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Home alone

The 9 February 2014 will no doubt be one of those dates that stick in the memory of the politically aware. Once again, the Swiss electorate - led by a nationalist-conservative movement - has distanced itself from Europe. It seems the home of the Swiss is still their *château*. But this decision has serious consequences for Switzerland as a centre of research, as is discussed in the Focus articles of this issue (starting on page 10, see also page 50). Researchers here are linked to Europe and the rest of the world in many ways. They engage with those outside, both in competition and in cooperation - as in the Scopes programme, for example, that for 25 years has been bringing together researchers from Switzerland and Eastern Europe. Academia, as the sociologist Bettina Heintz explains, is in essence a universal business. But the referendum of 9 February calls all this into question.

We also have a question for you, dear readers, we would like to know what you think of our magazine, which today has some 50,000 subscribers and now also appears in digital format in English. In the middle of the printed version you will find a prepaid questionnaire that you can fill out and send to us, alternatively it's also available online at www.leserbefragung-horizonte.ch or www.sondage-horizons.ch. Our editorial approach is one of presenting scientific results and findings while also opening up discussions on research policy - and we'd love to know what you think. Your assessment will help us to make this magazine even better.



Urs Hafner, Chief Editor

horizons





Keystone/Marcel Bieri

Focus: International research



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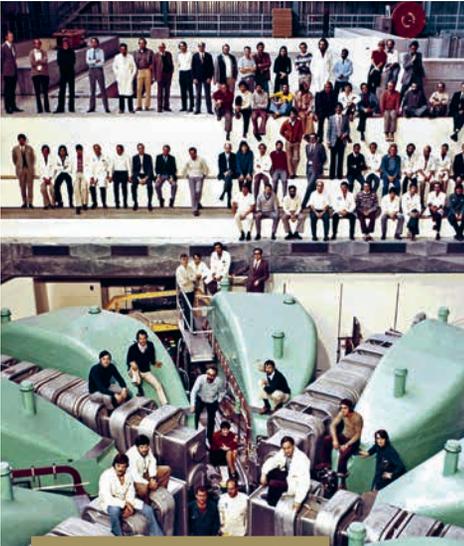
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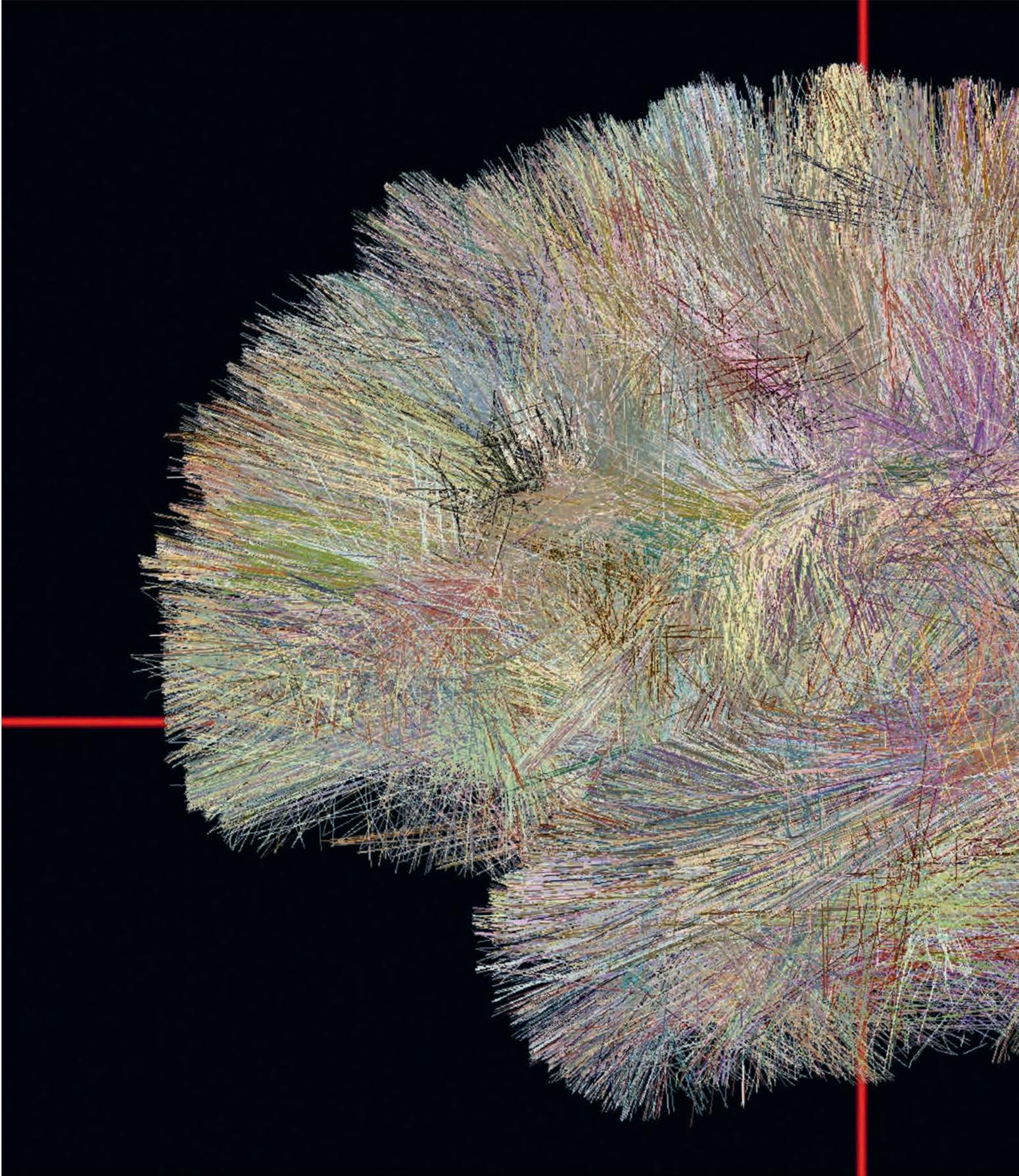
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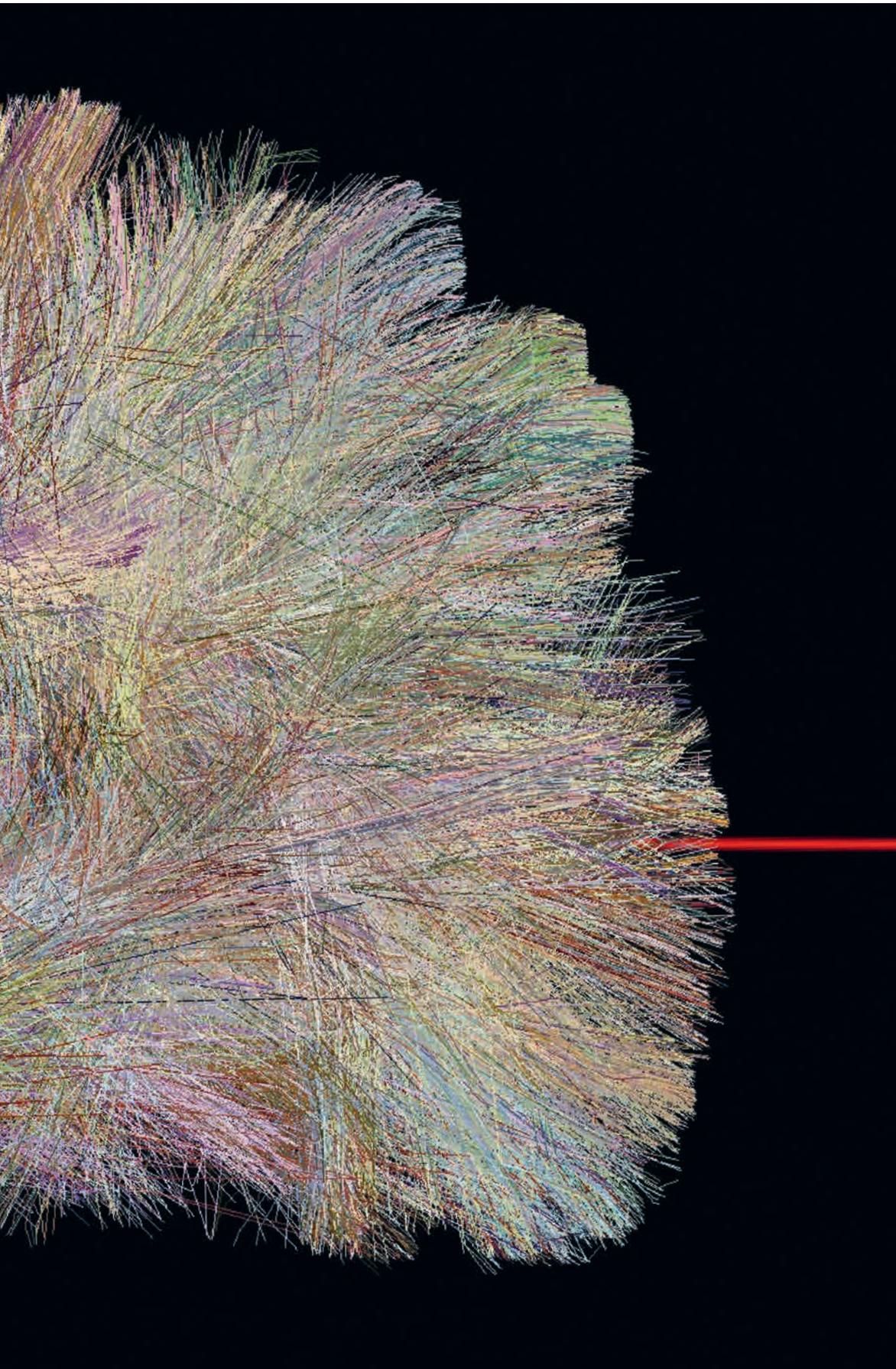
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A weighty ball of thread

Although it looks like a tangle of brightly coloured threads, it's actually an image of the nerve connections in the white matter of the brain of a six-year-old child. In contrast to grey matter, which is comprised of nerve-cell bodies, white matter is mostly made up of nerve fibres. Researchers from the Geneva University Hospital, led by Petra Hüppi, made this image using a non-invasive procedure. They followed the diffusion movement of water molecules and from this drew conclusions about the course of the nerve fibre bundles. This allowed Hüppi's team to prove that the brains of highly premature infants are wired differently from those of children who were born after the 28th week. Normally, the brain optimises the communication paths between its specialised regions while it is maturing in the womb. But this tendency is less pronounced among children who are born too early. Their nerve fibre bundles are laid out less efficiently and their brains are less well organised. The researchers believe that these structural differences could explain the cognitive, motor and social difficulties that can often be observed in later life among those born prematurely. *Anna-Katharina Ehlert*

Literature

E. Fischi-Gomez, L. Vasung and D.E. Meskaldji et al. (2014): 'Structural brain connectivity in school age preterm infants provides evidence for impaired networks relevant for higher-order cognitive skills and social cognition'. *Cerebral Cortex*.

Picture: Laura Gui, Cyril Poupon and Petra Hüppi

Getting to grips with quality measurement

By signing ‘Dora’ – the Declaration on Research Assessment – the Swiss National Science Foundation has confirmed that quantitative measurement of a publication’s impact is a poor guide to evaluating the quality of a research project. But what do publication metrics actually tell us about research quality?

Valérie Chételat (photomontage)



‘Dora’ states that a publication metric, if based only on ‘impact factor’ and used uncritically, has major weaknesses. I agree. And many of the measures proposed by Dora are sensible. But by insisting categorically on “eliminat[ing] the use of journal-based metrics”, the Declaration throws the baby out with the bathwater. What’s more, the Declaration offers hardly any alternatives.

Publication metrics – whether of journals or of individuals – are based on the assumption that the impact of a publication (i.e., how often it is cited) tells us something about its quality. In fact, I prefer metrics to a purely subjective peer assessment because such an assessment runs the risk of being influenced by the academic equivalent of insider dealing. Peer assessment is more transparent and more sensible when it is underpinned by quantitative metrics. In this case, peers can still correct weaknesses in a metric and, if necessary, deviate from it if they have reasonable grounds to do so.

There are different metrics, all of which have their weaknesses. But they can be combined meaningfully in research evaluations.

1. ‘Journal impact factors’ are calculated using databases belonging to private companies, are often not comparable between different disciplines and can be manipulated by editors through self-referencing. This is why they are suited only for a rough categorisation of journals, and ranking within a discipline is

more important than any absolute number of citations. The ranking allows for a qualitative differentiation between authors who regularly publish in journals of the upper third, and those who publish almost exclusively in the lower half.

2. Individual citation analyses, such as the

“I prefer publication metrics to a purely subjective peer assessment”.

Chris Boesch

h-index, also have to be put in the context of specific disciplines, not only because of their different citation cultures, but also because certain disciplines document their findings differently. In the engineering sciences, for example, patents and multi-page conference papers count as a publication. Moreover, the chronological development of citation numbers is worthy of our attention. If we take into account the personal situation of a researcher, we can observe that if someone is publishing less, it might be because he or she is building up a research group of their own.

3. Analysing authorship is also ultimately independent of the disciplines themselves. However useful it may be to identify the first and last-cited authors of

articles in biology and medicine, it is of little help in maths or particle physics. An article from CERN might be based on the work of hundreds of authors; but of ten authors of a medical case report based on a single patient history, how much work did each really invest? It ought to be up to each discipline to determine the optimum publication format and respective weightings – but despite all the differences, a discipline-specific metric would still be thoroughly desirable.

It is essential that a publication analysis accounts for these critical issues and has the broadest base possible. I am convinced that it is worth quantifying the quality of research, despite all the faults of the different metrics. Peers should then use these figures as a basis for making their own assessments.

Chris Boesch heads the Department for Magnetic Resonance Spectroscopy and Methodology at the University of Bern and is a member of the Biology and Medicine Division of the National Research Council of the SNSF.



Amongst all the various scientific fields covered by the Swiss National Science Foundation (SNSF), one idea takes precedence over all others: supporting high-quality research. This applies not only to proposed projects, but also to the profiles of researchers. The main evaluation criteria for projects are originality, relevance and feasibility. For researchers in the natural sciences, medicine and certain sections of the social sciences, evaluators employ measurement instruments to assess the ‘influence’ of a researcher. This influence may correspond to the citation frequency of an author, or to the impact a researcher has had in his or her discipline. The advantage is that the criteria are identical for any person.

But not everything is so simple! Blindly applying this approach would lead to research funds being allocated to scholars on the basis of a few numerical indicators. There are two disadvantages to this. First, it is easy to influence the process through the definition of the calculation criteria, and secondly, whilst it is certainly convenient to summarise the work of a researcher into a numerical value, it is also an over-simplification. For example, having published a long list of articles does not necessarily mean they were all of high quality, nor does being cited frequently over a time interval indicate a lasting impact on research. It is for these reasons that many voices are asking for the evaluation of researchers and their projects to be conducted on a broader basis. The calls of biologists in particular

led to The San Francisco Declaration on Research Assessment (DORA), echoing claims made by many researchers in the human sciences.

The aim of DORA is not to prohibit the use of the numerical reference indexes but to encourage the simultaneous use of other

“Our researchers cannot be defined merely through a numerical value”.

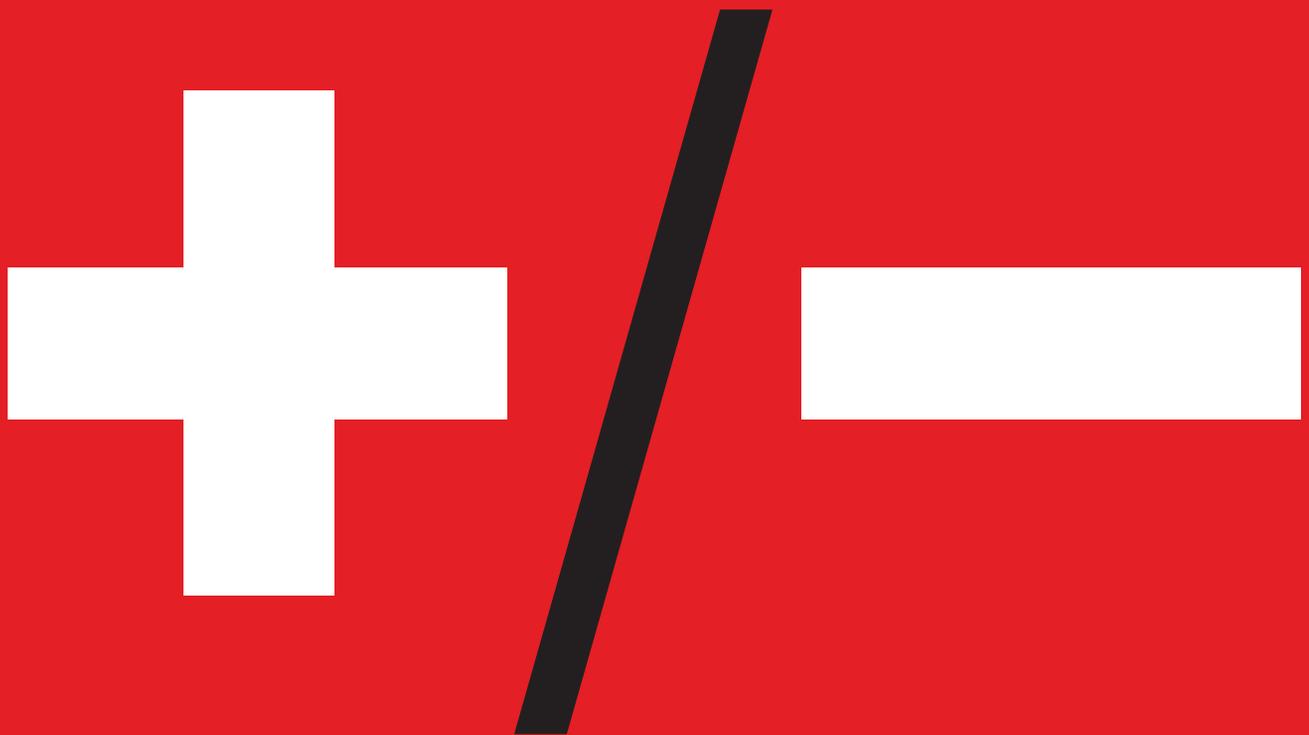
Paul Schubert

approaches, especially the critical reading of publications. In addition, where evaluations are made by experts in a discipline, the influence of a researcher can be measured using the actual results obtained, the influence of the research in the world of education or policy, or the success in promoting a new concept in the minds of other researchers.

