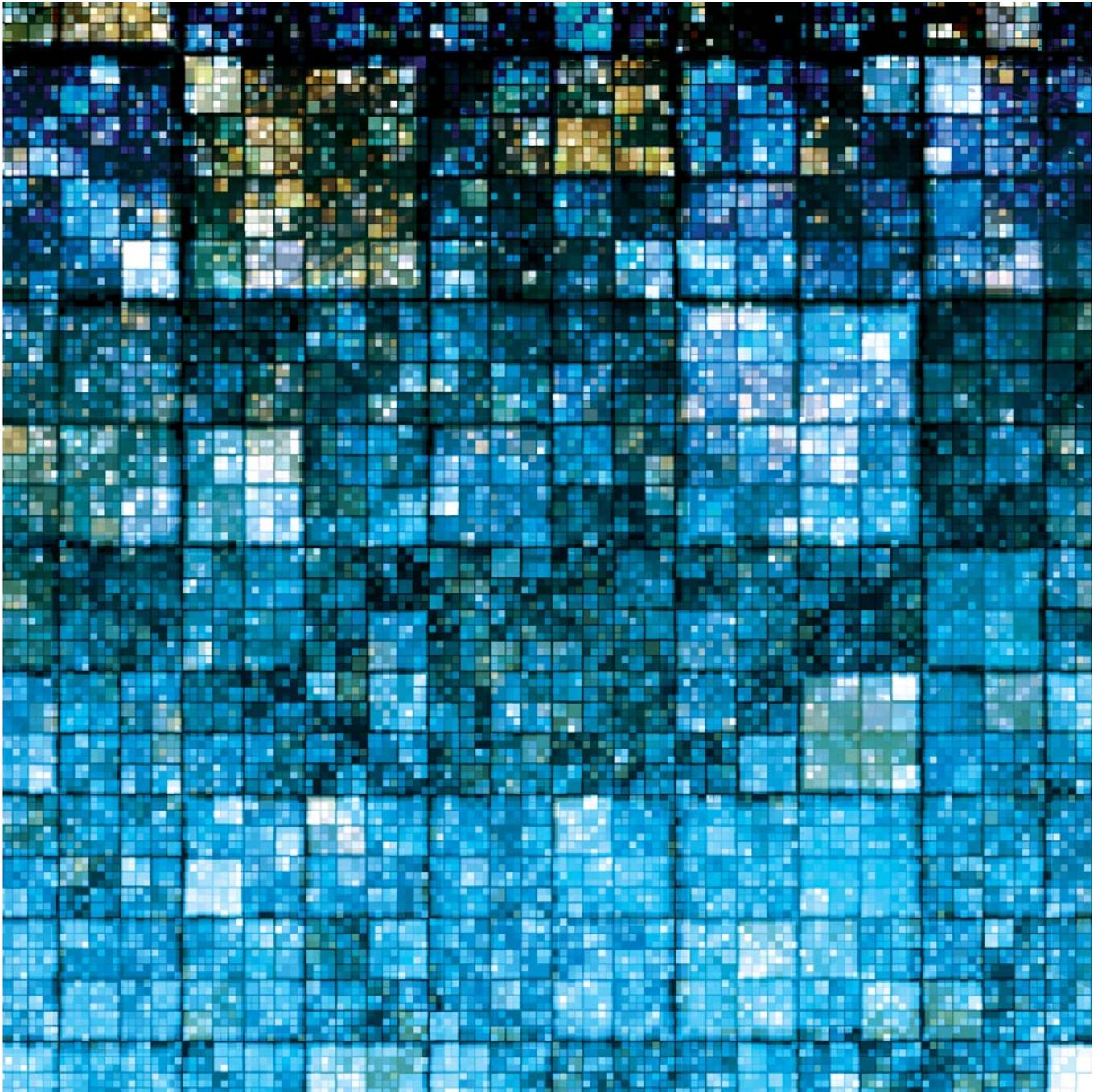
No, nor had we in the editorial office of the *Junge Akademie Magazin (JAM)*. That is, until *JA*-member Tobias Erb came up with the following idea: for a *JAM* exclusive, he worked at home and in the lab to expose a poem, which he had synthesised into a DNA molecule, to random mutagenesis, biologically, chemically and under UV radiation. The aim was to use the different degrees of change in the DNA and thus in the poem to visualise chance. You can see and read about the outcome of the experiment in our Dossier on chance. The extent to which chance plays a role in science is also addressed by other members of the *Junge Akademie (JA)*, involving disciplines such as immunology, electrical engineering and IT, psychology, politics and Big Data, particle physics and neuroscience. And maybe democracy can benefit from chance, too? The legal scholar Emanuel V. Towfigh describes how lotteries can promote public engagement.

Chance fertilises our research. Yet it is extraordinarily difficult to identify. Why this is and what tasks it generates for academia is explained by Wolfgang Gaissmaier, social psychologist, decision researcher and member of the *Junge Akademie*. To what extent the “coincidence of tradition” – the uncertainties of source material – distort our insights was the subject of a conversation between *JA*-member and theologian Katharina Heyden and the historian Arnold Esch.

In the second part of the magazine you will find reports on the activities of the *Junge Akademie's* Research Groups and projects. *JA*-member Gordon Kampe has sonified climate data collected by the geo-ecologist and *JA*-alumnus Alexander Knohl. And should you happen to be in Bielefeld on 29 April 2015, you could attend the premiere. If not, give chance a helping hand, buy a train ticket and head to Bielefeld!

[The editorial team and I hope you will enjoy this issue.](#)

Evelyn Runge



*Big data is supposed to create comprehensive datasets for insights and decisions – is this the end of random (mis-)judgements?*

# FRAGMENTS OF CHANCE

CO-ORDINATION EVELYN RUNGE

Chance permeates our world and our life – and it does not draw the line at science either. Whether in the lab or the vita, in the researcher’s method of approaching a subject, or the subject itself: nowhere is the power of chance totally absent. And thus it is with the choice of the following views on the topic: the only areas discussed are those in which current members of the Junge Akademie consider coincidence. Fragments of chance in every respect – but what better approach could there be to this topic?

ANGELIKA RIEMER

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*Immunologist and Junior Research Group Leader at the German Cancer Research Centre*

## **“Chance” discoveries**

Non-scientists often imagine life in the research lab as very focused, but rather boring: you start with hypotheses, set up experiments to test them and then proceed to confirm them. In reality, more than half the experiments fail to produce the expected results. And it is these very unexpected results that make research so exciting, because this is where the researcher’s curiosity comes into play: you can simply ignore the failed experiment or reject the hypothesis – or you can ask yourself what went wrong and possibly come up with some completely new findings.

Surely the most famous example is the discovery of penicillin. In 1928, the Scottish bacteriologist Alexander Fleming was investigating the pathogens that cause pneumonia. When he went on holiday he left some petri dishes in the lab and when he returned, some of them were covered in fungus. But it was precisely these dishes that were devoid of bacteria. Realising this before he threw away the dishes, Fleming decided to get to the bottom of it: he cultivated the fungus and discovered that it produced a substance that killed a number of bacteria. An ostensibly failed experiment spawned the first antibiotic.

Similar stories can be told about the discovery of x-rays or the development of Teflon and artificial sweeteners. Then there are the chance discoveries about the effects of a drug that was intended for something completely different. Sildenafil, for instance, was originally developed to treat high blood-pressure. Although it was not especially effective, many patients were unwilling to stop taking the tablets at the end of the trials. Under its brand name of Viagra, Sildenafil is one of the manufacturer's biggest sellers.

What do these chance discoveries have in common? Louis Pasteur put it in a nutshell when he commented 'Where observation is concerned, chance favours only the prepared mind.' Scientists therefore need excellent powers of observation, and the ability to think outside the box and recognise new connections as well as a great deal of patience – because the path from a chance result to an established finding, let alone a medication, can be very long indeed.

DIANA GÖHRINGER

*Junior Professor of Electrical Engineering and Information Technology at Ruhr-Universität Bochum*

### **Controlling chance in technology**

In the research lab, coincidence can sometimes be really useful – but in technology, random behaviour is not usually anything to get enthusiastic about. There are exceptions: we need random numbers for cryptographic methods, and chance plays a role in some algorithms as well, like in developing electronic circuits when you are trying to position and wire the components. But as a general rule, what a piece of equipment actually does should be predictable and strictly determined by the designer or programmer. After all, nobody wants the airbags in their car to inflate at will or the autopilot on a plane to start interfering with the flight for no reason.

We require technical systems to be reliable and available. This is called deterministic behaviour. The purely functional aspect – the possibility to brake a car effectively, for example – is often paired with the temporal requirement that the functionality should be available on demand. At this point, chance is completely excluded. We do make a distinction between hard and soft real-time requirements. Hard real-time requirements are particularly relevant in safety-critical systems which, if they fail, could lead to dangerous, life-threatening situations. When it comes to soft real-time requirements, however, there is a certain temporal tolerance margin. Video-conference systems are a case in point – you can accept slight delays in transmission.





When you are developing and programming new technical systems, especially if they involve intensive interaction with physical processes, the real-time capability and availability have to be checked and maintained very accurately. As tests can never cover all possible applications, it is both good and important that we have formal verification methods for electronic systems. Effectively, you can prove the correctness of the function and the real-time capability mathematically. But this is precisely the area where we still have a lot of work to do because modern processors, particularly those with multiple cores, are not always deterministic. In an ordinary personal computer this is not a problem – but it would be fatal to use that kind of computer for highly-critical applications without securing its real-time capability. So in engineering, chance has to be excluded or at least factored in very precisely so that it never has an opportunity to gain any kind of control over the entire system.

CARINA SCHMITT

*Private Lecturer in Politics at the University of Bremen*

### **Chance and big data in Political Science**

In my Statistics seminars I teach my students that, all other things being equal, the higher the number of cases and the greater the volume of information will reduce the statistical probability of error. This means that the more information I have, the less likely it is that my samples will wrongly suggest a relationship between two variables, which is actually just a coincidence. Looked at in this light, big data should be a blessing, destined sooner or later to exclude chance altogether because a statistically significant relationship caused by chance becomes ever less likely.

But the subjective impression gained by the political scientist is quite different. Big data actually seems to promote the arbitrariness of events and encourage coincidence. The impossibility of controlling the enormous amounts of information available creates areas in which chance can have a field day: chance plays a role when selecting appropriate indicators from huge volumes of data or when choosing statistical tools which have become ever more differentiated due to the complexity of big data.

But it is not just arbitrariness that increases – with the ever-growing amounts of data, academic progress – at least in Political Science – seems to be slowing down. Ever more sophisticated methods are used and ever more complex data is evaluated, but the gain in terms of knowledge is often only marginal. Whether this is a random pattern is

difficult to determine. It certainly does not dampen the obsession with collecting yet more datasets – which is not necessarily a bad thing. But it would be good if we could pause occasionally to sort and classify – and put chance in its place.

KRISTINA MUSHOLT

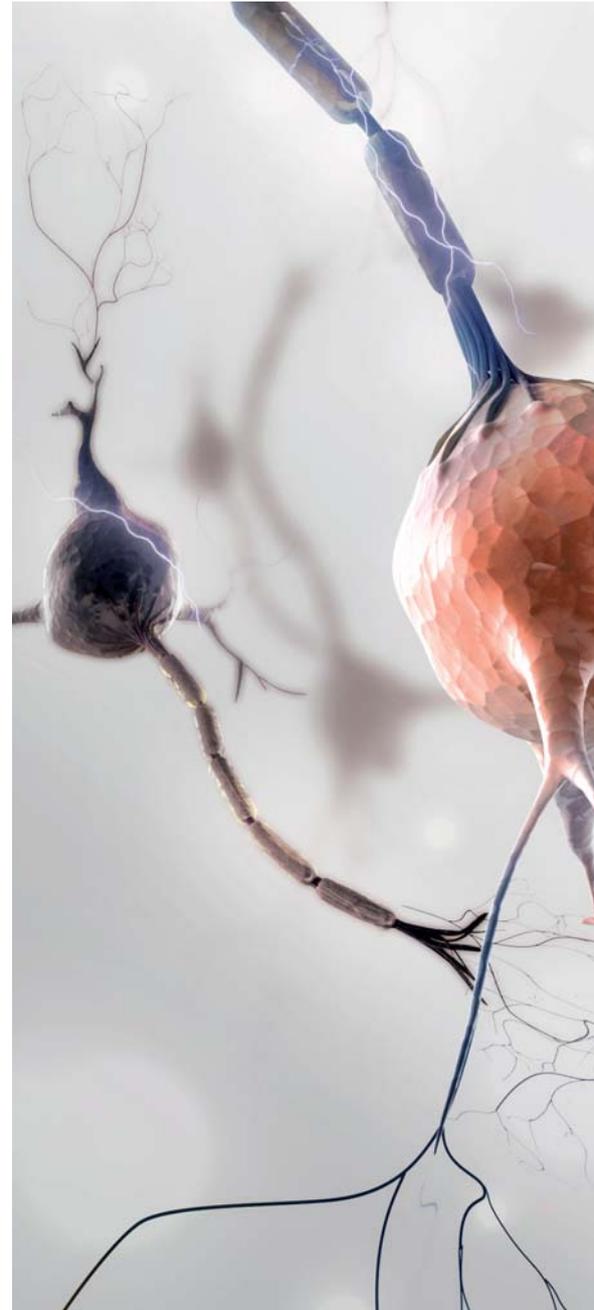
*Junior Professor of Neurophilosophy at the University of Magdeburg*

### **The actions of responsible agents: more than just chance**

For quite a while now, the topic of chance – or rather, the apparent opposite of chance, namely determinism – has dominated the debate at the intersection of Philosophy and Neuroscience. If ultimately our decisions and actions are based on neurobiological processes, and these processes are in turn determined by the laws of nature, how can our actions still be considered free, and how can we be responsible for them? *Prima facie*, it seems as though we are faced with a contradiction: an action can hardly be free if there was no alternative because it was already pre-determined.

But what would be the alternative to determinism? The opposite of determinism is indeterminism – which means chance. Now, let us imagine a scenario, on a quantum mechanical level, say, in which some of our actions were based on indeterminate processes. What would that achieve? Our actions would then be the outcome of chance. But how can we be responsible for the outcome of a chance event? Can I, as an agent, even conceive of an action as being my own if it only happens by chance? Obviously not: an action which is really mine cannot be random but must be the result of my decision as a person.

Which just goes to show that the initial question was ill-posed: instead of considering whether freedom and responsibility are compatible or incompatible with determinism, the philosophically relevant question we need to ask is what makes my actions my own – that is, actions that I can ascribe to myself, justify and stand by? And the point of neuroscientific contribution to the debate about free will should not be to question our freedom but to allow us to gain insights into the neurobiological processes that render free and responsible behaviour possible in the first place.



