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What is good research?

Last November, the Sunday edition of the *Neue Zürcher Zeitung* published an article entitled 'Fast-food science' in which the author complained that universities are publishing a torrent of uninteresting scientific results that are sometimes even contradictory. According to some newspaper columnists and internet commentators, Swiss researchers often produce nothing but hot air. To be sure, well-founded criticism of the science scene is needed. But the arguments of its critics are often shoddy. Here's a selection of the more popular objections to scientific studies:

- 1) "We know that already". This is a killer for almost all research results that are expressed in comprehensible terms. Anyone who says this hasn't understood that science progresses thanks to researchers proving or disproving existing knowledge.
- 2) "We don't need to know that". An erudite friend of my mother once made a derogatory remark about the Brockhaus encyclopaedia, complaining that "it's got so many irrelevant entries". Happy is he who knows so much he can judge what's relevant among all extant encyclopaedia entries and research topics.
- 3) "Not even the scientists know for sure". Researchers are never sure. If we expect this of them, then we've mistaken science for religious fervour. We only need to express mistrust when something is trumpeted as being the truth.



The Economist did a better job in two articles last October. Based partly on studies by John Ioannidis, they discussed what ails science today. For example, there are in fact too few 'uninteresting' studies that confirm existing knowledge. In this issue, we present an interview with John Ioannidis in which he summarises his arguments.

Finally, some news of our own. This is the hundredth issue of our Swiss research magazine *Horizons*. We are celebrating our birthday by launching an English edition in digital format and a tablet version in German, French and English. For more information, see www.snf.ch/horizonte.

Valentin Amrhein, Editor

horizons





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Switzerland: a nature park?

One hundred years ago scientists set the ball rolling for the creation of a Swiss National Park. More recently, and this time in the name of tourism, we've seen a host of natural parks pop up around the country. But they may also contribute to research.

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◀ Tree with deer: for many decades this pine tree was the symbol of the Park. This image is from a Swiss National Park hiking guide published in 1948. Picture: SNP Archives

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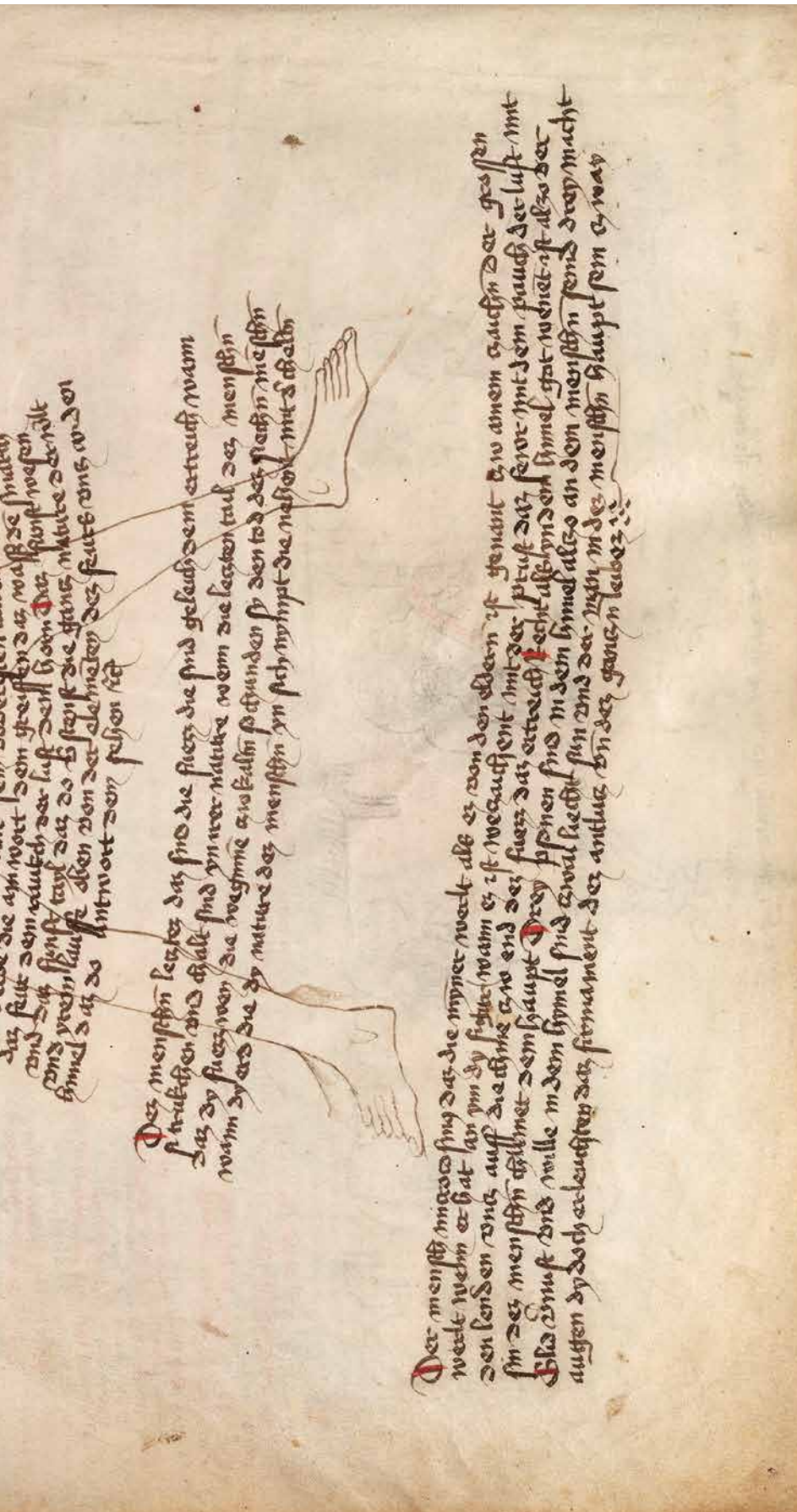
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Microcosm Man in a skirt of words

The man crosses his hands over his chest in a gesture of humility. In harmony with himself and his surroundings, he is an analogy of the coming-together of the microcosm and the macrocosm, of man and the world. His senses represent the primary elements, his right and left eye the sun and the moon, his stomach the sea, his feet the earth. And above everything is God, who the German text here says created humankind as a meticulous composite of the different elements of the universe.

'Microcosm Man' features in an anonymous southern German manuscript of the 15th century that comprises 16 plates, written in German and Latin. The mediaevalist Marcus Castelberg has made a commented edition of them for his doctoral thesis. This collection of plates is the only one of its kind to survive, but Castelberg thinks that it is probably representative of a genre of literature that was widespread in the late Middle Ages. Rather like an encyclopaedia, it presents the conventional knowledge of the day, touching on astrological, medical and moral topics. These plates were probably made for representational purposes by laypeople with an interest in education, and were intended for a reading public of their peers. But why does the man have a beard, and why a skirt made up of words? This figure unites pictorial traditions of both Christianity and the ancient world. His head refers to the iconography of Christ and of St Christopher, while Castelberg believes that his skirt might allude to a garment from antiquity. *uha*

M. Castelberg and R. F. Fasching (eds.): *Die «Süddeutsche Tafelsammlung»*. Edition der Handschrift. Washington, D.C., Library of Congress. Berlin and Boston, 2013.

M. Castelberg: *Wissen und Weisheit. Untersuchungen zur spätmittelalterlichen «Süddeutschen Tafelsammlung»*. Washington, D.C., Library of Congress. Berlin and Boston, 2013.

Picture: Rare Book and Special Collections Division of the Library of Congress, Washington, DC

Part-time science?

Many mid-level academic positions are only paid on a part-time basis. What are the pros and cons of part-time research? Is science at all possible on a part-time basis?

Valérie Chételat (photomontage)



Part-time work in the sciences is usually linked to the debate about equal opportunities. So it seems a topic that ought to attract the most interest among female scientists. And as it happens, I myself started out as a 'part-time professor' at the University of Hamburg. For the two years that followed the birth of my first daughter, I handed over a quarter of my teaching commitments to a colleague. However, I soon noticed that all my other commitments – such as exams and committee work – continued to be my responsibility. So as it turned out, I actually had little relief despite having given up 25% of my wages.

As we all know, part-time work is more intensive and more productive than the same number of hours in a full-time position, so the institution in question profits from it. Universities have also long acknowledged this, which is why younger scholars at faculties of the humanities and social sciences in Switzerland are mostly employed only on a part-time basis. However, the idea is not that they should take up other paid employment at the same time, but that they should use their free time for research – research that remains largely unpaid. This is justified by claiming that the unpaid extra work will help these young researchers to progress in their careers. For doctoral students, it can be a perfectly understandable thing to do. They still have much to learn in their research

area, but at the same time they are gaining their first experience in teaching and administration. And for the other three to four months of the year they are free to do whatever it takes for them to advance in their field.

At that phase of your career, part-time work is actually counter-productive. All your energies ought actually to be invested in improving your scientific qualifications.

Claudia Opitz-Belakhal

For postdocs, however, the parts just don't add up, because this largely unpaid research activity is done by those who already possess recognised academic qualifications. Furthermore, since Bologna, postdocs may (and indeed must) take on responsibility for examinations, and that demands a lot of their time. When research becomes a 'leisure activity', it often ends up falling by the wayside. And taking on such part-time work for family reasons, leads

postdocs on a road to nowhere. At that phase of your career, part-time work is actually counter-productive. All your energies ought actually to be invested in improving your scientific qualifications. To be sure, it is possible to compensate for a brief, less productive work phase by increasing your productivity afterwards. But this 'qualification phase' of your career usually lasts for ten to twelve years. So believing that it can simply be doubled is far removed from reality and will lead directly to academic failure.

Posts for assistant professors with reduced teaching commitments would be the best solution in my opinion. But full-time assistant positions that could be complemented by research phases (organised as sabbaticals or financed by scholarships) would also raise the compatibility of career and family. On the other hand, what's not suited to reconciling family and academic commitments are the part-time employment models for mid-level academics that we often find at universities. They cause many academics to undertake research projects or write books in so-called leisure time – leaving their partners to change nappies and cook meals. You can well imagine who's going to have a career under those circumstances.

Claudia Opitz-Belakhal is a professor of early-modern history at the University of Basel.



In academia today, it's often only part-time jobs that receive financing. This is the case at postdoc level, for example. What might seem convenient from a family point of view seems more of a problem for aspiring researchers who don't yet have any children. Will their careers be damaged by not being able to hold a 100% post? The superficially negative aspects of part-time work are obvious: there's less time for active research, for publishing and for writing research applications, as well as less time spent at the institute or at conferences. In other words, there's less face-time with the boss when he or she is busy deciding who to appoint to a full-time position.

While the first two aspects should not necessarily count against you if your research is of high quality (after all, quality is more important than quantity!), the last aspect is often the most critical because its impact is subtle and unnoticed by the decision-makers themselves. Regardless of whether these institute heads are well-disposed towards the part-time model, they still see their part-time employees less often and therefore have less time to become convinced of their abilities.

So generally speaking, does working part-time have to entail a negative impact on your academic career? We don't think so, on the basis of the following three specific issues in today's scientific culture: 1) The scarcity of full-time posts means that postdocs working 100% often combine

part-time positions in different projects, even at different institutions. In these cases too, their office time at the individual institutes is limited. 2) The digitisation of academia promotes research and networking outside the physical walls of institutions - it is hardly noticeable any more

Part-time work enables you to switch off from everyday office life. It can offer new stimuli and clear your head for the creativity that is so necessary in the sciences ...

Christian Hauck and
Martin Hoelzle

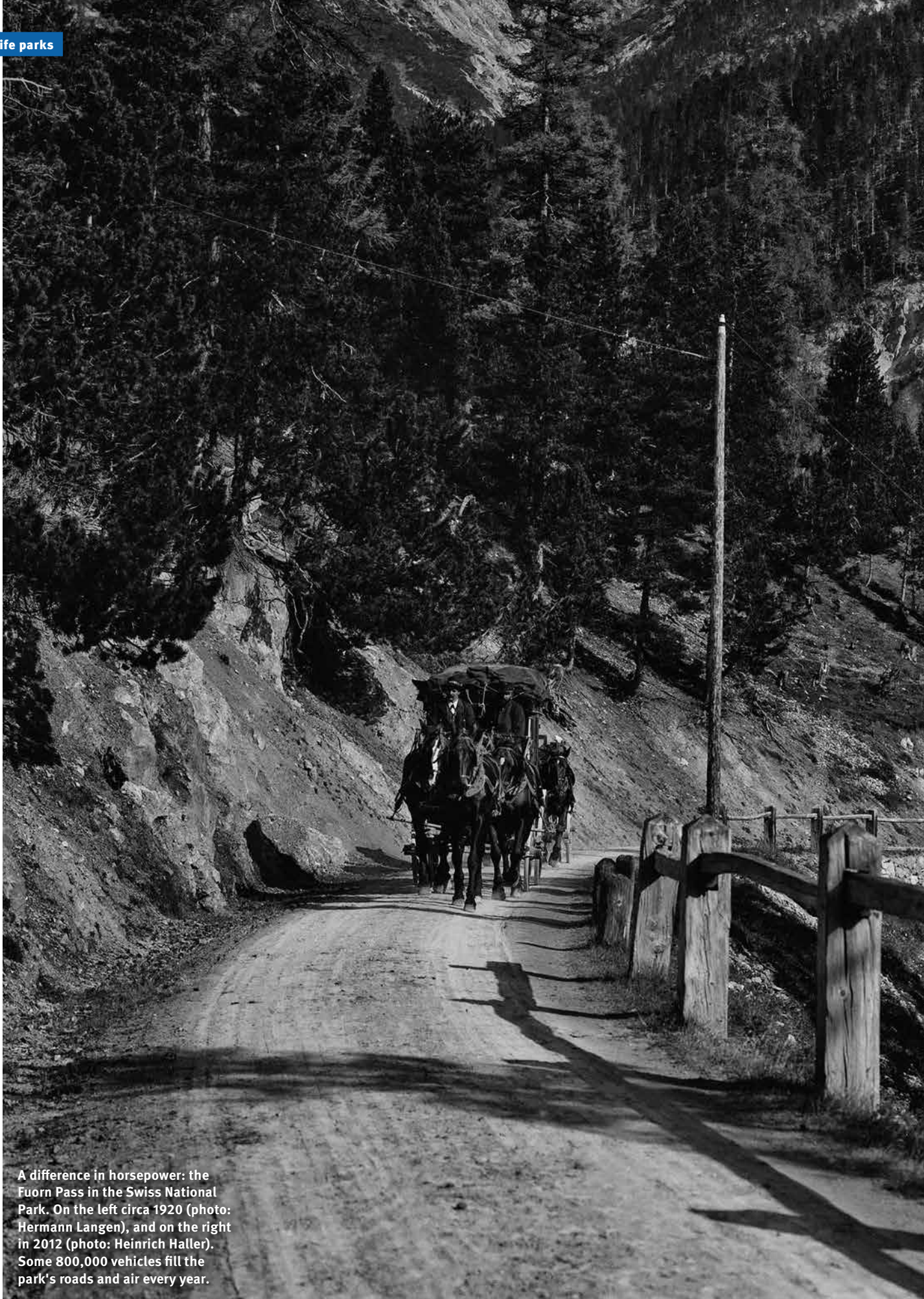
who is working part-time and who isn't. 3) Most researchers will be aware that you don't stop thinking about a project when you close your office door behind you. On the contrary, you often find the solution to scientific problems not at your desk, but in the shower in the morning, in your leisure time or while you're cooking in the evening.

But even though flawless workmanship is still in demand, with results and quali-

ty often being direct functions of time, the most important progress in science still comes from contemplation and creativity, or the proverbial lightning bolt of inspiration. Where and when this happens is (thankfully) impossible to predict, but it certainly doesn't stick to office hours, nor is it dependent on terms or percentages of employment. Part-time work enables you to switch off from everyday office life. It can offer new stimuli and clear your head for the creativity that is so necessary in the sciences - whether it comes riding your bike, walking in the mountains or watching the creativity of your own children.