The SNSF prefers and practices such a blended approach: where measurement indexes do exist for a certain field, they are supplemented, to varying degrees according to the discipline, with finer examination extending also to the qualitative aspects of an applicant’s file. Our researchers cannot be defined merely through a numeric value. They produce results which subsequently produce noteworthy effects

on the scientific and social landscapes. It is therefore essential that the selection work of the National Research Council be based not only on indicators but also on an ability to identify the proposals for new projects that will give rise to the science of tomorrow.

Paul Schubert is a professor of Greek at the University of Geneva and heads the Humanities and Social Sciences Division of the National Research Council of the SNSF.



Science without borders

Switzerland has decided to isolate itself. This attitude threatens the scientific community and will have an impact on the close ties it maintains with Europe and the rest of the world.



They too are the people. Students protest against the research consequences of Swiss isolation (EPFL, 10 March 2014).

Photo: Keystone/Laurent Gillieron

Unease in the universities

The Swiss electorate has accepted the initiative launched by the Swiss People's Party (SVP) against 'mass immigration'. But it strikes at the heart of research as it violates the principle of universalism that underpins our whole system of science and scholarship. *By Urs Hafner*

In the lead up to the referendum of 9 February 2014, the scientific world was guarded in its opinions about the SVP's popular initiative against 'mass immigration', which the Swiss electorate eventually accepted. Later on, and after the European Union reacted by excluding Switzerland from its large-scale research programmes, there was dismay and indignation everywhere at the supposed inaction of politicians and the cluelessness of the electorate, and at how they have seemingly gambled with the very future of Switzerland as a centre of research.

Research policy makers believe we are threatened because good scholarship and research is dependent on international networks and cooperation. It's worth noting that 'networking' and 'international' are buzz-words that the globalised academic scene likes to apply to itself. And scientists jetting from one conference to the next - so busy networking that they hardly have time for proper research any more - are all insistent on how important 'international networking' is for their work.

"The internationalisation of scholarship is perceived as something excellent in and of itself, independent of what it actually achieves", says Marcel Weber, a philoso-

pher of science at the University of Geneva. Getting as big an international profile as possible is a self-confirming, self-flattering means for a scholar to acquire power and money in his or her field. To be sure, he says, international prestige is not just a means of satisfying one's vanity. Recognition by one's peers also plays an important role in the self-monitoring of scholarship. Prestige is like a currency that leads to the "optimal allocation of resources". It is therefore part and parcel of scientific reason.

But Bettina Heintz, a sociologist of science at the University of Lucerne, says she cannot simply agree with those who insist that international networking is indispensable to scientific research. "This claim masks the working differences between the natural sciences and the humanities". Researchers in experimental physics and molecular biology, for example - two highly specialised disciplines - need such complex equipment for their work that they are compelled to collaborate in an international 'division of labour'.

The humanities, on the other hand, are not so dependent on collaborations. For a historian or a linguist, it is important and enriching to have personal contact with colleagues who work abroad, but in the end they often write their work on their own. They have to have access to texts written by their colleagues, but they are not necessarily dependent on being able to work with them in any kind of research association.

A cosmopolitan republic of scholars

What Heintz doesn't want, however, is for such observations on the differences between the disciplines to be interpreted as a rejection of cross-border contact between academics. On the contrary, she insists there must be opportunity to enter into contact with each and every other fellow in the world in order to utilise the global potential of all knowledge and experience fully. It is this 'norm of universalism', formulated by the US sociologist Robert K. Merton, that is the very foundation of our system of science and scholarship.

Science possesses a dynamic that crosses geographical borders, as has been observed since its very beginnings in the late Middle Ages and the Renaissance when the first universities were founded. Thomas Aquinas, Albertus Magnus and others studied and taught at universities and monastery schools in Bologna, Padua, Paris and Co-

logne, explains Michael Hagner, a science historian at ETH Zurich. The first modern research university in Europe – the University of Göttingen, founded in the early 18th century – also had an international outlook, he says. Science and scholarship were never before, and never again, as cosmopolitan as they were during the Enlightenment with its ‘Republic of Letters’. Throughout Europe, academics corresponded with each other in the two languages of science, Latin and French.

“Locally limited intelligence”

Conversely, we can observe how scientific systems stagnate and decline when isolated from their environment. Hagner mentions an example from the 17th century at the University of Tübingen, where professorships were passed down among local dignitaries. The result was a trend promoting ‘locally limited’ intelligence. From the 20th century, Hagner offers the examples of Nazi Germany and the Soviet Union, both cases that have been thoroughly researched. Under these totalitarian dictatorships, the only productive disciplines were those that stabilised the respective system, primarily the technological/military disciplines. In Germany, for example, bacteriology was denounced as a ‘Jewish science’ and so fell behind. And even after the end of National Socialism, the history of science in Germany “limped along for decades”, says Hagner, until it opened up to the Anglo-American world in the 1980s.

According to Hagner, even those cases of isolation that at first glance seem to have been intellectually fertile merely serve to confirm the premise that scholarship is dependent on intellectual exchange. The philosopher Hans Blumenberg became immensely prolific after his retirement, when he shut himself off from the world. But he would not have succeeded in this, had he not, as a young scholar, gathered experience of life beyond the bounds of closed knowledge systems. The same applies to Marcel Proust, who wrote his legendary *À la recherche du temps perdu* only in the second half of his life. Marcel Weber stresses that even men such as Immanuel Kant and Gregor Mendel, who are generally regarded as ‘lonely geniuses’, maintained an intensive contact with other scholars, without whom they would hardly have been capable of having their groundbreaking insights.

The referendum of 9 February will not sever all the connections that link aca-

demics in Switzerland to their colleagues abroad. But the universities that have raised large sums in Brussels in recent years will now lose millions of francs, and the damage done by the popular decision threatens to become far greater still. With the rigid ‘contingency principle’ envisaged by the SVP initiative, Switzerland is to extend the ‘protection of the Swiss species’, as Heintz calls it, in its universities to include EU researchers. With quotas already existing for non-EU citizens, nationality now has ultimate primacy before quality.

But the contingency principle does not just infringe upon the norm of universalism. It also affects the integrity of the foreign scientists and scholars who are being ostracised. Even those who have lived in Switzerland for years have been feeling ill at ease since 9 February 2014. ‘I would be a liar if I were to deny it’, says Hagner.

Urs Hafner is Horizon’s Chief Editor at the SNSF.

To Moscow and back

For a quarter of a century, the research programme 'Scopes' has been supporting scientific collaborations between Switzerland and countries in Eastern Europe. Interest in its ability to promote research remains undimmed. *By Simon Koehlin*

It's been 25 years since the fall of the Iron Curtain that for decades divided Eastern Europe and the Soviet Union from the West. It was a historic moment, and the beginning of a difficult process for the former communist countries. From one day to the next they had to switch from a planned economy to a market economy. Their industries suddenly had to cope with global competition. This led to economic breakdown in many Eastern European countries.

It was in this context that the Swiss parliament - along with other governments in Western Europe - provided a loan to help support those countries that were under economic duress. "The idea arose early on that we could use part of the promised money to strengthen the scientific scene in the countries affected", says Evelyne Glättli of the International Co-operation Division of the SNSF. Glättli coordinates the Scopes (Scientific Co-operation between Eastern Europe and Switzerland) programme that the SNSF launched in 1990 in cooperation with the Swiss Agency for Development and Cooperation (SDC), using money from the loan for Eastern Europe.

Ideological slant

"Scopes started on a very small scale", says Glättli. Until 1995 it was supporting numerous small research projects, personnel exchanges and conference visits. The programme was initially financed by the SDC alone. From the mid-1990s onwards, however, interest in the programme grew considerably and it got bigger accordingly - today it is financed by the SNSF and the SDC together, roughly half-and-half. The range of support on offer has also broadened. To-

day, two areas receive most of the funding: joint research projects that bring Eastern European and Swiss scientists together, and institutional partnerships in which Swiss researchers support colleagues in Eastern Europe who are furthering the modernisation of their research environment.

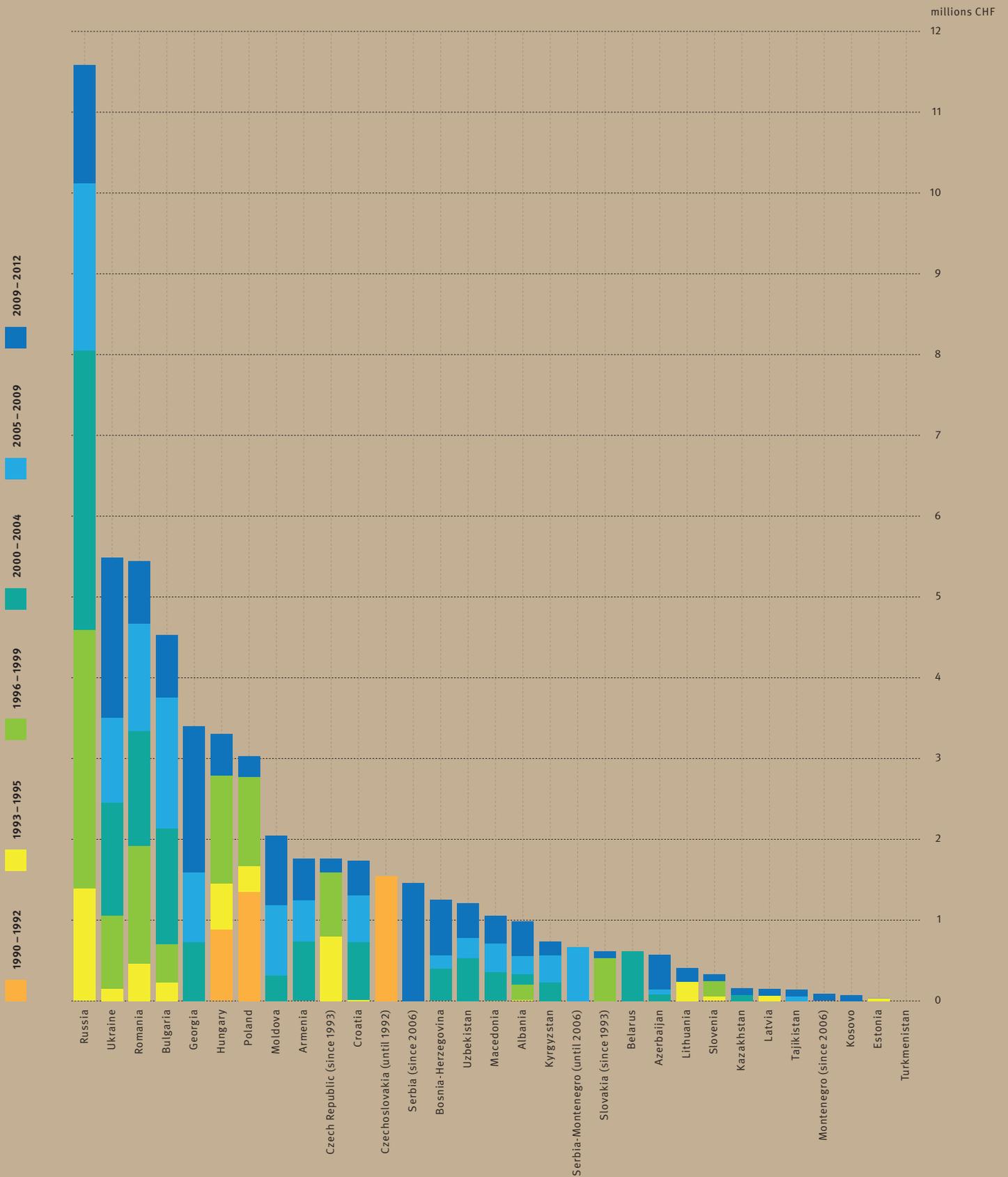
During the Cold War, socialist countries organised their science and research differently from Western Europe, says Glättli. Basic research was carried out by state academies. Hardly any research at all was done at universities. The focus there was teaching, and it had a strong ideological slant. Separate institutes carried out research in specific sectors - concentrating on agriculture, for example. "There was little exchange between the academies, universities and institutes", says Glättli. "And they were often inefficient and ineffective in both their organisation and their procedures. A single institute could have hundreds of people in its employment". However, Eastern Europe did have excellent researchers. Russia, for example, has a long tradition as a scientific world power.

Enriching partnerships

"That is why joint projects with Eastern European colleagues are also interesting for researchers from Switzerland", says Glättli. In the natural sciences and engineering particularly it can be rewarding to work with researchers in Eastern Europe, where there are many talented young people. But there are also other reasons that the Scopes programme is of interest to Swiss researchers. For example, it enables them to engage in research that cannot be carried out otherwise. In Eastern Europe there are archives, ecosystems and patient groups that simply do not exist in Switzerland.

According to Glättli, Scopes projects often emerge out of existing partnerships or contacts between individual researchers in Eastern Europe and Switzerland. There are quite a few researchers among the Swiss project partners who originally came from Eastern Europe themselves and who still maintain contact with their lands of origin. One example is Mikhail Shaposhnikov, who is now at the Laboratory of Particle Physics and Cosmology at EPFL. Originally from Russia, he has already run two Scopes projects with colleagues from his former homeland and Eastern European countries. He conducted research in the Soviet Union until 1991 and still knows lots

Cooperation with Eastern Europe: for 25 years
Scopes has been funding research partnerships
with Switzerland



of scientists from his time there. And because Eastern Bloc countries also carried out excellent research in his field, he says, it was “quite natural” that he should get back in touch with his former colleagues and set up Scopes projects, which he qualifies as “very successful”. The financial support from Scopes was also important to his Eastern European partners. “Postdocs and researchers earn so little in Russia, Ukraine and Georgia that they can barely live from their salaries and often have to take on jobs on the side too. Thanks to Scopes, the postdocs participating in the projects were able to concentrate fully on their science”. For the Swiss project partners it was interesting “to have enthusiastic young researchers here to work with us”.

Costs not covered

The story is similar for Thomas Breu from the Centre for Development and Environment (CDE) at the University of Bern, as his existing contacts also led to a Scopes project. He worked for several years with partners from Tajikistan and Kyrgyzstan at the National Centre of Competence in Research (NCCR) ‘North-South’. This offered him the opportunity to cement these partnerships through a project in which researchers from these two Central Asian countries were trained to use geographical information systems. “We profited from it too”, he says. For example, Swiss students learnt a lot about the local challenges in these countries. And with projects like that, you can maintain a presence on the ground and access up-to-date information. However, it has to be said that such projects don’t cover the costs on the Swiss side, Breu admits.

Glättli confirms that Scopes projects are financially less attractive to Swiss researchers. “The larger part of the money allocated goes to the project partners in Eastern Europe”, she says. Swiss researchers are only paid to cover extra costs such as travel expenses. All the same, Scopes has proven very popular - last year alone they received some 350 applications. “We reckoned on about 200”, says Glättli. As a result, less than 20 percent were approved, and many good projects had to be turned down.

In comparison to other funding institutions with similar programmes, Scopes stands out because of the unusually high number of countries involved. Many EU countries restrict their projects to one country or region, e.g., Central Asia. In the

course of the past 25 years, the Scopes focus areas have continually shifted. Recently, the Balkan states have joined in, along with South Caucasus and the Central Asian countries. Today Serbia and Georgia are among the most frequent Scopes partners, alongside Russia, Ukraine, Bulgaria and Romania. “Serbia seems to have realised how important research is for the development of a country”, says Glättli. Serbian researchers who get support from Scopes are given extra funding by their own state as a ‘reward’.

In the last 25 years, hundreds of Scopes projects have helped science advance in Eastern Europe and the former Soviet Union. It’s now a matter of getting research in Eastern Europe into the right shape so that the researchers there can participate in EU programmes, says Glättli. Not all scientists are accustomed to filling out the necessary applications and to getting their results published in scientific journals. And even a quarter of a century after the fall of the Wall, the structures in many countries bear no comparison with those in Western Europe. “The teams we support form a kind of germ cell that instigates change”, says Glättli. And every successive project can offer ideal conditions for strengthening local skills and establishing better networks.

Simon Koechlin is the editor-in-chief of the magazine *Die Tierwelt* and a science journalist.

“The teams we support form a kind of germ cell that instigates change”.

Evelyne Glättli,
SNSF



Manu Friederich

“It’s not for us to solve our partners’ problems. Our task is to do better research”

No one contests the importance of research collaboration. But collaborations with emerging countries are often overlooked. These can prove important for Swiss research, says Laurent Goetschel, a peace researcher at the Institute for European Global Studies in Basel. *By Roland Fischer*

Horizons: Prof. Goetschel, you argue that Switzerland’s international research collaborations should include countries that are barely visible on the world’s scientific scene. Are you talking about ‘development research’ or ‘north-south research’?

Laurent Goetschel: The concept of ‘development research’ is closely allied to development aid. It’s research that is intended to deliver ideas as to how best to carry out development work. I would prefer to talk about research on global problems and challenges but in local contexts. Referring to specific geographical contexts takes into account the many very different approaches. These range from questions of good governance to issues such as poverty, globalisation and public sanitation. What they all have in common is this: they involve tackling a research question in collaboration with research partners from countries with different levels of socio-economic development.

H: Doesn’t this almost inevitably smack of paternalism?

G: That’s a prejudice that has long confronted this kind of research. People think that if you’re helping people, then you can’t possibly end up doing good research. And vice versa. But it’s not for us to solve our partners’ problems. Our task is to do better research, and to do it in collaboration with them and to the advantage of both sides. Of course, without our involvement, local researchers in those countries often wouldn’t enjoy the conditions that north-south projects need. But on the other hand, our own research scene can also profit from such collaborations. This too can result in research excellence.

H: For example?

G: Being able to test well-known concepts and observations in foreign contexts. And there are topics that affect us directly, but that we can only investigate in meaningful collaboration with those kinds of partners: biodiversity, commodities, health and migration. And it’s exciting, for example, to talk with someone from the Sudan about peace research, because it opens up quite different perspectives.

H: And the brain drain? Don’t such collaborations mostly bring about the emigration of promising researchers from developing countries?

G: Ninety percent of the researchers involved who come from emerging countries carry on researching there. We know how to set up projects so that resources don’t migrate.

H: The National Centre of Competence in Research (NCCR) ‘North-South’ was closed last year. What sustainable structures have resulted from it?

G: It will hardly be possible to maintain the research networks it managed to establish with different countries. Just providing money for projects is not enough on its own. That’s a shame. In this respect, the conditions are worse than when the NCCR North-South was up and running.

Roland Fischer is a freelance science journalist.

Laurent Goetschel is the President of the Swiss Commission for Research Partnerships with Developing Countries (KFPE), which is celebrating its 25th anniversary this year. The goal of KFPE is to promote equitable research cooperation with developing and transition countries.