JAKOB MACKE

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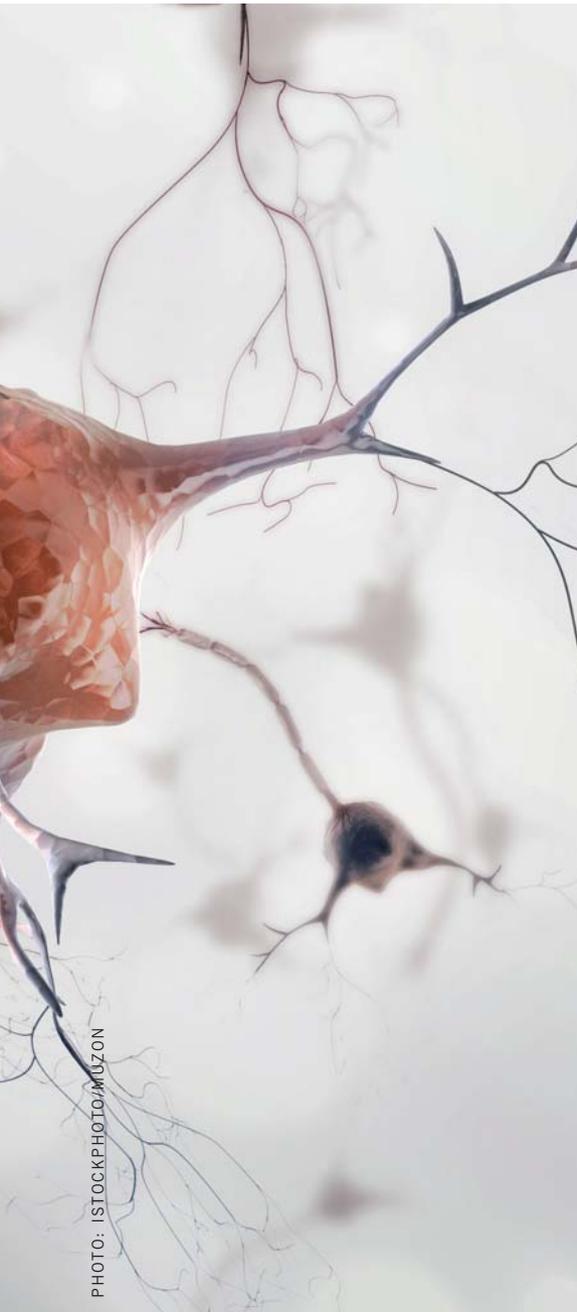
### **Does the brain throw dice?**

Humans and other animals are capable of doing amazing things with their senses. Using the light signals on our retina we can recognise and identify objects literally in the blink of an eye. The underlying calculations take place in the nerve cells which communicate with each other via electric pulses. One would think that these cells would function very precisely to achieve their extraordinary computational capabilities.

However, if one measures the activity of individual neurons in the cerebral cortex, it turns out to be very variable: if one shows the same object several times, for example, the cells do not always respond in the same way; their responses vary – apparently at random. Why is this signal so noisy? Is the apparent unreliability of the neurons simply a biological deficiency? Or is it evidence of our incomplete understanding of the neural code, basically telling us that we do not yet understand the fundamental principles? In recent years, an alternative explanation for the apparent randomness of neural responses has been put forward: Neural variability might help the brain to evaluate the noisy and incomplete input from the eyes and ears.

Our sensory organs do not deliver perfect measurements, and they can only ever capture a glimpse of the world around us. From a shadow, we might be able to recognise that there is an animal sitting behind a tree, but we might be unable to identify what kind of animal it is, or how it will react. We are therefore constantly confronted with the problem of having to make decisions and predictions in a world which (apparently) changes at random on the basis of incomplete information. In order to act optimally in these situations, the brain has to take into account how reliable different sources of information are.

We can now demonstrate that these necessary calculations can be achieved with the help of variable neurons – namely when the random disturbance of each neuron is precisely equivalent to the uncertainty of the information represented by this neuron. Similar principles are used in numerical procedures to represent randomness in statistical models. If this explanation turns out to be true, the apparent randomness of neural signals would not be a biological bug, but a feature which allows the brain to cope with uncertainty about the state of the world.



# SHOULD WE BE RULED BY LADY LUCK?

Compellingly incorruptible: how sortition could make politics more democratic

TEXT REBEKKA HERBERG AND EMANUEL V. TOWFIGH



*In late mediaeval and Renaissance Venice, positions were allocated by drawing lots: Scene on St. Mark's Square (Eugenio Bosa, 1847, oil on canvas)*

Chance has a bad reputation: it is chance that grants the proverbial blind squirrel the occasional nut despite its ineffectiveness; he who lands a chance hit has more luck than judgement. Leaving decisions to chance can only be a last, probably desperate, resort. Recently, a system based on chance caused a public outcry in Germany when the Higher Regional Court in Munich made the press draw lots for seats at the trial of right-wing NSU terrorists. After the first draw ended in shambles, the second was not much better, eliciting a torrent of criticism, complaints and actions. People called it a “game of chance” and a “lottery kiosk” and the overall tenor was quite clear: enlightened people do not leave significant matters to chance. We might just as well consult the oracle.

Our trust in something often depends on whether it has been carefully planned, executed and controlled – thus chance is not a candidate for political decision-making processes. Or is it? In the debate about the weaknesses of representative democracy, the idea of balancing out weak points with random mechanisms keeps cropping up again and again. If we look back in history, we discover that the egalitarian nature of sortition was invoked at an early stage to complement potentially elitist voting systems. Chance’s poor reputation is at odds with the role of random systems both in the history of democracy and in their potential to address current challenges. The strength of the principle of chance lies in its particular rationality: as the law of large numbers reveals, none of the options is favoured or disadvantaged by unforced random decisions. Rather, they lead to neutrality and thus ultimately to genuine representativeness.

### **Ancient Athens: sortition was considered fairer than voting**

In Ancient Athenian democracy, voting was treated with a good deal of scepticism and only used sparingly. The system we favour today for selecting our public officials with its inherent potential to influence the voter was considered less fair and only necessary if the position demanded special expert knowledge. Drawing lots, on the other hand, was seen as a fairer and more democratic selection mechanism. Aristotle reports on problems of corruption, for example, that were solved by holding a lottery instead of an election. The justification given was not some kind of “divine judgement”, but equal opportunities and incorruptibility.

For much the same reasons, sortition was also used in the Italian city-states of the late Middle Ages and Renaissance. To prevent the ruling families from monopolising power, lots were drawn for membership of the councils. Of course, the lot-drawing caught the interest of those not taking part and soon people were placing bets on the outcome: the draw that selected five of 90 noblemen in Genoa in the 16th century thus bred a lottery – to this day, “Lotto” in Italy is played with 90 numbers.

In such diverse political systems as Ancient Athens and the Italian aristocratic republics, the drawing of lots was therefore used to control elites and promote the political equality of those who were considered politically literate. Even though the majority of people did not belong to this group in either of the systems, the reasons for employing the procedure clearly demonstrate that the drawing of lots is a genuinely democratic tool: to achieve the political equality of the people (also) by controlling corruption and containing elites and to link politics to the will of the people are abiding requirements in democratic politics.

Thus it follows that there is something to be said for considering systems based on chance nowadays as well. For many years such systems played a marginal role and were only invoked in a few cases such as a tied vote or to ensure the independence of the judiciary. Today, however, political scientists are giving much thought to the idea of further sortition, and experiments have been conducted at municipal level. These approaches can be roughly divided into those that involve randomly composed citizens’ panels and those that combine random mechanisms with elections or allow for drawing lots to choose representatives.

### **European Commission lottery and voter participation tombola**

For the sake of efficiency, Hubertus Buchstein and Michael Hein suggest reducing the number of members of the European Commission to 15, for example by introducing a weighted lottery in which the more populous countries would have a proportionately greater chance of gaining a seat on the Commission. Other suggestions and experiments posit random systems to reactivate election-weary voters. Lots could perhaps be drawn for the right to participate in the election in order to increase the weighting of the votes. Or a proper lottery could be introduced, in which every vote cast was also a lottery ticket. Improbable as it may

sound, a lottery of this kind was actually held in the context of parliamentary elections in Bulgaria in 2005: voters could win non-cash prizes with their votes in a kind of tombola. Suggestions have also been made to draw lots for election dates to make government function more efficiently and to determine constituency boundaries at random in order to achieve a representative mix of citizens in each constituency.

### Representative advisory platforms

The various types of advisory platform which have emerged over the last few decades, such as Peter Dienel's "Planning Cells" or James Fishkin's "Deliberative Opinion Polls", constitute somewhat older and empirically tested models. They involve publicly-financed groups of citizens who spend several days intensively debating an issue and elaborating recommendations for decision-makers. Random mechanisms guarantee that these citizens' panels are politically egalitarian and representative: all the people living in the respective municipality have the same chance of being selected to serve; the composition of the body thus reflects that of the community.

Bodies of this kind have already been used successfully at local level in a number of places: in urban development in the town of Acre in Israel, which involves co-operation between Arab and Jewish inhabitants, via waste management statutes in Aachen, to land allocation in Weinheim. The scientific findings are encouraging: the acceptance level of political decisions based on citizen consultation is high across the board. In terms of social statistics, greater representativeness and heterogeneity are achieved on a regular basis than by conventional opinion polls, and the advisory groups are less prone to group polarisation. This means that genuinely open debates are being held – an advantage compared to referenda which are often dominated by socio-economic interest groups who have an impact on the results. However, there are findings which show that in heterogeneous groups the views of those with lower social status are accorded less weight; so good group moderation is essential if such effects are to be

avoided. But if the process is intelligently designed, random mechanisms can prevent group interests from gaining an inappropriate degree of influence and ensure that decision-making bodies come as close as possible to mirroring the composition of those they are representing. This is a requirement that modern parliaments, in which the demand is for political experts, cannot meet.

Overall, ideas of this kind, generated by the theory of aleatoric democracy, show that chance is basically an appropriate tool for closing the gap between political decisions and the will of the people by strengthening participation and consultation and facilitating representative assemblies. In an age of increasingly professionalised politics, this could be a good way of enabling the opinions and interests of the people to play a much more visible role in the political process. 

### Further reading:

Hubertus Buchstein: *Reviving Randomness for Political Rationality: Elements of a Theory of Aleatory Democracy*. In: *Constellations* 17 (2010), 435–454.

Hubertus Buchstein/Michael Hein: *Randomizing Europe. The Lottery as a Decision-Making Procedure for Policy Creation in the EU*. In: *Critical Policy Studies* 3/1 (2009), 29–57.

Emanuel V. Towfigh: *Das Parteien-Paradox*, habilitation thesis, University of Münster 2014 (to be published in 2015 by Mohr Siebeck).

Peter Dienel, <http://www.planungszelle.de>

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*Emanuel V. Towfigh, currently Speaker of the Junge Akademie Board, is a legal scholar and Senior Research Fellow at the Max Planck Institute for Research on Collective Goods in Bonn. The political scientist Rebekka Herberg works there as a research assistant.*

# THE (IN-)CALCULABILITY OF THE MICROCOSM

In the world of the tiniest objects, atoms and particles, chance is in charge – and yet it can be calculated using established physical theories

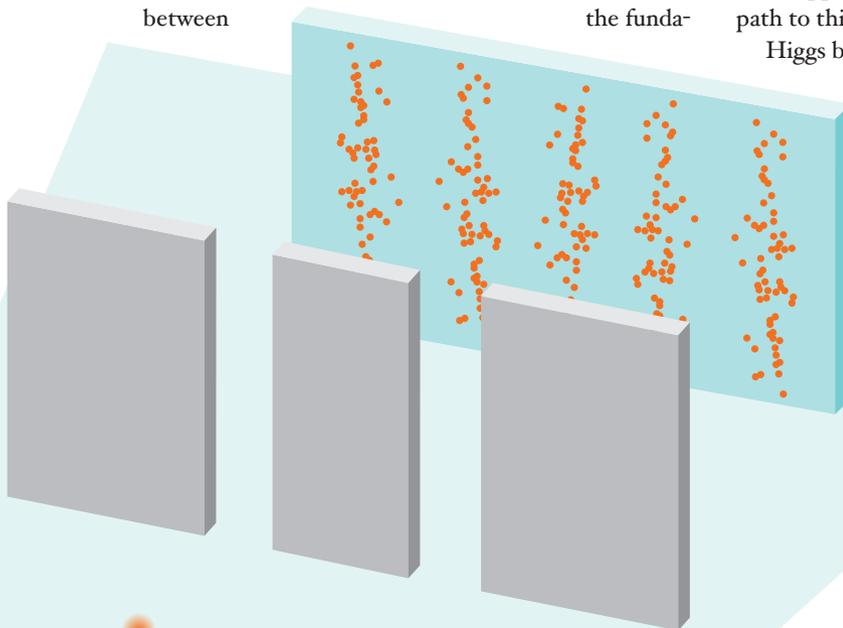
TEXT JENNIFER GIRRBACH-NOE

The main objective of many physicists is to find the “world formula” – that is, one single theory of “everything” from which we can derive all the forces and interactions between the funda-

mental building blocks of matter. This, we are promised, would enable us to know all the immutable rules to which everything that happens in our universe adheres. One small step on the path to this great goal was the discovery of the long-predicted Higgs boson at the European particle research centre CERN near Geneva.

Initially, this does not seem to have anything to do with chance. Rather, to non-physicists, it may seem as though, given the clearly-defined values and formulae for “everything”, the physical processes are basically calculable and predictable, clearly deterministic, and that strictly speaking, chance has no place in the world or at least not in the laws of nature.

Einstein for one was no friend of chance as his famous remark ‘God does not play dice’ reveals. But in this, Einstein was wrong. In the microcosm, chance really is in charge – yet is still to a certain extent deterministic and calculable.



Determinism in Physics means that the initial state of an isolated system (or of the universe as a whole) determines its development for all time – that with complete, precise knowledge of the initial state, one can accurately calculate all later states, at least in principle. Newton's classic laws of mechanics, for example, are deterministic: I can predict the exact trajectory of a ball if I know the initial velocity, direction, airflow/wind and other conditions. Any random capers – like the ball suddenly changing direction without any external intervention – would be frightening and would make ball sports unthinkable.

Even chaos theory – made famous by the butterfly effect – is based on strictly deterministic laws. Only here, even tiny deviations in the initial state cause major changes in later developments. And as we are clearly unable to ascertain the initial state precisely, because tiny measuring errors can never be excluded completely, the system develops in a supposedly random way. According to this theory, the future is therefore incalculable due to our lack of knowledge, but it is still pre-determined. The outcome of throwing dice is a typical example: theoretically, the result could be calculated using Newton's mechanics, but we do not know enough about the initial conditions – for all practical purposes, what remains is basically a random event. Nevertheless, using statistics, we can make statements about it: whilst the outcome of each throw is random, the probability of throwing a six (or any other number) is  $1/6$ . If you throw many times consecutively, the equal distribution of probabilities will be confirmed. If it is not, then the dice are loaded or have not been thrown often enough.