Finally, today there is also the possibility of job sharing at management level. This could be an optimum solution for many scientists planning their careers, and at the same time could lead to a massive increase in the percentage of women holding management positions at universities - a percentage that still remains too low at present. Regrettably, many of those in the top jobs at universities and research institutes are still too inflexible to be able to reconcile themselves to the job-sharing models that are already established in the business world. Here too, a little more creativity would be welcome.

Christian Hauck and Martin Hoelzle both have 50% jobs and share a professorship of geography at the University of Fribourg.



A difference in horsepower: the Fuorn Pass in the Swiss National Park. On the left circa 1920 (photo: Hermann Langen), and on the right in 2012 (photo: Heinrich Haller). Some 800,000 vehicles fill the park's roads and air every year.

Switzerland: a nature park?

One hundred years ago the Swiss National Park was an international pioneer. Today it celebrates its centenary. Other nature parks have also recently been established, offering a more open environment. They nevertheless also offer a great opportunity for researchers.





Switzerland boasts a dense network of wildlife parks. Unlike the Swiss National Park, whose primary purpose was to protect nature from man, these wildlife parks are focused mainly on the sustainable management of nature from the bottom up. The federal government heavily advertises them under different labels.

By Urs Hafner

Labels in life

There's going out for a walk, and then there's hiking. And where better to practise the more strenuous forms of perambulation than in a place labelled a 'park of national significance'? In such a park, like the Gantrisch Wildlife Park that stretches between the cantons of Bern and Fribourg, you won't just saunter over meadows and through woods. In a park of 'national significance', you're bound to have a more rarified experience. Nature will surely seem more natural than elsewhere, the air airier, the milk milkier. O brave new park that has such cows in it.

The Gantrisch region got its label from the Swiss federal authorities, and it does not wear it lightly. Just like the other twenty Swiss wildlife parks that are either already in existence or are currently being set up, Gantrisch fulfils certain conditions according to its specific category. There are three 'national parks', seventeen 'regional wildlife parks', a 'wildlife experience park', and they all have to be of 'high natural and landscape value'. In other words, they have to have lots of animals – and rare animals at that. Their topography has to be beautiful and unusual, and they have to have monuments and sites of significant cultural and historical interest. These have to offer an untouched habitat for flora and fauna, and a 'wildlife experience' to the general public. Above and beyond this, they must offer environmentally friendly products and services. And even if this all sounds rather vague, it's still specific enough to ensure that, for example, the urban area of greater Zurich would never succeed in becoming a 'park of national significance'.

Affixing labels to nature and sustainability has something schizoid about it, for they convey an illusion behind which the

reality disappears. "The process disappears in the product", as Karl Marx put it in one of his stirring phrases. He means that products and goods on the open market acquire a life of their own: a 'fetish character' that masks the conditions of their production – in other words, the sweat and the time that working people have invested in making them. In the case of wildlife parks, the actual living conditions of their inhabitants disappear in the 'product' that is marketed.

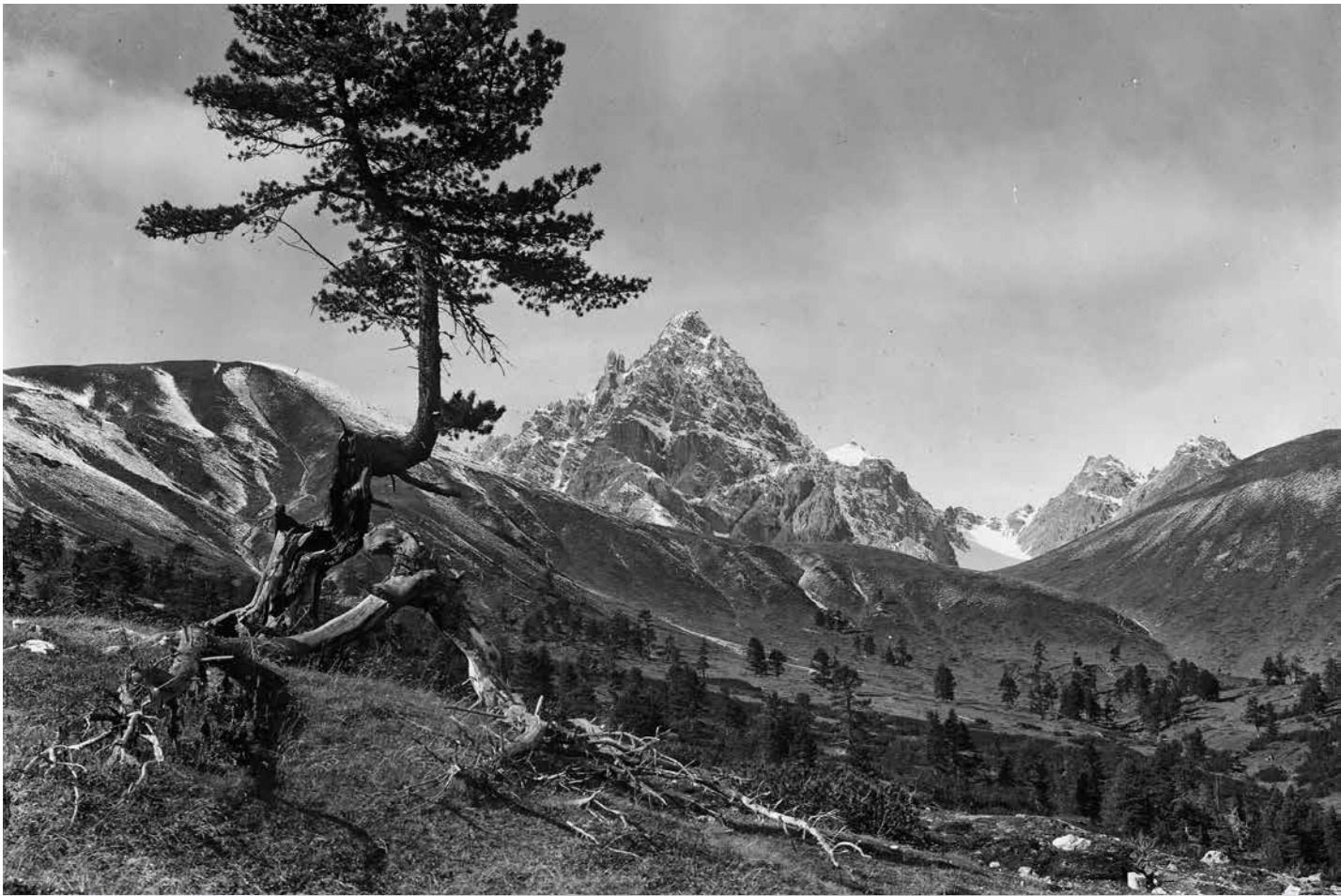
Nothing but a promise

Marx's observation is especially apt for labelled products, despite the appearance of informing consumers of their origins. But if the consumer decides to buy the product, then he or she has little choice but to believe the label, and this duplicates the illusion. Furthermore, nothing exists behind the label of these parks except a promise. And only the label serves to differentiate the park from other, otherwise similar regions. The federal government hopes that these regions will develop ecological forms of management on the basis of the labels they are given. If this is not the case after ten years, then the label will be taken away from the park in question. In contrast to the national parks, the regional parks place a great emphasis on initiatives carried out on the spot.

So when walking through the 'labelled' woodlands or when buying cheese with that same label, consumers are only given a rudimentary feeling of doing something good for nature – nothing more. It is all the more obvious that after a trip to the park they will continue with their normal lives, which are probably otherwise pretty devoid of anything eco-friendly. In some circumstances, the air of sustainability imparted by the label might even suggest to consumers that they have done enough already, and confirm them in their otherwise non-sustainable lifestyles.

Is this too negative a view of things? Shouldn't we just be happy that there are at least a few oases of green on the map? Should we hope that the parks might preserve a few habitats from the plague of the residential estates? Should we bank on the scientists who the parks now allow to engage with ecological concerns more intently? Perhaps it is they who will ultimately help us to achieve a state of affairs in which both 'wildlife parks' and their labels become superfluous.

Hardly any change here: in the space of ninety years, only the glacier in the background has melted. The Macuner Lake District has only been part of the National Park since 2000 (photos: above by Hermann Langen, circa 1920, below by Ruedi Haller, 2008).



Rest and recreation in the lab

One hundred years ago, the Swiss National Park was set up by natural scientists who turned it into their own, open-air lab. Today, such parks make up one seventh of Switzerland's total surface area – offering great opportunities to researchers.
By Marcel Falk

Standing on the summit of the Piz Quatterval or wandering through the Val Mingèr in the National Park, you will hardly imagine that you're right in the middle of a laboratory. But it was indeed a 'natural or open-air laboratory' that the founders of the Park had in mind a hundred years ago: 'a magnificent endeavour to return the land to the wild'. The Swiss National Park was placed under 'complete protection' in the name of science and has remained unique to this day.

The aim was to allow the primordial nature of the Alps to reconstitute itself and "be given as a gift to the future" – all the while under continual scientific observation. "This experimental arrangement made the Swiss National Park the global prototype of a scientific wildlife park", writes the historian Patrick Kupper in his book *Creating wilderness – a transnational history of the Swiss National Park*. Other national parks, on the other hand – such as those in the USA – are primarily intended for nature conservation and human recreation.

Reproducible and universally valid

"The outdoor field sciences came under increasing pressure at the start of the 20th century because they were not meeting the standards set by laboratory sciences", says Kupper. As a result, an idea was born: creating a laboratory on a 1:1 scale that would allow for reproducible, universally valid results. By completely shielding it from the influence of human beings and from civilisation in all its forms, the natural scientists of the day wanted to be able to watch nature at work. According to current theories, all traces of humankind would gradually be swept away and nature would return to its intrinsic equilibrium.

In order to be able to set up their countryside lab, the scientists who initiated the Park needed plenty of good luck and a tenacious spirit. Their way was paved in the political arena by a symbolically disastrous project: the plan to build a railway up the Matterhorn, which set off a storm of protest. "The Matterhorn project showed that nothing was safe from technology any more, not even the highest mountain peaks", says Kupper. The Federal Council requested an assessment from the Swiss Society for Natural Sciences (now known as the Swiss Academy of Sciences). The Society was well prepared, since it had recently founded the Swiss Commission for Nature Conservation. Led by the enterprising natural scientist Paul Sarasin, the Commission had already set its sights

on creating a national park. And it was thanks the 'vandalism of the Matterhorn', as people called it, that the Federal Council proved willing to be drawn into the project that would create one.

The illusion of protection

An ambitious research programme was set up by the scientists involved, with the botanist Carl Schröter and the zoologist Friedrich Zschokke leading the way. "The Swiss Society for Natural Sciences is to carry out a comprehensive monographic treatment of the whole spectrum of nature in the park". It was to include a "complete location catalogue of all living things" and would document the topographical, hydrological, geological and climatological conditions and human influences. Particular attention was to be paid to the settlement and forest history of the area.

The National Park was both an innovative and radical concept, says Kupper. The idea of linking conservation with a scientific focus had a major international impact. However, it proved difficult to implement consistently. As Kupper points out, "the Park Commission failed to live up to its own expectations in its efforts to realise its ambitious plans". The amount of money available was far less than was needed, and the idea of completely cordoning off the Park proved illusory. What's more, upcoming researchers did not find it sufficiently attractive. "Nature takes a lot of time over its own experiments. So the investigations had to be conducted over very long periods to allow the researchers to collect data. There was no promise of prestige in that", says Kupper.

One particularly persistent person was Balthasar Stüssi. He began to make vegetation surveys in 1939, but it wasn't until 1970, three years before his retirement, that he was able to publish a large monograph on the Alp la Schera. During this time, he remained a senior assistant at the University of Zurich and the National Park became a practical research site for several renowned researchers. It was there, for example, that the botanist Josias Braun-Blanquet developed some of the main foundations of modern ecology (which he called 'phytosociology'). Research carried out at the Park increased considerably after the SNSF was founded. Hans Leibundgut promoted a form of close-to-nature woodland management that was based on his research on primeval forests, including the National Park. The well-known geologist Rudolf Trümpy also did research there.

Iconic casualty: for decades this pine tree was the symbol of the National Park. Its remains still lie on the picnic area in the Val Mingèr (photos: above by Hermann Langen, 1920, below by Fredy Wyder, 2012).



Progressive erosion: the rocky peaks of the Grass da Val dal Botsch (photos: above by Hermann Langen, 1920, below by Ruedi Haller, 2013).

The name says it all

The founders of the Swiss National Park originally spoke of wanting to create a 'reservation'. But the concept did not get much support among the general public. This was why from 1910 onwards the founders increasingly used the term 'national park'. They also took their cue from the USA. It was a fortunate decision, as it was well suited to the wave of nationalisation that came in the wake of the First World War. Once again in the early 21st century there was a reshuffle, yet whilst environmentalists and researchers wanted 'protected areas', politicians instead created the categories of 'national park', 'regional wildlife park' and 'nature adventure park', emphasising the goals of regional development and recreation. *mf*

Literature

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B. Baur, T. Scheurer (eds.): *Wissen schaffen – 100 Jahre Forschung im Schweizerischen Nationalpark*. Bern: Haupt-Verlag, in press.

A. Wallner, P. Messerli: *Parkforschung Schweiz – ein Themenkatalog, Koordinationsstelle Parkforschung Schweiz*. Bern 2012.

"The studies carried out by leading authorities and specialists brought good results, but it ran aground somewhat in the second half of the 20th century", says Thomas Scheurer, the Secretary of the Research Commission of the National Park. The leading researchers concentrated primarily on their own specialist fields, and there was even a drop in the number of research projects in the 1970s. That was when the Research Commission decided that research in the National Park should be reorganised. Since 1989 it has insisted on increased monitoring in the Park and on consolidating interdisciplinary research, especially in the social sciences and humanities. The aim was to achieve an 'all-round understanding' of the Park. There was even the creation of a geographical information system to serve as a central resource.

"This experimental arrangement made the Swiss National Park the global prototype of a scientific wildlife park"

Patrick Kupper,
Historian

It could be said, then, that this approach is an attempt once and for all to fulfil the comprehensive specifications set out by the Park's founding fathers. However, this goal has yet to be attained, says Scheurer. Monitoring programmes have proliferated – there are just under 50 today – but applications for comprehensive research into ecosystems have been rejected on several occasions. "The future will show whether today's programmes are sufficient to achieve an integrated, overall view", says Scheurer.

Undisturbed benchmarks

Kupper believes that research in the National Park has increased in significance since the 1990s. After the 1992 Earth Summit in Rio de Janeiro, biodiversity became a central topic in ecology. If they were to evaluate the influence of humans, scientists would need benchmarks that were as untouched and well-documented as possible. It was at this time too that the management of the National Park was placed on a scientific footing. Problems with increasing numbers of vehicles, tourists or wild animals were now tackled in collaboration with researchers.

This reorientation of research in the National Park opened up completely new perspectives. And for some time now, the Park has no longer been alone. Since the revised Swiss Nature and Cultural Heritage Protec-

tion Act came into force in 2007, new parks have been springing up everywhere. Nineteen are either already up and running or currently being set up. This means that one seventh of Switzerland's surface area is now reserved for parks. Most of them are 'regional wildlife parks', such as in the Gantersch region in the Alpine foothills of the cantons of Bern and Fribourg. No special conservation regulations apply to them.

According to Kupper, the distribution of parks across the country is down to political considerations. Parks were not selected according to greatest natural value, but were opened in areas where the parks seemed to offer opportunities for local development. The 'park' label is granted for ten years and allows the promotion of tourism and the sale of local products; areas 'with a high nature and landscape value' need just apply to the federal authorities. Legislators hope that by assigning special value to local nature and landscapes, those areas will benefit from better conservation than in the rest of Switzerland.