The European patient

The Eupati project aims to achieve closer links between clinical research and European patient organisations. Switzerland is part of it too. *By Irène Dietschi*

The founders of the Internet platform 'patientslikeme.com' saw the light a full ten years ago: in a modern health system, patients are no longer satisfied with playing the role of the silent sufferer or the humble guinea pig. Developments such as personalised medicine have created a new balance of power in which patients have a say and take part in decision-making. 'Patients like me' uses health data sharing to enable patients not only to participate in therapeutic innovations but also to steer them. This can be achieved by using the Internet to bundle interests together, or to create new research approaches such as 'crowdsourcing', in which data is compiled by the users.

Now the European Union is going one step further by getting patients more closely involved in clinical research. Under the label 'Eupati' (European Patients' Academy on Therapeutic Innovation), patient organisations in twelve European countries are to be linked and brought together with representatives of industry and academic

research institutions. 29 European groups, comprising representatives of patient organisations, non-profit organisations and the most important pharmaceutical companies, have joined forces as a consortium under the auspices of the European Patients' Forum. "In clinical research, the patient is moving from the periphery to the centre" says Annette Magnin, Managing Director of the Swiss Clinical Trial Organisation (SCTO). The SCTO is currently setting up Eupati in Switzerland, along with the Swiss Positive Council (the organisation representing the interests of people with HIV), the Basel University Hospital and a representative of industry.

The goal of Eupati is to create patient-centric information and to train patient representatives so that they can present the views of those at the 'receiving end' during the development of new drugs and therapeutic concepts. This process is running on different levels. Patient 'experts' are trained and then pass on their knowledge to the leading representatives of patient organisations, who in turn inform their members. This all occurs in parallel to information being provided on the Internet that is available to everyone.

Critical assessment by laypeople

But just what is being discussed in terms of patients' 'needs'? Magnin says that the project isn't about specific illnesses or therapies, but about topics that concern everyone: personalised medicine, the use and risks of new drugs and the responsibilities and the active roles of patients in clinical studies. "Well-informed patients play a key role when it's a matter of implementing clinical research strategies, improving approval procedures or optimising treatment pathways". That's the basic principle behind Eupati. The whole process is a little reminiscent of the 'people's panels' that were popular in the 1990s. It is perfectly possible that the relevance of clinical studies will be improved if they are subjected to the critical assessment of ordinary people right from the beginning.

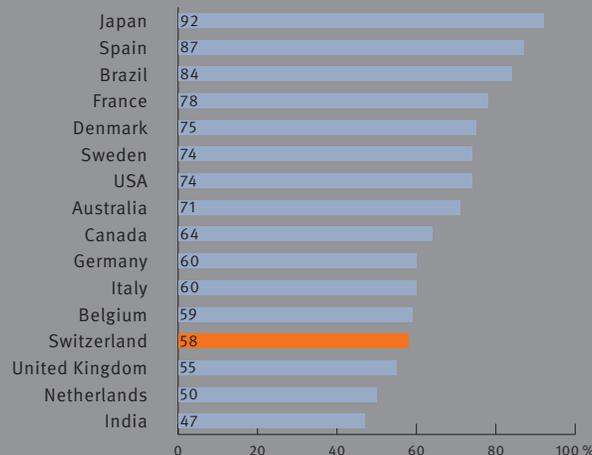
For Swiss patients, one fundamental benefit lies in the international network that Eupati offers. "Through Eupati, patient organisations with generally limited resources can get access to the infrastructure and contacts of a European network", says Magnin. This international access is essential for 'patient empowerment' and opens up new opportunities for action.

Irène Dietschi is a freelance science journalist.

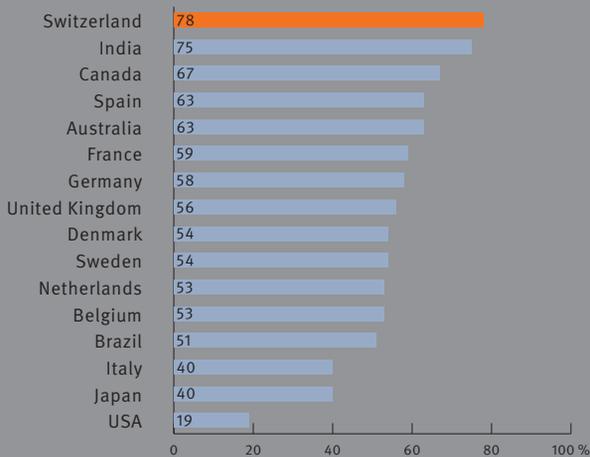
% of foreign researchers (2011)
– and the country of origin (%; ≥10%)



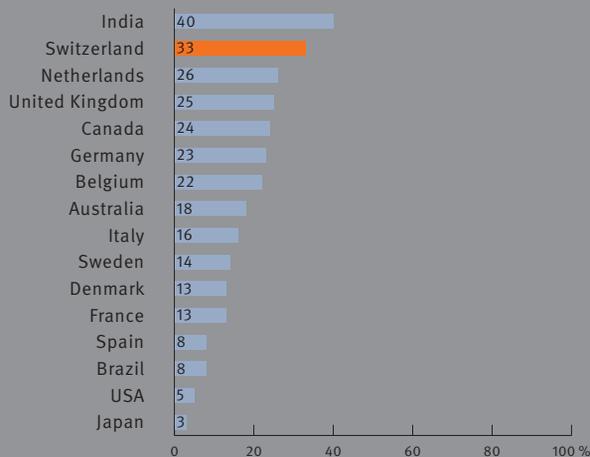
Return rate of researchers with experience abroad (%)



% of researchers with experience abroad



% of researchers active abroad (2011)



Yes to mobility: Switzerland goes international

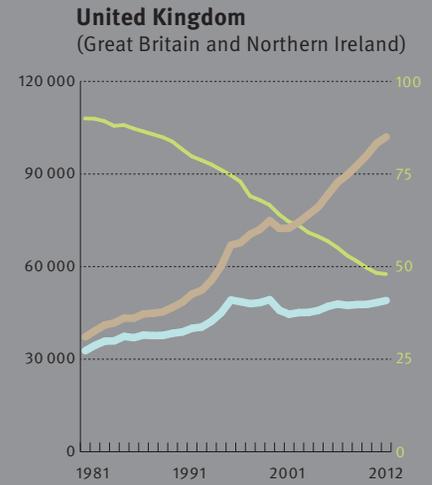
In late 2012, the largest ever comparative study about the mobility of researchers was published by Chiara Franzoni, Giuseppe Scellato and Paula Stephan. They wrote emails to 47,304 people from 16 countries, receiving 17,182 replies. The e-mail addresses were obtained from papers published in 2009 in the disciplines of biology, chemistry, and earth, environmental and material sciences. These 16 countries produced some 70 percent of the papers in these fields of research. Regrettably, researchers in China could not be included, as their response rate was less than five percent. Switzerland proved in many ways to be the most international of all 16 countries, with more than half of the scientists and students active in Switzerland stating that they had lived in another country at the age of eighteen – in other words they had come from abroad. Swiss scientists have gathered the most experience abroad during their careers, and in the year when the survey was carried out (2011), Swiss scientists were in second place among those who had been active abroad most often. Only in the rate of return of scientists with experience abroad was Switzerland situated at the lowest end. When asked for the main reasons for going abroad, scientists from all countries mentioned career advantages and the pull of working with excellent colleagues and at outstanding institutions. A better quality of life or higher wages played a less important role. *va*

Based on information from C. Franzoni, G. Scellato & P. Stephan (2012): 'Foreign-born scientists: mobility patterns for 16 countries'. *Nature Biotechnology* 30:1250–1253.

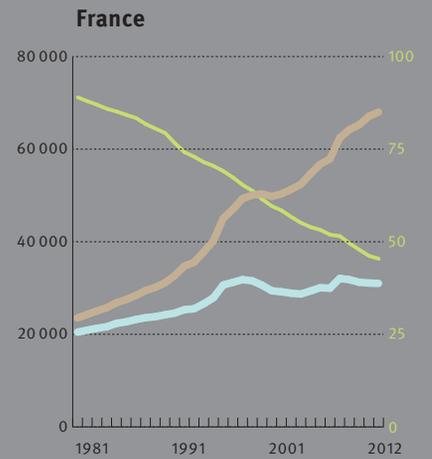
The movements of emigrants and their chosen countries

Shown here are the percentages ($\geq 10\%$) of researchers in natural sciences from one country working in another. In 2011, 34% of Swiss scientists abroad were researching in the USA and 30% in Germany. 33% of those researchers asked had worked abroad (see the graphic at the bottom of the left-hand page).



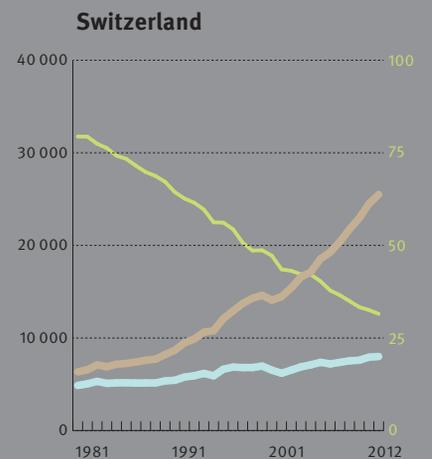
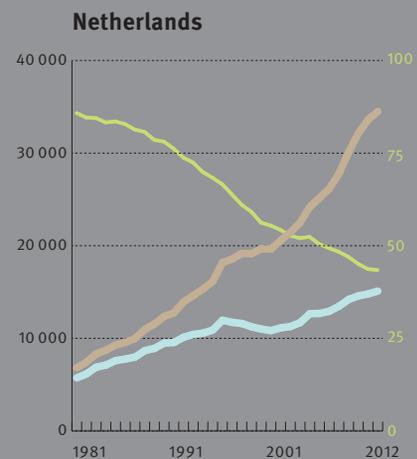


— Total number of papers
— National papers
— Proportion of national papers (%)



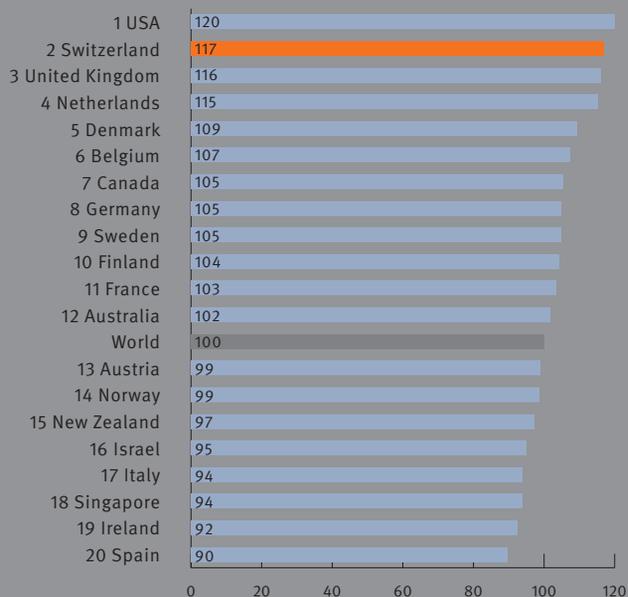
Authorship of papers: Two thirds are international

Jonathan Adams has analysed the provenance of the authors of 25 million papers. He contrasts 'purely national' papers published by one or more authors from a single country with 'international' papers published by authors from at least two different countries. In the six countries shown here, the growth in the amount of research over the past thirty years can be seen to be a result almost solely of the increase in international papers, whereas the number of purely national papers has remained relatively stable. In Switzerland, the relative proportion of purely national papers has sunk from 77 to 31 percent (shown as a bright green line in the graphic). Slightly more than two thirds of Swiss research publications are international today. In other European countries, roughly half of all papers are international. Researchers in the USA are the preferred partners for researchers from elsewhere, but in comparison to their European colleagues they publish less international papers. Adams has also shown that, on average, international papers are cited more often than purely national papers. *va*

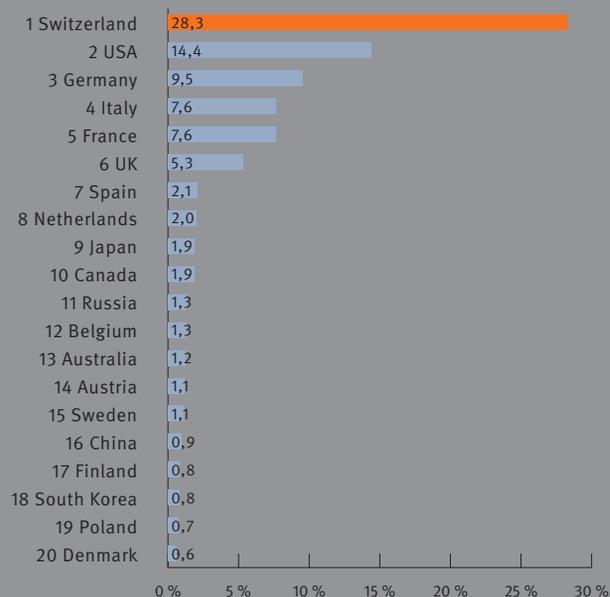


Based on information from the Thomson Reuters 'Web of Science', published in: J. Adams (2013): 'The fourth age of research'. *Nature* 497:557–560.

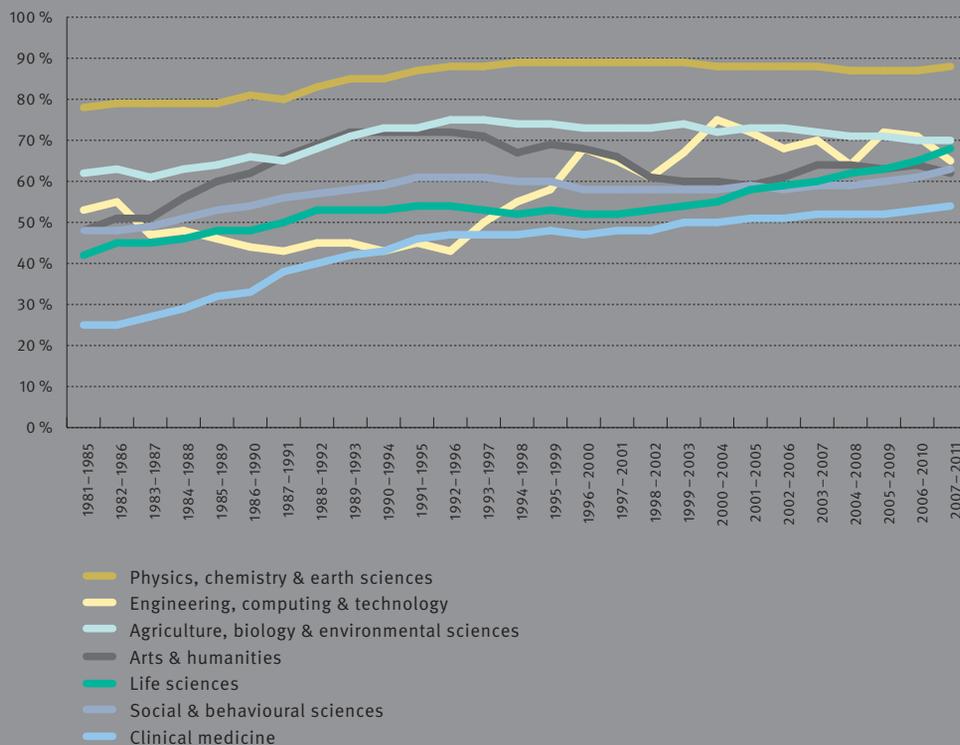
Relative number of paper citations ('impact', 2007–2011)



Country of origin of co-authors of Swiss researchers (2007–2011)



Proportion of international co-authorships, according to research discipline



In line with its international approach to research, Switzerland occupies top position according to the number of citations of papers. It is primarily researchers from the neighbouring countries and the USA who co-author international publications with Swiss researchers. The research field of 'physics, chemistry and earth sciences' produces the most international publications, which is in part attributable to the fact that Switzerland is home to international facilities such as CERN. In the field of 'arts and humanities', the number of co-written articles is low (35% of all articles), but where there are partnerships, they are also mostly international (this analysis is based solely on articles by Swiss authors written as part of collaborations between institutions). *va*

Based on information from Thomson Reuters (SCI/SSCI/A&HCI), published in: State Secretariat for Education, Research and Innovation SERI (2014): 'Bibliometrische Untersuchung zur Forschung in der Schweiz 1981–2011'.

Destination Earth!

At the Astronomical Observatory of the University of Geneva, Stéphane Udry is hunting exoplanets. His reserve of choice is the inhabitable zone around stars, where extraterrestrial life may exist. *By Philippe Morel*

A person's journey through life can be decided by the smallest of events, and Stéphane Udry, Director of the Astronomical Observatory of Geneva, is no exception to that rule. Twenty years ago, having reached the end of a two-year postdoc stint at Rutgers University (New Jersey, USA), supported by an SNSF grant, Udry was thinking about returning to Switzerland. But the experience had him doubting the pursuit of his scientific career: posts were rare and their nomadic nature meant a highly restrictive lifestyle, perhaps too restrictive for someone who prefers the family life. And so he was planning to teach.

Then he received a life-changing phone call. On the other end of the line was the Genevan astronomer Michel Mayor, offering him a position as assistant professor at the Geneva Observatory. He was in fact seeking Udry's specialist knowledge in dynamics to study binary stars, pairs of proximal stars that rotate around one another. "At that precise moment, life made the decision for me and I set out on an insane adventure that is yet to end", says Udry.

Udry is modest about all this. His adventure is actually better described as a scientific revolution, yet he considers himself merely a witness to the discovery of the first extra-solar planets, or exoplanets. "Shortly after arriving in Geneva, I introduced the doctoral student Didier Queloz to a number of analytical tools", he says. "And whilst we were sifting through data collected in Provence, we suddenly saw the potential signature of a body orbiting the star 51 Pegasi."

At the time, neither Mayor nor Queloz really grasped the magnitude of the discovery. So they spent the following year going

through their calculations, eliminating alternative explanations one by one. The official announcement took place on 6 October 1995, and a media storm descended upon the Observatory. "The public fascination for exoplanets is immense. If you're talking about a new solar system, you are talking about another Earth and the possibility of extraterrestrial life. These are subjects that immediately raise the questions of our origins", Udry says.

Surprise... surprise...