However, classic mechanics, from which these examples are all taken, only has a limited range of validity: at large distances

and low speeds. At speeds approaching the speed of light classic mechanics is replaced by relativity theory and at tiny, atomic distances by quantum mechanics. Whilst relativity theory does not provide any new aspects in relation to determinism, the overwhelming majority of physicists is convinced that chance plays a fundamental role in quantum mechanics. And this is true despite the existence of the Schrödinger equation that makes it possible to precisely calculate the temporal development of a quantum system – so quantum chance and quantum determinism go hand in hand.

### **Counterintuitive, but calculable: the world of particles**

If you are feeling totally confused now, you are in good company: Even Niels Bohr, one of the pioneers of quantum theory, remarked 'If quantum mechanics hasn't profoundly shocked you, you haven't understood it yet'. It is, however, relatively straightforward to unravel this confusion, at least mathematically: in quantum mechanics a physical system is completely described by its wave function – if you know the mathematical constructs, which are usually location- and time-dependent, you basically have all the information about the so-called state in which the system (permanently) finds itself: the temporal development of this wave function can be precisely calculated and is not random.

In the case of a single electron or photon, for example, the wave function is linked with the probability density at a specific location. This is very difficult to intuit as the famous Double Slit Experiment illustrates. In the set-up (see illustration on p. 13), the particle can take two different paths through the left or the right slit. However, the particle's wave function means that a single particle can keep its options open and pass through both at the same time so that it interferes with itself: if you fire individual



electrons or photons through the set-up one after the other onto the screen behind, an interference pattern of the kind you would generally expect in waves will gradually build up.

In quantum mechanics, chance only enters the picture when we take measurements, that is, when we observe the particle on its journey through the double slit. We then get a clear result as to whether it passes through the left or the right slit – only one state survives the superposition of states (and the interference pattern disappears). This is known as the collapse of the wave function. What we cannot predict in the individual case, however, is which state will be measured, and current academic wisdom has it that this is a result of pure, genuine chance – not a result of our lack of knowledge. Unlike the example of throwing dice, this is inherent in the system. And this is the aspect of quantum mechanics that Einstein steadfastly rejected.

### Particle physicists also throw dice

Just as with the dice, however, quantum mechanics does give us a way of harnessing chance with statistical or probability statements: although single events cannot be predicted, if you repeat the measurements often enough a structure emerges – a calculable distribution of probability. In the double slit experiment, if the set-up is symmetrical, it can be shown that the particle will use the left slit just as often as the right slit, so the probability distribution is 50 to 50.

Analogous statements can be made about other quantum phenomena, such as when a particle “tunnels through” a potential barrier although its energy is less than the height of the barrier – as though a marble rolling around a bucket were suddenly to break through the side of the bucket. The probability of such

an event can be precisely calculated using the principles of quantum mechanics, and if there are a lot of particles there will be a constant stream through the tunnel. Despite this, the point in time at which each individual particle does its tunnelling is random.

Even at CERN in Geneva, every collision of particles is to some extent a game of dice: high-energy protons are fired at each other almost at the speed of light in order to produce new matter from the energy in accordance with Einstein’s formula  $E = mc^2$ . What this kind of collision produces is random. Furthermore, most of the particles produced are instable and soon collapse. In total, the number of possibilities as to what can happen is huge – some of them more probable than others. The formation of the Higgs boson is one of the very improbable, that is, rare processes, and this improbability can be calculated in advance. But if you trigger enough collisions, everything that can happen will eventually happen at some stage. In order to be able to observe the rare events at all, you have to study and analyse vast numbers of collisions. If you then have enough data, the probabilities you have calculated will be reflected. So in spite of inherent chance, it is possible to conduct physical research, make unequivocal predictions and run experiments that prove the reliability of your calculations.

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*The theoretical physicist Jennifer Girrbaach-Noe has been a member of the Junge Akademie since 2014. She conducts research at Technische Universität München (TUM).*



# ON FATE AND THE MERCILESS LUCK OF THE LOTTERY PLAYER

From the purposeful to the arbitrary: chance plays an important role in novels – and requires the writer to maintain a sense of proportion

TEXT KAI WIEGANDT

One might say that the novel is the literary expression of chance. The genre has held a central place in western literature at least since Miguel de Cervantes' 1605 work, *Don Quixote* – that is, from the time when the religious interpretation of the world was experiencing growing competition from the empirical knowledge-acquisition methods of the natural sciences and sceptical thinkers like Michel de Montaigne, who chose neither to formulate general truths about people nor about himself. Whoever knows what he will believe, think and feel tomorrow? From conversations with sailors and a Brazilian cannibal, Montaigne discovered that life on the continent of South America was governed by rules that were different, but not necessarily worse, than his own. If France had not been a foreign, perhaps strange country from his, Montaigne's, point of view, would the forefathers' other random moods and interests have prevailed?

It was not least the discovery of distant worlds from the 16th century onwards that opened up a wealth of possibilities for interpreting the world. In Europe, such contradictory options gave rise to the suspicion that the orders which had been perceived as given could actually be historically and geographically determined and were therefore more random than one would like to believe. Novels deal with many issues, but always with this conflict, too. The randomness of the conditions and the life events portrayed in them are sustained by the ending of the novel which in retrospect makes sense of every random event, even if it is only aesthetic sense. In the novel, instead of a fate ordained by God, chance can step in, revealing itself at the end as a necessary event or the intention of the author. The fact that

novels can both accommodate chance and transform it into an order can have its social uses. Literary scholars have tried to show that the social function of the novel in the 19th century was to channel the randomness of life into seemingly inevitable stories and to break down the complexity of social reality into more or less predictable plots.



*Chance should be made manifest: B. S. Johnson with the loose, unnumbered chapters of his novel *The Unfortunates* (1969)*



Can a novel do anything other than imply that there is purpose behind the randomness? In the 20th century, various avant-garde movements identified a problem in the insularity of the novel, which aesthetically glosses over the aspect of chance, and responded with alternative forms such as Marc Saporta's *Composition 1* (1962), which turns the novel into a game of cards, or B. S. Johnson's *The Unfortunates* (1969) – “a novel in a box” – in which the reader determines the order of the chapters. These experiments reflect writers' discomfort with the form of the novel that robs chance of its temporal dimension by immobilising it in the juxtaposition of the words; that simulates an order which is just as arbitrary as that of the alphabet.

### Chance or divine judgement?

It is quite possible that the tension between chance and order in the novel is one of the reasons why many novels are about chance. When gamblers challenge chance and God in Dostoyevsky's novels, the novels are also about themselves. Texts that deal with chance very often turn to religious themes. In a novella by Heinrich von Kleist, a duel is supposed to bring about divine judgement. One of the duellers injures the other within a hair of his life but only sustains a scratch himself. However, the loser recovers whereas the victor's wound goes septic and eventually kills him. Whether this is seen as chance or divine judgement depends on who the victor really is. Robert Musil features a man who watches an aerial flechette being dropped from a plane above him – a common weapon in earlier days that was, however, soon withdrawn due to the unlikelihood of it hitting the target. The man stays where he is in the middle of an open field instead of taking cover. Would it be fate if the arrow hit him? And if it did not, just luck?

A more modern example of a novel that deals with the tension between chance and order is J. M Coetzee's *Disgrace* (1999), the title of which contains the Christian opposite of chance: grace. Grace is an act of God which occurs unexpectedly and

undeservedly and which is not always immediately recognisable as grace because the unexpectedly happy effect may only occur at a later stage. In retrospect, what had appeared to be random about the unrecognised act of grace is actually divine intention. The blows of fate experienced by the protagonist David Lurie and his daughter in this novel can be interpreted as punishment designed to bring Lurie back onto the straight and narrow: in doing so, it thus becomes recognisable as grace. It is, however, possible that misfortune is just precisely that and luck is but the merciless luck of the lottery player.

The oppositions cited here could create the impression that ultimately, chance and order cancel each other out in the novel. But a novel in which everything appears to be intentional seems contrived, false and artificial, which is also true of one that is governed by chance alone – although chance is no less capable of shaping everyday life. While it is presumably precisely the inability to differentiate everyday experiences that makes this kind of novel seem unrealistic.

### The novel needs chance to make it credible

According to the literary theorist Roland Barthes, novelists create reality effects when they sprinkle intention-driven action with details and events that seem random because they do not serve a recognisable function. The most credible stories appear to be those which contain enough elements of the extraordinary and random to prevent a clear intention from shining through, but not so many instances of chance that they seem unrealistic. If you are going to assert the power of fate or determinism you have to proscribe chance in order to remain credible; the novel, on the other hand, even if not every novel values credibility, needs chance to make it credible.




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*The English scholar Kai Wiegandt conducts research at Freie Universität Berlin. He became a member of the Junge Akademie in 2014.*



# INEVITABLE DISASTERS

Anyone dismissing extreme weather events as random events denies the role of human impact

TEXT JADWIGA R. ZIOLKOWSKA

According to the common definition, a coincidence is an unforeseeable, unintended and/or unexpected event. If we want to define the concept of "coincidence" in scientific terms, we turn to probability theory which represents chance events and stochastic processes with random variables. A probability density function then tells us the probability that a random variable will take on a certain value. For example: if we toss a coin ten times in a row there is a 25 per cent probability that we will throw heads five times, and a diminishing probability of throwing heads four times, three times and so on (binomial distribution).

It therefore follows from this mathematical description that if we repeat the experiment (tossing a coin ten times in a row) often enough, even a more improbable random event (such as throwing heads ten times) will occur at some stage. The fact that this happens is then not random, but to be expected – the only thing that is random is how many tries it takes. Now, probability theory can be applied to many fields such as weather forecasting, including extreme weather events, earthquakes and natural disasters. But in this case the difference between what is to be expected and what is random often gets confused.

In the course of societal and technological development, humankind has learned that certain human activities can increase or reduce the probability of natural disasters. As the signing of the Kyoto Protocol in 1997 and the declared intention of many countries to reduce CO<sub>2</sub> emissions show, we humans recognise

the impact we have on the climate and hence on nature. We are more than able to induce or hinder certain weather events. Something that would have been understood as coincidence a few decades ago is now seen as part of a chain of causality in which human action is an important factor. Nonetheless, we still tend to describe certain weather events as random. And at least one of the reasons for this is that we cannot – or perhaps do not wish to – completely grasp the extent and impact of human actions.

## The impacts of human actions on nature

Huge storms are another example. Everyone remembers Hurricane Katrina in 2005 and the subsequent flooding in the southern states of the US. At least 1,833 people died in this disaster, while the property damage was estimated at around 108 billion dollars. Since such devastating disasters do not occur very frequently, many people tend to describe them as random events. They forget – if they do not deny the impact or even the existence of climate change in the first place – that precisely this human-induced climate change favours such extreme events. Consequently, when it comes to finding reasons for natural disasters, diverse opinions are expressed.

Third example: in the last few decades, the number and magnitude of earthquakes in Texas and Oklahoma has increased considerably. Scientists are seeking to corroborate the hypothesis that this is a result of extracting oil and natural gas by fracking. When you force water, sand and chemicals below ground at very



PHOTO: JUSTIN1569/EN.WIKIPEDIA.ORG (CC BY-SA 3.0)

*Pure chance? This tornado destroyed several houses in Elie (Canada) in 2007*



high pressure, this may, in combination with unknown faults in the deep rock strata, trigger earthquakes. However, while scientists and environmental activists predict further disasters, many people remain unimpressed by the quakes that have taken place. Of course, earthquakes do often have natural causes when tectonic plates collide. Quakes of this kind occur relatively regularly, can be roughly predicted and are therefore to be expected. In the San Francisco area, for example, we know that serious earthquakes occur approximately every 100 years; the last was in 1906, so the next “big one” is due any time. However, fracking increases the probability of more frequent earthquakes and thus of a potential disaster.

These examples demonstrate that natural disasters are often not random events in the sense that they occur completely unexpectedly and unpredictably – but this is precisely what some people still believe. We as humankind shape the image of the earth by our actions and activities. Therefore what we should be doing is emphasising the causal connection between natural disasters and our human actions. 

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*Jadwiga R. Ziolkowska is an agricultural economist and an Assistant Professor at the University of Oklahoma. She has been a member of the Junge Akademie since 2012.*

# WHEN CHANCE DOES NOT SEEM RANDOM ENOUGH

## Misperception of chance: inevitable by-product of evolution?

TEXT WOLFGANG GAISSMAIER

***“We’re making it (the shuffle) less random to make it feel more random”***

*Steve Jobs*

Steve Jobs gave us the iPod, and the iPod has a shuffle function which plays songs in a random order. ‘Life is random’ according to the Apple spot. But for many users the shuffle was not random enough. They complained to Apple that their iPod had favourites and often played songs by the same artist or from the same album several times in succession.

A programming error? Not at all. Mathematically speaking, it is indeed precisely what we can expect of pure chance: clusters of events which intuitively do not look random at all. But Steve Jobs would not have been so successful if he had simply dismissed the customers' complaints as irrational. So the shuffle function morphed into a “smart shuffle” which allows the user to reduce the probability of playing a number of songs by the same artist or from the same album several times in succession. But that of course is anything but random, although it feels more like it, as Steve Jobs observed so wisely.

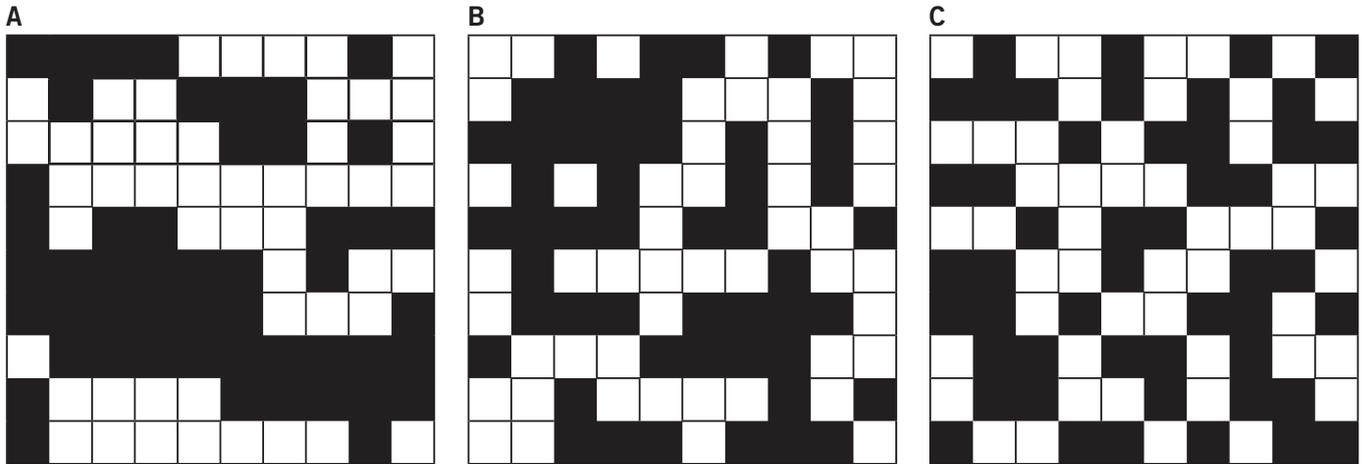
This pertinent remark by the long-standing CEO of Apple elegantly sums up ampler research which shows that the sequences of events that people perceive as random are actually those that have disproportionately frequent random alternations, meaning that they switch between the various options more often than chance would allow. In psychology, this phenomenon is referred

to as the “misperception of chance” and can best be illustrated by repeatedly throwing a coin: you take two people or groups (this works well in a seminar) and tell the one side to toss a real coin a hundred times and note down the results in the order observed; the other side does the same experiment in their heads, throwing an imaginary coin and also noting down the results. Usually, you only need to glance at the results to determine who did which experiment. Amongst the results for the hundred real throws you will find a series of clusters, or streaks, which do not appear to be the least bit random, such as heads coming up five times in succession. The results of imaginary coin throwing contain far fewer clusters of this kind because they simply seem improbable and are therefore corrected – with the result that fewer are finally noted down than chance would dictate.