"Founding so many parks offers a unique opportunity to researchers", says Astrid Wallner from the Park Research Group of the Swiss Academies of Arts and Sciences. We can now investigate many questions relevant to establishing a sustainable society, such as: how can the population develop a sense of responsibility towards its natural and cultural resources? Do the parks protect their biodiversity better than other regions? What type of regional governance is successful? "Comparisons between the parks themselves, and between the parks and other regions, can show us which strategies really work", says Wallner.

It still remains to be seen whether researchers will make use of this opportunity. But Wallner has noticed that researchers like to situate their projects in the parks, and that those anchored there tend to be better funded. "The 'park' label seems attractive to researchers" says Astrid Wallner. This is important, because it's not the intention of politicians simply to impose scientific research on the parks. "And yet how can the parks be proven to have developed sustainably if no one is monitoring them?" asks Wallner. So can the wildlife parks now be described as laboratories of sustainable development? She doesn't like the term, preferring to say: "They're model regions".

Further information

Congress: 'How much protection does nature need?' 25 and 26 September 2014 in Lausanne, kongress14.scnat.ch

Jubilee website, 100 years of the National Park: www.nationalpark.ch/go/jubilaum/

Flushing out the river

For more than a decade, artificial flooding has been used to revitalise the Spöl, a mountain stream in the Swiss National Park. Although this renaturation project has been a success, the same method is not employed in other mountain streams. *By Simon Koechlin*

The Spöl is actually quite wretched to look at. The broad bed of the biggest waterway in the Swiss National Park offers only a trickle of water. It's not what one would expect of a healthy, rushing mountain stream. But since 1970 the Engadine Power Plants (EKW) have been using the Spöl to produce electricity, which is why the river has to make do with just 12% of its original volume of water. Nevertheless, in contrast to other Alpine streams that have been similarly tamed, the Spöl is home to a wide range of bustling, living creatures such as are typical in a river environment.

This is thanks to a long-term research project that stretches back into the last millennium. Using the Spöl to generate power took away its momentum, so it was no longer able to transport pebbles and sediment downstream. The riverbed solidified, pools formed, and instead of the Spöl being home to creatures specific to a mountain stream, more mundane organisms established themselves. Some types of algae and moss even spread to excess. In the 1990s the Research Commission of the National Park – a body supported by the Swiss Academy of Sciences – had the idea of using artificial flooding to improve the ecology of the Spöl. “The result was a process of rapprochement between business and environmental protection that took several years”, says Thomas Scheurer, the manager of the Research Commission. In the end, it was agreed with the EKW that

the Spöl be flushed with a large amount of water from the Livigno Dam two or three times a year, from 2000 onwards.

Increased biodiversity

Christopher Robinson and Michael Döring from the Swiss Federal Institute of Aquatic Science and Technology (Eawag), along with other researchers, have since been investigating how the biodiversity of the Spöl has changed as a result of this artificial flooding. It brings a dynamism to its otherwise monotonous, measured flow, flushing fine sediments downriver. This helps to prevent the river bed from solidifying, says Döring, and its positive effect on the ecological community of life in the river quickly became visible. The Spöl's high concentration of freshwater shrimps had been relatively atypical for a mountain stream in the region, but there was a significant reduction in just the first three years. Instead, those aquatic life forms that are more typical of this environment became more frequent – such as mayflies, stoneflies and caddis flies.

The new flow regime also had a positive effect on larger species. Brown trout – the only type of fish naturally occurring in the Spöl – are now making spawning pits with their tails in the gravelly riverbed. Flushing out the riverbed means this can now happen more often again. The researchers have ascertained that the number of trout spawning pits has risen fivefold since the beginning of the project. “We can't return

The Stabelchod cabin in the National Park: in the 19th century it sheltered livestock out to pasture during cold spells (photos: above by Hermann Langen, 1920, below by Heinrich Haller, 2013).





The Val Cluozza and the river which bears its name: the valley contains some of the wildest scenery in the National Park (photos: above by Hermann Langen, 1920, below by Stefan Imfeld, 2008).

to a natural state with this method. But as a whole, the species composition in the Spöl is once again getting close to that of the natural rivers in the region", says Döring.

The artificial flooding is organised so that the EKW suffers no loss of production. The volume of water necessary for flushing out the river is 'saved up' throughout the year by means of a slight reduction in the daily outflow. "It's a win-win situation", says Jachen Gaudenz of the EKW. The new system actually means the company is losing less water than before, because the EKW already had to perform a maintenance flush regularly in order to clear outlets of mud and dirt. And for the National Park, the adopted solution is "a good approach", as research director Ruedi Haller confirms. "We regret the fact that the Spöl is no longer a natural waterway. But the flooding has recreated near-natural conditions - and the project has also yielded much general information about such renaturation concepts".

International showcase

Indeed, the Spöl is now regarded as a showpiece project for the renaturation of mountain streams. "Several rivers in other countries are being flooded artificially, according to a similar principle", says Döring. These include the Snowy River in Australia and the Colorado in the USA. In Switzerland, however, there are hardly any comparable projects - even though many Alpine streams are dammed. Thomas Scheurer believes that this is mostly on account of concession agreements, which regulate down to the smallest detail how much water an operating company can use from a reservoir, and at which time. If a more dynamic regime were to be introduced for the residual water flow, as in the case of the Spöl, then these concessions would have to be changed - "and that would mean massive legal expenses that the power plant operators would rather avoid".

All the same, an Eawag spin-off company founded by Döring is currently collaborating with the Oberhasli Hydroelectric Power Company (KWO) to see if a dynamic residual water-flow system might be possible at the outlet of the Trift glacier. The KWO is considering creating an artificial lake there. "The situation is different from

that of the Spöl. The Spöl flows down to the valley relatively untouched by tributaries, whereas below the Trift glacier the waters branch out into the meadowlands in a manner that is different both in the complexity of its outflow and in its dynamics", says Döring. So it first has to be clarified what kind of residual water-flow system might be the most suited to maintain the Trift meadows, or at least their most important functions.

Eco-catastrophe?

Last March, the Spöl project team had a taste of the risks involved when you intervene in nature. While the water level was low, large amounts of sediment from the Livigno reservoir found their way into the Spöl, and some four kilometres of the river were covered in sludge. Thousands of trout and innumerable micro-organisms perished in the mud. The media even spoke of an eco-catastrophe. But in the meantime it has become clear that the biodiversity of the Spöl has recovered amazingly quickly. In early December, the task force set up after the mishap declared that the species composition was close to its state before the incident, especially in the lower part of the river.

The accident may also have a positive side. "Such events also occur in other stretches of residual water", says Haller. But because the diversity of species in the stream in question is usually unknown before such contamination takes place, its consequences remain unclear. "Thanks to our many years of monitoring the river, we can now assess the effects quickly and precisely, and thereby make a contribution to improving an unsatisfactory situation in the management of residual water flows".

Outside the fence

Even grasshoppers can influence the climate, as experiments in the National Park have proven.

By Ori Schipper

These results call to mind the meditation exercises of pantheists and Zen Buddhists: everything is connected. The bacteria and roots in the ground, the grass, the weeds, the grasshoppers, the marmots, the mountain goats and the deer – not only do they all have an impact on each other, but they also influence the carbon balance and, ultimately, our climate.

Anita Risch and her team of researchers from the Swiss Federal Institute for Forest, Snow and Landscape Research (WSL) could well get a headache from all these complicated interrelationships – but at least they have the fresh, Alpine air of the Swiss National Park to clear their heads, for they carry out their experiments at some 2000 metres above sea level.

Since it was founded a hundred years ago, the National Park has been a constant object of research. But scientists long restricted themselves to observing how nature develops in the absence of human influence. The approach that Risch's group takes is instead a kind of compromise between this doctrine of non-intervention and the acknowledgement that controlled experiments can generate more detailed knowledge.

"Our first experiments were on a piece of meadow about the size of a shopping basket", says Risch. In their most recent experiment, the researchers have set up electric fences around different plots of 63m², just after the snow has melted, for five consecutive years. These keep out hoofed animals – deer and goats – while inside these plots other, smaller patches are marked out with open-air 'cages' nesting one inside the other. A close-meshed fence keeps out the marmots and mountain hares, inside this is another 'cage', this

"The connections are more complicated than we thought"

Anita Risch,
Biologist

time of wire netting to keep out mice. And right on the inside there is a mosquito net that keeps out insects.

Risch and her colleagues wanted to know how the community of organisms on the meadow – the different grasses and weeds and the bacteria that live in the ground around their roots – react to the absence of specific plant-eaters. The answers to this are also important for climate policy, because almost a third of the world's carbon is stored in the soil of grasslands, and soil respiration releases considerable amounts of carbon dioxide.

More carbon dioxide

"Our hypothesis was that excluding plant-eaters would slow down the nutrient cycle and that microbial activity in the soil – and thus its carbon dioxide emissions – would be reduced", says Risch. But their results present a more complex picture. The surfaces from which plant-eaters were excluded actually released more carbon dioxide. The highest emissions came from surfaces that were inaccessible to deer and mountain hares.

Astonishingly, insects – grasshoppers, butterflies and crickets – consume roughly the same amount of plant material as

hoofed animals. But the amount of grass consumed clearly does not relate directly to carbon dioxide emissions. Risch conjectures that the plant-eaters actually have a more indirect impact on life in the soil. She is not just thinking of the nutrient intake that is provided through animal dung, as she also suspects that when grass grows, it provides more shade for the soil. This in turn influences the moisture in the ground, and with it the activity of bacteria in the soil.

"The connections are more complicated than we thought", says Risch. Her team's image of a grasshopper that nibbles on a leaf, thereby influencing soil respiration and in turn our very climate, is just as apt a description of chaos theory as the more famous concept of the butterfly that flaps its wings and causes a hurricane. It is a serendipitous source of satisfaction.

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“You have to be able to explain the benefits of a university, otherwise you’ll have problems”

The University of Bern is merging its science communication and marketing departments. This will help the University to maintain a coherent image, says Christoph Pappa, Head of the General Secretariat.



Valérie Chételat

Horizons: Dr. Pappa, the University of Bern is being reorganised. The measures being taken include a merger of its communication and marketing departments, just as recently happened at the University of Basel. Why merge them?

Dr. Pappa: Quite simply, because our communication in a broad sense was too disparate, being spread over the whole university. The alumni division was in one place, PR was in another, and ‘events’ were somewhere else again. Every faculty had its own voice. There were too many frictional losses and there was too little coordination. This merger should now change all that – though it is not yet clear what shape the final, definitive organisation will take.

Are the goals of marketing and communication compatible in the strict sense – can they both serve science communication?

You mean can they communicate scientific knowledge?

Exactly.

Whether in a narrow or a broad sense, ‘communication’ does not have goals of its own; its goals are those of the University. With this in mind, marketing and communication aim in the same direction: they show people what the university is doing. That’s the case at all universities. The communication departments of the University of St Gallen, of ETH Zurich and of EPFL even have the explicit task of cultivating the brand of their respective institution.

Does communicating scientific truths serve to improve the image of the University in today’s competitive world of education?

We won’t just be looking at scientific results through ‘marketing glasses’. That would be impossible, not least because we would come up against internal opposition from our professors. We are aiming for a coherent, distinctive image, coordinated wording and a better use of our resources. Do you really think we wouldn’t publish results if we thought they might damage the image of the University?

Do your researchers ever come across such results?

Not to my knowledge.

How do you differentiate between science communication and marketing?

Science communication is aimed at the scientific community and the general public. For the latter, the communication department works in close collaboration with the scientists. This will still be the case in the new organisation. Marketing has the task of strengthening the University’s relations with its stakeholders.

When you announced the merger, did you have any negative response, perhaps from anxious scientists?

“Do you really think we wouldn’t publish results if we thought they might damage the image of the University?”

We presented the merger in the University Senate. A few responded to it, but positively. You see, in our age of competition among educational institutions, of increasing rivalries and ever scarcer resources, you have to be able to explain to people the benefits of a university. Otherwise, sooner or later you’ll have problems.

So would you like to have an even bigger marketing department?

Our prime concern is to invest our money in teaching and research. There will only be a small-scale expansion of our marketing department. Even in comparison to that of a smaller university, such as Lausanne for example, it’s still going to be a modest enterprise. *Interview by uha*

Christoph Pappa has a doctorate in law and is the Secretary General of the University of Bern.

A chemist of substance

At the University of Fribourg, Katharina Fromm's infectious enthusiasm for her subject inspires her students. As a researcher, she and her team are developing high-performance batteries and improved coatings for implants.

By Daniela Kuhn

It's a sunny winter's day, half past twelve in the afternoon. Katharina Fromm, a professor of chemistry, has just arrived in Bern to take part in her monthly meeting as a member of the Research Council of the Swiss National Science Foundation (SNSF). She's bought a pretzel and orange juice at the station, and places them on the table in front of her. But she hardly seems to need an energy boost. As she talks about her life in Fribourg, where she has taught and researched since 2006, she's both alert and at ease at the same time.

Eight years is the longest Fromm has ever lived in a single place. She was born in the Saarland in Germany, but grew up in different places, all depending on where her father's job took them. They first went to France, then back to Germany. When she was twelve they then went to the USA for a year, where she attended a French school because it taught maths at the same level as in Europe. After returning to Germany she took her school-leaving exams in French at the European School in Karlsruhe. "If you set off into the world at the right age", she says, "then you learn to leave with both a heavy heart and a smile" - for she knew she would always find new friends wherever she went. All the same, she's really happy that some of those friendships have in fact lasted to the present day.


She decided to study chemistry because it unites both theory and practice. "I like to work with my hands as well as my head", she says. She studied in Karlsruhe and Strasbourg, combining the natural sciences with languages, and earned her 'habilitation' in Geneva. She was then awarded an SNSF professorship at the University of Basel. The University of Fribourg is officially bilingual, though she actually employs three languages there, because the Master's degree is taught in English.

Fromm's research team is currently composed of twelve doctoral students and post-doctoral researchers. They are studying so-called oxide materials - substances that occur in batteries, for example. Their aim is to improve existing batteries and to develop new ones. "The energy turnaround is a challenge for the storage and production of energy", she says. Ideally, one day we should be able to power most cars with high-performance batteries. She always tells her students: "We're creating substances that no one has made before now, and that don't exist anywhere else!" Fromm's enthusiasm is infectious.


Resistant bacteria

Fromm and her team combine organic and inorganic substances in their other research field, too: developing new implant coatings. Today, people want to remain active even into old age, so an increasing number of body parts are being replaced. "The problem with that is the growing resistance of increasing numbers of bacteria that cause implant infections and create biofilms". Together with her team, she is working with industry to research new antimicrobial surfaces that destroy the bacteria. But it's not that the current market has been driving her research - on the contrary, she and her team have actually





“We’re creating substances that no one has made before now, and that don’t exist anywhere else!”



opened up this new field as a result of their systematic, fundamental research.

What Fromm doesn’t mention is just how respected she is, and how highly regarded. In September 2013 she was made a Fellow of the American Chemical Society, the biggest of its kind. This honour was created in 2009, and Fromm is the first European and only the third non-American to be awarded it. When asked about it, she says: “I was surprised, since I’m one of the younger recipients. I gladly accept it as an incentive to carry on with my work”.

Unpretentious and committed

Her modesty finds a corollary in her unpretentious yet committed manner when teaching her subject – such as when she stands before a hundred kids at Fribourg’s ‘Children’s University’, explaining the theory and practice of chemistry in straightforward language for half an hour. Aged 8 to 12, these children are the ones most open to the ‘conjuring tricks’ that take place in the laboratory. Fromm also makes sure that the media in Fribourg report on her subject: “We encounter some 80 chemical elements in our daily lives. I try to make people aware of it”. She gets annoyed if she sees products whose packaging claims that they’re free of chemicals: “There’s no such thing as ‘chemical free’!”

During the day, her students have her full attention. It’s this contact with them that is the most important to her: “In the end, the people who count are the ones you educate and mould”. She feels especially close to her team. As a woman supervisor, she is above all a role model for the young women around her. Up to the time they all take their doctorate, the women are not outnumbered by the men, but this changes afterwards. In the Department of Chemistry at the University of Fribourg, only two out of eleven research groups are currently

headed by women, and only one of these has a full-time, permanent position.

