# Conclusions at the Congress «We Scientists Shape Science»

At the science congress «We Scientists Shape Science» 26/27 January 2017 in Bern over 200 researchers and key players in the Swiss science landscape decided upon first steps towards improving science. The congress is a joint initiative by the Swiss Academy of Sciences and the Swiss Science and Innovation Council. The conclusions are based on the debate in the workshops and on online comments by the participants.

## 1. Time for Research

Saving time needs to be done on a systemic, institutional, and personal level. The higher up we climb the scientific ladder, the less time we have for research. The participants of the workshop propose several changes to ensure enough time for research in a scientist's life.

On the systemic level, we should reduce our obsession for quantity and focus on quality. The quantification of research outputs produces more quantitative evaluation, and the misuse of metrics happens in the «established » science system as well as amongst young researchers. Tools like the San Francisco declaration on research assessment (DORA) should be more taken into account, be it by the Swiss national science foundation (SNF), who has signed the DORA declaration, or by administrative bodies that are responsible for public science like the State Secretariat for Research and Innovation (SERI).

On the institutional level, the evaluation processes should be better formulated in accordance with the aims of an evaluation as well as with the context where the evaluation takes place in order to avoid 'rituals'. We should slow down the frequency and the intensity of routine evaluation. Evaluation must remain formative, not so much summative, and evaluation should not be seen as a tool for controlling. Additionally, we could enhance an evaluation's quality and save time for research by submitting only the most important two (=<5) publications to funding bodies rather than full lists. We have to slow down quantitative production of research outputs and focus on quality. A good way to ensure protected time for young researchers could be to generalize the ex-ante evaluation and leave them alone and autonomous.

On a personal level, saving time for research could be ensured by prioritizing our tasks. For example, going only to important international meetings, take sabbaticals and create time to think. Making administrative tasks more visible could be a way to better take it into account in order to enhance our time explicitly dedicated to research. Delegating tasks to our coworkers and to administrators (and trust them) is a way to better manage our own time. We must resist the tendency to become our own secretariat, graphic designer and attend all technical meetings rather than send delegates.

## 2. Space for Creativity

What can we do to preserve our own «creative islands»? What do we need in terms of spaces and framing conditions such as supportive environments? The input by Marc Creus, professor at the University of Basel, pointed out that scientists may not necessarily be used to deal with something like creativity, because it is not systematic, not measurable and not reproducible. Useful actions to take refer to the concept of «spaces»; changes in scientific culture; research grants and publishing; as well as thinking out of the box:

Spaces supporting diversity and openness

– Spaces in form of time: Offer «freedom grants» that allow to take Fridays off, for example, or to set up a creative learning group etc.; money for thinking time, like e.g. additional six months «extra» research time; a small budget for PhD students who want to make use of it to pursue «crazy» ideas of their own, with total freedom, etc.
– Mentorship in a new way! Creativity might be boosted with an ambitious mentor who helps to make sense of creative ideas.
– Provide platforms for exchange across disciplines at the Swiss Academy of Sciences, where listening, learning, and exchange are deeply valued by scholars from all disciplines.
– Increase the freedom and responsibility of PhD students in their research.
– Consider changing research group compositions and sizes

Changes in scientific culture

– Use substantially extended hiring criteria that go beyond measurable parameters, don't limit criteria to publication record and funding grants
– Teach students in different kinds of science (e.g. philosophy, sociology and history of science)

Research grants and publishing

– In writing proposals: Allow for more openness for surprise and for more openness to formulate multiple hypotheses
– Foster and experiment with interdisciplinary and transdisciplinary approaches
– Decrease pressure to do over-selling; decrease pressure to predict results
– Decrease publication pressure
– Don't use business criteria like milestones and deliverables in scientific research
– Give each other more creative instead of hypercritical feedback

Thinking out of the box

– Expand your interests, cultivate your curiosity, also beyond science
– Play Serious Games
– Take risks and embrace failures
– Attitude to gain knowledge in science out of risk and failure
– Preserve the child in yourself, spend time with 4-year olds, include undergraduates in your research