### **After five reds, it's black's turn!?**

To put it another way: we wrongly expect chance to distribute events equally – in proportion to the respective basic probability – even in a short run. If the probability of two events is 50 per cent respectively, we want to see a ratio of 50/50 in short sequences, too. The more frequently one of the events occurs in succession, the greater the probability, we wrongly surmise, that now the other event must occur. Anyone who has ever played roulette knows the feeling: after five reds, it seems to be more probable that it is now black's turn – even if we actually know that the events are independent of each other. This phenomenon is called the gambler's fallacy and is, indeed, particularly common amongst people with a gambling addiction; they often suffer from the illusion that they will beat the bank in the end.

## Which grid is most random?



*Illustration of a classic experiment on the perception of chance. Solution and explanation on the next page*

So although everyone basically finds it difficult to accept chance as an explanation, some people find it more difficult than others. Apart from those addicted to gambling, people with religious or other paranormal beliefs are, for example, more prone to discovering illusory patterns in random sequences. Hence the assumption that misperception of chance at least contributes – along with other factors, of course – to the development of complex supernatural worldviews.

The misperception of chance is thus a phenomenon with implications going well beyond iPods and casinos. It is also very robust: even people who know about it are susceptible to misperception. But where does it come from? And why have we not conquered it in the course of evolution? There is no exhaustive answer to this question, but it is very instructive to view the problem through the lens of signal detection theory. To put it simply, we can find ourselves in a situation in which there really is a pattern (“signal”) to be discovered, such as a regular sequence; or we find ourselves in a situation in which there is no pattern (“noise”), that is, a series of events is genuinely random. In order to be successful, people have to recognise real signals (“hits”) and reject noise for what it is (“correct rejection”). This classification can lead to two mistakes: on the one hand, we may miss real patterns (“misses”);

on the other, we may set off a “false alarm”, that is fall victim to an illusory pattern.

### Programmed to recognise patterns

Seen from this angle, misperception of chance can be understood as a low threshold for interpreting a sequence of events as regular (“signal”) instead of random (“noise”). On the one hand, this leads to a high hit rate in regular sequences but increases the risk of false alarms, that is, illusory patterns on the other. If the hreshold were high it would be the other way round: we would miss many real signals while only rarely setting off a false alarm. The reduction of one error increases the other – a delicate balance. So a high hit rate and a susceptibility to false alarms are two sides of the same coin. This assumption has been backed up by studies demonstrating that those who are particularly susceptible to misperceiving chance are the same people who are best at tracing actual regularities.

In general, humankind seems to be programmed to recognise patterns and to put up with the existence of illusory patterns. Perhaps if we look at it in evolutionary terms, a higher price had to be paid for missing existing regularities than for setting off false alarms. Furthermore, in our natural environment – unlike

# SHOT, SOVEREIGN

The history of photography is a history of chance

TEXT EVELYN RUNGE

on our iPods, in casinos or psychology labs – random sequences of events are probably the exception. This neither renders the misperception of chance in itself as neither rational nor a selective advantage. But it shows that we cannot simply dismiss it as irrational, as much of the literature tends to do. Rather, it seems to be an unavoidable evolutionary by-product of an otherwise useful process of pattern recognition that is worth the price.

Of course this does not mean that as rational individuals we must or should simply resign ourselves to the misperception of chance – particularly in academia it is important not only to enhance the recognition of actual patterns but to uncover illusory patterns for what they are. ✿

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*Wolfgang Gaissmaier is Professor of Social Psychology and Decision Sciences at the University of Konstanz. He became a member of the Junge Akademie in 2012.*

✿ The most random grid is actually B: the probability of a change of colour from one square to the next approximates most closely to what would be expected if the choice of colour for each square were completely random. However, test subjects confronted with a large number of such grids regularly categorised those like C, which have a disproportionately high probability of change, as more random – as they saw it, the clusters of black squares in Grid B simply appeared too crowded together to be random.



*Elderly couple with a young female spirit (William Hope, c. 1920)*

### I Dark/room

In William Mumler's self-portrait two people can be seen: Mumler himself – and behind him a woman, ghostly, ethereal. His dead cousin! Of this, the jeweller and amateur photographer Mumler was sure. What a goldmine – his contemporaries came to his studio in droves to be photographed with their dear departed. In the 1860s, Mumler made a profession of spirit photography until he was taken to court for fraud.

It was chance that led Mumler to discover spirit photography. His cousin had not really returned; instead, Mumler had failed to clean a previously-used photographic plate properly. The spirit was a double exposure.

### II Event/real time

The relevant role of chance in the 21st century seems to be less about technical matters than about turning everyday randomness into a photographic event. The art historian and philosopher, Georges Didi-Huberman, speaks of the dual functionality of the image, which expresses itself in presentation and representation and in crossing the boundary between fascination and horror – as in January 2009, for instance, when one of the first photos to cause a sensation on Twitter was the emergency landing on water of an Airbus A320 in New York City. Janis Krums was the first person to post a photo in a tweet (<http://twitpic.com/135xa>). His text message – or perhaps one should say personalised caption commentary – was 'There's a plane in the Hudson. I'm on the ferry going to pick up the people. Crazy.'

Since then, more than a million people have called up the photo. 'Chance is the miracle of the photographic image: not fixed and yet present' says the photo historian Timm Starl. 'It refers to both the moment of exposure, which creates it, and the moment of viewing, which is at its mercy.'

### III Chance/automated

'The Narrative Clip. Capture, store and relive special moments with the world's smallest wearable camera.' Memory capacity: 4,000 images; weight: 20 grams; battery life: two years – and at 36x36x9 mm only a little larger than an old photographic negative. The Narrative Clip takes photos of everything it sees, one picture every 30 seconds. You can only stop it taking pictures

if you cover up the lens. Clipped onto your clothing, it records your jogging route, journey to work or family get-together. Or the canine view if the little camera is fixed to a dog's collar.

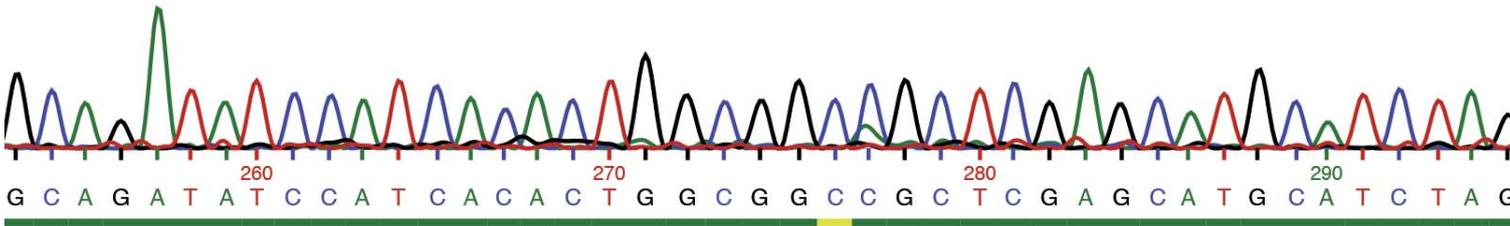
In 2012, a Swedish team tried to raise 50,000 dollars to develop their "Memoto Lifelogging Camera" by crowdfunding; 36 days later, they had 550,000 dollars in their account. The camera has now been on the market since 2014. The sovereignty of the Narrative Clip is that it takes shots automatically which, according to the promotion video, makes every image into a recording of life as we live it. Geotags and a timeline mean every image can be located. Nothing left to chance? 

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*Evelyn Runge has been a member of the Junge Akademie since 2011. She conducts research in media studies at the University of Hildesheim.*



*'Crazy': Janis Krums happened to be present when the passengers were evacuated from an airbus that made an emergency landing in the Hudson River in January 2009.*



# THE TRANSIENCE OF BEAUTY

## Visualising DNA mutation in a lab experiment: how biological chance distorts an aphorism

TEXT ULRICH PONTES | GRAPHICS TOBIAS ERB

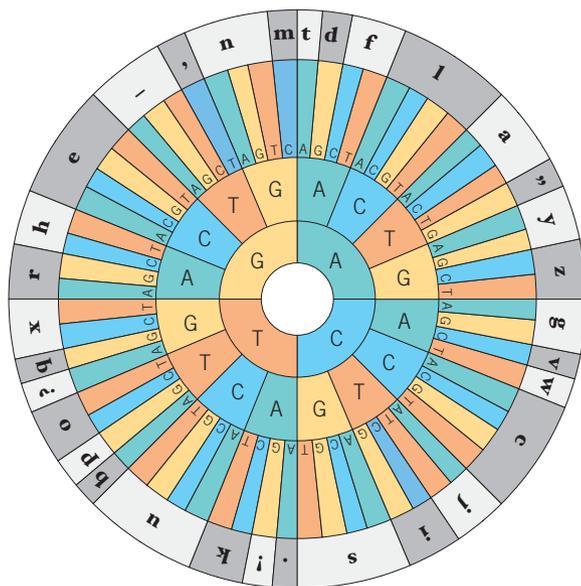
*His research is located somewhere between control and chance: as a synthetic biologist, JA member Tobias Erb works with bacteria. He wants to determine and preserve their properties as precisely as possible. However, like all living creatures, bacteria are not perfect. During replication – copying genetic material – mistakes sometimes occur which cause chance mutations in the DNA sequence.*

**Tobias Erb:** In Biology, this element of chance really does exist – it is implicit in the copying mechanism. But there is also a biological reason for it: if mistakes never happened, evolution, adaptation to the environment, could not take place. So we might say that the enzymes that replicate DNA are as perfect as possible but also as slovenly as necessary. Under normal circumstances, one mutation occurs every ten to one hundred thousand replications.

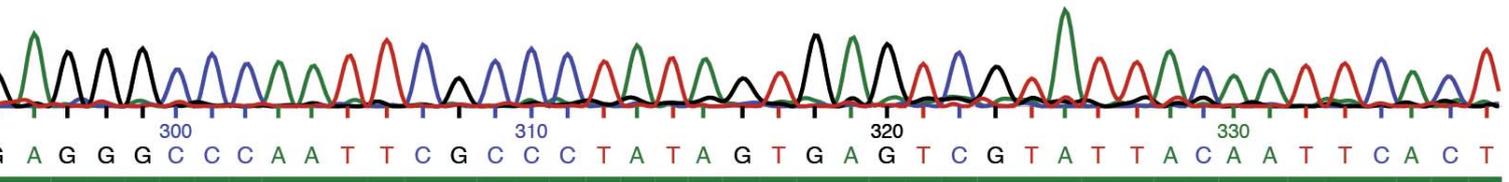
*The idea of recreating this natural mechanism in a lab experiment in order to visualise chance caught Tobias Erb's imagination. He conducts research at the Max Planck Institute for Terrestrial Microbiology in Marburg. And given that biologists see DNA as a genetic code, a kind of secret language, a second thought was not long in coming to him either.*

**Erb:** I had the idea of translating a short poem into DNA. On paper this is an easy thing to encode: DNA is composed of four different building blocks, the bases. For a sequence of three there are 64 different options – enough to encode the alphabet and punctuation. Of course, there are also redundancies, just as there are in biology: frequently-occurring amino acids can also be represented by several different combinations of bases.

*Today, the poetry DNA that was calculated on paper can even be used to synthesise an actual molecule: specialist manufacturers will produce any sequence you like, explains Tobias Erb. Then you can introduce the poetry DNA into a bacterium and let it mutate biologically. For practical reasons, he chose an aphorism by Novalis and a quotation from Friedrich Dürrenmatt for his experiment. And instead of waiting for it to keep dividing in a petri dish, Tobias Erb put the whole of the DNA replication machinery into a test tube.*



*Translation of character strings into DNA and back again: the genetic code chart assigns a letter or punctuation mark to every possible combination of three of the DNA building blocks A, T, C and G – “t” is thus encoded by the sequence AAA; “f”, which occurs rather more frequently in the original text, by AAC and AAT.*



*An approximation of the test results: the mutated DNA sequence is read out by specialised firms – what emerges is a so-called sequencing chromatogram that can be decoded with the help of the genetic code chart*

**Erb:** In order to speed things up, I replicated the DNA in vitro by polymer chain reaction (PCR), but only using the normal enzymes in the bacteria. Or to be more precise, I first of all propagated the original substance and then tried to systematically increase the mutation rate – on the one hand by exposing it to UV light and on the other, biochemically, by changing the combination of salts in the PCR. In the first case you would expect a moderate increase in mutations, in the second, a massive one.

*Methods like this that set out to boost elements of chance are also used in other contexts to achieve high mutation rates – for investigating the function of individual genes, for example, or for propagation purposes. And, as Erb's experiment shows, the methods work – biologists really can reinforce chance. Minimisation, by contrast, as the experiment also demonstrates, has its limits: unexpected, explicit errors found their way into the sequence in the first replication. What now? Tobias Erb hopes to be able to take the experiment further still.*

**Erb:** I have introduced both the less and the more mutated sequences into E. coli bacteria in the form of extra-chromosomal DNA and then frozen them. One could leave them there to propagate and analyse them every six months. The text will probably disintegrate more and more. This DNA sequence is of no practical use, it only has a kind of aesthetic value, so there is no selection pressure to preserve it. It is a different story with genes that are resistant to antibiotics or help bacteria to better utilise a certain sugar – which is an explicit advantage in the evolutionary struggle. One could claim that practical things endure whilst beauty melts away.

#### Original:

„auch der zufall ist nicht unerguendlich, er hat seine regelmaessigkeit.“ novalis (even chance is not unfathomable, it has its regularity.)