Fromm is not just active in the Swiss National Science Foundation, but also in the Chemistry Platform of the Swiss Academy of Sciences, the Swiss Society for Crystallography and the Swiss Study Foundation. Her administrative work in Fribourg also takes up much of her time. Writing up projects means spending especially long evenings in the office. And if something occurs to her at four in the morning, then she gets up and sends an e-mail: “The life of a researcher never lets go of you”. But with her husband, who is also a chemist, she says she can also talk about everything under the sun.

They live just a few minutes’ walk from the University in the suburb of Péroles, where they enjoy a small-town, homely environment. At the fish counter in the local shop she spots one of her students – and in the department store she meets another, who asks her about test data. Fromm recently returned to Fribourg after a long trip. And when she arrived back it struck her once again: life is good here.

Katharina Fromm

Katharina Fromm was born in St. Ingbert in Germany in 1969. Since 2009 she has been a full professor in the Department of Chemistry at the University of Fribourg and a member of the Research Council of the Swiss National Science Foundation. After completing her chemistry studies in Karlsruhe and Strasbourg, she was awarded an SNSF professorship at the University of Basel.

What's the smell of trust?

The 'creativity researcher' Claus Noppeney investigates how new luxury perfumes are developed. He has been observing scent designers who create concepts called 'Rage', 'Euphoria' and 'Trust'.



Perfumes never really interested me. I did not imagine that I would ever research the production of scents. Today, however, I'm pretty much part of the scenery at perfume industry events. I visit trendy scent-concept stores in Los Angeles, and our research is discussed in well-known perfume blogs. Together with my colleague Nada Endrissat, I'm working on an ethnography of scent design.

How did this come about? Four years ago, I had a visit from a group of former fellow students from my time at the University of St. Gallen (HSG), where I studied economics and management. They were hunting for business projects, and I told them about a designer of 'emotion-based' scents in Zurich who had just entered the niche market of high-class perfumes. 'Rage' and 'Euphoria' were the scent names of his luxury unisex brands. Later, at a party, my friends told me excitedly about a visit they had made to his agency, and of the pictures and scents to be experienced there.

That hooked me, and thus the idea came about for 'Wissensduft': 'the scent of knowledge'. Together, my research colleague and I followed the creation of the scents 'Trust' and 'Reencounter', starting with the conceptual work in the Zurich design agency, then moving on to its olfactory implementation by parfumeurs in Berlin and New York and finally through to the last stage, the branding of the product.

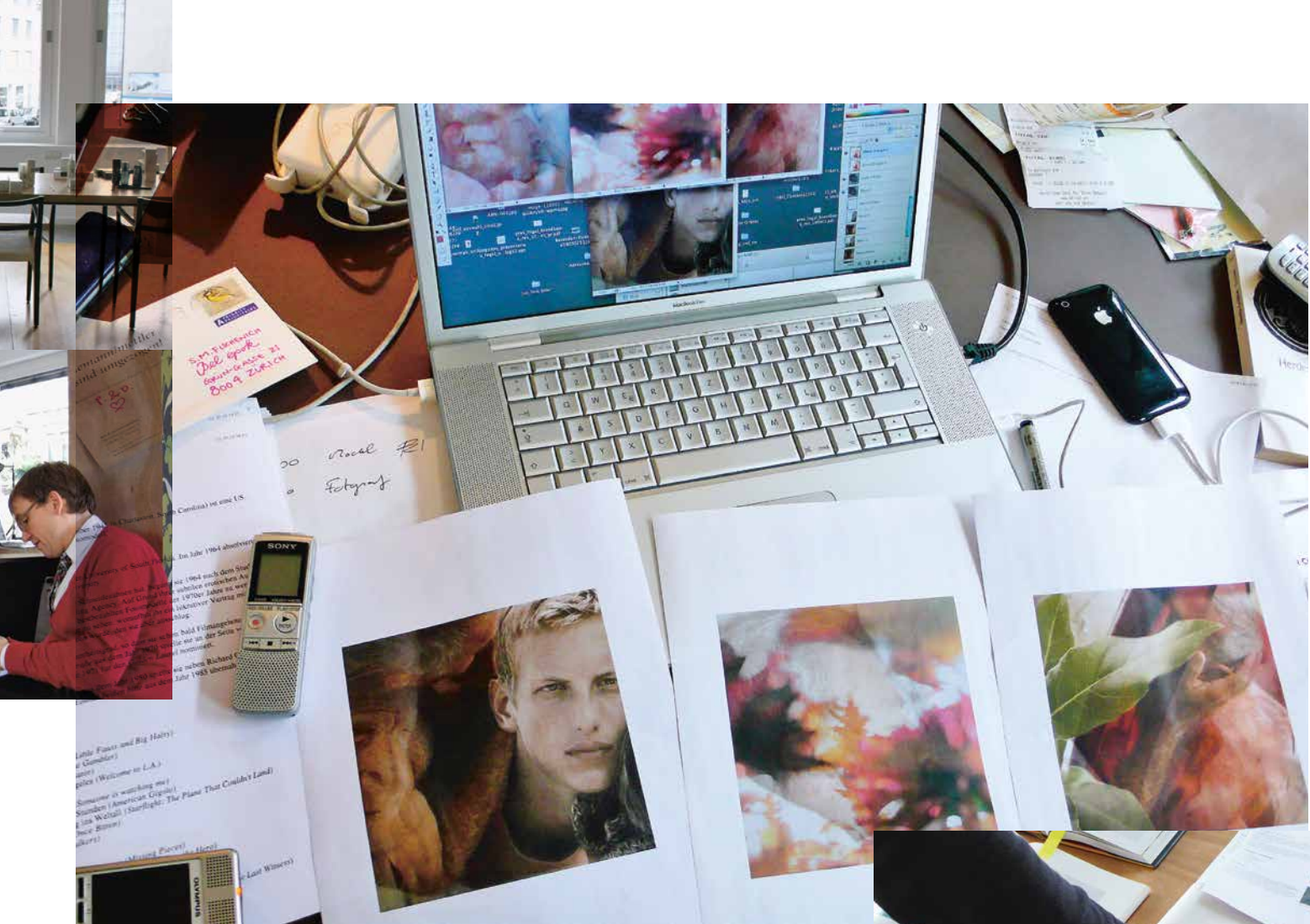
Our first meeting was set up so that we could observe how our Zurich designer was going to draft the concept for the scent

'Trust' - but he failed to arrive at the agreed time. "Just popped to the main station" he texted us. A little later he arrived at the agency with a pile of fashion and lifestyle magazines that he had just bought. Now the first stage of work began. He flicked through a torrent of pictures at breakneck speed, jotting down notes here and there, making copies, cutting out, scanning, trawling through Google's image archives using ever new search terms, and reaching into the bookshelves beside his desk - always looking for yet more pictures.

In the meantime, we had set ourselves up as observers. At the start, I felt invasive when I set up my tripod, drew out the cable and pointed my camera at the designer. I was worried that our presence would disturb his work. But soon our arrangement became completely normal. I was impressed with the endurance that the designer showed when skimming through thousands of images, creating ever new arrangements and collages on his worktop, only to jettison them all again.

His picture compilations were dominated by pastel colours. The embrace of two lovers - a young man, his head resting on the breast of his older partner - was intended to represent the topic of trust and a sense of security. The images chosen showed vine leaves and wood fibres and were intended to point towards how the future perfume was going to smell.

The topic was initially abstract, but gradually grew more and more tangible. By digitally manipulating the images, he



Multisensorial: the collages created by the agency bestow character upon a fragrance (above). Claus Noppene (in the red sweater) is a Professor at Berne University of the Arts. Here he gets to watch parfumiars at work. Photos: Claus Noppene, Nada Endrissat

finally came up with three emotionally charged, passionate, interrelated compositions. Despite this digital process, it was actually his hands-on work with the material that was important. What was striking was how calm and continual the flow of work was, despite the innumerable phone calls, e-mails and meetings. The interruptions seemed just to flow into the creative process.

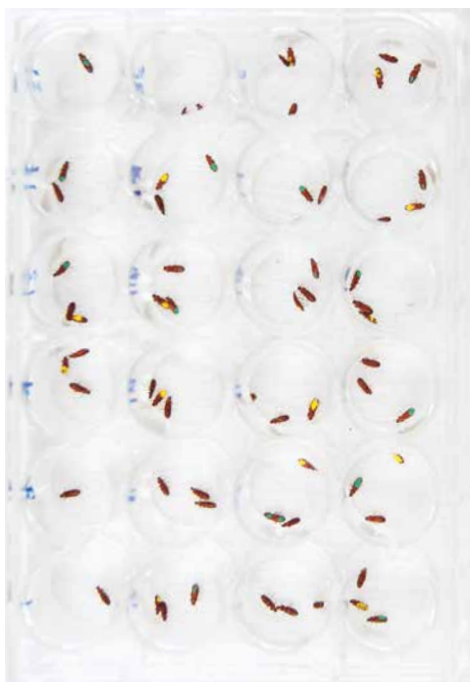
Luxury brands work with images, photos, associative texts and colours in order to guide the development of a scent. The affective, emotional and visual content of the concept images created by the designer are used as orientation points both by the parfumiars and by the advertising agency at the final stage when the product is branded. Here they decide on the name of the product, the design of the packaging and bottle, plus the campaign that will be set in motion to promote the scent.

Meanwhile, I often wear the scent whose development we observed at first hand. Time and again, I am surprised by how others react to my new fragrant aura.
As recorded by Susanne Leuenberger



When the climate changes the mating game

Global warming might lead not just to the loss of species, but also to the creation of new ones. *By Simone Nägeli*



Sometimes a corner of a shelf can suffice to research into evolution. Oliver Martin's research group is investigating the red flour beetle - *tribolium castaneum*. It is smaller than a grain of rice, which is why whole populations of them can fit into a single cubic meter filled with different containers (see photo). The researchers of the Institute of Integrative Biology (IBZ) at ETH Zurich are observing the beetle's development so as to gain insights into the mechanisms of how species arise and develop. With climate change in mind, their research is also focussed on the future - because the flour beetles allow them to investigate the impact of global warming on the development of biodiversity.

Oliver Martin and his doctoral student Vera Gräzer have now proven that rising temperatures do not just threaten biodiversity, but can also fundamentally alter evolutionary processes. In their experiments they have compared the reproductive success of female flour beetles at higher temperatures when living either monogamously with only a single male partner, or polygamously with several partners. They discovered that polygamous female beetles at first produced more offspring than monogamous females.

"Then we wanted to find out whether polygamous populations fare better in the long term than those with a monogamous mating strategy", says Martin. His group bred more than 35 generations of both completely polygamous and monogamous beetles. They kept individual females isolated with either a male harem or just a single

male. The temperature was increased slowly at a rate of 0.2 Celsius per week, meaning that the beetles had to adapt to an increase of five degrees over six further generations.

During this continual increase in temperature, the polygamous female beetles produced less offspring than monogamous beetles. "Over several generations, polygamous beetles were more sensitive in their reaction to warming", says Martin. This is probably because the polygamous females adapted their organism to a more intensive mating activity during their mini-evolutionary process. But when the researchers then simulated global warming, these females had fewer resources to help them adapt to the higher temperatures. "This shows that in the long term, polygamous species might adapt less well to rising temperatures than do monogamous species", believes Martin.

Polygamous systems

But in polygamous systems, the pressure of sexual selection is greater than for monogamous beetles. Sexual selection is an important driver of evolution because it is through the choice of partner that individuals are selected to reproduce and are able to have their characteristics inherited by future generations. Does this increase in sexual selection perhaps lead to the creation of new species? As a matter of fact, during these experiments with increasing temperatures, polygamous beetle populations became genetically more distant from each other than was the case with monogamous populations. When flour beetles from different polygamous popu-

Postcoital blues: below, two flour beetles before, during and after mating, and far left, the experimental design in the laboratory.

Photos: Sonja Sbilordo and Vera Gräzer (far left)



lations mated, this only rarely resulted in offspring. This is an initial step towards a species splitting up and the concomitant creation of new species.

Caution is advised

So does this now mean that global warming could contribute not just to the loss of species, but also to the creation of new ones? “That is perfectly possible” says Martin. But at the same time he advises caution, given the results indicating a diminished adaptability among polygamous beetle populations. If new species emerged from polygamous populations, these might well be less adaptable, and so would in the end decline quickly and disappear.

But Martin does not want to weigh up the greater potential for forming new species against the diminished adaptability among polygamous flour beetle populations. “Our results allow neither for a wholly positive nor a wholly negative interpretation with regard to climate change”, he says. Instead, what they have really shown is that global warming could change the development of a species. It doesn’t just compel a species to adapt, but also influences its sexual selection and thereby its adaptability. The combination of these consequences of global warming shows that the situation is more complex than so far imagined. “We must keep this in mind when drawing up prognoses for the development of biodiversity”, says Martin.

“Over several generations, polygamous beetles were more sensitive in their reaction to warming”.

Oliver Martin,
Biologist



The flour beetle as a model for evolution

The flour beetle, *tribolium castaneum*, is a pest that is common in temperate climate zones and that feeds off human food stocks. For several reasons it is ideally suited as a model organism for scientists. Its genetic make-up was completely decoded in 2008. This beetle reproduces very quickly, with one female laying up to a thousand eggs. Because it only needs very little space, numerous populations of the beetle can be kept in a small area. There is one more reason why the flour beetle is suitable for studies of evolution: it is very undemanding. It can survive in a packet of flour and reproduce there without having to take in water. It makes excellent sense to test the effects of the anticipated global warming on such a robust species, says the biologist Oliver Martin from ETH Zurich. “If we find that it has an effect on this species, then we can assume that there will also be an effect on more sensitive species, possibly even of much greater magnitude”.

Off target, too often

Why are most published research results incorrect? We look at a few reasons currently being discussed, along with some possible solutions.
By Valentin Amrhein



Science obviously functions well. Our drugs are effective, the Higgs-Boson has been discovered, climate change is real, and light is still quicker than anything else. The fact that none of this is 100% certain isn't a fundamental criticism of research in itself, because the empirical sciences regard all knowledge as provisional. Truth is only an ideal goal, and the path to it is paved with an increasing number of new studies that take considerable delight in contradicting each other. This might be normal in scientific debate, but is it also behind the often-discussed loss of scientific credibility? If so, then researchers must find better ways of explaining to the general public why scientists are satisfied with almost never reaching the whole truth.

As it happens, scientists are often way off target. Too often. In 2005 John Ioannidis wrote in *PLoS Medicine* that most published research results are actually wrong. The high error ratio is often caused by faulty developments in the scientific system. The simple statistical considerations underpinning his claim were recently declared to be exemplary by *The Economist* magazine (see bibliography below).

Of course, there are obvious explanations for many a wrong result, such as faulty trials or inaccurate evaluations or interpretations of data. In other cases, data may have been treated selectively so as to match a researcher's preconceived opinions. But it's also interesting that almost everyone is at fault for the same reason, whether they're researchers, institute directors, newspaper sellers or editors of scientific journals. They all want results that astonish. They want to feature people who hunt for the improbable, and actually end up finding it.

Enemy of the truth

Chance is a great enemy of truth. If someone spends many hours studying things that aren't true, then sheer probability means he or she will eventually uncover some data or another to confirm what

he or she wanted to find. All the same, everything would be simpler to interpret properly if there was also disclosure of the many trials in which nothing surprising was found. The significance of single positive results would then dwindle away in the face of many negative results. However, negative results mostly disappear into desk drawers because uninteresting studies, by definition, are just not news worthy. This is the reason why so many positive findings seem far more certain than they really are.