And for the last twenty years, he's gone from one surprise to another, and the other worlds that he and his colleagues have discovered are somewhat different from their only benchmark, our Solar system. This is the case with Kepler-16b, a rocky planet with two suns, much like Tatooine, the planet created by George Lucas for the *Star Wars* trilogy of films. "Nature's diversity fascinates me", says Udry. "And you can't understand it without relying on your imagination. In this respect astronomy, just like the other scientific disciplines, has an artistic element: if we're to build and move forward, technical discipline must be complemented by creativity".

In fact, open-mindedness may be capital. For example, following the discovery of the first exoplanet, an American team realised it already held data on similar kinds of stars and proved subsequently that they too hosted exoplanets. They had been led astray by the prevailing models and had restricted their search to planets whose orbits lasted somewhere around eleven years - the time it takes Jupiter to travel around the Sun. But in reality, the orbits of the first known exoplanets take only a few days.





“I am convinced that there’s life elsewhere in the Universe”.

Udry already had a vivid imagination. He’d grown up reading fantasy and science fiction, although he is quick to add, “I mean Isaac Asimov, for example, stories with solid scientific bases, not stories about little green men”. Yet, even having spent many evenings lying in the grass and contemplating the night sky above his home in the canton of Valais, he was never really drawn to amateur astronomy. His fascination went beyond and into the infinity of space. It was only after returning to Switzerland that he truly began to watch the skies, using the telescope of the Observatory of Haute-Provence.

A lonely navigator

A short while later he went to the European Southern Observatory in La Silla, Chile. This region of South America is renowned for its clear skies, the quality of which is due to a mixture of high altitude, desert conditions and a lack of light pollution. Yet the southern sky actually lost out in the competition for Udry’s attention, as he was more taken by the sunsets over the Andes. “Very soon I found myself alone, having to operate the Swiss Euler telescope. Leaning on the rails and being faced with the vast desert and Pacific Ocean, I had the impression I was a lonely navigator, the captain who goes down with the ship”. There was also an added bonus to the long stays in Chile: the quality of light and air go hand in hand, which meant several years of dodging the hay-fever season.

It took little time for the University of Geneva’s team of planet hunters, originally led by Mayor, then by Udry, to earn an international reputation. It is now based not only on observational knowledge, but also on the development of instrumentation suited to their task, such as the HARPS and ESPRESSO spectrographs. Good news also came from within Switzerland with the creation of a new national research centre, ‘Planets’. “This centre enables us to achieve critical mass and to build bridges between

the instrumental, observational and theoretical specialist fields of the universities of Geneva, Bern and Zurich, as well as ETH Zurich. Enough to keep me busy for ten years once I retire”, he says with a smile.

Before then, Udry intends to devote further efforts to his new holy grail, finding planets both comparable in mass and size to the Earth and which orbit within an inhabitable zone, in other words, at a distance from their star permitting water to remain in its liquid state. “I am convinced that there’s life elsewhere in the Universe”, he says. “The chances of finding conditions conducive to its emergence are very low. But think of the size of the Universe! Even if it’s not infinite, it’s still very large”!

Philippe Morel is an editor at the SNSF.

Stéphane Udry

Stéphane Udry was born in 1961 in Vuisse, near Sion. Having studied physics at the University of Geneva, he completed a two-year postdoc at Rutgers University (New Jersey, USA) with the support of the SNSF. In 2007, he was appointed ordinary professor at the Astronomy Department of the University of Geneva, which he has directed since 2010. He is also co-director of the national research centre ‘Planets’.

Drawn to the magic of roots

Few people know as much about root cultures as the biologist Inna Kuzovkina. And the plant cells she and her colleagues from Kyrgyzstan are growing in Moscow and Bishkek might soon play an important role in the fight against cancer.



“Most people can’t imagine how beautiful roots are! At our Institute of Plant Physiology they grow in glass flasks. They are very sensitive cultures, so you need good eyes and careful hands to look after them – and a lot of devotion too. Sometimes, when I’m really happy at work, I also talk to them.

“Outside the lab, the roots and their buds form a unity – the bud is the part of the plant that emerges above ground. It was a big surprise, a triumph really, back in the 1980s in the Soviet Union, when we succeeded for the first time in cultivating isolated roots in our laboratory. We use different natural strains of a soil-dwelling microbe by the name of *agrobacterium rhizogenes* that infects roots and induces them to grow. Under its influence, the roots constantly form delicate lateral roots, and they continue developing if you keep an eye on them and regularly replant small pieces of root in a fresh culture medium. Some of our cultures have been thriving for over twenty years.

“As part of the recent Scopes project with colleagues from Kyrgyzstan and Switzerland, we created root cultures of medicinal plants of the genus *scutellaria*. There are 32 different types of this genus found in Kyrgyzstan, of which 17 are endemic. They grow only there, and nowhere else on earth. Many of these species are increasingly endangered because their having a medicinal nature means they’re simply plucked out, unchecked. We hope that our cultures will make a contribution to the biotechnological conservation of Kyrgyzstan’s plant diversity.

The Russian and Kyrgyz biologists (Inna Kuzovkina 2nd from left) collect medicinal plants in northern Kyrgyzstan (right), then grow their roots in the lab (far right). This research was supported by the Scopes programme (see p. 15). Photos: Baktybek

Asanakunov, G. A. Lazkov, Inna Kuzovkina, Anastasia Guseva



“*Scutellaria baicalensis*, the ‘Baikal Skullcap’, is used intensively, not least because it’s regarded as the second-most important plant in Chinese medicine. Even in the West, it has been the subject of increasing interest since it became known that it contains substances such as the flavone wogonin. A few years ago this flavone was proven to be harmless to healthy cells but deadly to certain cancers. Wogonin gathers exclusively in the root – just like many other plant metabolites – and this makes our cultures of great interest to the pharmaceutical industry.

“They’re especially interested because, besides our root cultures, we’ve also been able to establish calluses of the endangered skullcap genus *scutellaria andrachnoides*, which is endemic to Kyrgyzstan too. Calluses are accumulations of cells that have regressed to an earlier, as yet undifferentiated state and which then reproduce as a kind of plant stem cell. In contrast to root cultures, calluses do not form any proper roots, but simply grow as clusters of cells.

“Together with our doctoral students, we did a biochemical analysis of the content of these cells, and we found to our astonishment that while our root cultures contained several different flavones, the calluses contained almost nothing but wogonin. This could considerably reduce the effort needed to isolate this potential cancer drug.

“I am 75 years old and I don’t find travelling as easy as I used to. That’s why my colleagues from Kyrgyzstan visit us in Moscow more often than my group goes to



Bishkek. Many years ago, my colleagues and I jointly supervised Anara Umralina, who is now the head of the plant physiology lab at the Kyrgyzstan National Academy. We've been good friends ever since. But without the generous financial assistance from Switzerland - for which our Russian-Kyrgyz collective is extremely grateful - this project would never have come about.

"Many colleagues at my age are still interested in science and are continuing with their work - just like me. That way, we can improve our small pensions a little. In my case, my pension is worth only a third of my salary. But what's more important: we old people want to pass on our experience. I would like to know that my root cultures will be in good hands one day".

Recorded by Ori Schipper, editor at the SNSF.



“A tool that particle physicists dream of”

The Large Hadron Collider (LHC) may have only just started to produce results, but CERN is already planning its successor. They aim to sketch the outlines within five years, according to the physicist Olivier Schneider.



Valérie Chételat

Horizons: Olivier Schneider, aren't physicists already weary of what was branded as the biggest scientific experiment ever?

Olivier Schneider: No, not at all! Quite the contrary, research using the LHC is only just beginning. It was designed to achieve an energy level of 14 teraelectron-volts (TeV). So far we have only achieved a little more than half of that. As of 2015, the energy level will be further increased. Then, with the machine upgraded, the experiments in 2020 and 2025 will lead to yet more uncharted territory and offer the prospect of more exciting discoveries. So far, the LHC has unlocked only one percent of the data it is intended to deliver. That leaves quite a lot to do during the next 20 years.

H: So why, if there is so much still to achieve, are there already plans for a successor?

OS: The first talks for the LHC began in 1984, but the first collisions didn't take place until twenty-five years later. If we're to be ready to take the baton from the LHC, we need to start running today. The Future Circular Collider (FCC) will be based on technology still to be sufficiently developed, particularly superconducting magnets: the magnetic field needs to be doubled. These will be placed in a tunnel some three to four times longer than the LHC, where we will be able to achieve energy levels in the

region of 100 TeV, in other words, a real *terra incognita*. But let's not forget that we are still only at the stage of feasibility studies, not of a clearly defined project.

H: This Collider would cost something like 20 billion Swiss francs. That's what the Swiss National Science Foundation invests into basic research over a period of two decades. Is it reasonable to invest such an amount into building infrastructure only to be used by particle physicists?

OS: First, let me point out that there is still no official cost estimate. But yes, that is the expected order of magnitude. Secondly, I find the comparison somewhat misleading: no one nation will want to bear the entire sum of such a project alone. It will see the light of day only as part of a global collaboration. The FCC is a tool that particle physicists dream of. But in the end politicians will also have their say. Should the means be lacking, we would have to downsize not only the project but also our ambitions.

H: During the 1990s, the United States was forced to abandon a similar project due to budgetary restrictions. Do you not risk staking everything on a single collider?

OS: The issue was not a lack of money. At that time, NASA's budget was significantly larger yet remained untouched. It was

“So far, the LHC has unlocked only one percent of the data it is intended to deliver”.

a hard blow to US particle physics. A large number of very active laboratories in this field had to reorient their research, and nearly 2,000 American researchers have since joined CERN experiments. Abandoning a new project once it's under way is a worse catastrophe than just relinquishing the idea of a post-LHC collider. It would jeopardise the know-how acquired by several generations of researchers. It is therefore up to donors to shoulder their responsibilities.

Interview by Philippe Morel, editor at the SNSF.

Olivier Schneider is a professor at the High-energy Physics Laboratory at EPFL, chair of the Swiss Institute of Particle Physics (CHIPP) and a member of the CERN Council.



Blood, sweat and stool

In Chad, Swiss researchers are investigating parasitic diseases in humans and animals. The aim is to improve the health of vulnerable nomadic communities.

By Christian Heuss

It's with a handshake and a black goat that a research deal is sealed with the clan chief of the Foulbé nomads. "Only through long-lasting relationships and mutual respect can we research their health", says Jakob Zinsstag from the Swiss Tropical and Public Health Institute in Basel, who, over the last twenty years, has often been here on the southern banks of Lake Chad.

So with the goat safely stowed in the luggage area, ready for handover when we reach the nomads, our 4x4 vehicle drives out of the town of Gredaya, heading further and further into the green bush of the Sahel. The going is bumpy, and the puddles in the mud road testify to the recent rains. From the trees and bushes, there's the twittering of the first migratory birds to arrive from Europe. For outsiders, every fork in the road adds to the sense of disorientation. The only person who seems to know exactly where we're going is Ali Baye Abba Abakar. "My brain is like sat-nav", he laughs. Along with the nurse Hadjé Falmata and

the driver, Abba Abakar is a crucial member of the team led by Zinsstag's doctoral student Helena Greter. Abba Abakar speaks the local languages and has stored on his mobile the telephone numbers of many nomadic families.

The Foulbés, the Goranes and the Kuris are very different in their nomadic lifestyles, their social structures and the routes they take, but they all belong to the most vulnerable population groups in one of the world's poorest countries. Because they have no fixed place of residence and move from one pasture to the next along with their several hundred cattle, donkeys and carts, they fall through the gaps in the state's net. Nomadic children have no schools, have poor access to medical services and are prone to a high rate of child mortality.

Zinsstag pursues a systematic approach. "If we want to improve the health of these people, then we have to understand how they live". Health is not just a medical problem, it's just one aspect of the overall socio-economic picture. That is why Zinsstag, a veterinarian and epidemiologist, does not just work together with doctors of human medicine but also with geographers, ethnologists and public health experts.

Runaway cattle

Despite Abba Abakar's sense of direction, it's only after a difficult search that Greter and her team find the nomads. Their cattle had broken out that afternoon, which meant that they'd had to relocate their overnight camp. Now, dotted across a space





Open-air health care: Helena Greter taking a dung sample (top right); the nomads with cattle-branding tongs (top left), milking a cow (opposite page) and preparing to catch cows (previous page). Photos: Christian Heuss

measuring roughly one hectare, ten families camp with their children at the base of a large tree. They have their cooking areas here, their colourful canvas tents and all their meagre belongings. Behind them, the cattle are grazing. As daylight fades, the smoke from little fires serves to ward off the malaria-carrying anopheles mosquito.

Shortly after the research team arrives, the men of the group sit with them in a circle. Over cups of bitter-sweet black tea, Greter explains her research plans. She and her team would like to visit the group three times in the coming months to examine both people and animals for parasitic worms. Her work is geared to solving a health problem that the nomads themselves have identified. Their cattle are often affected by a worm - the large liver fluke - which reduces their ability to give milk and consequently also their market price. The people also host a similar flatworm, the *schistosoma haematobia*. This parasite leads to schistosomiasis, an often chronic illness that weakens those who suffer from it, and that can lead to blood in the urine and even to death. Earlier examinations showed at least one in ten children to be infected.

Here, humans and animals share the same living space. So are there similarities in how they are all infected by these parasites? This is the question occupying Greter. At their watering holes, she collects water snails, which serve as intermediate hosts during the life-cycle of the flatworm. Greter determines how many of the snails carry worm larvae. Using this data and a mathematical model, she and Zinsstag want to determine the best point in time

for a medical treatment to be applied simultaneously to both men and animals. Zinsstag is convinced that "this way, we hope to eliminate the parasitic infestation completely in the long term".

Greter speaks French, Abba Abakar translates. The nomads ask a lot of questions, and there is much laughter. Greter wants to examine fifteen animals and fifteen people in the next 24 hours. She keeps to a strict protocol that was agreed by ethics commissions in both Switzerland and Chad. She has medicines with her, in case she discovers any illness.

Caught with a lasso

With a clear, starry night spent under only mosquito nets, the hard manual work begins shortly after daybreak. Greter has to examine dung samples in order to find out which cattle are infected with worms. The Foulbé men catch these impressive beasts with a lasso and hold them fast by the horns. Greter plunges her arm - clad in a green plastic glove - deep into the rectum to draw out fresh dung.

In the early morning, things are already busy at the campsite. While the men are helping Greter, the children are standing around and enjoying the unusual sight of a researcher at work. Meanwhile, the women are seeing to the food. Some of them are milking cows, others are churning butter and grinding corn into a kind of polenta pulp. After a short break, Greter sits with the men to discuss the examinations she needs to carry out among their families. She picks a random sample of men and women from the group and supplies each

with two white plastic cups - one for a stool sample, the other for urine. Falmata, the nurse, will then use a detailed questionnaire to ask them about their general state of health.

By ten in the morning, the sun is burning mercilessly in the sky, and time is pressing. Greter sets up her field laboratory in the shade of a bush. Her solar-powered microscope stands on a folding table. She had practised every step of the process for analysing urine and faeces back home in Basel - but now, out here in the field, everything is different. Blowflies flock to the dung samples, and Greter has to adjust both the staining method and her own timing. But with her second dung sample she immediately recognises the worm eggs with their typical, spindle-shaped silhouettes.

In the coming months, Greter will conduct hundreds of examinations, all of which will be very carefully documented and statistically evaluated. This will not just provide a more precise picture of the health situation of the nomads. Greter will also improve her overall knowledge of nomadic life in Chad. "It is an extraordinary opportunity", she says, while putting the next specimen slide under her microscope.

Christian Heuss runs the Communication Department of the Swiss Tropical and Public Health Institute in Basel.

Mighty microbes

Intensive agriculture is its own worst enemy. If it were to broaden its perspective and pay more attention to what lives underground, it could cut costs and increase yields. *By Ori Schipper*

It's crazy. There's no other word for it when you consider the excessive use of fertilisers in the agricultural sector. To be sure, it makes for high yields in crop cultivation, but the plants only utilise half of the available nitrogen from the fertiliser. The other half escapes into the atmosphere or is washed away and pollutes our rivers and lakes.

By focusing only on the highest possible yield, intensive farming is going down the wrong track. Apart from anything else, this wasteful use of plant nutrients obscures the fact that the world's total reserves of phosphorus, for example, will only last for some 50 to 100 years. Now Franz Bender and Marcel van der Heijden of the Agroscope research institute in Zurich-Reckenholz have produced results that prove how expanding our current perspective could prove doubly rewarding.

These two researchers have conducted an experiment that shows how unseen subterranean biodiversity has a decisive, positive impact on the nutrient efficiency of maize and wheat. They took earth samples from nearby grazing land, sterilised it and then added to their samples either a greater or a lesser variety of soil organisms. Then they put the earth into lysimeters, large containers with a drain hole at the bottom through which rainwater seepage escapes.

A quicker nutrient cycle

The chemical analysis of the water seepage allowed them to draw conclusions about the amount of nutrients washed out, which differed greatly according to whether the earth in the lysimeter had been given a larger or a smaller number of soil organisms. The soil teeming with bacteria, fungi and worms had a quicker nutrient cycle. The nitrogen was chemically converted by the subsurface organisms and subsequently retained in the soil. In fact the organism-rich soil lost only half of the nitrogen to the rain when compared with the organism-poor soil.



A simple set-up, but with major results: agricultural crops rely heavily on soil biodiversity. Photo: Franz Bender

Microbes in the soil also unlock phosphorus from the predominant chemical compounds that often make it inaccessible to plants. Above all, the symbiosis with mycorrhizal fungi means maize and wheat absorb roughly a fifth more nitrogen and almost twice as much phosphorus when they grow in soil that is rich in organisms.

All this has an impact on the productivity of the plants. The more life there is in the soil, the greater the growth of maize and wheat – something that Bender and van der Heijden have now been able to prove for the first time. “Organisms in the soil and mycorrhizal fungi have the potential to improve agricultural yields both qualitatively and quantitatively”, they write in their article.

When arable land is farmed intensively, the living networks in the soil are often disrupted. As a result, the nutrients fed into the soil with the fertiliser remain largely unused and seep away, write Bender and

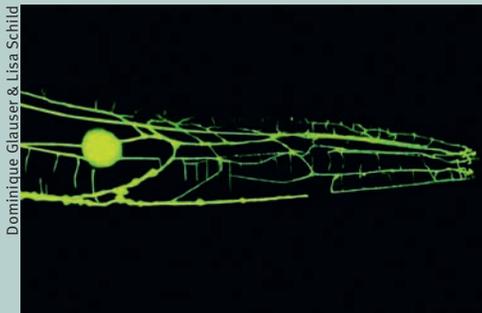
van der Heijden. If there was wide adoption of practices such as crop rotation, reduced ploughing and direct sowing – all of which are beneficial to the invisible creatures in the soil, and all of which are already common in Switzerland – then agriculture could profit greatly. If we were to abandon our pointless extravagance with nutrients, then farmers would not only save on the cost of fertiliser – and not even at the expense of high yields – but also help to solve environmental problems such as polluted lakes.