#### After one DNA amplification:

„auch **fmr** zufall ist nicht unerguendlich, er **hat** seine regelmaessigkeit.“ novalis

#### After exposure to UV light:

„auch **fmr** zufall ist nicht unerguendlich, er **hat** seine regelmaessig**w**sit.“ novalis

#### After disrupting the replication machinery by changing the salt combination:

auch **fmr** zufal**l**.“ **wriedrich duerrenmattnuoil  
gnsaigualiceesexalyegoej!?**

*The quotation and the results: blue indicates the mutations that do not alter the encoded letters; red stands for obvious mutations. The UV light causes some mutations whilst the salt concentration is responsible for massive mutations. The sudden appearance of Friedrich Dürrenmatt is explained by the fact that two quotations were encoded in the DNA sequence, and an excerpt from one apparently mutated into the other.*

# THREATENED PROPORTIONS OF UNDERSTANDING

## Chance as a methodological problem for historians: a conversation between a theologian and a mediaevalist

INTERVIEW AND PHOTOS KATHARINA HEYDEN

*It was chance that their thirst for historical knowledge took Arnold Esch and Junge Akademie member Katharina Heyden to the same cities: Göttingen, Bern and Rome were the places chosen by the historian and the theologian, albeit at different times. Whilst it is impossible to draw any scientific conclusions about historical chance itself, there is much to be said about the uncertainties of the source material. In this written conversation, the two academics consider this kind of chance, which they and their colleagues are bound to face and need to reflect on.*

**Katharina Heyden:** In the State Archive of Bern there is a group of files bearing the delightful shelfmark “U.P.” – “useless papers”. These are documents that were actually supposed to be thrown away but were inadvertently forgotten. The people responsible simply failed to dispose of the bin bags. To what extent are sources like this relevant for historians today? Does the fact that these surviving sources are random enhance the insights to be gained from them?

**Arnold Esch:** Let us start by classifying the archival fonds you mention in terms of the potential of historical sources as a whole. These files were not supposed to be passed down but merely served the present; that was why they were declared “useless” and supposed to be disposed of. But so much time passed that a new generation came along which discovered an interest in researching precisely these kinds of everyday business files (not in the context of a state treaty) and let them stand alongside the prevailing narrative tradition. What this tells us is that a source, a discovered source, must respond to a research interest,

otherwise that source (particularly one that is just left over from some business or other and is not a conscious narrative source) will remain silent – effectively, the random find remains unfound.

**Heyden:** Most researchers are probably aware, at least in theory, that any historical knowledge can only reproduce a fragmentary picture of past realities due to the selection of sources, even if this is not always the way they actually work. You have introduced a differentiation into the study of history between what you call the “chance of tradition” and the “coincidence of tradition”. To what extent does this help us to say more than simply that all knowledge is fragmentary?

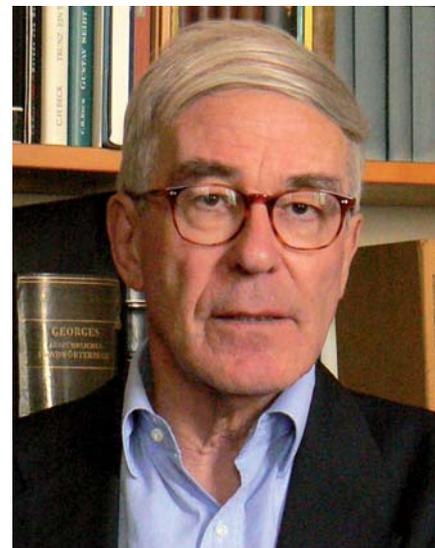
**Esch:** Basically, everyone realises that the image of past realities we derive from sources is fragmentary. And what gets lost on the way is often ascribed to coincidence, without giving much thought to the matter. Historians, however, should try to suppress the idea that coincidence can explain things and, where possible, look for rational explanations for losses, distortions and asymmetries in tradition. One way of doing this is to opt for the “chance of tradition” rather than the “coincidence of tradition”, that is, to realise that people, events and files do not all have the same chance of being passed down to posterity and thus becoming known to the historian. This in turn uncovers a disturbing issue: what becomes clear is that it is not a case of “a little bit of everything” surviving, rather, tradition is revealed as patchy, and this patchiness not only reduces the volume of our knowledge but distorts the proportions of our understand-



## THE THEOLOGIAN

*Katbarina Heyden, born 1977, studied theology in Rome, among other places. Like Esch, she completed her Habilitation in Göttingen, specialising in church history, and moved to the University of Bern in 2013 to take up a professorship in Ancient History of Christianity and Interreligious Dialogues. She has been a member of the Junge Akademie since 2012 (for a detailed portrait see JAM 15, 2013).*

ing. Let us consider a couple of examples from the mediaeval manuscript tradition: if legal documents from the period when the people were successfully opposing the Bishop and creating the first free parishes only document the victory of the church, then something is clearly wrong somewhere – tradition must have determined that the records of victory have been preserved better by the church than by the laity. If the private records of a significant trading city only contain documents about land dealings and not commercial transactions, then something is clearly wrong somewhere – tradition must have determined that whilst the records of land ownership (which were of long-term importance) were preserved, those of trading activities (which were completed by a specific date) were not. Which means that the unequal chance of tradition makes the Middle Ages seem more ecclesiastical and more agrarian than they were anyway. Once you have realised this, or that the sinking ship is more likely to feature in the sources than the one that arrives safely, or that the bad bill of exchange is more likely to be remembered



## THE HISTORIAN

*Arnold Esch, born 1936, completed his Habilitation in Göttingen, before taking up a professorship in Mediaeval History at the University of Bern. From 1988 to 2001, he was the Director of the German Historical Institute in Rome. His research focuses on the Italian history of the High and Late Middle Ages but also includes significant contributions to historical methodology and theory.*

than the good one, you can start to rectify the distortions and steer the debate in a different direction. You cannot do that with coincidence.

**Heyden:** We are talking about the proportionality of historical insight. You once compared the claim made by many historians that they record history exemplarily to a children's game of throwing darts at a wall and then drawing a target around any chance hit afterwards. We like to imply that we have got to the very heart of a matter and do not mention the fact that our knowledge of the sources often derives from a chain of chance events and coincidences, and that we simply do not know anything about the context. But what reference points would we have to better describe the white walls on which we pin our insights?

**Esch:** Every historian must be allowed to claim that he or she records history exemplarily. My reservations are merely directed at some of the "case studies" that blow up small, random findings

into entire world explanations without sufficiently considering the sustainability of the source. *Mundus in gutta* is all well and good, but not every drop contains a world. We should declare what we cannot know much more openly – and more modestly. Or, to answer your question directly: if you cannot cover the white walls, you should not paint the concentric circles of a world explanation all over them, but leave them blank or only add the paler colours of the restorer.

**Heyden:** We can at least reconstruct and describe the chances of tradition to some extent. You mentioned examples showing that tradition favours the unusual rather than the usual and that the historical selection of sources makes the Middle Ages appear more agrarian and ecclesiastical than they were anyway. So how can historiography accommodate the coincidences of tradition?

**Esch:** If the chance of tradition relates to the formation and expression of tradition (some things never become part of tradition, others are scaled up or scaled down), the coincidence of tradition refers to the inventory of tradition: war, flooding and fire drastically reduce the original sources. Whilst the chance of tradition is something we can halfway calculate, coincidence, blind as it is, randomly strikes anything that happens to be in its path. Coincidence does not pursue any ends and thus does not intervene in the proportionality of our insight. But it often remains completely unclear what has actually been lost, and the danger is that we do not recognise the fragmentariness and re-frame the fragmentary as a whole. We do, however, tend to bargain more with the impact of the coincidence of tradition than with that of the chance of tradition; but it is chance that provides historiographical knowledge, not coincidence.

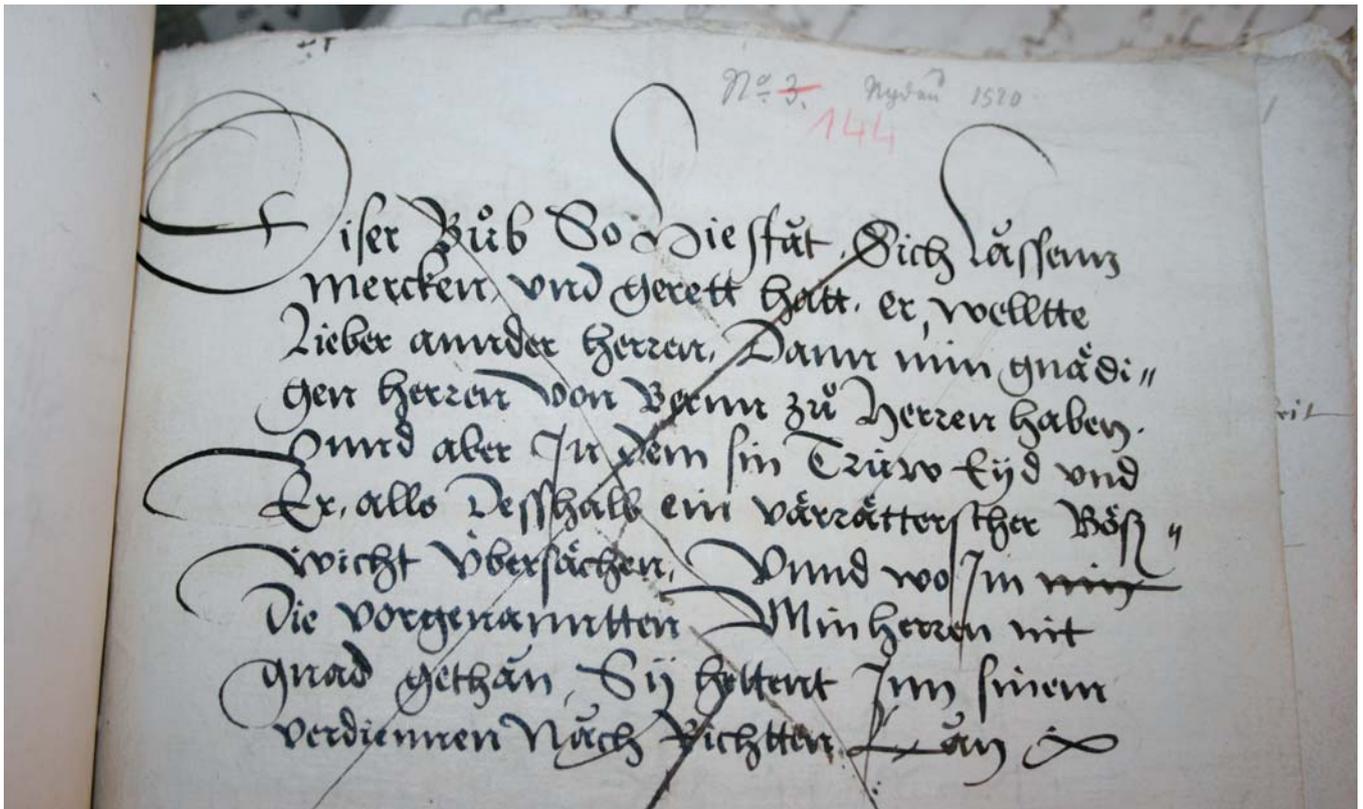
**Heyden:** So historical sciences cannot simply say ‘this is how it was’ but, given the randomness of the sources, can they claim anything more than that ‘this existed as well’? Or, to put it another way: against the conscious backdrop of the chance of tradition and the coincidence of tradition, is restricting oneself to the individualised the only way to narrate history?

**Esch:** No, I would not go that far. Historians should still use tried and trusted methods to analyse and present history; ‘restricting oneself to the individualised’ would only hinder historical insight. But they should always be aware of the chance/coin-

coincidence of tradition issue; awareness of this kind can also help us not to become “slaves to sources” (as Hermann Heimpel would have phrased it), that is, to believe that the sources available are a perfect reflection of reality. The fact that some doubt the sources from the start because they are thought to be “subjective” (which is the first thing that occurs to them when they want to say something clever about historical methods) is not a problem that concerns me. On the contrary: the more subjective the better because this is the only way we get really close to the people, and we should be reconstructing the people as well, not just the facts. The problem is one of proportionality, of the distortions that are hardly perceptible but can be so momentous.

I do want to emphasise that the chance of tradition and the coincidence of tradition are a methodological problem for all historical sciences, not just for historians. Archaeologists also have to consider that it is not coincidence alone that determines their inventories and (in the case of surface remains exposed to history) take the different survival chances into account because otherwise they cannot judge the gap between what originally existed and what has been preserved, that is, the proportions of tradition; they have to remember that most of the statues in museums are the result of excavations conducted post-Middle Ages, whereas above ground in the Middle Ages – and only here can we speak of the “*Nachleben* of antiquity” – hardly a statue survived (and if it did, it tended to be a *Togatus* rather than a *Venus*); they have to know that of all the buildings in antiquity the *thermae* had a better chance of survival than the temples because they offered rooms that could be used for many different purposes, whilst the temple cella, which was intended exclusively for the god and the priest, could not accommodate a Christian congregation. Just as in the case of spolia, or the reuse of ancient architectural elements, the only things that had a chance of survival were those that were of use to posterity; nobody thought about museums or history. As I explained in my essay on the chance of tradition and the coincidence of tradition (“*Historische Zeitschrift* 240”, 1985), art historians, legal historians, classical philologists, German scholars – they are all confronted with source problems of this kind that cannot simply be ascribed to coincidence.

**Heyden:** Alongside the coincidence of tradition, the coincidence of discovery also has an enormous influence on our



*A happy coincidence of tradition: the notice explains that the “lad” Ueli Schütz von Nidau was put in the pillory in an iron collar on 8 February 1520 for criticising the government. In the judge’s opinion, he had thus forfeited his life; he was given special clemency and was only pilloried. One day later, this notice was “useless paper” and only survived in the archives (above) by chance.*

conception of history. For my subject, for example, the history of Christianity, the chance finds of the Dead Sea Scrolls and Nag Hammadi Codices were extremely important because suddenly documents cropped up that were considered unorthodox by the circles that determined tradition, and therefore should not have been handed down. The scrolls were hidden by minorities to prevent them from falling victim to selection. But it required coincidence in the form of wandering shepherds and a lost cat for this act of defiance against the (undoubtedly low) chance of tradition for them to become known at all. The chance discovery of these new sources then opened up completely new research areas, generated new research questions and initiated the re-reading of well-known sources – ‘finding makes the searching easier’ according to an aphorism by the Israeli poet Elazar Ben-yoetz. Can we surmise or even calculate how many sources have yet to be discovered? Can and should we systematically increase the chances of random discoveries?