Then there is our own delight in a good story. Scientific papers are almost always constructed as a narrative that leads directly from the very first idea, via the development of the hypothesis and data collection, to the desired results. After all, even the peer reviewers of a scientific journal want to read a convincing tale. So it's easy to imagine the great temptation to adjust an original hypothesis to fit the eventual findings. Put figuratively, the problem with retrospectively adjusting a hypothesis is rather like an archer shooting blind at a plain wooden wall, then painting the target around the arrow. It's a bullseye! - hypothesis proven.

Pressure from all sides

These problems have long been known, but current developments are clearly doing little to change things. For example, Daniele Fanelli of the University of Edinburgh analysed 4,600 papers from across the disciplines and found that the number of negative studies - those that did not find the desired result but were published all the same - went from 30% in 1990 to 14% in 2007. Funding bodies and employers are presumably putting so much pressure on researchers that they are publishing more and more, and all the while making their stories 'better'. This desire for impressive stories is also becoming a dominant feature in science. But it means that scientists are throwing caution to the winds. Those small, unexciting steps are actually important, but they are being ignored, along with self-criticism.

Likewise, we also know a range of options to correct the system. To prevent the metaphorical painting of targets around arrows, or at least to make the whole process more transparent, we could publish the objectives and hypotheses of studies before data is collected (as is already common practice in certain branches of the medical sciences). Alongside this, negative results should be given a higher status. In the field of medicine, many studies are simply not being published, almost certainly because of their negative or unfavourable results.

Basic work should also be afforded a higher status in research - such as checking extant knowledge by reproducing third-party studies. This is easier said than

done, because the methods of the original studies are often not described in sufficient detail. Nor does academia show much interest in repeating the trials of others. However, journals such as *PLOS ONE* are now bucking the trend, by openly declaring that they do not look for studies offering big surprises. They only want to publish the results of experiments that have been carried out impeccably; similarly they also offer column inches for repeat experiments.

Not punishment but reward

We should aim for a different state of affairs in future. Researchers should be praised, not punished, when their work leads them along less straightforward paths or when they disclose their own errors and failures. Even the best researchers make mistakes, and in order for others to build on their experience, this should be discussed without any notion of sanction. And it's not just the pharmaceutical industry that should disclose its data records to the public; scientists at our universities should also open up their figures and methods of evaluation.

All too often, the rational for falsely claiming correctness is that, at worst, a flawed study will be rejected by a journal. It can then be submitted to the next journal at no cost. One solution to this is offered by the 'open science' journal model, such as employed by *F1000Research*, in which papers are first published and only then peer-reviewed. This might sound like it makes publishing easy, but in fact, it places higher demands on researchers, because articles remain on the journal's website even if they are rejected, along with the peer reviews carried out on them. In addition, peer reviewers will invest more effort knowing that their assessments - along with their names - will be made public. At the same time, authors will scrutinise their studies in greater detail before entering into a scientific discussion with peer reviewers in a public forum.

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Lynx, bears, wolves – and humans

In ecological terms, the prospects are rosy for lynx, bears and wolves in the Alpine region. But humans remain a risk factor. This is why nature conservation research into large predators is expanding into the social sciences.

By Hansjakob Baumgartner



Today is a golden age for large predators – at least in the Alps, where the living conditions for lynx, bears and wolves are better than ever. The forest habitat is intact and is expanding. There is also prey in abundance, as the populations of deer, chamois and ibex are at record highs.

In the mid-19th century, things were different. Deforestation had reduced the wooded areas in the Alps to half of what they are today. Ibex and antlered deer had been eradicated, and roe deer were a rarity. Only the chamois were able to survive, after a fashion. The weapons used by hunters were continually improving, and this helped them to finish off the three large predators. There was even general approval for this state of affairs. This included no less a figure than the natural scientist Friedrich von Tschudi, the author of the standard work *Das Thierleben der Alpenwelt* ('Animal life in the Alps'), published in 1853. He saw nothing wrong in man ridding himself of "the resolute enemies of his person and his cultural attainments".

Today, lynx, bears and wolves are protected by national laws and international agreements. There is a consensus that biodiversity is a precious commodity that must be maintained – including those species that as predators play a key role at the top of the food chain.

And yet these large predators are still being hunted down. Poaching is the biggest factor in the mortality rate of the Swiss lynx; in Italy, the wolf expert Luigi Boitani estimates that 15-20% of wolves die every year at the hands of humans; and the resettlement of bears in Lower Austria that began in the 1990s foundered most probably because of illegal killings.

Keeping a watchful eye

Humans therefore remain a risk factor for large predators. We have also become a new field of research for nature conservationists. There is even competence centre for this: the Swiss Federal Institute for Forest, Snow and Landscape Research (WSL). In one of its latest studies, 72 European publications were analysed to ascertain people's personal acceptance of large predators. The

results show that older people who are oriented more towards traditional values and have a somewhat lower level of education tend to be less tolerant of large predators than younger people with an academic background who are more open to new ideas. But the biggest impact on acceptance is the degree to which people are directly affected. The majority of the general population is by and large well disposed to lynx, bears and wolves – except those living in the same areas as these species. Opinions are most negative among hunters and those involved in small animal husbandry.

To be sure, sheep farmers have sound reasons for bearing a grudge against wolves, for without them, their lives would be easier. Hunters aren't wrong when they say that the presence of lynx makes hunting more difficult. And it's not at all unjustified to be afraid of bears when they display no shyness towards people, but prowl about in residential areas as was the case of the bear M13 in Val Poschiavo in early 2013.

Ultimately, however, these disputes about large predators come down to political conflicts of interest. In order for all three species to be able to survive in sustainable numbers, these conflicts have to be either resolved, or reduced to a point from which they can no longer escalate. And this can't happen without compromises.

Authorised culling

In Switzerland, one step further was recently taken in this direction. In 2012 the WWF, Pro Natura, the Hunters' Association and the Sheep Breeders' Association drew up a joint policy paper. It recognises that the return of the large predators is a natural process and not the result of them being furtively released into the wild (as is sometimes claimed in the case of the wolf). The preservation of these animals as part of our native fauna is thus fundamentally affirmed. On the other hand, the controlled shooting of these animals is no longer altogether excluded, as long as the population of the species in question is not endangered.

Such interventions in the predatory population will be possible, for example, if the loss of working animals exceeds an acceptable level, or if deer are depleted by

lynx and wolves to such an extent that they can no longer viably be hunted. The organisations devoted to conservation have changed their tune in this regard; until now they had rigorously excluded the possibility of hunting large predators. Furthermore, reasonable measures to protect livestock are to be expanded.

Old animosities

But how is this agreement to be implemented? How low, for example, must the roe deer population drop before lynx can be shot? And if the stocks of certain game are depleted, could this really be traced back to a predator, or could there be other reasons? And to what extent can one reduce the population of lynx without endangering it altogether? Such questions still offer much potential for conflict.

When there are disputes about predators, it is often not factual differences that are the biggest hurdle, but problems between people. These are often caused by old animosities that need not have anything to do with the actual object of conflict. The biologist Manuela von Arx from the research programme Kora ('Carnivore ecology and wildlife management') has taken a closer look at these issues, analysing the nature of communication between hunters and conservationists when they discuss large predators. She has ascertained that the two interest groups have learned to relate quite well to one another on a national level, not least thanks to the discussions that took place for the above-mentioned policy paper. In actual fact, nature conservationists and hunters share many common concerns.

Communication on a regional level is more difficult. In Simmental in the canton of Bern, for example, where the lynx caused a stir in the late 1990s and where several wolves have settled temporarily, the mutual mistrust is deeply rooted. "But much can be achieved through intensive direct contact and a shift in communication, away from arguments and accusations and instead towards dialogue and participation based on mutual respect and revealing common values". And von Arx is convinced that "behind seemingly incompatible attitudes you can always find compatible interests".

Leap to freedom: the male lynx Vino after reintroduction in Tössstock, canton of Zurich (March 2001), wearing a tracking device. Photo: Keystone/

Arno Balzarini

It's not just honey bees that pollinate wild and cultivated plants. Wild bees are just as important. But their numbers are dwindling drastically.

By Simon Koechlin

Wild pollen collectors

Bee mortality is being talked about everywhere. It's mostly beekeepers who are the focus of discussion, since they are losing more honey bee populations every winter. But it's often forgotten that insects living in the wild, such as wild bees and hover flies, are also important for pollinating wild and cultivated plants.

"Wild pollinators are just as important as honey bees", says wild bee expert Andreas Müller from ETH Zurich. This has been proven by a large-scale study that was recently published that investigated the connection between pollinating insects and the productivity of 40 widely cultivated plants. The more wild pollinators they had, the higher the yield of the plants. In the case of just 16 of these cultivated plants, on the other hand, the yield was greater when there were lots of honey bees.

However, Müller insists that one should not make the mistake of putting a greater emphasis on protecting wild bees than on traditional beekeeping. Because it's also been proven that pollination and fruit yield are highest when cultures are visited by many different pollinators, both honey bees and wild bees. This is because the species complement each other. Some, for example, prefer to fly out very early in the morning, while others even venture out during bad weather.

"Many specialised species of wild bees pollinate plants that don't attract honey bees", says Müller. Alfafa, for example, which is an important forage crop, hurls its pollen at the pollinator using a kind of explosion mechanism. Honey bees don't like that at all. Blueberries are also dependent on specialist bees. They rely on several wild bees and bumblebees using their wing

muscles to make the plants vibrate so that the pollen is shaken onto their bodies.

However, the number of specialised wild bees is diminishing in both Switzerland and Europe as a whole. "Roughly half of the 750 or so species of wild bees found in Central Europe is endangered today", says Müller. On the one hand, the range of blossoms has declined markedly, and on the other hand there's now a scarcity of so-called small structures – deadwood, piles of rocks and stretches of ground with little vegetation, all of which are needed by wild bees for their nesting areas.

Weakened ecosystems

According to Müller, Switzerland has not yet seen any significant losses in production on account of this decline in pollinators. But many farmers today are already buying commercially bred wild bees in order to improve the pollination of their fruit crops. Furthermore, a lack of pollinators can lead to an impoverishment of our ecosystems. Researchers have established that there is a correlation between the decline in wild pollinators and the decline in the flowering plants that they pollinate.

In order to maintain the present variety of wild bees, Müller says that something urgently needs to be done. "Any and all measures are useful that provide for a greater range of blossoms and small structures", he says. A decisive role is played by efforts undertaken by farmers, such as setting up ecological compensation areas that are intended to be more bee-friendly. But private citizens can help too: "Whoever leaves the golf course behind and instead affords nature a little space in the garden will soon be able to observe wild bees".



Literature:

Swiss Academies of Arts and Sciences (2014): 'Bienen und andere Bestäuber: Bedeutung für Landwirtschaft und Biodiversität'. *Swiss Academies Factsheets* 9 (2). www.akademien-schweiz.ch/factsheets

Lucas A. Garibaldi et al. (2013): 'Wild Pollinators Enhance Fruit Set of Crops Regardless of Honey Bee Abundance'. *Science* 339: 1608–1611.

Golden crown: a female wild bee with her head covered in pollen. Photo: Keystone/Science Photo Library/US Geological Survey



Lost knowledge

Clinical studies are often broken off, unfinished. This is a waste of financial and human resources, and means that valuable knowledge is being left by the wayside. *By Roland Fischer*



Almost finished: unfortunately most incomplete medical studies are never published. Photo: Adrian Moser

It used to be easy to acquire medical knowledge: doctors learnt on the job over many years of tending to the sick. Today, however, medicine has become one of the most complex scientific fields – and one of the most expensive, too. The methods employed to make the most objective assessment of successful treatments have become ever subtler in recent decades. They now occupy a whole range of specialists, from the doctors engaged in research to regulatory authorities and ethics commissions.

The gold standard is the randomised, controlled trial (RCT). Yet when properly carried out, such studies require considerable logistical efforts and financial resources. This is also the reason why many a study is broken off before it has been completed. That is troubling, because the resources invested are then wasted. Experts have long known about this problem, but until now, not much was known about the extent of it nor the reasons for it.

In a major study, experts from Switzerland have now ascertained that of all the RCTs that are given a green light from ethics commissions, nearly 30% do not make it to the end. Once they are cleared to proceed, almost all the studies do start up – but

then they often get stuck halfway because of problems in recruiting patients. And as if this was not enough, over 60% of the discontinued studies leave no trace behind. In other words, nothing is ever published. The researchers heading up the survey are Matthias Briel from the University of Basel and Erik von Elm from the University Hospital of Lausanne. They do not just find this annoying; they actually find it “unethical” too, because “it means available evidence is lost”.

Every patient counts

Half-finished RCTs are of little value to individual researchers because their lack of adequate patient numbers means they offer neither spectacular results nor solid statistics. And this in turn means they are hardly going to get into an important journal. But their results could still be useful for the scientific community, as medical information is increasingly being gained from meta-analyses that pool a multitude of RCTs. This places value in every single patient whose case has been studied. Briel and his colleagues are therefore advocating for the effective use of clinical study registers. Even better, they say, would be the compulsory publication of RCTs, regardless

of how far they progressed.

What is also interesting is that the researchers found a considerable difference in the number of cancelled studies, depending on whether they were initiated by academics or industry. Studies set up by the healthcare industry performed better – perhaps because they were planned more carefully and coped better with problems that arose. The number of discontinued RCTs that were initiated by academic researchers is an astonishing 40%. Here, says Briel, lessons could be learnt from industry. And it's not just about the greater financial resources that industry has at its disposal.

Tried and tested structures and procedures, managed professionally, could help university researchers to navigate through rough patches in their studies. Briel mentions the Clinical Trial Units (CTUs) as an important step forward. CTUs are centres of competence that are being set up at many university hospitals. According to Briel, research funding organisations could also offer additional help in overcoming the threat of discontinuation. For example, they could budget for a financial reserve to be drawn upon with a minimum of red tape, were a study to hit unforeseen problems.

Self-defence, one leaf at a time

When a plant suddenly becomes a herbivore's lunch, it has little say in the matter. But just because it can't run away, doesn't mean it can't defend itself. Its defence is aimed at the herbivore's digestive system and comes in the form of toxic hormones called jasmonates. Research into jasmonates has struggled with how plants turn a local injury into a generalised alarm signal. The breakthrough was made by Edward Farmer and his team at the University of Lausanne, and their work on thale cress, *Arabidopsis thaliana*, was published recently in *Nature*.

The key appears to be electrical signals. They propagate from leaf to leaf activating jasmonate synthesis along their way, much like nerve signals in animals. But Edward Farmer notes, "we cannot speak of a vegetable nervous system because plants have no neurons. Their sensory system is, however, undoubtedly very sophisticated".

The team in Lausanne also confirmed that certain defence genes are expressed in response to this electrical activity in the leaves. Three genes, known as GLR genes, have been specifically identified. Their role is also tied to synaptic transmission in the nervous system of vertebrates, leading researchers to toy with the idea of a homologous defence mechanism, involving GLR genes and dating back to before the separation of plants and animals. *Fleur Daugey*

S. A. R. Mousavi, A. Chauvin, F. Pascaud *et al.* (2013): 'GLUTAMATE RECEPTOR-LIKE genes mediate leaf-to-leaf wound signaling'. *Nature* 500: 422–426.



Undercurrent: electrodes measuring electrical activity in thale cress.

Juan Gaertner/Shutterstock



Way down in the bowels: an intestine afflicted by Crohn's disease.