Ori Schipper is an editor at the SNSF.

Pain relief worms

Nematodes, roundworms that live in the soil, could be the key to moving forward in the treatment of pain, as studies into their genes have shown that there are some similarities with humans. Dominique Glauser and his team at the University of Fribourg have honed in on genes involved in pain perception, or nociception, in the *Caenorhabditis elegans* roundworm. Their tests involved exposing the insects to different heat intensities and observing their behaviour. They identified two types of behaviour: firstly, when the temperature was low, the worms simply kept away from the heat source. Yet when it was high, the worms demonstrated behaviour characteristic of escape. The study of mutant worms, incapable of avoiding harmful heat, sheds light on the genes that play a role in avoiding negative sensations. Most of them are related to the functioning of sensory neurons responsible for perceiving pain, known as nociceptors. As many pain-related diseases stem from nociceptor inefficiency, the nematode model paves the way towards a better understanding of the mechanisms involved. Glauser's results and his further research are, therefore, a source of long-term hope for the discovery of new painkiller targets. *Fleur Daugey*

L.C. Schild, D.A. Glauser (2013): 'Dynamic switching between escape and avoidance regimes reduces *Caenorhabditis elegans* exposure to noxious heat'. *Nature Communications* 4: 2198.



The nerve cells responsible for feeling pain are widely ramified in roundworms, too.



The top chicken foot shows symptoms of bird flu, the bottom foot is healthy.

A genetic puzzle in bird flu vaccines

Let's hear a round of applause for the replicons. This yet-to-be-approved class of vaccines sounds like something out of a sci-fi movie. And in fact, they're futuristic by name and by nature, as they have the potential to solve two problems faced by conventional bird flu vaccines. First, conventionally vaccinated chickens (i.e., those that have been given the inactive virus) cannot easily be distinguished from animals that are actually afflicted by the active virus. Secondly, conventional vaccines are often unable to prevent the replication and spreading of further viruses.

This is why Gert Zimmer and his team at the Institute of Virology and Immunology in Mittelhäusern are experimenting with genetically altered viral particles. These replicons differ from an intact virus as they don't contain the gene for the protein shell that encloses and protects the genetic material. And without this shell, the replicons cannot insert their genetic material into the living cells where they would otherwise replicate.

To produce a vaccine, Zimmer's team uses helper cells, also genetically modified, which have been implanted with the protective protein gene. In these helper cells, the two parts of the puzzle then come together. The mangled genetic material of the replicon becomes enclosed by the shell, allowing the replicons to be able to attack chicken cells and trigger an immune response. But because, unlike the helper cells, the chicken cells have no shell protein, the replicons land in a cul-de-sac and cannot replicate further. *ori*

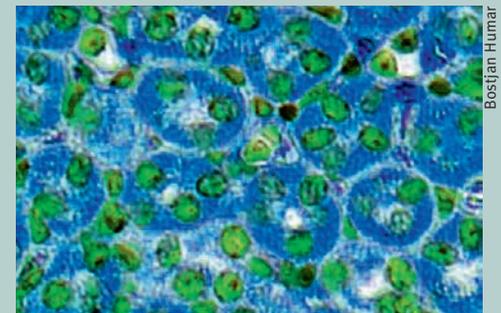
S. Halbherr et al. (2013): 'Vaccination with recombinant RNA replicon particles protects chickens from H5N1 highly pathogenic avian influenza virus'. *PLoS One* 8:e66059.

Serotonin protects

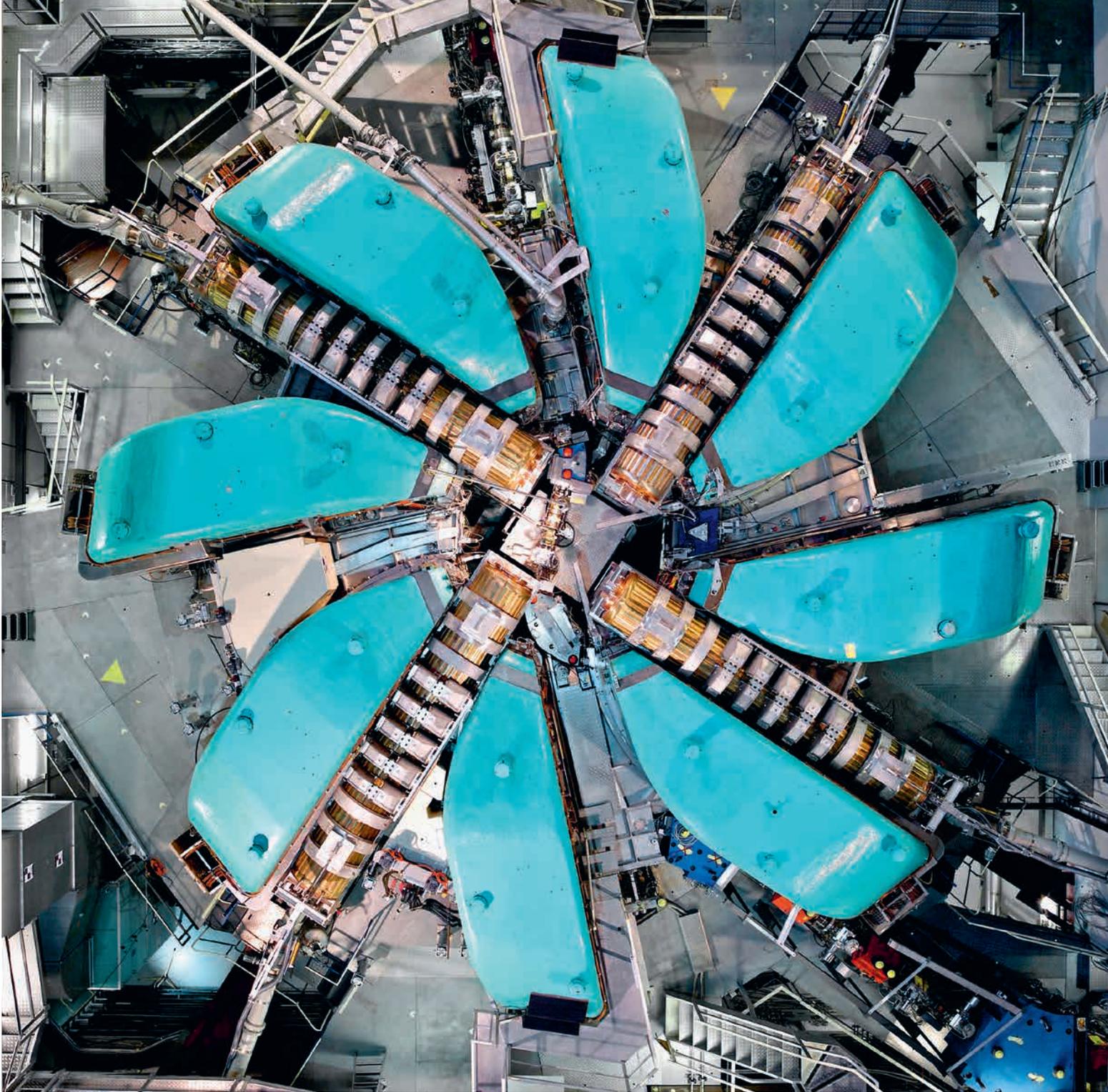
The neurotransmitter serotonin conducts nerve signals in the brain, but it also occurs in the blood and plays an important role in the functioning of numerous organs. In the liver, for example, it promotes cell growth. As researchers at the Zurich University Hospital have already shown, this means that the liver can regenerate and regain its original volume after a cancerous tumour has been surgically removed or after the liver has been damaged by toxic substances. Now the same team from the Clinic for Visceral and Transplant Surgery, led by Rolf Graf, has discovered that serotonin is also crucial to protecting the body from damage caused by reperfusion. This can occur after the blood supply has been interrupted during surgery; the surrounding tissue can actually be damaged by the return of blood to the organ.

Such damage can be reduced using a method known as preconditioning. Surgeons disconnect the blood supply briefly, several times before the operation, in order to prepare the tissue for the impending loss of circulation. This method even works when the blood flow is halted in an arm or leg: "The mechanism is based on the same molecular basics as the regeneration of the liver", Graf says. Preconditioning stimulates the release of serotonin from blood platelets, as the team has been able to show in experiments with mice. *Fabio Bergamin*

C.E. Oberkofler, P. Limani, J.-H. Jang et al. (2014): 'Systemic Protection Through Remote Ischemic Preconditioning Is Spread by Platelet-Dependent Signaling in Mice'. *Hepatology online*.



Cut off the blood to save the organs: the protective effect can be seen in the blue colouring of the kidney cells.



What holds it together? The ring cyclotron of the PSI proton accelerator, seen from above. Photo: Paul Scherrer Institute, Markus Fischer

Not just any old iron

Forty years ago, engineers and researchers at the Paul Scherrer Institute built a proton accelerator. Today, it still belongs among the best research facilities in the world of physics. *By Simon Koechlin*

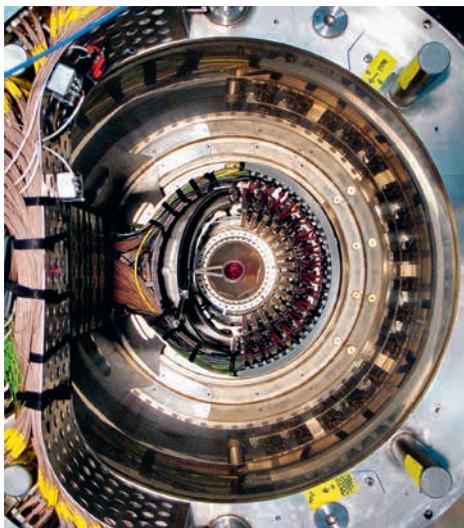
Nothing ventured, nothing gained. This saying is certainly true in modern physics. In the 1960s, Jean-Pierre Blaser, Hans Willax and their team at ETH Zurich wanted to build a new kind of accelerator for protons, the positively charged constituents of every atomic nucleus. Many simply shook their heads at the idea. “Well-known physicists said: ‘That can’t work’”, says Klaus Kirch, the Head of the Laboratory of Particle Physics at the Paul Scherrer Institute (PSI). But Blaser and Willax wouldn’t be put off. Their proton accelerator was built – with a loan of nearly 100 million francs – and began operating 40 years ago. Today, it’s still one of the most successful research facilities in the world.

This is partly thanks to the courage and ambitions of Blaser and Willax, but also thanks to the fact that PSI has been continually developing and improving the accelerator. This is discussed by Andreas Pritzker in his *History of SIN*, which tells the story of the development of the proton accelerator at PSI’s forerunner, the Swiss Institute for Nuclear Physics (SIN). In his view, it is successful because it can be used in many other research fields besides particle physics.

The proton accelerator was built for ‘medium energy physics’. The aim was to create so-called pions. “These particles are important in holding together protons and neutrons in the atomic nucleus”, says Kirch. In order to create and investigate pions, you first take a hydrogen molecule and split it; this is how protons are formed. These are then sent through three accelerators, the last of which is the so-called ring cyclotron. There the particles fly round in a circle and are accelerated using eight magnets. This means of acceleration, which was revolutionary in Blaser’s and Willax’s day, needs considerably less energy than the acceleration of particles in a straight line, Kirch explains. “In terms of efficiency, the proton accelerator at PSI is probably the best in the world today”.

Near loss-free proton streams

In total, the protons travel some 180 times around the ring accelerator. Their speed reaches roughly 80 percent of the speed of light, and then, as the researchers describe it, they are ‘extracted’ from the accelerator. The protons are first pointed at ‘carbon targets’. This collision creates pions and muons, the ‘heavy brothers’ of electrons. Then they continue their path towards a lead target, knocking neutrons off it. If the protons come into contact with another material, it becomes radioactive. It is a real



Physicists use this machine to study muon decay.

Photo: Paul Scherrer Institute, Malte Hildebrandt

art to direct the proton stream out of the accelerator without any such losses, says Kirch. Over the years, the physicists at PSI have greatly increased the efficiency of the equipment. Today, it runs so ‘cleanly’ that 99.99 percent of the accelerated protons are available for experiments.

Refining a standard model

With a diameter of some 15 metres, the ring accelerator is certainly impressive. Compared with other large installations in the field of particle physics, however, it is rather modest. But this proves that good research is still possible, even when far removed from the mighty dimensions of particle accelerators such as the LHC at CERN in Geneva. Yet only PSI’s particle accelerator creates the quantities of muons needed to deliver results in the search for specific, rare instances of decay in these particles. “These experiments have produced results that are really fundamental”, says Kirch. “They help us to test and refine the standard model of elementary particle physics”. And only at PSI do the muons travel slowly enough to be used to investigate thin layers of material. In order to study the magnetic properties of a material, for example, muons are brought to its surface. When they decay, the researchers can use the direction in which the decaying particles travel to make deductions about the magnetic fields of the material. “These experiments are not usually intended to discover any direct practical applications but to examine materials which might be suitable for use as superconductors or in new storage media and hard drives”, says Kirch. In total, more than 500 researchers use the proton accelerator every year to carry out experiments with muons.

There are just as many users for the Swiss Spallation Neutron Source SINQ, which is used to study neutrons knocked out of lead by protons. Because neutrons

have to be slowed down for experiments, the equipment is situated in a tank of heavy water. Neutrons are a unique tool for investigating the magnetic structures of materials. It is also possible to use them to create internal images of archaeological artefacts without causing any damage. The accelerator even has ‘healing properties’. Exactly 30 years ago, PSI began to use proton beams to treat patients with certain types of cancer. “At the beginning, the protons for this proton therapy came directly from the accelerator”, says Kirch. Demand grew with the success of the therapy – the cure rate for eye tumours is roughly 98 percent – and so today there is a dedicated accelerator.

More than ever before, the proton accelerator is proving its worth as a high-quality research facility – and Kirch says that’s what really impresses him. “How is it that a piece of equipment can last for 40 years without landing on the scrap heap?” This is in part thanks to the research environment in Switzerland, which allows for greater continuity. It has meant that the ever-motivated scientists at PSI have been able to improve and expand the proton accelerator over the years. The latest example dates back to 2011, when it started to produce ultracold neutrons. There will be further adjustments and improvements in coming years. But no revolutionary alterations are planned at present. It’s more a matter of making it more reliable, says Kirch – so that the proton accelerator can remain indispensable for yet another generation of researchers.

Simon Koechlin is the editor-in-chief of the magazine *Die Tierwelt* and a science journalist.

Literature:

Andreas Pritzker: *Geschichte des SIN*. Brugg: Munda-Verlag, 2013.



Who finances what?

Particle accelerators, observatories or genetic databases – the federal government wants to know what infrastructure Swiss researchers need. But some things get left by the wayside. *By Simon Koechlin*

In research, great emphasis is placed on collaboration. Many scientists run projects that require access to equipment or databases that are beyond their own budgets. Such infrastructure is also becoming more and more important in Switzerland. “Classical research infrastructure includes, for example, the particle accelerator at CERN and the big telescopes at the European Southern Observatory”, says Katharina Eggenberger from the Research domain at the State Secretariat for Education, Research and Innovation (SERI). Today, research infrastructure is also increasingly regarded as including databases and service provision centres – such as archives holding census and opinion poll data from across Europe.

The SERI is currently drafting a ‘Roadmap for Research Infrastructures’. An inventory is being compiled of existing infrastructures, and the federal government is also ready to embark on new infrastructure projects that will be of great significance to Switzerland as a research location. The quality of both existing and future projects is being evaluated by the SNSF. If its assessment is positive, then a project is included in the Roadmap, and the parties involved decide who will pay for it – the SNSF, the Swiss Academies of Arts and Sciences or universities. The final decision on financing, however, will only be taken within the framework of the Federal Council Dispatch on the promotion of Education, Research and Innovation (ERI) for 2017–2020.

At universities, however, there are mixed feelings about the Roadmap. “It’s certainly a good idea to get an overview”, says Raymond Werlen, General Secretary of the Rectors’

Conference of the Swiss Universities (CRUS). “However, we have to decide now what infrastructure is going to be important for us from 2017 onwards – even before the goals of the next budget period have been discussed”. Furthermore, the Roadmap itself is not easy to comprehend, and it isn’t quite clear just what types of infrastructure will be covered.

What about editions?

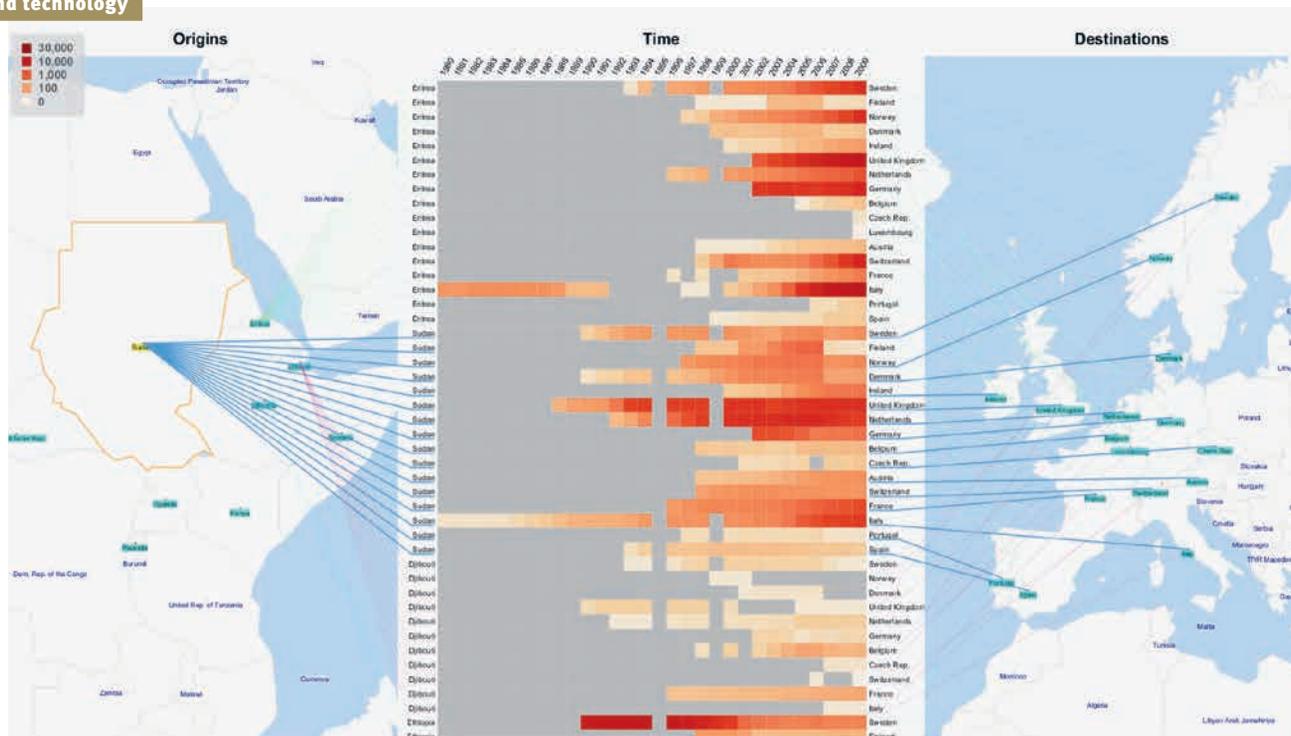
Markus Zürcher agrees. From his position as the General Secretary of the Swiss Academy of Humanities and Social Sciences, he criticises the fact that certain editions will not be regarded as research infrastructure. Today, such scholarly editions are almost always made available in digital format and serve as a basis for new research projects. “You can see from the draft that they still find it difficult to recognise that researchers in the humanities today work with such resources”, says Zürcher. For this reason, says Ingrid Kissling-Näf from the SNSF’s Humanities and Social Sciences Division, the SNSF has issued a call for edition projects in the humanities.