**Esch:** Random discoveries, albeit in a more modest form than the example of the Dead Sea Scrolls you describe, are something that anyone who works in archives can make: you are looking for something which you cannot find, but you find something else instead, maybe something more important that might even take you in a completely new research direction. When I hear that, unfortunately, there is still a great deal of scholarly research to be done in an archive, I say to myself: be grateful, this is the only chance you have to find things that are unknown, have been filed in the wrong place or simply overlooked. Admittedly, this is not the way you argue when you are writing a funding application because you cannot bet on the coincidence of discovery any more than you can on any other coincidence. But that is the way it is. In a well-ordered northern archive with a few 12<sup>th</sup> century charters (Lucca has more than 4,000), the coincidence of discovery cannot take effect; it needs mass, disorder, secrecy. And it needs a discoverer who is full to the brim with expectations and knowledge: because if you do not know the problems of the time and do not have any questions to ask, you will not discover anything. If it all comes together, however, the chance discovery may happen of its own accord, but it cannot be ‘systematically increased’. Apart from which, it is not always possible to say whether a surprising find is the result of pure chance or the particular resourcefulness of the historian. Resourcefulness is a great gift that cannot be taught and, whilst it is prepared for



*“U. P.” stands for “useless papers”: papers in the State Archive of Bern that escaped the incinerator only by chance – or rather, negligence – are of enormous interest to today’s historians*

coincidence and perhaps knows how to approach it, it cannot induce it. The – more or less chance – discovery of whole archives is a special case: the geniza of the synagogue in Old Cairo (the storeroom where devout Jews deposited their letters and contracts made holy by being in Hebrew script) unexpectedly yielded thousands of manuscripts that had been exchanged between Morocco and India between the 9<sup>th</sup> and 19<sup>th</sup> centuries; in 1975, the City Archive of Messina, which was believed to have been lost, was unexpectedly discovered in the archives of a Spanish family because, in 1678, the victor had taken the entire archives as part of the spoils. And not to forget the stocks in archives that remained inaccessible for a long time, not because they had to be found in caves near the Dead Sea, but because they were largely unknown to researchers. In my lifetime alone, several major fonds have finally been released for research: the Archive of the Inquisition, the Archive of the *Index Librorum Prohibitorum*, the Archive of the Apostolic Penitentiary (with some 100,000 items dating from the 15<sup>th</sup> century alone, it can be assumed that the latter will yield a good few finds, whether chance or systematic). From the point of view of research, these were previously “undiscovered sources”; a hundred years ago, nobody knew that there was a Penitentiary Archive in the first place, not even Emil Göller when he wrote his book on the Penitentiary! This kind of – not exactly chance, but certainly unexpected – form of discovery exists as well.

**Heyden:** We ourselves are also involved in selecting sources every day and thus influence the source base which future generations will use when they are trying to understand our reality. How do you rate the chances and coincidences of tradition in our digital age? Will more or less be preserved? And does the digital tradition also favour the unusual, or do the new storage media generate quite different chances of tradition and discovery?

**Esch:** The digital age will radically change the issue of tradition. And this future has already begun. How the selection of sources and tradition will be formed in future is something I am unable to predict. Even historians who are more familiar with the technical problems of digitisation than I am, and archivists who are professionally involved with source selection and tradition, are unable to tell me anything definite. The problem with the mass of modern tradition is no longer space in the archives (the

“miles of shelves” that used to feature in debates), but the space in our storage memories – and in our heads. I am not thinking so much about official documents that will continue to be saved for posterity, but the billions and trillions of personal statements that accrue on social media (and of which, if they had been handed down from the 10<sup>th</sup> century, a mere five would make the historian jump for joy!). I just read that the billions of tweets are supposed to be archived, but how they could ever be of use to historical science is quite unclear: a selection, which would make a tradition of them, is no longer conceivable. Perhaps one could consciously resort to the mechanical census which makes use of coincidence, which plays the coincidence of tradition, so to speak. Because coincidence is blind and therefore just, and will determine future research far less than the targeted selection (which is unavoidable in the light of current research interests) made by historians today. In future, chance and coincidence will no longer hide away in the availability of the material, but in the access to it.

Looking at the question of how future generations will view us and our times in retrospect, my experience during my years at university was that students like to address questions such as: What things do you think will be passed on from our time? What would you like to see passed on from our time? This enables you to play through the process of tradition forwards instead of backwards – and why not do it under the conditions of digital tradition? That is also a way of practicing historical thinking and is seen as an existential question (and, on top of that, one that the professor does not know any more about than the student).

**Heyden:** A final question: is it not the case that the historical selection of sources also has a good effect in that it creates space for following generations to live? Do we not need the coincidence of tradition and discovery in order to avoid suffocating in the vestiges of our ancestors, in order to have scope for our own present?

**Esch:** Regular massive losses of tradition with the effect that following generations have more space to live: that sounds like a mysterious natural budget of history. And it is certainly one way of looking at things. But you cannot explain it scientifically. So, why not let it stand without explanation, unexplained like the liberating mercy of forgetting.



## AWARDS, HONOURS AND FELLOWSHIPS

### KATHARINA DOMSCHKE | RESEARCH AWARD OF THE GERMAN SOCIETY FOR BIOLOGICAL PSYCHIATRY

Würzburg-based Professor and Vice Chair of the Department of Psychiatry, Katharina Domschke, received the “2014 Research Award for Molecular Research” from the German Society for Biological Psychiatry. The prize, endowed with 5,000 Euros, honours her important discoveries regarding genetic mechanisms that influence anxiety and depression.

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### TOBIAS ERB | STARTING GRANT OF THE EUROPEAN RESEARCH COUNCIL

Tobias Erb, who recently moved to the Max Planck Institute for Terrestrial Microbiology in Marburg, wants to use methods taken from synthetic biology and chemistry to improve the CO<sub>2</sub>-fixation mechanism in plants. This project, named “Syborg”, will be facilitated by one of the European Research Council’s sought-after Starting Grants, which provides up to two million Euros over a period of five years.

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### LENA HENNINGSEN | “FAST TRACK” PROGRAMME OF THE ROBERT BOSCH STIFTUNG

The “Fast Track” programme hones the leadership skills and abilities of excellent post-doctoral women researchers in order to raise the long-term quota of women in top positions in science and research. In 2014, the programme entered its 8<sup>th</sup> round, accepting the sinologist, Lena Henningsen, from Freiburg as well as the academic coordinator at JA headquarters, Beatrice Michaelis.

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### KATHARINA HEYDEN | PROJECT GRANT OF THE SWISS NATIONAL SCIENCE FOUNDATION

“The Dispute between Palamas and Akindynos about Divine Energies. Edition, Translation and Dialogic Commentary of Central Works of the Controversy” is a three-year project by Katharina Heyden, Professor for the History of Christianity in Bern. The Swiss National Science Foundation has granted 370,000 Swiss francs to fund the project.

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### JULE SPECHT | BERLIN SCIENCE AWARD (YOUNG TALENT AWARD)

In 2014, the Governing Mayor of Berlin’s Young Talent Award went to yet another JA member: Jule Specht, Assistant Professor of Psychology at FU Berlin, won the 10,000 Euros award for her research on personality development over an entire lifetime, with a special focus on old age. The official award announcement stated that demographic change has made her research a particularly hot social topic.

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#### CHRIS THOMALE | DR OTTO SCHMIDT AWARD FOR THE EUROPEANISATION AND INTERNATIONALISATION OF LAW

This was the first conferral of the Dr Otto Schmidt Award by the legal publishing house of the same name. For his contribution entitled “Greater Collaboration in Lieu of Unification? – A Response in European Private and Corporate Law”, Heidelberg-based law expert Chris Thomale won a 2nd prize of 2,500 Euros in the young scholars’ essay competition.

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#### VIKTORIA TKACZYK | MAX PLANCK RESEARCH GROUP

The history of the science of sound in its dual role as an object of scientific research and an instrument for knowledge transfer: this is the focus of a new Max Planck Research Group which theatre scholar, Viktoria Tkaczyk, is to establish at the Max Planck Institute for the History of Science in Berlin.

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#### REBEKKA VOSS | ARCHES AWARD FOR GERMAN-ISRAELI COOPERATION

The Award for Research Cooperation and High Excellence in Science (ARCHES), granted by the German Federal Ministry of Education and Research, is designed to foster cooperation amongst Israeli and German scientists of all disciplines. The 2014 winners were Rebekka Voß, Professor of Judaic Studies at Goethe University Frankfurt, and her project partner Dr Maoz Kahana from Tel Aviv University. Their project is called “Beyond Borderlands: Wandering Concepts and the Emergence of the Jewish/Christian Self in Early Modern Europe”. Both partners receive 100,000 Euros each for their project groups.

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#### BERNADETT WEINZIERL | STARTING GRANT OF THE EUROPEAN RESEARCH COUNCIL

Bernadett Weinzierl explores the behaviour and climatic impact of aerosol particles such as soot or desert dust in the atmosphere. The Junior Professor, who teaches and conducts research in Munich, procured a European Research Council Starting Grant, which will now allow her to establish this independent and autonomous research project with a budget of two million Euros over five years.

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#### HANS JAKOB WÖRNER | KLUNG WILHELMY SCIENCE AWARD FOR CHEMISTRY

Hans Jakob Wörner, Professor of Physical Chemistry at ETH Zurich, received the Kung Wilhelmy Science Award of 75,000 Euros for his pioneering work in researching ultra-fast electron movements in molecules on time scales of under  $10^{-15}$  seconds.

# INSTITUTIONS UNDER SCRUTINY

A conference by the RG ‘Art as Research?’ took a closer look at the structures and processes that facilitate or generate art

TEXT DEIDRE RATH

Visitors to “The Institution” were not exactly in for a traditional theatre performance. Instead, they were confronted with a variety of concurrent locations, performances and interactive opportunities that required a response from them: they could either go on an individualised tour accompanied by two performers or listen to experts on discussion panels, enjoy concerts, stroll in the indoor garden or visit the ever-expanding archives. For eleven days, the artist duo Melanie Mohren and Bernhard Herboldt, *JAM* members since 2011, performed in the rooms of an empty apartment in Stuttgart. Herboldt/Mohren’s creation essentially revolved around one theme: the various aspects of a fictional institution and the situations to be found there. Their “durational performance” not only took place in multiple locations, but was also subject to its own time system: every eight minutes and 31 seconds – which is exactly the amount of time that light takes to travel from the sun to the earth – their fictional world expired and regenerated. Visitors were far more than passive spectators – they were constantly part of the stage, part of the play; they were narratives inscribing themselves in “The Institution” (see also: “A Rather Different Institution” in *JAM* 17 English Edition, page 30).

A presentation of this example of an experimental approach, together with a sociological introduction, kicked off a three-day conference with the title “Testing Institutions” that was held on the *Kulturcampus Domäne Marienburg* at the University of Hildesheim in mid-November. The aim was not just to analyse the inherent clocked structures that define artistic and cultural institutions, or to propose abstract alternative models; rather, the initiators Annemarie Matzke, Professor for Experimental Forms of Contemporary Theatre in Hildesheim and member of the theatre collective, She She Pop, and Pirkko Husemann, the

Artistic Director of the artistic centre Schwankhalle Bremen and *JAM* member, wanted to emphasise practical examples from theatre and the arts. Not that theoretical approaches to the notions of institution and institutionalisation were neglected: they received their fair share of academic attention at the conference, too.

## Rigid constructs with an authentic aura

The lecture “Emotion – Responsiveness – Magnetism: Inside the Institution” by Konstanz-based post-doc Robert Seyfert raised the question as to what defines institutions from a sociological perspective. In sociological terms, institutions are dominant, restrictive entities: rigid constructs, designed to structure and control our social, but also our work behaviour. But what actually makes us want to be part of an institution, or more specifically, of a cultural institution? Seyfert averred that cultural institutions, in particular, were able to create an individual, authentic aura. Depending on the responsiveness of each person, an institution could virtually absorb its employees, blurring the boundaries between their private and professional lives.

Such spell-binding magnetism can also emanate from individuals, such as charismatic leaders who appear to be a sort of institution in their own right. Jonas Tinius of King’s College, Cambridge (UK), cited the director of the free “Theater an der Ruhr” in Mühlheim, Roberto Ciulli, as an example. Feeling too constrained by institutional structures, Ciulli decided to create his own venue in 1980. His somewhat different model involved long rehearsal periods and artists’ contracts which, in the absence of traditional state subsidies, were a far cry from the salaries paid under collective agreements. Everything was governed by the ongoing creative process, rather than the rules of

a superordinate institution. And despite, or maybe precisely because of this, Ciulli's directorship generated numerous successful productions – which does, however, beg the question as to what will happen when the Ciulli era comes to an end.

### A long and winding road to the museum repository

The conference placed a special focus on both analogue and digital archives. Long gone are the days when archives were the dusty underground vaults of public or private institutions. On the contrary, they have gained importance in recent years and their current practical uses are being re-defined. The exhibition 'Counter-Worlds' (16 November 2013–23 March 2014) in Hildesheim, for instance, presented the archive as a place where knowledge is perpetuated and conserved, but also made available to the public. This collaborative project between the Roemer and Pelizaeus Museums and the University of Hildesheim showcased a place that usually remains hidden from public view: the museum repository. In this particular example, more than 14,000 items from the ethnological collection are inventoried and preserved in the repository. 'Counter-Worlds' was meant to provide a glimpse behind the scenes of a museum, showing exhibits that had not yet made it onto the exhibition floor, whilst also tracing the long and winding road taken by objects that were originally housed in collections and eventually ended up in museum repositories. Basically, the institution as such was thus presented as an exhibition format. Viola Vahrson, Professor for Art History at the University of Hildesheim, provided insights into the work of a curator and also described the process by which a seemingly hermetic art institution can open up, and integrate the outside world and visitors into its exhibition formats.

The only non-European presenter at the conference, Adham Hafez, highlighted the political dimension of the archive as a place of knowledge. Originally, the choreographer and artist from Cairo had planned to present his project ARC.HIVE. However, he changed the angle of his presentation in the light of a new law that had come into effect just a few days previously. The law requires all of the almost 40,000 NGOs in Egypt to re-register in order to demonstrate that they conform to the ideals of 'national unity' and 'public order and morality'. Organisations may no longer raise funds from abroad without government approval, which could spell the end particularly for non-governmental organisations. In other words: the said law

has, according to Western interpretation, effectively abolished non-state art in Egypt.

Hafez must deal with the fallout from this law as well. His project ARC.HIVE is meant to be a constantly growing collection of works by performing artists from the Arab world. Three research centres in New York, Cologne and Cairo as well as an online portal are meant to offer interested parties free access to their knowledge base. Whether and how the institution in Cairo will survive depends on its re-registration, which is still pending. In this situation, the sentence that greets visitors to Herboldt/Mohren's 'Institution' certainly seems quite impossible: "The Institution bids you welcome. Each room, each wall, each hidden corner, each person, each movement, each lighting change and each sound only exist because of you. All you see here only exists because you are here. Now, at this very moment. The Institution is your institution."