Treating bowel disease with light

Some 12,000 people in Switzerland suffer from chronic inflammatory bowel diseases such as Crohn's disease and ulcerative colitis. They are thought to be triggered by over-activity of the immune system and lead to stomach cramps, diarrhoea, fever and weight loss. Many patients also react badly to the currently available medicines, which is why alternatives are being sought. One promising approach is photodynamic light therapy that Maria-Anna Ortner and her colleagues are pursuing at the Zurich University Hospital. They treat patients with 5-aminolevulinic acid, a substance that only becomes active when the affected tissue in the intestine is irradiated with light. In mice, this phototherapy reduced the immune response and the symptoms associated with colitis after just eight days, without any side effects. For their initial clinical tests on patients, the researchers adopted this time-frame, monitoring for success eight days after treatment. Only one out of seven patients actually showed a clear improvement after eight days. The researchers were positively surprised, however, when three more patients also responded to the treatment - though only after 29 days. "Clearly, the human intestine needs more time to recover than that of mice", says Ortner. A treatment that could alleviate chronic bowel inflammation in half of all patients would be a medical breakthrough. This is why Ortner is now planning a second clinical trial, in which the success of the treatment will only be monitored after 29 days. *Liselotte Selter*

Evolution's misappropriations

The fact that evolution acts less like an inventor and more like a tinkerer is something that the biologist and Nobel Prize Laureate François Jacob remarked back in 1977. Life might often bring forth forms that are perfectly adapted to their respective function, but it has frequently been the case that their original purpose was quite different. For example, the auditory ossicles - the tiny bones that now magnify sound waves in the middle ear and transport them to the inner ear - originated in the gill arches that provided primeval fish with oxygen.

Evolutionary biologists have coined the word 'exaptation' for such creative 'misappropriations'. This has allowed them to fill the conceptual gap left by the notion of 'adaptation'. It remains a matter of dispute just how great was the respective role played by exaptation and adaptation in the history of life on Earth. Aditya Barve and Andreas Wagner from the University of Zurich have been helping to clarify this problem in their theoretical work, using computers to simulate the development of bacterial metabolic processes. Their virtual bacteria were specialised, for example, in using glucose as their sole source of carbon. But in 96% of cases they were still able to use carbon sources to which they were not adapted. "Such hidden properties are far more widespread than was always assumed", says Wagner.

These researchers have also come across something else that is astonishing: complex metabolic networks have a greater evolutionary potential for innovation than simple networks. "It is an advantage to complexity that no one has so far appreciated", adds Wagner. *ori*

A. Barve & A. Wagner (2013): 'A latent capacity for evolutionary innovation through exaptation in metabolic systems'. *Nature* 500: 203–206.



Complexity: 247 points representing simulated bacterial metabolism.

Aditya Barve and Andreas Wagner

A question of sharing

From agriculture and tourism to electricity production: the region of Crans Montana and Sierre needs a lot of water. Although this region is already dry today, it will not suffer from any lack of water as long as this valuable commodity is properly shared. *By Felix Würsten*

How does climate change affect the dry valleys of the Alps that are used so intensively? This question is being asked intently by the region of Crans Montana and Sierre, part of which has one of the lowest precipitation rates in Switzerland. And yet many there need large amounts of water. There is the Lienne power station with the Tseuzier dam, there are tourist resorts that need drinking water, farmers who need to irrigate the grasslands and ski resorts that need snow on their pistes. The big question is whether the region will be able to get water in the future, and if so, how. It is all the more urgent because the Plaine-Morte glacier, which is an important source of water for the area, will have completely melted away by the end of this century – if not before.

Quantity isn't the problem

Scientists from the University of Bern have joined researchers from the Universities of Fribourg and Lausanne to sketch out various scenarios in an effort to solve the problem. They first looked into how the hydrological system functions in the region. Local climate scenarios allow them to proceed from the assumption that higher altitudes will in future see a similar amount of precipitation as today. "The region of Crans Montana will in future still have sufficient water at its disposal", says Rolf Weingartner from the Geographical Institute of the University of Bern. "However, there will be a shift in how it is distributed. In summer particularly, there will be less water available in future. In some years there might even be a drought. So the challenge is to achieve an optimum use of existing resources".

This will not be so simple. The big water consumers all have their own specific needs, and they also have a number of conflicting interests. It is not clear how a solution could be negotiated if there were

an acute water shortage. Would agriculture take precedence so that farmers can water their fields? Or the golf course whose tournament is important for tourism? Or the power company that uses the water to produce its electricity?

But not only are there different water consumers. The matter is made even more complicated because the catchment area for their water stretches over eleven different communes with varying degrees of access. The commune of Icogne has a lot of water, for example, while other communes don't even have a spring. "In our project we were able to show that there is a whole network of written and unwritten laws as to how the water is shared between the communes" says Weingartner. "Under present conditions this is not a problem. But if water becomes scarce in the summer months of years to come, this complex set of rules will make it difficult to ensure fair distribution".

Involving all the stakeholders

Even before their project started, the researchers established contact with people in the region. The different stakeholders all came together: politicians, people from the tourism industry and agriculture, and representatives of the power plant operators and environmental associations. Alain Peruchoud, who was there to represent Sierre Energie, praises how it was done: "The local representatives were involved in exemplary fashion", he says. The researchers drafted four different scenarios for regional development together with the stakeholders, then evaluated them with a view to their sustainability. "Societal and economic change will actually have a much bigger impact than climate change on the future water supply", says Weingartner. For Peruchoud, this is good news: "In the coming years we won't have any water shortages, but we will have to regulate water distribu-

tion better. The chance to solve this problem now lies in our own hands".

In his opinion, it's now primarily a matter for the communes to get to grips with the problem quickly. "They have to think about how they want to divide up the water. Thanks to the research project we now have a neutral analysis from outside. And that helps", he says. Maria-Pia Tschopp, the Prefect of the district of Sierre, is convinced that "among younger politicians especially, there is the will to deal with this topic". However, she feels that it is not clear how the results of the research project can be implemented in concrete terms, and what role the cantonal authorities should play in all of this. "It will still take a while until all those involved are convinced that there is a real need for action", says Tschopp.

This is also a matter of concern to Weingartner. As a researcher he can make a contribution on several different levels. "We are considering whether to continue the dialogue with the politicians and the people in the context of an Agora project financed by the SNSF". And Weingartner also sees a need for action on the part of the scientists. "The underlying data are partly inadequate, especially with regard to water consumption and the legal situation. If we want to establish a meaningful monitoring system, then we have to determine what key parameters must be recorded".

Weingartner also wants to investigate whether the Tseuzier dam could be used as a multi-function reservoir in the future. Then the water in the lake would be used for other purposes besides generating power. But here, too, there are many open questions. "The power industry is in a state of upheaval, and many power stations have to renew their licenses in the coming decades", says Weingartner. "This offers us an opportunity to rethink how we use our reservoirs. And we can provide an important stimulus in this discussion".

Don't eat yellow snow: the fluorescent dye uranine helps trace the path of melted glacial water all the way down to the valley. (Plaine Morte, August 2011) Photo:

Flurina Schneider, Institute of Geography, University of Bern.



> Clip of the report on the Montanaque project by the TV show "Einstein"

A small slice of Switzerland in space

The first 100% Swiss Made satellite has been in orbit for four years now. At the end of its mission in 2018, instead of becoming another item of space debris, it may help demonstrate a workable solution to this issue.

By Philippe Morel

SwissCube orbits the Earth at an altitude of around 700km yet measures just 10cm cubed. Nor is everything given away by the title 'the first entirely Swiss-built satellite', as it was actually developed, designed and produced chiefly by students at Ecole Polytechnique Fédérale de Lausanne (EPFL) and the University of Applied Sciences and Arts Western Switzerland (HES). "Giving students hands-on experience like this is a real booster to their education", says the project leader, Muriel Richard.

Student success

In total around 200 students participated in the processes of establishing protocols, conducting tests and selecting appropriate technology, then assembling the components, building prototypes and, eventually, constructing the satellite itself. And by all accounts they were successful. SwissCube not only resisted the intense vibrations of the launch, but has since orbited the planet more than 22,000 times, remaining fully operational despite exposure to solar radiation and drastic changes in temperature.

Besides its educational aims, the project has also fostered a full-fledged scientific mission. To design this, they enlisted the help of the World Radiation Centre (WRC)

in Davos, specialists in solar radiation. The mission aims to investigate 'air glow', a photochemical phenomenon occurring at night at an altitude of 100km, where oxygen atoms recombine and emit a low intensity light or 'glow'.

Since its launch, SwissCube has photographed air glow on over 250 occasions. Unfortunately, the data collected is of limited scientific value, as a compromise had to be struck on the choice of detector. The initial choice proved to be overly susceptible to radiation, leaving mission planners to opt for a more robust, but much less sensitive model.

More space waste?

During the planning phase of the mission, there was little concern regarding the fate of the satellite. In 2009, however, this attitude had to be dropped when two satellites collided in space and another was destroyed by a Chinese missile. These events littered the path of SwissCube's planned orbit with debris. Fortunately the satellite

has yet to suffer any damage, but Richard is adamant in saying, "today, any new satellites will be fitted with propulsion systems allowing changes in orbit and controlled destruction".

SwissCube may still dodge its fate of becoming yet more space waste, as researchers at the Swiss Space Centre have drummed up the Clean Space One project. This project aims to launch a satellite capable of collecting debris and bringing it safely back to Earth. If all goes to plan, the Clean Space One team will honour SwissCube by making it the target of their first mission, planned for 2018. "Switzerland is a relatively small space-faring nation", says Richard. "If we can demonstrate that it is possible to deal with debris, it would force larger nations to take the problem seriously".



Balancing act: the student built satellite measures just ten centimeters and weighs only 820 grams. Photo: Alain Herzog/EPFL



This cloud chamber, almost big enough to climb inside, may reveal the origin of aerosols.

Cloud secrets

There might be smoke without fire, but there's no cloud without water. Yet clouds are made of more than just water. If they are to form, it must be in the presence of aerosols. It is these floating microscopic particles that allow enough water molecules to accumulate into droplets. The origin of aerosols, however, has been the focus of scientists at Cern, where a team of 77 scientists from 19 institutions, created the 'Cloud' experiment.

Amongst these institutions is the Paul Scherrer Institute, which contributed to the construction of the Cloud experiment and developed a device to detect extremely precise molecules. "We have shown that a very important role in the formation of aerosols and therefore clouds is played by dimethylamines (DMA). These molecules are produced in conjunction with ammonia during the decomposition of organic matter", says Urs Baltensperger from the laboratory of atmospheric chemistry. In the presence of DMA, the creation of aerosols from sulphuric acid molecules found in the atmosphere is multiplied by 10,000. Baltensperger adds, "this goes a long way towards our understanding of cloud formation. But there are still some gaps".

Their work also introduces a small paradox into our relationship with the environment, as the application of DMAs to create cloud cover would favour areas of low pollution (i.e. where industrial pollution does not generate enough aerosols to produce clouds). And as clouds reflect solar radiation, greater pollution counteracts global warming. *Daniel Saraga*

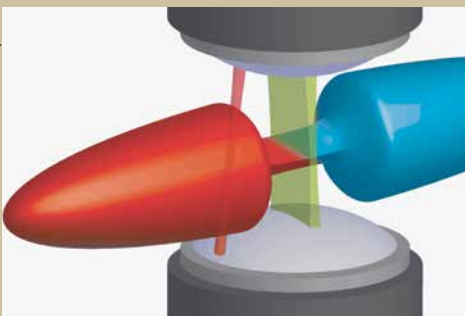
Almeida *et al.* (CLOUD collaboration): 'Molecular understanding of sulphuric acid-amine particle nucleation in the atmosphere'. *Nature* (2013), DOI 10.1038/nature12663.

Model for the thermoelectric effect

'Thermoelectric effects' allow for the conversion of differences in temperature into electric power. And contrariwise, they allow for cooling (or heating) by way of electrical currents. These effects were discovered 200 years ago, and there are already many useful devices that apply them: portable refrigerators, temperature sensors and on-board power generators for space probes. For now, these devices are only modestly effective and still cannot exploit potential sources of electrical energy such as the heat produced in many industrial processes. In addition, these effects involve a complex set of physical phenomena, for which there is still no complete theoretical understanding.

The effects have recently been demonstrated in a cloud of lithium atoms controlled by laser, as reported in an article by Antoine Georges (University of Geneva and Collège de France), Tilman Esslinger (ETH Zurich) and Corinna Kollath (University of Bonn). Unlike condensed matter, this system of 'cold atoms' (at 250 billionths of a degree above absolute zero) produced measurements that correspond precisely to theoretical predictions. On this basis, this team of researchers has concluded that their device represents an ideal model for studying and improving the efficiency of thermoelectric materials. *Anton Vos*

J.-Ph. Brantut, C. Grenier, J. Meineke, D. Stadler, S. Krinner, C. Kollath, T. Esslinger and A. Georges (2013). 'A Thermoelectric Heat Engine with Ultracold Atoms'. *Science*, DOI:10.1126/science.1245981



Experimental model: the temperature of the red lithium cloud is lifted from near-absolute zero by the green laser beam.



Ice research: the search for cosmic neutrinos starts here (March 2012).

Cosmic messengers found in Antarctica

You know when a new e-mail reaches your inbox, because you hear a short sound announcing its arrival. But how would you know if a message from the depths of space had reached Earth? Blue Flashes. If you're in Antarctica, at least. That's where scientists are hailing the coming of cosmic neutrinos bearing the universe's secrets.

Neutrinos are sub-atomic particles with a mass of almost zero, no electric charge, and which therefore only interact extremely weakly with matter. They are generated both by the Sun and by the atmosphere, but above all by various cosmic objects (black holes, quasars, dying stars, etc.). They even bear the signature of their creator. But whilst judging by their energy levels (10^{11} to 10^{21} eV), you might predict they'd be bouncing off the walls, they actually go through everything: galaxies, planets, even living beings, and without causing any damage.

In fact, it's only very seldom that they leave a trace. When they do collide with an atom they produce a bluish trail called Cherenkov radiation. To record this, scientists at the South Pole have built a colossal detector, IceCube, composed of 86 strings of 60 photosensitive spheres all buried deep in the ice. And since 2012, they have observed the trails of 28 high-energy neutrinos.

"Astrophysics is opening a new window of exploration", says Teresa Montaruli, physicist and IceCube contributor at the University of Geneva. The main aim of her group's work is to identify the source of these neutrinos. "These discoveries will help us begin to understand high-energy cosmic phenomena", she says. Meanwhile, scientists hope that help will soon be to hand in the form of the arrival of more of these heavenly messengers. *Olivier Dessi-bourg*

'Evidence for High-Energy Extraterrestrial Neutrinos at the IceCube Detector'. *Science*, 22 November 2013, 342:6161. DOI: 10.1126/science.1242856



Swiss thinking

The great philosophers of the Enlightenment seldom took residence in Switzerland, nor did it figure in their deliberations. All the same, Switzerland did become a laboratory for political theory - though not a particularly democratic one. *By Urs Hafner*

Traditionally, Switzerland's reputation is one of a free country. It conjures up the image of an Alpine republic that inspired the imaginations of the Romantics and of many an enlightened thinker: a veritable Arcadia of unspoilt mountain shepherds and virtuous, upright citizens. By the mid-19th century it surfaced as a liberal, free state, capable not only of staying afloat in a sea of repressive monarchies but also of throwing lifelines to political refugees. Switzerland became a safe haven for humanity.

Of course, these images of Switzerland contain elements of exaggeration. They achieved popularity among the educated European classes between 1750 and 1850, during the great upheaval from *ancien régime* to incipient modernity and have even retained some of that popularity to the present day. But they often served only the needs of those who simply saw what they wanted to, an idealised place of freedom. The common ground in both these images is actually an absence. They dispense with thinkers and philosophers. The citizens of the Old Swiss Confederacy and their women were supposedly farmers and warriors, not intellectuals. And yet in the early modern period, the Reformed cities of Geneva, Lausanne, Bern, Basel, Zurich and Neuchâtel were indeed home to a host of active political philosophers, known today only by their names, if at all: Emer de Vattel, Isaak Iselin, Johannes von Müller, Karl Viktor von Bonstetten, Benjamin Constant, Johann Heinrich Pestalozzi, Germaine de Staël, Karl Ludwig von Haller, Johann Caspar Bluntschli and others besides them. The great Jean-Jacques Rousseau is the exception who proves the rule, so to speak.