Eggenberger can understand the reservations expressed, and she admits that the Roadmap is not yet fully developed. However, she is most emphatic that projects in the humanities and social sciences will also be recognised as infrastructure. The most important reason for setting up this Roadmap, however, is to improve coordination for financing purposes. There is room for savings in several areas. For medical imaging, for example, the purchase of expensive equipment, such as tomographs, is often done without any prior discussion between different institutes. “The Roadmap will give us a better overview of what’s important for us as a research location, and who will pay for what”, says Eggenberger.

Simon Koechlin is the editor-in-chief of the magazine *Die Tierwelt* and a science journalist.

This is infrastructure too: an MRI scanner.

Photo: Valérie Chételat



A booming field: data visualisation, here of refugee movements between Sudan and Europe.

Picture: Screenshot of Flowstrates – Ilya Boyandin, Denis Lalanne, University of Fribourg

A picture paints ten thousand digits

In the age of big data, visualisation has become an essential tool, helping us to discover the hidden relationships that lie beyond the reach of algorithms. *By Daniel Saraga*

Big data is getting bigger. Government statistics are escaping red tape thanks to ‘open data’, then there’s accumulating commercial and financial information and beyond that the abundance of traces we leave as we surf the Internet.

But still the question remains: what do we do with this mass of information and how can we transform it into useful knowledge? One option uses powerful statistical algorithms to uncover correlations, a process known as ‘data mining’. But humans can also get the data to talk. “If the data is well represented visually, the eye is capable of quickly detecting relationships which are beyond algorithms”, says Denis Lalanne, a researcher in the computer science department at the University of Fribourg. “This is the case with trends, outliers and even similarities between datasets”.

From the UN to New York cabs

Along with his PhD student, Ilya Boyandin, and his colleague, Enrico Bertini, Lalanne has been developing new tools, including for visualising ‘flows’ (the popularity of routes from an origin to a destination) and

analysing changes over time. These infographics are published in the form of an open source library and have found a multitude of uses, such as studying the allocation of funds for international aid or the distribution chains of logistics companies.

“I was surprised by the response our work has generated”, says Lalanne. One notable project, known as “Flowstrates”, was created in collaboration with the United Nations to study the movement of refugees between different countries. But it’s been taken over by other users and adapted to investigate not only the mobility of workers in Chile and students in Australia, but also the international trade of resources and the movement of New York taxicabs.

Choose and elucidate

“Existing tools are no match for the range of questions that even a single user can have”, says Lalanne. After all, good data visualisation is not about representing everything; that just leads to illegible graphics and charts. “The key is to understand the needs of a user and to define practical usage scenarios in order to select relevant information”, he says. As the tool is interactive,

it must allow easy exploration of data and give rise to new hypotheses, which can then be put to statistical tests.

“We’ve compared the conclusions drawn from different diagrams. This proved that the way the information is presented clearly influences what we can take from it. Our goal is to stay as close to the data without distorting it. But it’s clear that visualisation can be used in communications to target a message easily”.

The success of data visualisation has started to attract students. Computer scientists are going even further and developing ‘visual analytics’ algorithms to analyse the charts and graphics generated by other computer programs. But for now, the top tool for sifting through torrents of information, and not drowning under them, is still the faithful old eye of *homo sapiens*.

Daniel Saraga is a freelance science journalist, working also on behalf of the LargeNetwork agency.

Getting the truth out of supervolcanoes

Amongst the most destructive of natural events are eruptions of supervolcanoes, which are characterised by their enormous craters, not by conical mountains. And whilst the eruption of Mount Pinatubo in 1991 ejected some 10km³ of minerals and metals, when the Yellowstone Caldera erupted two million years ago, it coughed up more than 2,600km³. A disaster of this scale is able to reduce global temperatures by 10°C for ten years.

This is why it's important to understand supervolcanoes. But as Carmen Sanchez Valle, a researcher at ETH Zurich, explains, there is still difficulty in understanding some of the processes. "The mechanism that pushes supervolcano magma upwards is different from that of normal volcanoes, where mounting pressure is usually caused by the reinjection of magma into the magma chamber or by the accumulation of gas bubbles".

Hoping to uncover the mechanism behind supervolcano eruptions, Sanchez Valle and her colleagues have forged a solid hypothesis on the basis of a foolproof magma test. They placed a fragment of it under considerable pressure and temperature and observed it using X-rays. The conclusion was that these super magmas are driven out of the chamber by a difference in density between the magma and the rock wall of the chamber. Once the density difference becomes critical, it is like letting go of a balloon that's being held underwater: the magma is suddenly released and floats to the surface. *Pierre-Yves Frei*

Malfait *et al.* (2014): 'Supervolcano eruptions driven by melt buoyancy in large silicic magma chambers'. *Nature Geoscience*, 7(2): 122–125.



Eruption: this supervolcano left behind a small lake. (Yellowstone National Park)



A sulphur trap: setting up an experiment in the Gola di Lago in Ticino.

Dangerous wetlands

Trace elements occur in only negligible amounts in the environment and the human body, which is why at first glance they hardly seem worth observing. But they often play a significant role in biochemical processes. It is a tricky matter to obtain information about the cycles of these elements, but one that is by no means incidental to research. Now for the first-ever time, researchers from the Swiss Federal Institute for Environmental Sciences and Technology (EAWAG) have investigated precisely how selenium, sulphur and arsenic are emitted from peatlands.

Over the course of two summers in the canton of Ticino, the researchers measured how much of these trace elements moors emit into the atmosphere and at what temperatures. Their findings show that the earth releases selenium far more readily than has always been assumed. They suspect the decisive role in mobilising selenium bound in the soil is played by plants.

Furthermore, they found that the volume of selenium and arsenic emitted is greatly dependent on the air temperature, which is why they believe that more of these trace elements will be released into the atmosphere as global warming takes hold. After all, wetlands make up some ten percent of the earth's surface. These amounts are too small to be a direct danger to human health. Nevertheless, such processes have a long-term influence on the global distribution of these elements, and so the result could still be medically relevant - not least because almost a billion people currently suffer from a lack of selenium. *Roland Fischer*

B. Vriens *et al.* (2014): 'Natural wetland emissions of methylated trace elements'. *Nature Communications* 5.



Stable even in harsh environments: a prototype organic transistor.

New sensor for oceanic measurements

A team at Stanford University, supported in part by the Swiss National Science Foundation, has developed a field-effect transistor (FET) that has proven to be stable even in corrosive natural environments. This discovery, based on an organic polymer, could be the starting point for designing cheap and robust sensors for use in environmental and life sciences, especially for continuous measurements of ocean salinity and pollution levels.

The team, headed by Oren Knopfmacher, has been studying the properties of a photovoltaic polymer called PII2T-Si (based on isoindigo with siloxane side chains) and has discovered that the material remains stable for months, even when exposed to moist air. This gave the researchers the idea to use it as an FET, which are used to transform specific biochemical interactions into exploitable electrical signals. They are therefore capable of detecting not only DNA, proteins and small molecules but also heavy metal ions. Organic transistors also have the advantage of being easy to produce in large quantities and at low cost, unlike transistors based on silicone, nanotubes or graphene. The main downside, however, has always been their stability, although that problem now seems to have been solved thanks to PII2T-Si. *Anton Vos*

Knopfmacher *et al.* (2014): 'Highly stable organic polymer field-effect transistor sensor for selective detection in the marine environment'. *Nature Communications* 5, 2954.

Hermaphrodites, eunuchs and bishops

What is a man, and what is a woman? In the Arab and Latin Middle Ages, transitions between the two genders were more fluid than today.

By *Caroline Schnyder*

When a child is born in Switzerland, the registrar's office has to be told whether it is a boy or a girl. No other option is provided for. Since last year, however, it has been possible in Germany to enter a child in the register of births without giving its sex. According to how these matters are classified and counted, it is reckoned that for every ten thousand births, between one and ten children have no clear sexual characteristics.

Such intersexual children are often operated on or treated with hormones – though this practice has long been criticised, and if we take a historical view it does not even seem to be necessary. This is because the norms that require a child to display the physical characteristics of either a boy or a girl stem from the 19th century, when unambiguousness was the end goal with regard to both the anatomy and the societal role of the sexes. In pre-modern times, however, the transition between male and female was more fluid.

As for the Middle Ages, we know little about intersexuality, and indeed little about the significance of the body and gender roles. The mediaevalist Almut Höfert, SNSF Professor at the University of Zurich, has been working with her team to investigate mediaeval sexual ambiguities. They are researching groups that seem to

thwart our notions of sex and gender roles, notions that have their starting point in a supposedly inherent 'sex' and an acquired 'gender'. Their focus is on 'intersex' people (or, using the word from Greek, 'hermaphrodites') in the Latin and Arab Middle Ages, along with childless, celibate men such as eunuchs and bishops.

What is unusual about this project is its transcultural approach, as it is investigating both the Latin and the Arab Middle Ages. Like Serena Tolino, who is researching the eunuchs of the Shia Fatimid Caliphate, Höfert also loves Arabic. This project is not about making some kind of political statement, she says. It is an intellectual experiment. On the one hand, this means being ready and willing to question what is taken for granted, and on the other hand, using cultural differences to identify what might otherwise be overlooked.

Latin and Arab sources

The project is by no means easy. The sources are in Latin and Arabic, and there are only a few researchers who have mastered both languages. Furthermore, the team is faced with an asymmetrical corpus, as the history of gender and sexuality in the Middle East is a young discipline, the first comprehensive investigation of the phenomenon of eunuchs only being published in 1999. Whereas, studies on mediaeval bishops fill entire shelves.

As for hermaphrodites, it is still a question of gathering sources. An initial, unexpected finding lies in the terminology: in contrast to the Latin 'sexus', mediaeval Arabic does not have any word to denote the physical aspects of gender, says Höfert. And whilst the hermaphrodite is described in Latin as someone displaying both sexes ('utriusque sexus'), in Arabic a hermaphrodite is someone who "does not absolutely belong to either the male or the female".

Such results are what Höfert had hoped from her project, she says. The 'gap' in Arabic brings into focus a decisive difference between pre-modern and modern notions of sex and gender. For modern humans it seems paradoxical that while men and women are and were physically separate, there was no concept of sex. This compels us to try and find new analytical methods and also to take a closer look at the Latin 'sexus'.

It is also well worth looking at mediaeval Islamic law. The hermaphrodite was a prominent figure in the discussions of almost all law schools of the time. In a legal system that provided for clear gender roles and segregated areas for men and women, the question naturally arose as to how someone should live who could not be assigned to either of the two sexes. What, for example, should a hermaphrodite wear on a pilgrimage to Mecca, during which men are to wear a white, unstitched cloth but women wear stitched clothes? What would be their share of an inheritance? How should they be buried? Such questions and others like them were examined thoroughly by legal experts. The hermaphrodite tended to be assigned to the female sex in these matters. This might just have served as an intellectual challenge. Alternatively it was intended to affirm the strict separation of the different domains for the sexes. According to Höfert, both possibilities can be observed here.

Symbolic characters

Regardless of the fact that hermaphrodites are mentioned in legal and medical texts, they are mostly symbolic characters, not concrete people, and this is true of both Latin and Arabic sources. The situation is different for eunuchs, who figure prominently in the history books. In the Fatimid Caliphate there seem to have been several thousand of them. As in the case of the hermaphrodite, the eunuchs too are a challenge to analytical concepts in gender research. Did the young boy or man whose



Billich verwundert sich Jung vnd alt
 Ab diesem kind vnd selzamer gstat
 Liplich geboren do man zeltt für war
 Tussend fünfhundert vnd nüntzeche Jar
 Im Jenner vff dem ersten tag
 So yeder man der fröiden pflag
 Ein niwes Jar frölich zempfan
 Rührte diso kind an die welt zu kan
 Söliche zu Zürich ist beschehen
 Piderb hüt hand es gesehen
 Redent für war on allen zorn
 Ob siner weiche sy es geboren
 Subtil mit glidmas hüpsch vnd ganz
 Nithalb hab es ein manen schwantz
 Einer frowen scham stünd nach da by
 Ein knollen rotfleisch ouch da sy
 Sölich figur ist geboren zwar
 In dem hürigen niwen jar
 Nach kriechischer sprach ist der nam sin
 Androgynos vnd ouch In latin
 Wirt es genant hermaphrodit
 Dar von dan Quidius schript ¶ Qui. 4. mer
 Das sölich veneris vnd mercurij kind
 Durch die wasser görtter erzogen sind
 Durch das man eigentlich mag verstan
 Gros vnkünscheit syg vnder vns kan
 Wir zu trincken füllen vnd üppikeit
 San einer almal zum anden seit
 Von brassen bülen vnd zu triben
 Es syg von töchren ald e vribren
 Kupplen ars welben vnd dero ley
 Das ist allenthalb yetz das geschrey
 Wir füre nun ein selzen vorden
 es sind allein fier honpt sünd wordē
 San vnkünscheit vnd füllery
 Vnd ouch grosse hoffart dar by

Die strafft nieman für kein tod sünd mer
 Es syg ritter knecht oder herr
 Das hand vnser vordren nie gethan
 Sunder vff frumkeit vnd eer silghan
 Aber yetz strept niemans nach manheit
 Allein vff füllen vnd vnüterkeit
 Ein bid er man stellen vff sin wid vnd kind
 Söliche yetz manlich raren sind
 Das zeigt dis figur hie klar vnd ganz
 Ser frowen scham star ob dem schwantz
 Saru das die groß vnkünscheit
 Hatt nider truckt alle manheit
 Vnd all sig hafft hüt über wunden
 Sölich In macrobio wirt funde ¶ macro:
 Hannibal ward hie durch vffürt (li. 3. satuz)
 Vnd all sin volck mit Im zerstört
 In campania ganz nider gleit ¶ Val. max.
 Alles das vallerius von im seyt (li. 9.
 Durch wibische vnkünscheit das bschach
 By Olyfernes man das ouch sach
 Verlor den strit vö vnkünscheit wegen
 Das mag man von vns ouch wol segē
 Das vnser manheit ist yetz gleit
 Vff brassen schlenen vnd vnkünscheit
 Sa durch wir ha' b wiber worden sind
 Als man ertlich volck In africa find
 Die ir wessen vermischer tribent
 Alles plinius von men tuder schreibe ¶ Plin. li. 7.
 Androgyne ist der selben nam
 Ich fürcht es werd nütz gütz drus kan
 Gott der natur das hat angezeigt ¶ Aug. de.
 Im wid wertig sy die vnkünscheit (do. hri.
 San Sodomot vnd Gomora die zwe stett
 Das helfsch für vom himel verbrent hert
 Von ir wüsten vnüterkeit wegen
 Sarum wirt vns gott das nit vertregen
 Das mag vns dis figur bedüeren
 Als einist by der Römer n zirenn
 Gschach durch ein kind sechs manott ale
 Sy vclunt die zerstörung des römische gwalt
 Als vns titus liuius schript ¶ li. 21. bell.
 Sa kein misserat vngestrafet blipt (pu. li. 10.
 Noch eines müs Ich Tuchen
 Man hat für am himel gsehen
 In dem hürigen niwen Jar
 Das sond jr nit verachten gar
 San lucio Junio kam zu vnstatt ¶ Val. li. 1.
 Sz er die wunder zeichen veracht h.
 San bald Im mer sin güt verfanck
 Vnd er personlich selber tranck
 Sarum wend jz sin vor kumer vnd leid
 So stiechend die sünd der vnkünscheit
 Lond vff rugend vnd manheit tringen
 Das wirt vch glück vnd heil bringen
 Hie vnd dort ewenlich
 Söliche vns allen gott verlich
 Amen ¶ Gdruckt zu Zürich ¶

testicles had been removed (and in some cases even his penis) belong to a third sex? Or was he sexless? Or was he situated between the sexes?

In pre-modern times we come across eunuchs and castrated men in many cultures. Alessandro Moreschi, the 'last castrato' who sang in the choir of the Sistine Chapel, died only in 1922. As in Ancient Rome, in Byzantium or in China, eunuchs also achieved positions of great power - despite often having begun their lives as slaves. For the north-African Fatimid Caliphs of the 10th to 12th centuries, eunuchs served not just as mediators between their harem and the rest of their court but were also appointed as generals to lead military campaigns and were made the governors of cities and provinces. In Cairo they controlled trade and food supplies. In the legal aspects of gender, eunuchs were mostly treated as men, says Tolino. In chronicles, on the other hand, it is often difficult to say whether the men referred to had been castrated or not. In situations of war, eunuchs were barely differentiated from other men.

Gender of authority

It is noteworthy that in the Latin Middle Ages, bishops - who were both princes and priests - were also men who occupied positions of authority yet had no sons with any legal right to inherit. Höfert therefore describes both bishops and eunuchs as a 'gender of authority'. At first glance it might seem strange to want to consider both groups together, she says, as not only were the contexts in which eunuchs and bishops were acting too dissimilar, but their respective origins were also markedly different.