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*A glossary of the conference papers is scheduled to appear in the journal 'Performance Research' in its summer edition 'On Institutions'.*



*From sociologists to choreographers: the conference participants*

# THE SOUND OF CLIMATE DATA

An interdisciplinary musical theatre project involving science and art addresses Bielefeld's climate in the next hundred years

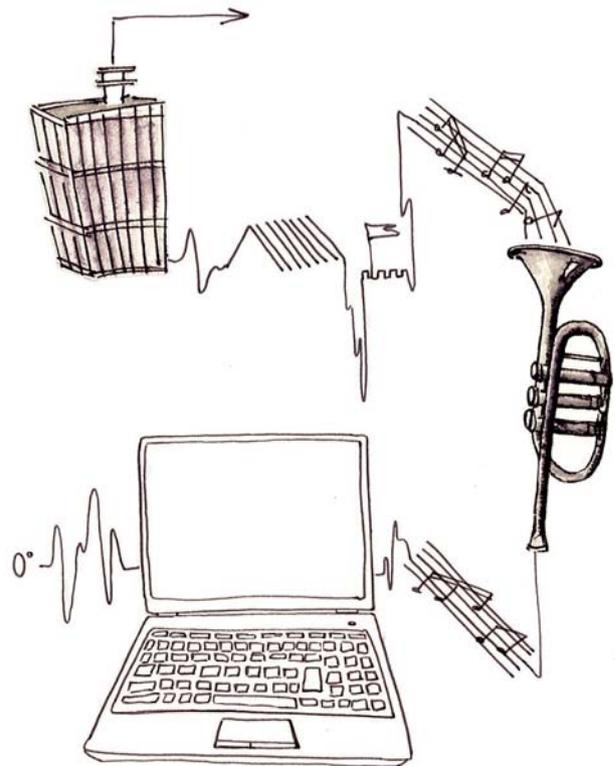
TEXT AND ILLUSTRATION DEIDRE RATH

No-one can say exactly what Bielefeld's climate will be doing a hundred years from now, but it will soon be possible to get an impression of what it could sound like. The geo-ecologist Alexander Knohl and the musicologist Gordon Kampe, the one an alumnus, the other a member of the *Junge Akademie*, are already working on it. The enterprise is made possible by a computer programme that turns the climate data collected by Knohl into sound. Whereby "sound" is not quite the right word: the clicks and creaks and chirps are not particularly easy on the ears – experts call it sonification. Instead of being visualised in graphics, the abstract data are conveyed on the acoustic level. It is not the eye but the ear that registers structures and possible anomalies.

Acoustic knowledge production as a rather different form of data analysis – at first sight, this does not seem to have much to do with music or art, so it is fitting that the project is embedded in a broader context: because Gordon Kampe is currently involved in a musical theatre project with the title "Squares. Roofs. People. Pathways." which will run from May 2014 to April 2015 and focus on the town, seeking perspectives for the Bielefeld of the future (visit <http://pdlw.wordpress.com>).

## From utopia filling stations to musical theatre production

Just what the city could look like will be revealed by a whole raft of events. Apart from so-called "utopia filling stations", which will encourage thought experiments in public places, the artists, academics and dramaturgs will work together with interested parties at workshops to devise a city tailored to the needs of the inhabitants. A symposium on the theme was held in January. All the musical and theatrical outcomes will be channelled into a final, full evening's musical theatre production. And it is here



*From data to sounds to musical theatre: seeking the future city*

that the sounds of climate data will find a place in the form of a paraphrased piece to be written by Kampe for eight musicians, two singers and two actors. Although the piece is being composed for a classical ensemble, Gordon Kampe confirms that electronic elements will not be completely absent either. The premiere will take place on 29 April 2015.



# ETERNAL ECONOMIC GROWTH?

## RG 'Sustainability' at a workshop investigating the growth narrative in knowledge and historical cultures

TEXT DEIDRE RATH

It just never burns out: the lightbulb in the Fire Department in the US town of Livermore has purportedly been going strong for 114 years. This record, which can be followed live via a “bulbcam” ([www.centennialbulb.org/cam.htm](http://www.centennialbulb.org/cam.htm)), is celebrated as a sensation in the durability stakes. Longevity of this kind can be achieved in a lot of products, but it is not very beneficial to the economy. In 1924, the leading lightbulb manufacturers therefore decided that, as of then, their lamps would only last for 1,000 hours – supposedly to protect their customers, but probably for the sake of the economy. After all, consumption is seen as the guarantor of a functioning national economy. Irrespective of whether we are talking unemployment, poverty or debt reduction, the political diagnosis – which is rarely challenged – is always the same: no growth, no prosperity.

But how did the idea of eternal growth become so powerful? This was the question posed by Veronika Lipphardt, a member of the *Junge Akademie* and a historian of science at the Max Planck Institute for the History of Science in Berlin, the teaching of history specialist, Martin Lücke (FU Berlin) and the economist and philosopher, Birger Priddat (Witten/Herdecke) at a workshop with the title “Growth at all Cost?”. Held at the beginning of November, it was attended by humanities scholars and social scientists. The lectures revealed that various growth topoi have been embedded in fields such as biology or archaeology for several centuries. But it is only in the last 60 years that economic thinking has declared a very specific notion of growth to be indispensable: continual economic growth. As the social scientist Matthias Schmelzer demonstrated in the 1960s, gross national product asserted itself as the sole indicator of economic growth. The participants at the workshop, on the other hand, tried to elaborate on a broad spectrum of alternative parameters.

What emerged was that the concept of eternal growth did not only have negative connotations, but in certain areas such as education, was actually viewed positively.

Considering the issue from the perspective of economic history, Birger Priddat emphasised the close connection between the paradigm of eternal growth and the Enlightenment and secularisation: only when the individual was freed from his God-given unchallengeable position in the Christian worldview were progress, and thus the improvement of life, even thinkable. Capitalism’s secular promise of salvation made an eternal increase in happiness on earth into a viable notion. By contrast, the philosopher of economics Wolf Dieter Enkelmann described growth not as a characteristic of the capitalist system but as a principle of civilisation: everything that went beyond reproduction could be defined as increase. The good life was always more than just life. Consequently, growth was not only related to a material but also to a conceptual level.

In her lecture on “The Growth Narrative of Stone Age Man”, Veronika Lipphardt described how seminal teaching and non-fiction books assert that, as early as the Stone Age, *Homo sapiens* was geared towards growth. They claim that this was a reaction to the shortage of supplies in the Stone Age world, which meant that Stone Age man had to develop a subsistence strategy geared towards growth. In these narratives the entire evolution of humankind inevitably adheres to capitalistic principles, closely linked with the growth of the brain, technology, population density, competition and aggression. Supported by an extremely participative audience, a lively discussion involving various disciplines generated many further points.



# COMMENTARY

## German funding policy – heading for randomness?

TEXT AND INFOGRAPHICS TOBIAS ERB



*Yay or nay, a random decision? Many researchers are probably not too happy about the trends in approval rates for grant applications*

As an experimental biologist, I am often exposed to chance in my daily routine in the lab, because biological model systems are too complex to fully comprehend and control. I am thus confronted with randomness in all kinds of variations, from the troublesome fellow who foils our experimental set-ups when cell cultures grow more slowly than planned, or when DNA-amplifications do not work

according to the standard scheme, to the joyous windfall when we happen to observe a tiny abnormality in the photometric spectrum of an enzymatic reaction. The latter just recently transformed our understanding of enzyme catalysis, opening up a whole new field of research.

Whilst this type of coincidence is a generally accepted facet of our science system,

it is a completely different story when chance begins to threaten the system itself. Unfortunately, we have been seeing more and more indicators that this is the case. Take Research Grants, for example, the most important individual funding programme of the German Research Foundation (DFG). The approval rate speaks volumes: over the past five years, it has been continually decreasing from a

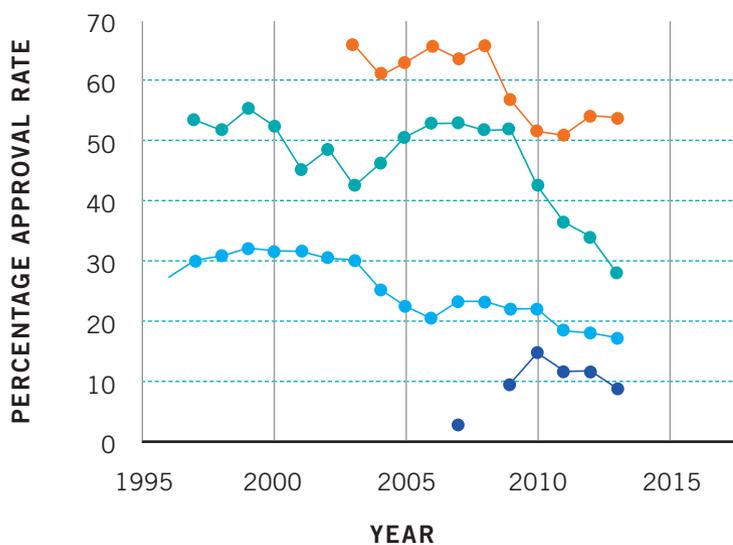
steady rate of over 50 per cent of applications approved prior to 2009, down to a sorry low of approximately 30 per cent in 2013. Austria and, to some extent, Switzerland are, or have been, experiencing similarly dwindling approval rates in the last few years.

The danger lurking behind these low success rates is that the review of applications will no longer serve to weed out a small number of poor applications, as should be the rule for standard funding instruments for basic research, but instead, a large majority of deserving applications will get the axe. If, however, only a fraction of projects with a comparable level of overall quality can be funded, will the selection not ultimately border on the random?

Another consequence of the more competitive selection process could be that future applications might be required to provide (even) more assurances, and that preliminary results will play an increasingly important role in research proposals. Yet should it not remain the mission of basic research to push forward into the unknown and consciously cultivate the element of chance? If funding policy is restricted to supporting the expected, if science no longer leaves room for chance, will the current funding system not lose its meaning as well as its credibility?

It may be premature to speak of a fatal trend in Germany. But let the United States be a warning example. The success rate for individual applications to the National Institutes of Health (NIH), which is, after all, the largest funding agency for

## APPROVAL RATES FOR INDIVIDUAL APPLICATIONS



— NIH – Research Project Grants — Swiss National Science Foundation – Project Grants  
 — DFG – Research Grants — ERC Starting Grants

biomedical research in the US, has been halved over the last decade, eroding to an historic all-time low of 16 per cent in 2013. This means that in a given review round, a mere one or two out of ten standard applications will be approved. These figures are seriously reminiscent of the approval rates for the Starting Grants of the European Research Council (ERC). Contrary to DFG and NIH individual project funding, however, the ERC is explicitly committed to promoting excellence only. Its success rate of ten to twelve per cent is thus considered extremely competitive.

We still have an opportunity to reverse this dangerous threat to basic research. There are various possible options,

ranging from creating new permanent positions at universities to counter the makeshift funding of young talent with third-party funds, to an upward adjustment of the DFG budget to accommodate changed financial circumstances. No matter which way we go, the German-speaking world should definitely steer clear of the “American situation” where chance is not only an element of research, but actually governs it.

*The microbiologist, Tobias Erb, is a member of the RG ‘Science Policy – After the Excellence Initiative’. He is a researcher at the Max Planck Institute for Terrestrial Microbiology in Marburg.*

# PEER REVIEW

**NEW!**



*Playing suggestion*

# A SIMULATION GAME IN THE PURSUIT OF KNOWLEDGE

*'Play is necessary to live a human life.'*  
**Thomas Aquinas (scholastic)**

*'Play teaches us to keep our composure by adopting a cheerful countenance in a bad game.'*  
**Arthur Schopenhauer (philosopher)**

*'You don't have to do this to impress me!'*  
**Leia (princess)**

PEER REVIEW is a simulation game for four to six players. It is designed to train young academics and encourage self-reflection in established researchers. It also aims to provide basic information on the way the academic system functions for a broad general public.



- SIMPLE STEP-BY-STEP INSTRUCTIONS WITH INNOVATIVE 6-POINT STRUCTURE
- 37 FIELD-TESTED REVIEW STANDARDS
- 50 TITLES, AWARDS, DISTINCTIONS FOR ALL DISCIPLINES
- 192 CUTTING-EDGE RESEARCH TOPICS
- INTERDISCIPLINARY AND SOCIALLY RELEVANT THROUGHOUT

# A VOICE FOR JUNIOR RESEARCHERS

## A glance abroad: Poland's Young Academy campaigns for careers in research and better general conditions

TEXT MICHAŁ WIERZCHOŃ, JAKUB FICHNA AND ANNA BIELEC

The Polish Young Academy (Akademia Młodych Uczonych, AMU) was established in 2012 as a part of the Polish Academy of Sciences (Polska Akademia Nauk, PAN). The PAN statutes explicitly define the aims of the AMU: *its mission is to promote the situation of young researchers, in particular through (1) making statements and shaping programmes related to research and academia, (2) organising debates, discussions, conferences and (3) disseminating ethical standards among young scholars*. All thirty-five members of AMU are elected for a 5-year term; current AMU members were elected by The Polish Academy of Sciences in 2011–2012. They represent different academic disciplines (equal representation of humanities and social sciences, life sciences, physical sciences, engineering sciences and medical sciences), different scientific institutions (mainly Polish universities, but also PAN Institutes and Departmental Research Institutes) and different regions of the country (i. e. large university towns like Warsaw, Krakow or Poznan, but also smaller scientific centres in Opole, Bialystok or Olsztyn). AMU members have similar obligations to regular members of the Academy, but they do not have the right to vote. Membership of the AMU is regarded as very prestigious, both by peers and more experienced, senior researchers.

The AMU provides a platform where the young scientists representing different fields of research can meet and discuss how to support the scientific careers of a new generation of Polish researchers as well as debate other important current issues (such as the parameterisation of scientific journals or the formal definition of a young scholar). AMU also gives its members an influential voice in PAN, where they represent junior researchers

at national level. Furthermore, the Young Academy aims to have an impact on science-related governmental activities in Poland, such as taking part in the meetings of parliamentary commissions and committees of the Ministry of Science and Higher Education (e.g. Science Policy Committee), commenting on proposed changes in the Law (e.g. Law on Higher Education or Law on Public Procurement), taking part in the Round Table on Humanities initiative, etc.

The AMU also aims to strengthen the community of young scientists and scholars in Poland by collaborating with many formal and informal groups representing the young generation of researchers. Below we present selected projects run by the AMU during 2014.

### Scientific mobility

On the initiative of AMU members a series of events was organised to analyse the domestic and international mobility of Polish researchers. The project aimed to identify and discuss not only the benefits of scientific mobility, but also the barriers that prevent Polish scientists from changing their work environment. In collaboration with the “Citizens of Science” movement and the “Science, a Human Thing” initiative, the AMU organised a series of symposia and a sociological survey (with over 1000 participants!) to propose comprehensive expert evaluation of this issue. The outcome of the project will be published as a formal statement that will be delivered to science policy makers.