Analytical minds

Despite their different political orientations and fields of activity, these thinkers all had things in common. Their life and work were discussed throughout the German and French-speaking worlds, says Béla Kaposy – a historian of ideas who teaches at the University of Lausanne and occupies an almost unique place in Switzerland today. They knew all the ins and outs of the contemporary economic, political and cultural discourse in Europe, and they were fierce analysts of what today we would term the international body politic.

One shining exception: Jean-Jacques Rousseau reads to Madame d'Épinay from 'Julie ou la Nouvelle Héloïse' (drawing by Felix Philippoteaux, 19th century).

Picture: Keystone/Interfoto/Sammlung Rauch

They are now the focus of Kaposy's attention, and that of his doctoral students, as for several years he has been devoted to a thorough investigation of the politico-economic ideas of the early modern period.

There was something else that these thinkers had in common: their perspective was determined by the restricted territorial dimensions of Switzerland itself. They wanted to understand how Europe functioned in order to safeguard Switzerland's modest place amidst Europe's royal empires. 'Peace theories' were popular at the time, but these thinkers took a critical stance towards them because they suspected – often rightly – that they were a mask for the interests of the great powers. Unlike other contemporary observers of events, they were more sensitive to the presence of imperial undertones.

Moral debate

It's natural to assume that thinkers raised in the societies of republican Swiss states would have propagated republican theories. Republicanism stood in contrast to the prevalent monarchism of early modern times (which allowed communities to fall under autocratic rule) and gave rise to a far less common system, a sovereign state ruled either by the aristocracy or by representatives of 'the people' – by citizens, merchants or even artisans. Monarchism therefore stood for the hereditary principle, whereas liberal republicanism favoured elections. But the philosopher Hannah Arendt traces our understanding of republican politics back to the 'polis' of the Ancient Greeks, arguing that Athens played host to the invention of politics and with it – and inseparable from it – "secular, visible freedom". Her idea of freedom is the public execution of political acts among equals. Those 'equals' are, for example, other citizens endowed with the same rights in an autonomous city – such as the guild republic of Zurich in the Old Swiss Confederacy.

But from Kaposy's point of view, these Swiss thinkers only agree with Arendt's appreciation of political action to a limited degree. Once again the exception is Rousseau, who consistently propagated the sovereignty of the people. Otherwise, the so-called republican philosophers of the 18th

and early 19th centuries preferred to debate the morality of the contemporary political elite: how they should act, and whether they should raise the status of the leading families in the towns in order to prevent the outbreak of revolts. Political thinking as applied in and to the Swiss Confederacy thus took a critical attitude towards power structures, but was not republican in a democratic sense.

Nor was this the case with the liberalism of the early 19th century. As with liberal movements elsewhere, voices spoke out in favour of market forces, pushed politicians to regulate less and called for the abolition of guilds. But whilst British economic thinking was very popular in Switzerland, according to Kaposy, Swiss liberalism had certain specific features. There was a real understanding of the tensions between politics and economics and of social cohesion and peace. The negative consequences of economic liberalisation – poverty and the impoverishment of the lower classes – were named and shamed. Liberalism in Switzerland helped to establish social insurance institutions. And in Europe, Swiss liberalism became admired and was regarded as both anti-colonialist and anti-imperialist.

Suspected conservatives

So why has this Swiss tradition of political thought been forgotten, even in Switzerland itself? For one thing, research into the Enlightenment has traditionally been centred on literature and France, says Kaposy. Politics and Switzerland have slipped through the net, as it were. Furthermore, in recent decades the academic discipline of the history of ideas has largely fallen by the wayside. It has been displaced by social and economic history and is unjustly suspected of having adopted a conservative stance.

These days the history of political ideas naturally factors in the social dimensions of leading thinkers, their social environment and the intellectual discourse they propagated. So is the discipline perhaps on the verge of a *renaissance*? Given that the boom years have finished for the majority of the population, battles for resources will probably intensify. But if there are battles to be fought, then – hopefully – there will also be more arguments and more debate.

Playful poses, theatrical gestures

After family, it's friends who are the most popular subjects for private photography. And friendship is often demonstrated by the physical proximity of those featured in the pictures.

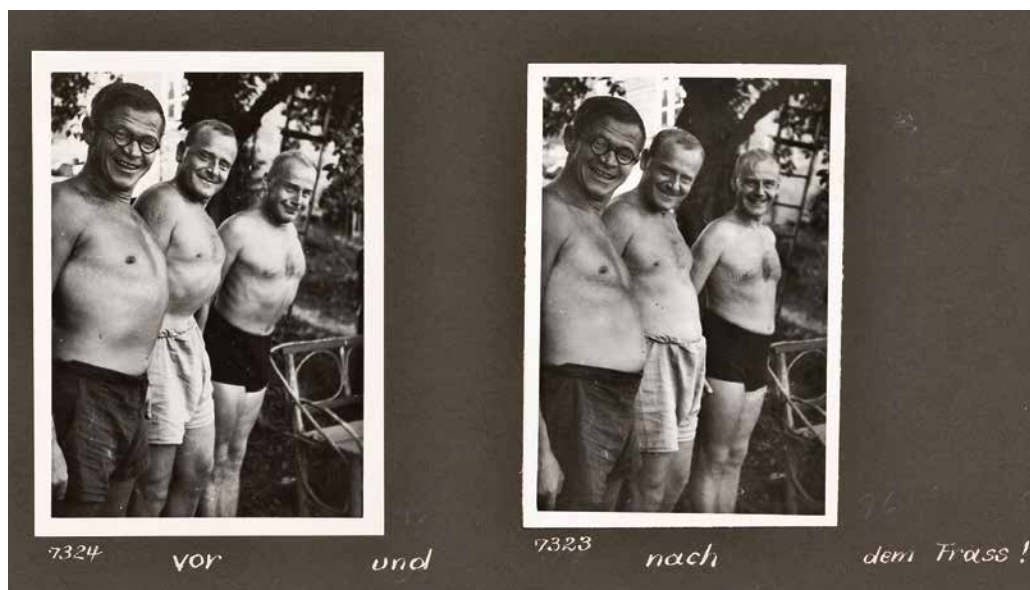
By Caroline Schnyder

It's almost as if they were posing for a fashion magazine. Two young women with bob-cuts and clad in brightly coloured, sleeveless dresses turn their faces to catch the sun. The taller of the two has her arm around her friend, who in turn leans on her. A mutual smile confirms that it's all staged, signifying their playful delight in posing together. This photo from 1934 is to be found in Doris Keiser-Zanolari's photo album. It was taken – presumably with a self-timer – on the balcony of the finishing school in Lausanne where she spent a year after high school. For the historian Nora Mathys, it is typical of the photos taken among friends in the first half of the 20th century.

For her doctoral thesis on depictions of friendship in private photography, Mathys has analysed private archives held by the Swiss National Museum – 168 albums belonging to men and 65 to women. She also consulted single photos not in albums, along with photography guides and photo magazines. Her period of investigation covers the first half of the 20th century. It was a time when the new hand-held cameras became affordable to the upper classes, allowing them to take snaps whenever and wherever there was enough light to do so. The results of Mathys's work can be seen in a beautiful book entitled *Fotofreundschaften* ('Photo friendships') that, in its composition and design, is reminiscent of a photo album itself.

Male bodily hygiene

Mathys photographed each individual picture with a digital camera and entered it in a database. Ten years ago, she says, it would have been almost impossible to carry out such a study. She took a serial approach to the pictures because it was only thanks to the sheer volume that she could identify conventions in the pictorial language of the times, and how those conventions adapted and shifted. For instance, there are many



Hold it in... now let it out: friends in front of the camera in the first half of the 20th century.

Photo: Swiss National Museum, LM-10196993-96

pictures of young men engaged in personal hygiene, whereas there are none of women in similar situations. And the gesture of placing one's arm around the shoulders of a friend, common today, arises only in private photography; it was unknown in studio photography and in painting.

The lead characters in Mathys's study are men and women between 18 and 40 years from the Swiss urban upper-middle class. The topics and life phases covered in these photos are barely dealt with – if at all – in written sources of the time. The year that Doris Keiser-Zanolari spent in French-speaking Switzerland is an example of a traditional feature in the life of young girls from German-speaking Switzerland, intended to turn them into disciplined young mothers. But the surviving photos show how the girls at her finishing school endeavoured to evade the roles that had been assigned to them.

But how do friendships actually become visible? How are they depicted? Whether the people in photos are friends can often only be deduced from consulting the albums, says Mathys. Friends are more likely to reappear often, in different situations in different photos. She has observed how friendship is often signified in private photos by a physical proximity that comes across as obviously more relaxed than in

any studio portrait. In private photos, a degree of naturalness becomes the ideal. In the case of women, mutual physical contact remains an important means of depicting intimacy. With men such contact is rarer, and often one-sided.

Memories in perspective

The exuberance that is perceptible in the moment when those two women took their photograph on the balcony is a fundamental aspect of photography among friends, says Mathys. Playful poses and theatrical gestures can be found in many photos, and such pictures bring into perspective the function of memory that is all too often regarded as stereotypical of private photography. But friends don't just take photos so as to remember each other or the things they've done together. They also do it just for the sake of it, as an act of sharing a happy moment of mutual theatricality or creativity. Photography among friends, she says, is also a means of affirming friendship and the here-and-now.

Nora Mathys: *Fotofreundschaften. Visualisierungen von Nähe und Gemeinschaft in privaten Fotoalben aus der Schweiz 1900-1950*. Baden: Hier + Jetzt, 2013. 328 pp.

The arms trade and international law

In the eyes of their critics, countries that export weapons are morally co-responsible for the adverse consequences of armed conflict. They are regarded as ‘accomplices’ and guilty of ‘prolonging wars’. But what can a legal perspective tell us about this responsibility? May countries export weapons to repressive regimes at their own discretion, or are they subject to the provisions of international law? In a comprehensive study, the legal scholar David Furger from Bern has explored international law to see if there are corresponding rules. The result was sobering: the transfer of conventional weapons takes place “largely outside explicit barriers of international law”. There is also a lack of consistent case-law. However, Furger maintains that under certain conditions, responsibilities may indeed be derived from various areas of international law such as human rights, humanitarian law and the law of neutrality.

The most recent developments confirm Furger’s findings. Last year, the UN General Assembly adopted the multilateral Arms Trade Treaty (ATT). Prior to granting an export licence for arms, ratifying countries must now check whether those arms might be employed in human rights violations or in infringements of international humanitarian law. If there is a ‘considerable’ risk of this, the export of arms is prohibited. Furger’s work also discusses the significance of this Treaty, its strengths and its weaknesses. *Nicolas Gattlen*

David Furger: *Völkerrechtliche Staatenverantwortlichkeit für grenzüberschreitende Waffentransfers*. Zurich: Schulthess, 2013. 564 pp.



Bullets for bullion: can states export weapons as they see fit?

Bjarne Henning Kvaale/Shutterstock

Elisabeth Horem



Timothy's commentary on Aristotle: a 13th century Iraqi manuscript.

When Timothy translated Aristotle

In the late Middle Ages, the ultimate authority in philosophy was Aristotle. His writings became known to Europeans during the 12th and 13th centuries, primarily via Islamic culture. A decisive step in this process of knowledge transfer was taken in 8th century Baghdad, a culturally vibrant city. This process involved Syrian Christians, as the church historian Martin Heimgartner from the University of Zurich can demonstrate. On the orders of Caliph Al-Mahdi, Aristotle's *Topics* was translated from the Greek and Syriac into Arabic by Timothy I, Patriarch of the Church of the East. In fact, Aristotelian logic formed the basis of Timothy's discussions about religion with the Caliph, its arguments being skilfully used by Timothy to explain the Christian doctrine of the Trinity. This might be a reason why the Islamic world didn't fully adopt Aristotelian logic until the mid-9th century onwards, having initially favoured other, Platonic systems of thought.

Heimgartner investigates the transfer of Greek and Arab culture and the prehistory of the later reception of Aristotle, and it is thanks to him that we know about the theological disputes and intercultural events of the 8th century in such detail. The basis for his work is the correspondence of the Patriarch, including his own reports on his discussions of religion, which Heimgartner has edited and translated from the Syriac into German – some of them for the very first time. *uha*

Fighting depression with self-esteem

Gloomy, unmotivated and exhausted – you're suffering from depression, so you're hardly going to be brimming with self-confidence. That much is obvious. But up to now, the sequence of things was not so clear: is it depression that causes low self-esteem? Psychologists speak in this case of a “scarring effect”. Or is it the other way round, and do people with a low sense of self-worth run a higher risk of suffering from depression? Psychologists call this the “vulnerability effect”. According to Ulrich Orth, a psychologist from the University of Basel, proof can be found of both effects. But over the course of several studies he has now shown that the vulnerability effect is far more significant. This means that a low sense of self-esteem indeed contributes to depression.

So someone is more likely to develop depression, if he or she feels of little value, of no use to anyone and unappreciated. Self-esteem is measured by means of a standardised questionnaire. The findings of Orth's research team in Basel have a broad base – they have evaluated data from more than 35,000 people, including the results of long-term studies. Orth has also checked the influence of different factors. The results show that the vulnerability effect has an impact on both young and old, women and men – and to judge from the research thus far, it is even found across many different cultures. Orth believes that his findings have practical importance: “We know now that a low sense of self-esteem is one of the factors that can cause depression, or worsen an existing case”. This could result in possibilities for the treatment, or even the prevention, of today's widespread incidence of depression. *Susanne Wenger*

U. Orth, R.W. Robins (2013): ‘Understanding the link between low self-esteem and depression’. *Current Directions in Psychological Science* 22, 455–460.



The vulnerability effect: too much self-doubt may make you unhappy in the long run.

eyetronic/fotolia.com

**“Good work is more important
than spectacular results”**



Research funding organisations should place less importance on results and instead be more insistent about researchers making their data generally available, says the epidemiologist John P. A. Ioannidis. *By Ori Schipper*

Horizons: Prof. Ioannidis, at a recent appearance before the National Research Council you made no bones about criticising the current scientific system. Is it in a state of crisis?

Prof. Ioannidis: You can't put it in such general terms. Science is more productive than ever, but it's suffering from a problem of credibility. Many published results are simply untrue, though it's rare for them to have been falsified intentionally. It's more common for their experimental design to be flawed. Or they might have used inadmissible statistical information. Not all scientific disciplines are equally affected by this problem, but every researcher should know the state of affairs in his own field. Some disciplines have improved how they monitor research and now produce credible, useful results. Other disciplines have made less progress with quality control. But if you don't scrutinise your results, you can't know if they're right or wrong.

You are a researcher too. How have you come to question the very system in which you yourself participate?

For me, it's not a matter of questioning the whole scientific system. I have simply come across problems and mistakes that are widespread in both my own work and that of colleagues. Most results in the biomedical field that have supposedly been proven to be statistically relevant have either been exaggerated or are simply wrong. For example, various hormone additives and vitamin additives in our food have claimed to possess curative properties or anti-cancer effects. But these claims don't stand up to examination in larger-scale studies. So I began to carry out empirical evaluations to see how results are obtained, what they are, whether they are scrutinised and, if so, whether we find the same results when the tests are repeated. I'm not engaging in a fundamental critique. I just want to show where problems occur and how they can be rectified.

But these problems affect many other researchers too. Are you simply braver than the others, or are you more tenacious in being willing to speak out?

No, I don't think that it's got anything to do with courage. It's more about my own research interests. Just as others are interested in the flight of birds or separation anxiety, I'm fascinated by questions about research. I'm open for discussion and have worked with over 2,000 other scientists. And I'm fully aware that mistakes are bound to lie dormant in my own work, too.

In your opinion, research funding organisations should expect results that are not so spectacular. Are you calling for more humility?

Yes. And even though we're all interested in big discoveries, you can't force them. Of

course there are breakthroughs time and again. But if you plan your trials well and carry them out properly, then anything you discover has a better chance of being the real deal. If researchers risk not getting funding because they can't promise important results, then there's also a risk that they'll claim to have made major findings even when their results are less significant. Research funding organisations should therefore place less importance on expecting results and more on the rigour of the methods employed and on a high quality of research. They ought to insist that scientists make their experimental data available and accessible to the public.