And yet this approach has proven worthwhile because the structural parallels are striking: childless men stood outside the succession of fathers and sons, making dynasties more flexible. So this project does not just open up new vistas on the history of sex and gender, but also unexpected perspectives on pre-modern politics.

Caroline Schnyder is responsible for knowledge transfer and public relations at the University of Lucerne.

Worrying news: This leaflet reports the birth of a hermaphrodite in Zurich on 1 January 1519. The red mark above the navel was interpreted as an admonition from God against the spread of immorality. Photo: Zentralbibliothek Zürich, Collection of Prints and Drawings and Photo Archive.

Between the academy and the administration

They acquire third-party funds, coordinate 'knowledge transfer' and hold research threads together. The people who work at the interface between academia and administration are highly conspicuous at our universities. *By Irène Dietschi*



Not only research managers but also researchers themselves arrive at universities increasingly like hamsters in wheels. "Arbeitsplatz" (Workstation), installation by René Zäch (2002).

Thun Art Museum; Photo: Daniel Mueller

Romy Kohlmann is an important person for the 'Plant Fellows'. That's the name of an international postdoc support programme in plant sciences financed by the European Union and coordinated by the Zurich-Basel Plant Science Center, a competence centre of ETH Zurich and the universities of Zurich and Basel. As Programme Officer, Kohlmann is the first port of call for researchers, and above and beyond this, she also has a multitude of other tasks to do. She writes reports for the EU, organises the annual meetings of the current forty Fellows and supports them in the knowledge transfer of their research results. "It's an exciting, varied job", says Kohlmann, who studied politics in Leipzig and Lausanne. What's important in her career, she says, is that you understand what research is all about; management skills alone are not enough.

The job of a programme officer is neither wholly academic nor administrative, but instead lies somewhere in between. This growing area at the interface between the two is referred to as a 'third space'. Its representatives, who are still waiting for an official overall job description, call themselves 'science managers' or 'research managers'. 'University professionals' is also a common designation. As a proportion of employees at universities, their numbers have increased greatly in recent years. This is not just because of the general growth of the university sector but because of the increasing complexity of the organisational tasks bound up with it. Of central importance, for example, is the acquisition of third-party funds. Management tasks - such as heading a study programme, a national research focus area or an institute - are often no longer the preserve of professors alone but now also of science managers.

Focus on management

"University professionals have an academic background and are anchored in a discipline themselves, but their focus is on management", says Patricia Gautschi of the Centre for Continuing Education of the University of Bern. Gautschi heads the university's course in research management. She has also carried out two studies to investigate the situation of science managers at several universities in the German and

French-speaking regions of Switzerland. The results give a heterogeneous picture that is expressed in the statistics alone: at a centrally organised university like ETH Zurich, the proportion of science managers stands at 2.8% of all employees, whereas at the University of St. Gallen, which has a decentralised structure, it is considerably higher at 4.1%.

Gautschi's results show that the success of research projects is often thanks to science managers. However, their overall conditions tend to be difficult. Often, their contracts are for fixed periods, their job descriptions are vague, and there are great variations in how their work is graded and remunerated. The positions occupied by those interviewed ranged from 'high level consultants' who hold doctorates to senior assistants who don't. University professionals find it difficult to deal with the scepticism they encounter among the academics. "Many scientists have a fundamental aversion to anything that is not 'academic' in a classical sense, and that is by its nature a management issue", says Gautschi.

The economisation of the academy?

This aversion is in part expressed by an unwillingness to delegate tasks and competencies, because - so the academics claim - 'we don't need that', or 'we can do that better'. Many scientists fail to recognise the abilities of their third-space colleagues. They often see them as enemy beings that are driving forward the economisation of the academy - and thereby purportedly sucking out the very finances that would otherwise be destined for research purposes. "The situation is paradoxical", says Gautschi, "because for academics it's actually a relief if they can pass onto us those tasks that really have little to do with their core areas of expertise". She suspects that in many places there is simply a lack of 'management culture' and that the traditional university structures make it difficult to allow for anything new to happen.

With time, however, they will have no other choice. Thomas Breu, the Co-Director of the Centre for Development and Environment at the University of Bern and Coordinator at the National Centre of Competence in Research (NCCR) North-South, says that "it's a fact that universities could

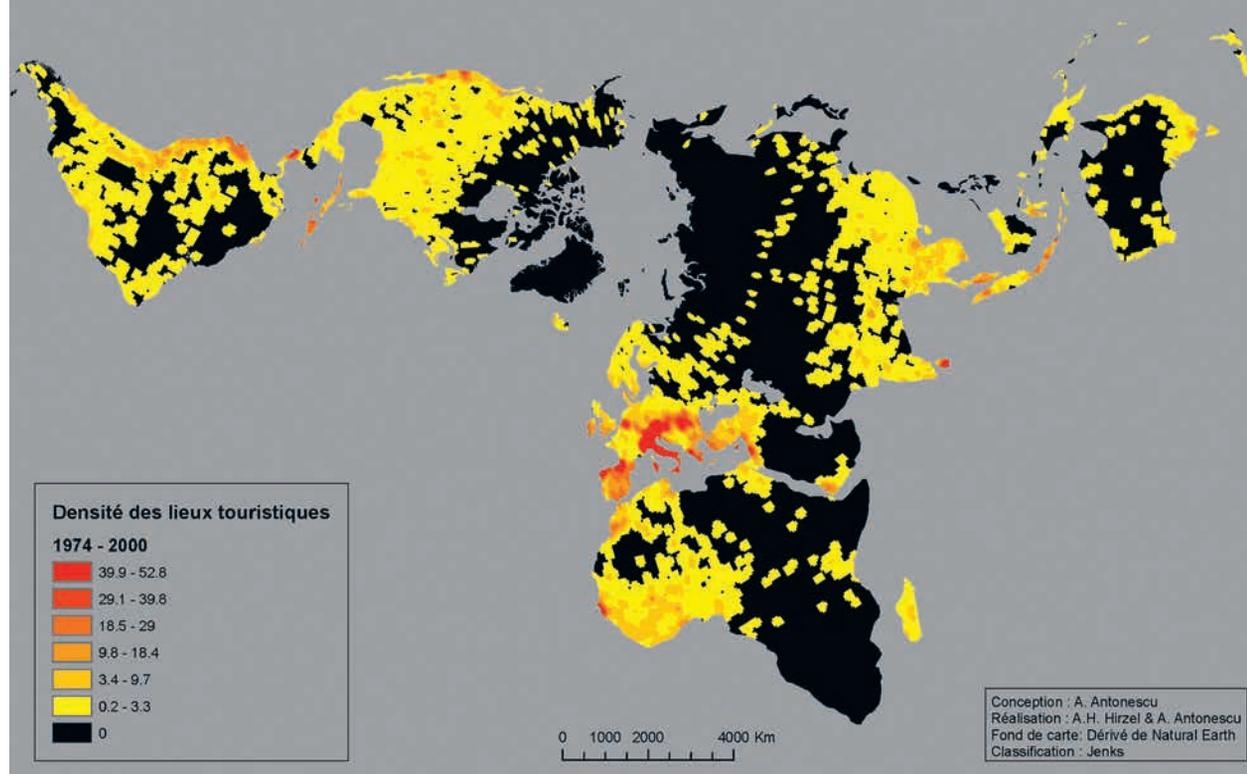
not function without these professionals". He is referring to the financial situation of the universities. For example, the University of Bern used to function primarily on its own resources, today its budget depends largely on third-party funding. Breu's Centre has an annual turnover of ten million francs, but 'only' two million of these come from the University. "These figures are thanks to the success of the research managers. Academics would be unable to achieve that on their own", says Breu.

Resistance and humour

Breu has a doctorate in geography and has held several third-space positions during his career. At the age of 43 he took on the coordination of the NCCR North-South - a large-scale programme with almost 400 researchers and offices in eight regions of the world. "A job like this needs a certain degree of resistance, and humour too", he says. He acquired the necessary management expertise on his own over the years. Breu thinks it is important that university professionals maintain a research field of their own. This is not just to improve their status among the scientists they deal with, but also helps them to understand the other side of things. "Unlike in business, at a university you can't just decree what's got to be done".

Gautschi has observed that there is a very great need for more knowledge about third-space activities - the course she runs at the University of Bern has seen a full house every year for four years now. "Despite all the scepticism, there is an increasing willingness to engage with management topics", she says. Many institutes have recognised that they can improve their profile by professionalising their structures, and that this can help them stand out from the competition.

Irène Dietschi is a freelance science journalist.



Virulent expansion: the global density of tourist destinations, 1974 to 2000. Picture: Andreea Antonescu

Charting tourism's globalisation

Tourism may have expanded recently, but according to a study looking at the period between 1800 and 2000, growth in the number of destinations has not been linear. In fact, it has been a case of fits and starts. *By Marie-Jeanne Krill*

There's no denying that globalisation is taking over or that tourism hasn't escaped its clutches. But who's to say when a tourist destination emerged or how it has evolved since? These are the questions being asked by Andreea Antonescu, a PhD student in the research team of the Interdisciplinary Teaching and Research Unit for Tourism (UER) at the Kurt Bosch University Institute at Sion.

In search of answers, she is taking a geo-historical approach to the topic and has produced a hundred or so maps to support her research, relying on information drawn from both antique and contemporary travel guides. "The literature in this area is vast. And since travel guides first appeared in and around the 1780s, they've done nothing but proliferate and diversify", she says. For her work, she has stuck to the best-known and most widely disseminated series from French, German and English-speaking regions over different periods between 1800 and 2000. Her sources therefore include the *Joanne Guides*, the *Guide Bleu* and *Routard*; *Appleton's*, *Fodor's* and *Murray's*; the *Rough Guides* and the *Baedeker* series. Whilst this outlook is a Western one, she doesn't rule out referring to more varied sources in the future.

"Although initially centred on Europe and the United States, the scope of tourism has gradually extended to the rest of the world", says Antonescu. "But there was nothing linear about this development. Change came in spurts, with fits and starts at different moments". The first period of expansion came between 1830 and 1870 when the tourist network became characteristically dense in Europe and the United States. It was during this time that many sites became renowned, including beach and mountain resorts (in total some 12,000 tourist spots were put on the map), yet the rest of the world remained relatively unchanged.

In the colonies too

Then, between 1870 and 1914, this pattern of rapid growth changed course thanks to a number of innovations, such as the expansion of railways, the introduction of the motor vehicle and the custom of spending winter in the mountains. Furthermore, the 25,000 new resorts that did pop up over this period did so in an uneven fashion: Europe and the United States continued to densify, but so too did China, South Africa and European colonies.

Progress ground to a halt during the First World War. Actually, some 25,000 des-

tinations locked up shop, some temporarily - some permanently. And then, from 1920 to 1950, there were only 9,400 new locations built, despite more new customs such as the spending of summer by the seaside and the widespread use of the car. It wasn't until 1970 and onwards that the tourist system underwent true globalisation with the creation of more than 36,000 new destinations. And, excepting a few areas in Russia, the Amazon and Africa, tourist infrastructure now covers the entire planet.

Of course, with the passage of time, some places have ceased to function as tourist hotspots. This was the case for a large number of places between 1929 and 1973. Conversely, others have achieved the feat of retaining their status over the long term. "Of the 2,400 destinations listed in 1793, there are 140 still functioning today", says Antonescu. Included in this list are Lavey-les-Bains in Switzerland, and many Italian cities (Florence, Padua, Naples and Rome, for example), as well as some other European cities such as Innsbruck, Madrid and Seville.

Marie-Jeanne Krill is an editor for *Horizons*.

How stress disturbs sleep

We all know from our own experience how everyday stress can prevent us from getting a refreshing, good night's sleep. In a study of 145 young women, a research team led by the psychologist Klaus Bader from the Basel Psychiatric University Clinics has now investigated the precise relationship between stress and sleep. For two weeks, they measured the stress levels and sleep quality of the group of female students aged 18 to 25. The women maintained sleep diaries, and at night wore a measuring device on their wrist which recorded their bodily movement. The level of stress experienced proved to have an indirect influence on how they slept. The decisive factor was whether the women carried over their daily pressures into the bedroom in the form of inner anxiety. Mental agitation seemed especially significant. If their minds were teeming with thoughts, then their sleep afterwards was felt to have been less refreshing.

"It depends on how well you're able to switch off", sums up Bader. The ability to deal with stress therefore depends on whether our everyday tribulations are able to rob us of sleep. The researchers have also noted that experiences in early childhood play a role too. Those women who were subjected to particular pressures in their childhood or youth showed low-level biological stress reactions in a laboratory test that involved doing arithmetic under time pressure. "Stressful childhood experiences such as violence or trauma have long-term effects on the body", says Bader. More research is needed to clarify what this means for stress management and sleep. *Susanne Wenger*

K. Bader *et al.* (2014): 'Daily stress, presleep arousal and sleep in healthy young women: a daily life computerized sleep diary and actigraphy study'. *Sleep Medicine* 15: 359–366.



The promised land: a deep, healthy sleep in freshly laundered sheets.



Feminine economy: women in La Paz demonstrate in favour of fair trade.

Solidarity economy in Bolivia

Just how important is the principle of reciprocity in Bolivia's economy? This is a question posed by Isabelle Hillenkamp, a postdoc in development at the University of Geneva, in her new book on social solidarity economies (SSE). She takes up just this single case study to examine the place of the reciprocity principle in the production, trade and funding of SSE entities. SSEs are an alternative approach to economics, and this particular example distinguishes itself through its roots in the solidarity values of traditional Andean culture. This is manifested in the swapping of raw materials, the loaning of equipment or the designating of workforce to ensure orders are finished on time, but these acts of solidarity also mean accepting some down sides, such as mismanagement and the deterioration of means of production.

What is interesting is that in many practical examples, as Hillenkamp's analysis confirms, heightened tensions result from the inevitable encounter between the practice of reciprocity and the market. This manifests initially through (insufficient) prices for products. But the SSE can counteract this by internally regulating competition or collective property, for example. Yet success is variable. And so it is important, the author notes, for there to be institutional mediation to allow the coexistence of reciprocity and market principles - in other words, society must undertake political commitments to offset the forces at play. Because SSEs create paid jobs for sections of the population excluded from formal employment, they therefore express democratic pluralism and these specificities must be taken into account when setting about macroeconomic regulation. *Dominique Hartmann*

Isabelle Hillenkamp: *L'économie solidaire en Bolivie – entre marché et démocratie*. Paris: Editions Karthala (Graduate Institute Geneva), 2013.

Albanians in the Waffen-SS

The Waffen-SS, whose uniforms were famously adorned with skull-and-crossbones, have come to stand for everything that was bestial about the Nazi dictatorship. This 'Schutzstaffel' formed a parallel army to the Wehrmacht, and their duties included guarding the concentration camps. In the countries conquered by the Nazis, they were allowed to recruit from the local population.

In the Balkans, the Waffen-SS created the '21st Waffen Mountain Division Skanderbeg', named after an Albanian national hero and comprising some seven thousand Albanian Muslims. According to the historian Franziska Zaugg, who has investigated this seemingly peculiar unit for her doctoral dissertation in Bern, they were, in military terms, a flop. The Division was dissolved even before the end of the War because most of its soldiers had already deserted. The SS leadership had tried to use anti-Semitism to build a bridge between National Socialism and Islam, but neither religion nor ideology had any role to play in everyday life in the military. The Germans had no notion of the cultural customs of the Albanians and their major source of information was the novels of Karl May. The Albanians in the SS, however, were mostly compelled to join by their clan chiefs who hoped that the Germans would lead them to national independence. They cared not for Nazi ideology, they disliked wearing their uniforms, and when the time came to flee, they cast off their unfamiliar footwear to do so.

The brutality of the war left its mark on the country itself, and the former members of Albania's SS division found it almost impossible to reintegrate afterwards, says Franziska Zaugg, whose work was supported by the SNSF with a Marie Heim-Vögtlin Grant. Even after the Second World War was officially declared at an end, conflict continued for decades on a local level. *uha*



"Name, age, marital status?" Recruiting Albanians for the Skanderbeg Division, ca. 1942.



“Scholars still don’t know where their interests really lie”



The Internet generation is putting copyright under pressure, and in academia, 'open access' is on the advance. But books as a medium are still of central importance for historical domains, says the historian Monika Dommann.
By Urs Hafner

Prof. Dommann, you've written a handsome, thick book about the history of copyright.

Do you own the copyright to your book?

No. After working intensively on the book for ten years, I handed over the rights to a trade publisher. In return, I didn't have to raise funds to cover the cost of printing, they hired an editor to proofread my book and graphic designers to produce a lovely cover for it and their marketing department is putting the right advertisements in the right places. I couldn't have done all this on my own. Whether the decision was right is something I'll only know in a few years, when the digital revolution has progressed even further.

For scientists and scholars, 'open access' is very much on the advance. The argument goes that publicly financed work ought to be made freely available. Why didn't you put your book on the Internet as a PDF?

I certainly could have done. But I have too little faith in the Internet and its algorithms to be able to entrust my book to it. I don't know which channels it might land in, or whether it would just be swallowed up altogether. In this case my personal interests are different from the public interest. But we have to ask: what is the 'public interest' anyway? Is it someone living on another continent who I'm excluding? Or is it you? I really don't know. The 'public interest' is, just like the 'author', a fiction, one that for two hundred years has had to stand for all manner of things.

For artists, copyright secures them the ownership of their work. It protects intellectual property. But what is 'intellectual property' really?

Modern copyright was established in the late 18th century. It was intended to protect 'intangible goods', the products of people who worked with their minds. The aim was to give these people control over the reproduction and circulation of their works and provide a defence were their works were not used as originally intended. Copyright is based on a notion that is rooted in early modern times, namely that work done should be remunerated and that protecting intellectual property - i.e., the artistic, non-material product of an author - is in fact a contribution to progress in society. The utilitarian approach assumes that it wouldn't be worth investing time and money in projects with uncertain outcomes if their products were not protected.

So was copyright an instrument developed by the emerging bourgeois, capitalist society of property owners?

Yes, it was a free market instrument that was intended to enable creative artists and all those working with their intellect - writers above all - to earn a decent living

from their work. Copyright does not draw on any tradition or inheritance, but focuses on something new and useful that an individual has created. It thereby sets itself apart from what was the norm in the traditional societies and in the societies of 'estates' that by the 19th century were already seen as backward.

What is the view of copyright in the socialist tradition?