### Educational and public outreach activities

In 2014, AMU members took part in various events popularising science: the “Science Picnic” organised by Polish Radio and the Copernicus Science Center at the National Stadium in Warsaw, the “Science Festival” in Jabłonna (near Warsaw), and the European Researchers’ Night in Olsztyn. AMU presentations ranged from Greek and Roman mythology, via technical advances in bridge construction and the functioning of the digestive system, to DNA isolation. AMU members also run individual educational initiatives to promote careers in academia. Examples of such projects include the workshops for undergraduates and doctoral students on the diagnosis of RNA viruses and electron microscopy, co-organised by Prof. Beata Hasiów-Jaroszewska, or Prof. Janusz Bujnicki’s “More Good Research” programme that offers training for young academics with little experience in applying for grants and research funding.

### Interdisciplinary research

The AMU co-organised a panel discussion on the role of interdisciplinary research. The debaters acknowledged the well-known advantages of interdisciplinary studies. However, they also noted that current science policy in Poland supports interdisciplinary research but does not check whether indeed an interdisciplinary approach is necessary to solve a specific academic problem. The AMU proposed that interdisciplinary research should only be supported if such an approach was really meaningful and that funding should be focused on large interdisciplinary projects rather than small individual ones. The AMU’s findings were disseminated among science policy-making institutions and have received attention, for example, from the Science Policy Committee of the Ministry of Science and Higher Education.

The examples of projects run by the AMU illustrate the broad scope of initiatives proposed by this relatively small group of young academics. By doing so, the AMU aims to represent the voice of young Polish researchers at national level. The reputation of the AMU is growing; the networking with other academic communities is constantly developing. AMU members hope this will allow them to influence governmental and institutional policy in Poland in a way that will support the academic careers of young Polish researchers.



*Pałac Staszica, home of the Polish Academy of Sciences*



*At work: members of the Polish Young Academy*

*Michał Wierzczoń is a Deputy Chairperson of AMU, Jakub Ficbna is the Chairman, and Anna Bielec is Administrative Director.  
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# PUBLICATIONS 2014/2015



**BEDROHT ENTSCHEIDUNGSFREIHEIT  
GESUNDHEIT UND NACHHALTIGKEIT?  
ZWISCHEN NOTWENDIGEN GRENZEN UND  
BEVORMUNDUNG**  
*(IS FREEDOM OF CHOICE A DANGER TO HEALTH AND  
SUSTAINABILITY?  
BETWEEN NECESSARY CONSTRAINTS AND  
PATERNALISM)*

Hardly anybody would deny that a person's freedom of choice ends where others can be harmed. But in our increasingly pluralistic society, we lack a consensus on the severity of such harm, or what even constitutes harm to others. This dissension becomes particularly evident when religious and secular world views collide, or when individual benefit conflicts with the common good. How can one find a judicious balance between individual freedom and paternalism in the interest of the community? Are individuals able and willing to make good decisions for themselves? And to what extent can science contribute to these significant social considerations? This volume explores the problem from an interdisciplinary perspective with a special focus on health and sustainability.

**Editor**  
Florian Steger

**Publisher**  
mentis Verlag  
*Münster, 2014*

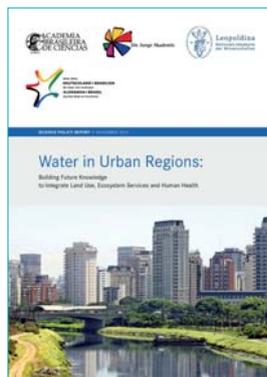


**VORGESTELLTE INSTITUTIONEN/PERFORMING  
INSTITUTIONS**

What defines an institution? Artists, curators and academics debate the functions of institutions, highlight the critical issues and show how they could be reinvented. Their conversations draw on examples taken from architecture, the visual arts, law, and a tradition of institutional criticism in the performing arts. The book compiles excerpts from these discourses and combines them with scenes and archive materials by the artist duo Herboltd/Mohren.

**Editors**  
Melanie Mohren,  
Bernhard Herboltd

**Publisher**  
Alexander Verlag  
*Berlin, 2015*



## WATER IN URBAN REGIONS

### BUILDING FUTURE KNOWLEDGE TO INTEGRATE LAND USE, ECOSYSTEM SERVICES AND HUMAN HEALTH

Urban regions in many parts of the world are facing increasingly complex ecological and social problems with regard to securing their water supply. In this policy paper, the Brazilian Academy of Sciences, the Leopoldina and the Junge Akademie state their position on the issue, describing core fields of action and presenting possible solutions. The volume is based on the joint conference on “Water Issues and Ecological Sustainability in Areas of Urbanization”, which was held from 5 - 8 May 2014 in São Carlos (Brazil).

## Editors

*Deutsche Akademie der Naturforscher Leopoldina, Academia Brasileira de Ciências, Die Junge Akademie*

*Berlin, 2014*

## Download-URL

[www.leopoldina.org/uploads/tx\\_leopublication/2014\\_Policy\\_Paper\\_GermanyBrazil.pdf](http://www.leopoldina.org/uploads/tx_leopublication/2014_Policy_Paper_GermanyBrazil.pdf)



## KLANG – TON – MUSIK

### THEORIEN UND MODELLE (NATIONAL)KULTURELLER IDENTITÄTSSTIFTUNG

### (SOUND – NOTES – MUSIC

### THEORIES AND MODELS OF (NATIONAL) CULTURAL IDENTITY-BUILDING)

Sounds, notes and musical works have helped build (national) cultural identities, especially since the beginning of the Modern Age, and they still do today. Which media-specific sociocultural prerequisites must be met for this to occur? What are the decisive parameters (sound, tone, melody, rhythm)? Are there times or places in which the phenomenon does not occur? The identity-building effect of songs, anthems, sounds and notes has been investigated repeatedly. So far, however, there has been no systematic interdisciplinary synopsis and critical reflection of the research conducted within the individual disciplines. This volume explores the emergence of collective identity through music from a cultural-anthropological, aesthetic, historical and practical artistic perspective; in addition, it features three conversations with renowned composers, conductors and opera singers.

## Editors

*Wolf Gerhardt Schmidt, Jean-François Candoni, Stéphane Pesnel*

## Publisher

*Felix Meiner  
Hamburg, 2014*

# EVENTS 2014/2015

- 
- 2014/2015 in review 30–31 October **Workshop of the European Young Academies**  
*Berlin*
- 
- 6–7 November **‘Growth at all Cost? Narratives of Growth in Their Historical-Cultural Dimension and in the History of Science.’**  
Conference run by the RG ‘Sustainability’ in co-operation with the Max Planck Institute for the History of Science – see article on page 37.  
*Berlin*
- 
- 14–16 November **‘Testing Institutions’**  
Conference run by the RG ‘Art as Research?’ in cooperation with the Institute for Media, Theatre and Popular Culture and the Herder-Kolleg at the University of Hildesheim – see article on page 34.  
*Hildesheim*
- 
- 24 January **‘Salon Sophie Charlotte’ of the BBAW ‘In the right light’**  
Contribution ‘There’s only one room’  
A journey with *JA* members in a light show by Evy Schubert.  
*Berlin*
- 
- 24 January **‘City Theatre – Theatre and the City. Squares. Roofs. People. Pathways.’**  
Conference with Gordon Kampe – see article on page 36.  
*Bielefeld*
- 
- 25 January/17 February **‘Performing Institutions’**  
Book presentation and discussion run by the RG ‘Art as Research?’  
*Konstanz/Berlin*
- 
- 17–19 February **‘The Future of Research in the Digital Age’**  
Joint interdisciplinary conference run by the *JA* and the Israel Young Academy.  
*Jerusalem*
- 
- 5–7 March **Spring plenary session**  
*Frankfurt/Main*
- 
- 16–18 March **‘Causation from Correlation?’**  
Interdisciplinary workshop .  
*Oblstadt*
-

**What's on in 2015**

- 7–9 May **'A Career in Science'**  
Conference in co-operation with the German National Academic Foundation.  
*Cologne*
- 
- 1–2 June **'Writing, Reading, Listening'**  
Workshop run by the RG 'Popular Culture(s)'.  
*München*
- 
- 5 June **Members' Alumni Night**  
*Berlin*
- 
- 6 June **Summer plenary session and *Junge Akademie* gala**  
*Berlin*
- 
- 9–11 July **'To Boldly Go Where No Man Has Gone Before. The Fascination with the Unknown: Time'**  
Conference run by the RG 'Fascination'.  
*Berlin*
- 
- 23–30 August **Summer Academy with the German National Academic Foundation**  
*Kloster Roggenburg*
- 
- 7–13 September **Writing workshop**
- 
- 18–20 September **Autumn plenary session**  
*Halle/Saale*
- 
- 30 September–2 October **'The Popularisation of Holy Texts and Their Normative Boundaries in Judaism, Christianity and Islam'**  
Conference run by the RG 'Popular Culture(s)'.  
*Bern*
-

# CATCHING UP WITH ... BÉNÉDICTE SAVOY

There is a life after the *Junge Akademie* – which is why this space is reserved for alumni

## 1. Is joy important for your work? Should it be?

Work can be joyful or joyless. The trick is to fill the joyless with joy. Which sometimes works.

## 2. What do you enjoy about your work?

Joy itself. The beaming faces of the students when they have a eureka moment. My team. The successes of the younger generation.

## 3. What is humankind's greatest achievement?

Mmh ... the ability to doubt itself? That is not an achievement, of course, but a fact. The greatest fact of humankind.

## 4. If you were to die tomorrow, what achievement would you look back on with most pride?

You can achieve goals. But I never set myself any goals. And if I were to die, my pride would die with me, wouldn't it?

## 5. What aspects of your research are relevant for humankind?

What matters is that there are people who are allowed to follow their calling with intellectual autonomy, free from economic constraints and the obligation to produce applications. Humankind needs to decide for itself how much of that is relevant. Things that may not be useful today may be useful tomorrow. Thinking is a long-term investment.

## 6. What advice would you give Ph.D. students?

Do not allow the institution to restrain you.

## 7. What advice would you give a professor?

Ditto.

## 8. What was humankind's greatest mistake?

No idea.

## 9. What does the German academic system need?

More poetry.

## 10. Should we abolish the universities?

And then what? No! No!



## ABOUT THE INTERVIEWEE

Bénédicte Savoy was a member of the *Junge Akademie* from 2007 to 2012. She is a Professor of Art History at TU Berlin but has taken a sabbatical from teaching until 2016 on the strength of an 'Opus Magnum' Fellowship, awarded by the Volkswagen Foundation.

## 11. What has your career at university and in research made of you?

'What has it made of me ...?' That sounds like the lyrics of a heart-sick love song! So far, university has not broken my heart. I strive daily to make sure it stays that way.

## 12. What did the *Junge Akademie* make of you?

It has given me great moments of intellectual joy (and friendship). I often think of a discussion about hysteria between a neurobiologist and a literary scholar. And I remember the moment epigenetics entered my intellectual world.

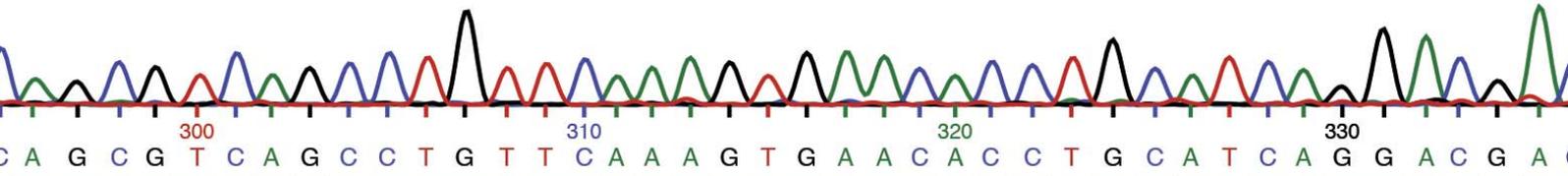
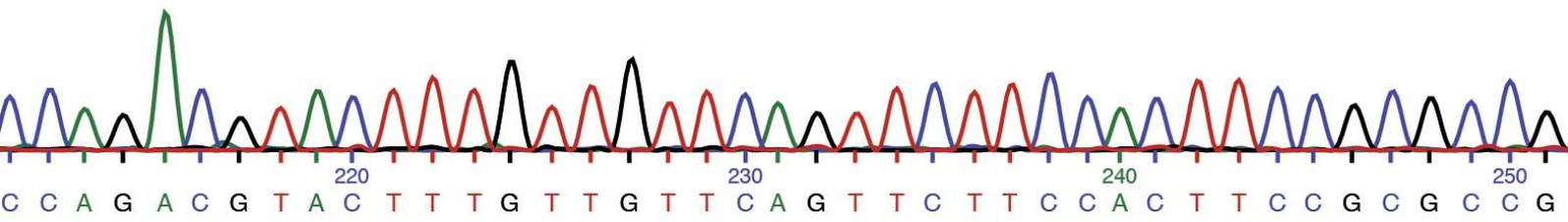
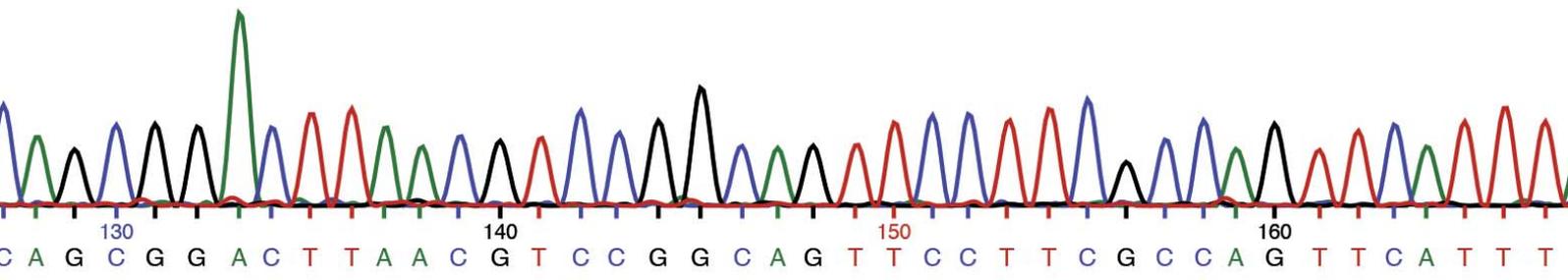
## 13. Do you have anything to say?

Not always. But when I do, I usually say it quite bluntly.

## 14. Any final words?

'Quite bluntly.'





## JUNGE AKADEMIE MAGAZIN

The *Junge Akademie Magazin* was conceived by members of the *Junge Akademie*. It provides insights into projects and events of the *Junge Akademie*, reports on members and publications, and intervenes in current academic and science policy debates.



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