But it's human nature to believe that what we do and support is significant and useful. That may be, but the system should allow scientists to say: "I've worked hard and conscientiously, but nevertheless I've come up with nothing useful or practicable in recent years". In my opinion that would be very honest. As long as you've done your work well and correctly, then you shouldn't be penalised for failing to produce spectacular results.

"Most results in the biomedical field have either been exaggerated or are simply wrong."

Do you see any signs that the scientific system is moving in a more honest direction?

There are reasons to hope so. No doubt most researchers accept that honesty is the best policy in the long run. And yet they are still subject to immense competitive pressure and have to assert themselves through their work. But the importance of their contribution should lie less in their results and more on criteria such as good experimental design and reproducibility, for these are at the heart of scientific endeavour.

More and more is being published all over the world, which is why it is increasingly difficult to monitor the quality of research across the board.

That's true. But it doesn't bother me that the number of publications is increasing. That's actually a good thing. Scientific production shouldn't be shrinking. The problem is that mistakes can spread once they're published. For example, ten years ago the first studies were published in Eu-



“Self-correction functions in science – but not quickly enough”.

rope and the USA that looked for disease characteristics in our genetic makeup. They associated specific genes with smoking, depression, obesity or asthma. Only one percent of these findings were later confirmed in larger-scale studies. But today, 60% of the contributions to the literature on genetic meta-analysis come from China – and they are worthless because they make the same mistakes that we made in Europe and the USA, right at the start.

If mistakes are passed on, then they also multiply over time. Doesn't the process of self-correction function properly any more in the sciences?

It functions, but what matters is how quickly. In olden times we used to think that the sun orbited the earth. We needed 2,000 years to correct this misconception. But today it's problematic if it takes two years to discover a mistake and correct it, because there are far more scientists out there than ever before. They're doing more research and publishing more – but they're basing their work on the results of their predecessors and colleagues, some of which are actually wrong. My primary concern is to speed up the process of self-correction in the scientific system. This can only happen if results are checked swiftly and independently. In many fields, self-correction is not yet efficient enough. Until not too long ago, some disciplines, such as psychology, were not even bothered about the reproducibility of their results. They only recently began to repeat important trials.

Do you like Don Quixote?

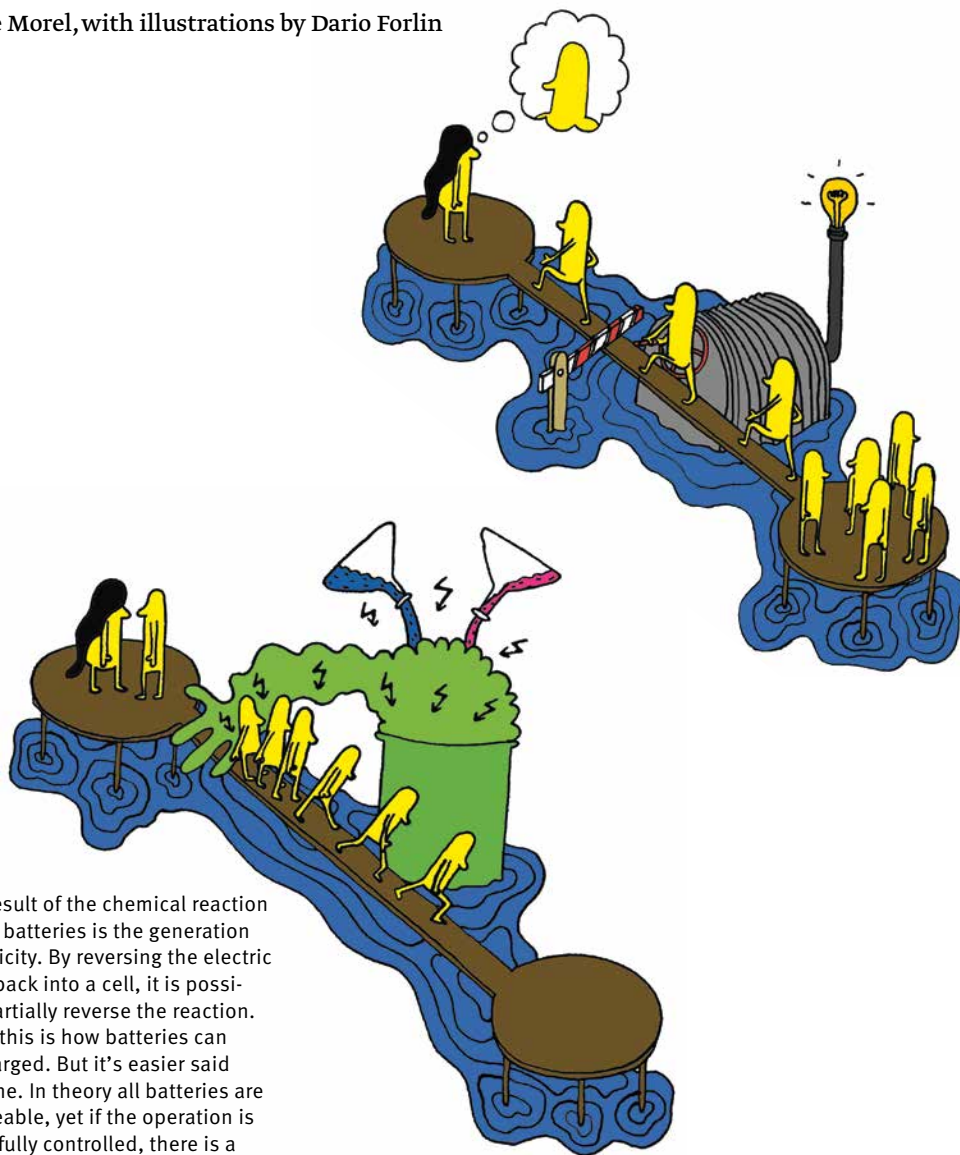
Yes, he's a wonderful fictional character. But I don't think that he can serve as a role model for me in my endeavours to bring about change and improvement. I'm trying to be realistic. I see great potential for optimisation, and I'm pointing it out. Actually, all scientists are a bit like Don Quixote: we pursue certain ideas, just like he did, and we're willing to fight for them too. But perhaps this fight should be less about defending our ideas. It should be more often about ensuring that our ideas get as close as possible to truth and reality, and that these ideas are as exact and as free of mistakes as we can make them. Whatever that reality is, we should try harder to understand it.

John P. A. Ioannidis

John P. A. Ioannidis is professor of medicine and disease prevention at Stanford University in the US, where he is Director of the Stanford Prevention Research Center. He has previously also chaired the Department of Hygiene and Epidemiology at the University of Ioannina School of Medicine in Greece. Ioannidis was born in New York and grew up in Athens in Greece, where he studied medicine. He is one of the most-often cited scientists in the world. His article 'Why most Published Research Findings are False' alone has been downloaded almost a million times since it was published in the journal *PLoS Medicine* in 2005.

Put a Li-ion in your batteries!

By Philippe Morel, with illustrations by Dario Forlin



1 For the last few years the world of portable electronics has become dominated by Li-ion (lithium-ion) batteries. These batteries operate on the same principle as conventional lead-acid batteries, i.e., a redox reaction inducing ion and electron transfer between a cathode and an anode. The materials used for the anode and cathode define the potential of this reaction and therefore the voltage of a cell. Increasing the voltage is as simple as linking several cells together to form a battery!

2 The result of the chemical reaction in Li-ion batteries is the generation of electricity. By reversing the electric current back into a cell, it is possible to partially reverse the reaction. Indeed, this is how batteries can be recharged. But it's easier said than done. In theory all batteries are rechargeable, yet if the operation is not carefully controlled, there is a risk of overheating and leakage. This is particularly true for lithium, which reacts strongly with air and water to form the very corrosive lithium hydroxide.



3 The success of Li-ion batteries is mainly due to their high energy density. For a given weight, a Li-ion battery can produce seven times more energy than a lead-acid battery. This is thanks to the properties of lithium, a lightweight alkali metal with a very high electrochemical potential. But there are other advantages too. They discharge less rapidly during storage and are not susceptible to the memory effect, a phenomenon resulting from semi-charging and affecting battery performance. As with many resources, however, lithium is scarce. It is only found in a few countries, including some significant sources in South America's *salars*, the salty remnants of long-evaporated seas.

Open data and the NSA affair

By Martin Vetterli

The open-data movement has already reached almost the whole of society. Thus today, for example, digital content can be used freely (open content), computer programs perused and altered (open source),

official data consulted (open government) and educational courses pursued free of charge (open education).

Research, too, is affected. At present, the demand for free access to scientific literature is a major talking point. Behind this open-access movement lies the noble goal of making commercial publications freely accessible

to readers – because they are in fact financed from public funds. Last August, the European Commission proudly announced that soon the majority of publications will be freely available. But this new system also has knock-on effects, because the cost to researchers of submitting publications has risen considerably. For this reason, the SNSF is giving financial support to those publishing in open-access journals. This chosen path is the right one, however, as it promotes the free dissemination of knowledge and learning.



SNF/Beat Brechbühl

For scientists, the open-access movement is only the beginning. The next big challenge will be free access to the data from work that has been published. This will bring in its wake complex questions regarding the storage and shared use of data. But this development will also prove positive for the scientific community, since it will allow for a whole new culture of reproducibility of scientific experiments. In recent years, this issue has come under fire. But for science it is the greatest commodity of all, as it is the very basis of the success story behind scientific research. Perhaps the open-data movement can aid us here.

Of course, this shift to more and more digitised, publicly accessible data has its downside. Sensitive health data and online behaviour in one's private sphere are often afforded an inadequate degree of respect. The spying affair involving the NSA has shown how quickly our privacy can disappear. So researchers should not be naïve, nor should they shut their work off from technological developments. It has to move with the times in order to be able to continue making new discoveries. And for this, a certain degree of 'openness' is indispensable.

Martin Vetterli is the Chairman of the National Research Council and teaches electrical engineering at EPFL.

Letters to the Editor

The independence of universities

(Horizons No. 99, December 2013)

The debate on the private financing of universities and other higher education establishments has overlooked two equally worrying aspects relating to their independence: academics dabbling in politics and, economists particularly, sitting on boards of directors and other decision-making bodies in the world of business. And let's not mention their involvement with lobbies funded by the very same private sector. [...] My reservations are bolstered by Urs Hafner's comments on page 22. He takes up a *laissez-faire* approach, fortunately with a pinch of irony, to an ideological statement often

presented as a scientific, or quasi-scientific fact: "do we not live in a market economy where free competition provides the best solution?" Each term should have been subject to serious discussion and verification.

Michel Charrière, Pensier (FR)

Corrigenda:

The social psychologist Heinz Gutscher remains the Chairman of the Swiss Academy of Humanities and Social Sciences (SAHS), despite the statement to the contrary in the most recent issue of *Horizons* (No. 99, p. 19). We regret this mistake and apologise to Heinz Gutscher.

Bern:

Welche Religion(en) für unsere Gesellschaft?

New questions and tensions between secularisation and globalisation

21 March 2014

UniS Building, University of Bern, Bern

Nachhaltige Universität: Discussing education, research, student projects and university strategies

28 March 2014

University of Bern, Bern

15th Swiss Global Change Day: Researchers discuss global change

2 April 2014

Freies Gymnasium, Bern

► www.proclim.ch/

Herausforderungen der wissenschaftlichen Politikberatung: Anne Glover, Chief Scientific Adviser to the President of the European Commission

23 May 2014, Bern

Geneva:

Science Cafés:

31 March 2014:

"Facile/pas facile ... d'inventer un microbe"

28 April 2014:

"Facile/pas facile ... de personnaliser son traitement"

26 May 2014:

"Facile/pas facile ... de créer un cerveau humain"

Musée d'histoire des sciences, Geneva

► www.bancspubli.ch

Geneva Health Forum 2014:

Challenges and solutions

15 – 17 April 2014

International Conference Centre of Geneva (CICG), Geneva

Dompter la lumière:

An interactive exhibition for all ages, free

9 April 2014 – 11 April 2015

Musée d'histoire des sciences, Geneva

Lausanne:

Les jeux sont faits! Hasard et probabilités.

A fun introduction to games of chance and statistics

Until 27 April 2014

Espace des inventions, Lausanne

Anatomies: De Vésale au virtuel. An interactive, thought provoking and immersive exhibition

Until 17 August 2014

Musée de la main, Lausanne

► www.verdan.ch

Promoting healthcare research

Basic clinical and biomedical research have a long tradition in Switzerland. In addition to these two fields, healthcare research has also become established in many countries. This field investigates the efficacy of medical care under everyday conditions and looks for new solutions to ensure a high-quality health system that also meets the challenges of today's society. Why do we also need this research

Colourbox.com



discipline in Switzerland? What is the current comparative state of research on the international level? And what measures need to be taken in order to promote healthcare research in Switzerland? On behalf of the Federal Council, the Swiss Academy of Medical Sciences (SAMS) has drafted a plan to consolidate healthcare research (www.akademien-schweiz.ch).

'Use-inspired basic research'

Since 2011, researchers have been able to submit their applications for SNSF funding under the category 'use-inspired basic research'. This new category places an additional focus on the acquisition of knowledge geared to possible applications and practical implementation. The SNSF has since made an initial assessment. The proportion of project applications submitted under the 'use-inspired' category makes up just 20%, so its introduction has not led to a marked increase in the number of funding submissions, nor has it opened up new research areas. As expected, the applications received mainly come from clinical research, engineering, architecture, universities of applied sciences and a broad range of disciplines in the humanities and social sciences. This new category is contributing significantly to the visibility and better evaluation of projects situated between basic research and applied research.

Research without borders

The future of research in Europe has been outlined in the 'Science Europe Roadmap'. It identifies nine areas in which its member organisations – including the SNSF – wish to collaborate in order to consolidate the research system and realise the following strategic goals: supporting 'borderless' research, improving the scientific environment, promoting science and communicating science. Over 50 institutions and other stakeholders have helped in drafting this roadmap.

'Artificial' is wrong

What is artificial and what is natural? This seemingly simple question never ceases to bewilder, and this bewilderment leaves its mark on political debates. The Swiss Academy of Sciences has therefore asked four pairs of experts to share their views. The heart surgeon Thierry Carrel discusses the matter with Antoinette Brem, a theologian and companion for the terminally ill; the architect Peter Zumthor is in conversation with the former director of WWF Switzerland, Claude



land, Claude Martin; the top chef Anne-Sophie Pic meets the aroma analyst Christine Hunziker; and the artist Pierre-Philippe Freymond engages with the sportswoman Géraldine Fasnacht. Their views, published in the book *Kehrseiten - Gespräche über Natürliches und Künstliches* (Flipsides - Conversations about what's natural and artificial), are astonishing. The difference between natural and artificial is clearly something that is felt, rather than being rationally definable. These conversation partners all link the 'artificial' with a lack of authenticity and genuineness, and therefore with what is 'wrong'. The book is published by Vdf-Hochschulverlag (www.vdf.ethz.ch).

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The SNSF

The SNSF is the principal body for the promotion of scientific research in Switzerland. It is mandated by the Confederation to promote basic research in all fields and disciplines and each year distributes some 755 million Swiss Francs amongst more than 3,500 projects involving about 8,750 scientists.

The Swiss Academies

Also mandated by the Confederation, the Swiss Academies of Arts and Sciences are committed to an open dialogue between science and society. They are on the side of science, each specialising in a respective domain, yet also acting in an inter-disciplinary way. Being anchored to the scientific community rewards them with access to the expertise of around 100,000 researchers.



“Most results in the
biomedical field have
either been exaggerated
or are simply wrong.”

John Ioannidis page 46

“We’re creating substances
that no one has made before
now, and that don’t exist
anywhere else!”

Katharina Fromm page 24

“Do you really think we
wouldn’t publish results if we
thought they might damage
the image of the university?”

Christoph Pappa page 23