Pitting socialism against capitalism doesn't work here. To be sure, the early socialist Proudhon rejected all forms of ownership. But in the 20th century even so-

“The 'public interest' is, just like the 'author', a fiction, one that for two hundred years has had to stand for all manner of things”.

cialist states such as the Soviet Union and the GDR signed international conventions on copyright. Even in the capitalist USA, where a high value has always been placed on the idea of property, copyright originally only covered American publications. Until that changed in the early 20th century, American publishers had a *carte blanche* to reprint European publications as they saw fit. As a result, the Europeans regarded the USA as heel dragging pirates.

Copyright is under pressure from the Internet generation. For example, the Pirate Party thinks that films, texts and images should be freely available on the Internet. Are they right?

According to current law, of course, they're wrong. But the law is also an arena for disputes. And copyright was always a matter of controversy. For a long time it was only argued about among small groups; the representatives of authors, publishers, the industry and media companies - all of them already experts in copyright - squabbled about royalties and how to formulate the law. The Pirates are the first group to have linked copyright with the topic of data protection and to have made it a matter of political and public debate. They are a social movement, like feminists or environmentalists.

Whose interests do the Pirates represent?

The interests of those who consume information technology and electronic entertainment. The Pirates refuse to accept that



a consumer should be criminalised just because he or she downloads films from the net. They therefore represent a morality of consumption that was already practised in the 1960s under the motto 'It's illegal, but is it immoral?' The Pirate parties will disappear as soon as their policies are taken up by the traditional parties interested in winning votes.

You say that today's debates about copyright are nothing new. When did copyright first come under fire?

Among scholars in the USA in the 1930s. When microfilms and photostat methods became common, several academics realised it was in their interest to have their books and articles copied and distributed as widely as possible, because it meant they were cited more. That in turn increased their reputation, so they welcomed the new medium. Libraries for their part were interested in putting journals onto microfilm and using this as a medium of distribution. This was cheaper for them than buying books. In response, publishers and authors started a campaign against photocopying and took libraries to court. Each group was pursuing different interests. But scholars hardly raised their voices.

Why not?

That's the question. When and why does a group organise itself to represent its interests? And why is it more common that groups *don't* get organised? Scholars still don't know where their interests really lie in the whole copyright debate. They're

not even sure in times of change like today, when media use is being redefined and legal relationships renegotiated.

How did the conflict between publishers and libraries end?

It fizzled out with the Second World War. But it then surfaced again when Xerox copying spread in the 1960s. That was a turning point for the history of copyright. Those in favour of copyright did succeed in linking payment to the individual use of media - in other words, every institution that rented a photocopy machine had to pay a fixed fee. But from that moment on it was impossible to control the number of copies made, and so it was also impossible to control how often works were used. That is still the case. With a USB stick you can make one copy, a hundred copies, or none at all, and you can delete everything at the end. It makes no difference.

Does this mean copyright is being diluted?

The conflicts are intensifying. We're in a state of permanent change. We have to find out how best to use new media, and whether every use of a medium really has to be coupled with a monetary payment, or whether we will have to develop other modes of use. Pop music has already reacted to the disappearance of CDs. Concerts have become important again, and crowd funding is replacing the income that fell away when CD sales dropped. In science, we still need book publishers to act as a filter and a guide to orientation. In the humanities, especially in narrative historical

“Fewer books are being published, so publishers have to adapt to the Internet if they want to survive. Many will disappear”.

sciences, there is still the need for time to write books, because their form and content determine and influence each other. You need to use an epic form to analyse revolutions, evolutions and continuities.

Do conference proceedings really have to be printed?

Short texts such as conference papers are perfectly suited to the PDF format; they can be linked to databases and can be read on an iPad. Fewer books are being published, so publishers have to adapt to the Internet if they want to survive. Many will disappear. In an optimistic scenario, consumers and producers will come together and pull the rug out from under the big publishers - those, for example, who make too large a profit from expensive journals.

And what's the pessimistic scenario?

Restrictions could be placed on copying unprotected material, thereby closing off access to research data - audiovisual sources, for example. Or researchers with no idea of new media could fail to choose carefully among the distribution channels for their work. And then, when book production has become too expensive for them, they will find to their horror that those other channels have in the meantime ceased to exist.

Urs Hafner is Horizon's Chief Editor at the SNSF.

Monika Dommann

Monika Dommann has been a professor of modern history at the History Department of the University of Zurich since 2013. Before that she was an SNSF Professor at the University of Basel. Her habilitation thesis *Autoren und Apparate. Die Geschichte des Copyrights im Medienwandel* (427 pp., 2014) has just been published by S. Fischer.

In the sunshine

By Philippe Morel. Illustrations by Cyril Nusko

1 Nothing has changed when it comes to avoiding sunburn. The best way is to stay away from direct exposure to the sun's rays. Of course, sunscreens do provide partial protection, as they contain products that block the radiation that causes sunburn, particularly UV rays. Sunscreens can be composed of two types of filters: chemical or mineral.

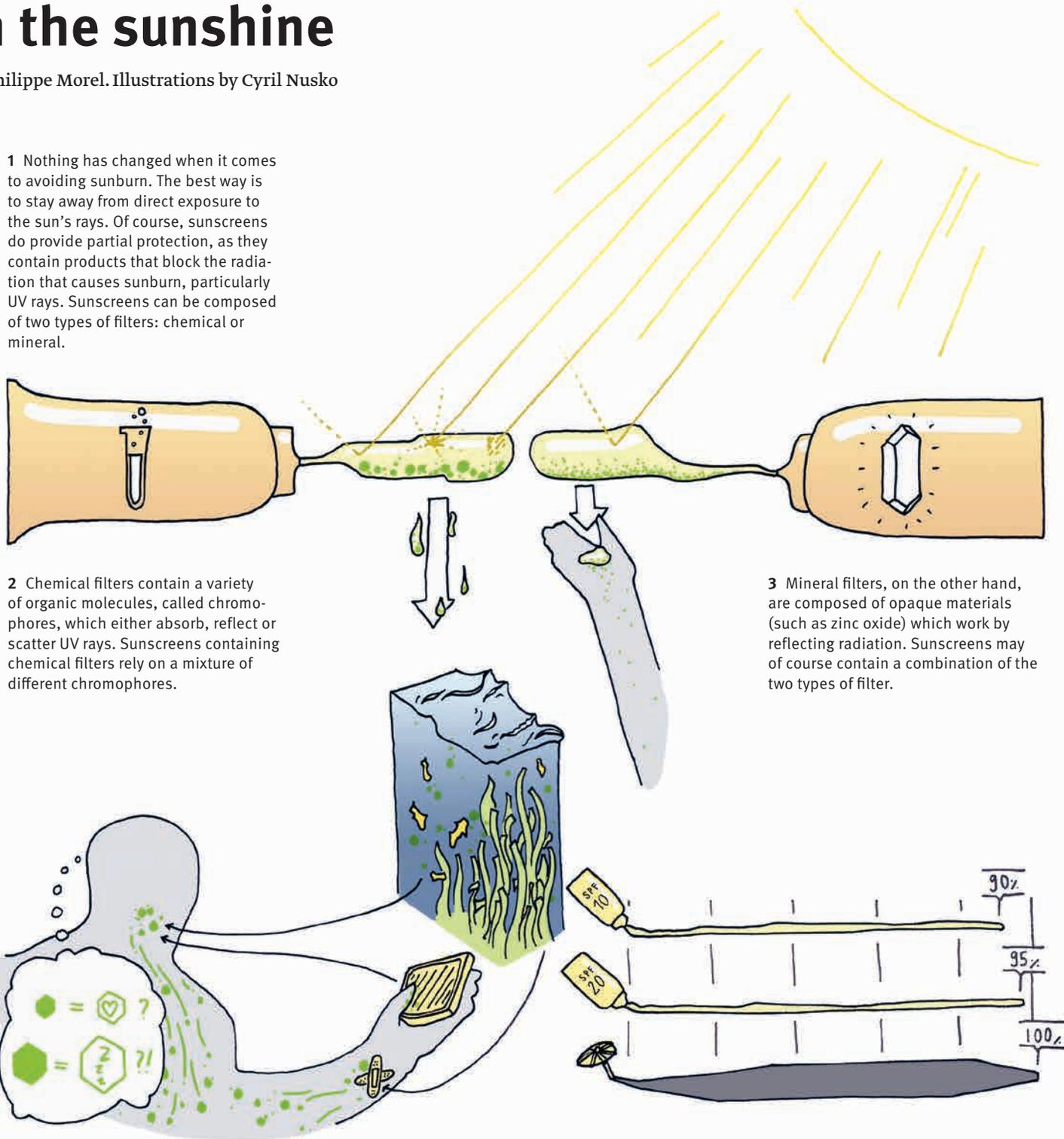
2 Chemical filters contain a variety of organic molecules, called chromophores, which either absorb, reflect or scatter UV rays. Sunscreens containing chemical filters rely on a mixture of different chromophores.

3 Mineral filters, on the other hand, are composed of opaque materials (such as zinc oxide) which work by reflecting radiation. Sunscreens may of course contain a combination of the two types of filter.

4 A number of chemical filters are suspected of disrupting endocrine function, i.e., their similarity to hormones can upset an organism's physiology. And by taking a dip or a shower, we wash these substances into aquatic environments. Mineral filters don't

entail this risk, but their popularity was hampered, until recently, by their cumbersome application. This problem has since been resolved by resorting to nanoscopic minerals. But this has once again raised the question of risk to health and the environment.

5 The effectiveness of a sunscreen is indicated using a protection factor (SPF). This number indicates the difference in time it takes for sunburn to occur with and without the sunscreen, e.g., SPF 10 allows you to stay in the sun 10 times longer than you could without it. In other words, an SPF 10 cream lets through just one tenth of UV rays, i.e., it blocks 90% of rays. That means a cream with an SPF of 20 will be not be twice as effective, since it blocks only 95% of rays.



Switzerland and the Europe of knowledge

By *Thierry Courvoisier*

On 9 February, a large number of Swiss citizens expressed their doubts about the “ever-growing” world and its finite home. Unfortunately, this legitimate sentiment was used to support a proposal hostile to the process of European integration and which really contributes nothing to



SCNAT

a healthy debate on growth. The result is that Switzerland and its political, economic and academic sectors have been isolated from the continent that surrounds it on all sides. The federal authorities plan to compensate for the loss of funds that used to originate in the financial flows linking Switzerland and Europe in matters of education

and research. They are also fighting to regain Switzerland's place as a country associated with research programmes and to ensure that our students can participate in European exchange programmes. This is an essential struggle.

The fields of education and research are led by giants: North America, China,

India and Australia. Furthermore they sit on political structures which mean one or sometimes two states cover entire continents. Only Europe is split up, forming nation states that are diminished on any political map of the world. Furthermore, development, including scientific and artistic development, remains the domain of individual domestic policy. So European research organisations are very small when compared to their global competitors. We will only ever be able to take a seat at the world table by integrating research communities into a coherent European area. This applies just as much to research and innovation in Switzerland as it does in the rest of the continent. We are one of the most successful nations in education and research. We therefore have a responsibility to participate and contribute at the vanguard of creating a Europe of knowledge at the service of all its citizens, including the Swiss. We must offer strong support to the political authorities at home and abroad in the struggle to ensure that Switzerland returns to the European research and education programmes.

Thierry Courvoisier is President of the Swiss Academies of Arts and Sciences and Professor of astrophysics at the University of Geneva.

Letter to the editor

But what about the surrogate mothers?

(*Horizons* No. 99, December 2013)

The article “Who can be a father, who a mother?” describes how people from a rich industrialised nation - Israel - profit from mass surrogacy tourism in an emerging country - India. It portrays these surrogate births as a good thing for childless male couples. But what about the women's perspective? Who guarantees that it's not financial need that drives them to offer up their bodies? The word ‘surrogacy’ obscures the fact that we're dealing with a real person: a pregnant woman who gives birth to her baby. How can we be sure that these ‘surrogates’ don't regret the contract they have signed, either during the pregnancy, at birth, or afterwards? How can we be sure they wouldn't rather keep their children?

It would be interesting to have further information on the situation of ‘surrogate mothers’ in poorer countries - those who enter into contractual pregnancies in order for couples from industrialised nations to fulfil their desire for a child.

To what social groups do these women belong? What is their economic position and what is their welfare provision? How high is their compensation? Do they get psychological help and is there a cancellation period for their contract? And how do all those involved fare years later - the adoptive parents, the surrogate mothers and, of course, the children?.

Sonja Klimek, University of Fribourg.

7 July 2014

Ist eine neue Wissenschaftskultur nötig?

The need for a new scientific culture; meeting of the National Academies of Switzerland, Germany and Austria
University of Zurich

5-6 July 2014

Science Night: “Tout ce qui brille (everything that glitters)”

Musée d'histoire des sciences
 Parc de la Perle du Lac, 128 rue de Lausanne, Geneva 1202
 > www.ville-ge.ch/mhs/nuit_science.php

26 August 2014

Zusammenarbeit der Gesundheitsberufe

Cooperation in Healthcare
 Symposium: Why have a charter?
Kursaal Bern
 3, Kornhausstrasse, Bern 3000

Until 26th October 2014

“The pile dwellers – on the water and over the Alps”

Bernisches Historisches Museum
 5 Helvetiaplatz, Bern 3005
 > www.bhm.ch/en

11 July to 16 August 2014

“100 Years of the National Park”

Zernez: Open-air theatre, depicting the history of the Park's foundation.
 > www.nationalpark.ch/go/en/about/about-us/centenary/

From 14 June 2014 to 25 January 2015

“100% pure wool”

Musée d'histoire naturelle
 Chemin du Musée 6, Fribourg 1700
 > www.fr.ch/mhn

From 19 June 2014 to 19 April 2015

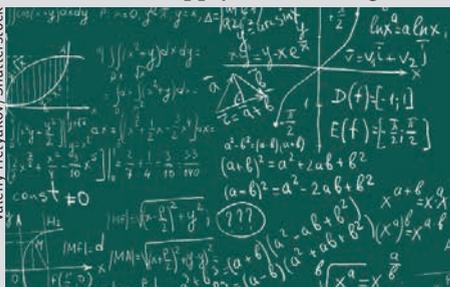
“Imagine Japan”

Musée d'ethnographie de Neuchâtel
 4 rue Saint-Nicolas, Neuchâtel 2000
 > www.men.ch

Promoting the natural sciences

The federal development programme 'MINT Switzerland' supports the promotion of projects and initiatives within the framework of MINT competencies in Switzerland (MINT stands for 'Mathematics, Information technology, Natural sciences and Technology'). Anyone embarking on a MINT initiative or a project in the fields of education, further education, the attractiveness of careers or raising general awareness can apply for financing to the

Valeriy Tretvakov/Shutterstock



Swiss Academies of Sciences. Institutions, individuals and groups with proven experience in these fields may apply. Candidates must also provide financial resources of their own. The closing date for applications is 7 June 2014. The information dossier and application form are available at: www.akademien-schweiz.ch/MINT.

More money for fundamental research

In 2013, the SNSF was able to invest CHF 819 million in new projects in fundamental research - more than ever before. This is an increase of CHF 64 million, or eight percent, over the previous year (2012: CHF 755 million). According to the recently released Annual Report, the SNSF approved over 3400 research projects last year. As in previous years, the largest allocation (40 percent) went to the fields of biology and medicine. Mathematics, natural and engineering sciences received 33 percent, the humanities and social sciences 27 percent. www.snf.ch/publikationen

Working towards a national education strategy

The Swiss Academies of Arts and Sciences have issued a plea to the federal government and the cantons to develop a national education strategy in collaboration with stake holders (www.akademien-schweiz.ch). When compared with the situation in many other countries, the Swiss education system comes across as confusing. The

often-discussed lack of skilled employees is just one of the challenges to our education system. Work also needs to be done to improve the low status of apprenticeships, and to improve the counterproductive competition between the dual education system and a focus on the academic baccalaureate. The Academies are following up on this plea with a symposium in Bern on 16 October 2014, entitled 'Designing federal education'.

Reduction of poverty and global risks

Poverty is one of many urgent global problems to which the 'Swiss Programme for Research on Global Issues for Development' (r4d) wants to contribute solutions, by supporting inter- and transdisciplinary research for development. The programme is a joint initiative of the Swiss Agency for Development and Cooperation (SDC) and the Swiss National Science Foundation (SNSF). The first transnational research partnerships between groups from Switzerland and from developing countries have taken up their work. With a total budget of CHF 97.6 million for ten years (SDC 72 million, SNSF 25.6 million), the programme aims to generate scientific knowledge and research-based solutions for reducing poverty and global risks in poor countries. The programme is dedicated to establishing methods and options for finding integrated, holistic approaches to solving problems and to preserving public goods in developing countries. www.r4d.ch.

Neurobiologist honoured

This year's Otto Naegeli Prize for Medical Research, worth CHF 200,000, is being awarded to the neurobiologist Silvia Arber. Eight years after the SNSF awarded her the

Lucian Hunziker



National Latsis Prize, Arber is being honoured for her work on how the interplay of neurons and muscles affects motor control. Together with her group, Arber has decoded how muscle contractions are controlled in mice.

The information does not just flow from the brain to the spinal cord and from there into the muscles, but also from the spinal cord into the brain for the fine motor control of the forelegs, as Arber has shown.

Horizons

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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

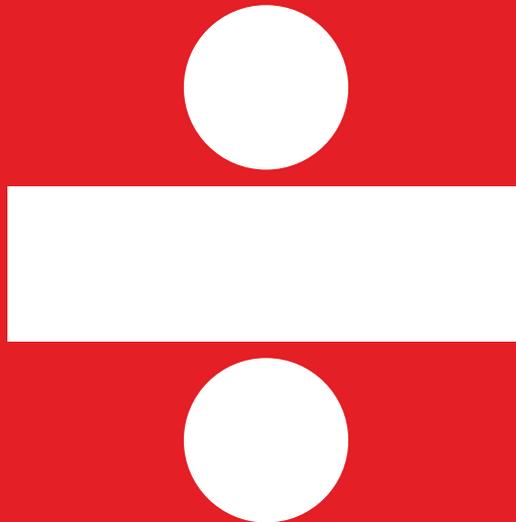
Also mandated by the Confederation, the Swiss Academies of Arts and Sciences are committed to an open dialogue between science and society. They are on the side of science, each specialising in a respective domain, yet also acting in an inter-disciplinary way. Being anchored to the scientific community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

“Scholars still don’t
know where their
interests really lie”

Monika Dommann page 46

“A tool that particle physicists
dream of”

Olivier Schneider page 28



“We must offer strong support to the
political authorities at home and abroad
in the struggle to ensure that Switzerland
returns to the European research and
education programmes”

Thierry Courvoisier page 50