## 3. Scientific career

The workshop group suggests to focus on the following three aspects: 1. Define excellence in a new way: Reconsider the existing criteria (impact factor, h-index) and add new criteria that value inter- and transdisciplinary approaches, non-linear career paths (experiences outside of academia), teaching and science communication. This means: Value quality instead of quantity. (If fully implemented and lived, DORA can help essentially in this respect. Therefore: Live DORA!) 2. Improve the hiring process: In order to install the new criteria of excellence, the procedures used for hiring new faculty should be clearly communicated and universities should focus on scientists that step out of the box, meaning people who have established their own research profile and may have done research on different subjects in the course of their career. The system needs a flatter

hierarchy and more middle non temporary positions 3. Change our concept of PhD: A PhD is not only a training for professorship but for becoming an independent thinker. PhD students should have a time credit for enhancing their soft skills. Scientists - leaving academia - with a PhD can be valuable for society in many ways.

Noteworthy, there are places in Switzerland where the current system works fine, whereas at other places this is not the case and as a result there is dissatisfaction. It became also clear that different disciplines have different needs, thus, we need a system that respects the different needs.

Some participants of the workshop - Anne Jorstad, Adria C. LeBoeuf, Elias Mulky (with input from others who choose to remain anonymous) - elaborated the issue further and drafted the report «Scientific careers in Switzerland»: Read

## 4.   Scientific practice

We should create awareness for the non-reproducibility-topic. A pillar for improvements would be an intense mentoring of young scientists by the PI. Master and PhD thesis should normally start by reproducing experiments they want to build their work on; this reproduction should be published and recognized. To improve the publication system, we should have full PhD theses instead of paper theses; including negative results. The thesis should be public and searchable. The broadest possible solution: All scientific work is published in one journal only; all researchers have the right to publish the same limited number of articles per year. The peer review could shift from pre- to postpublication.

After the workshop, the following issues were additionally raised:

– Peer-review should be made a lawful place where whistleblowers are protected and rewarded.
– Research proposals should be divided into different categories based on their riskiness whereby some funding should be allocated to low risk research such as reproducing published reports.
– All scientific data should be made available with very few exceptions.
– Irreproducibility should be regarded as normal and no longer be treated as a taboo. To this end, an open space should be created where scientists can publish their reproducibility efforts and different parties (including authors of the original study) can enter into an open, positive dialogue. These reproducibility efforts should be properly accredited and the process fast and rewarding.

## 5.   Open Science

Open Science is already part of many research programmes in Europe and worldwide. We want open access; including all aspects of a publication - open science is not just access to an article, but to all elements leading to an article (open data, open peer review etc). A solution of open access financing is needed, in order to avoid an intolerable financial burden on (publicly funded) institutions and scientists, who do all the work. As scientists we should take more risks in going towards open science by publishing more in Open Access Journals and putting articles in the archive. For realizing «open data» we need established infrastructures for data sharing, in a global collaboration to allow interoperability and with quality systems included. Providing data openly should be mandated and rewarded with a «data citation index». Sharing data has to be part of every research plan.

Open science needs training of scientists, funders and administrators to embrace the full power of the digital revolution. Articles should allow access to content that can be mined, e.g. links to raw data or links to Digital Object Identifiers. Libraries should form knowledge management systems which provide services to maintain archives, to develop shared vocabularies and ontologies necessary to link data, and to extract scientific facts from publications and research databases.

As scientists we should support open courses, alternative journals and alternative metrics (beyond just impact factors) to judge scientists and promote open science in all our activities.

## 6. Science in Society

– Although science is still well recognized in society, there is ample room for improving the relationship between scientists and the public. In particular, the current mostly one-way communication between scientists and society has to be replaced by a dialog taking place in both ways.
– Communication of complex scientific issues of societal relevance is an integral part of the research process, and therefore primarily the task of academics and should not be delegated to journalists. For this sake, more scientists should be trained at an early stage in their career as competent and honest «knowledge brokers» («interface researchers»). This should be supported by institutions and/or funding agencies. Universities of Applied Sciences (Fachhochschulen) are supposed to be essential players in this context.
– Knowledge brokering is very demanding, and needs to be promoted by educating scientists, particularly young researchers, in inter- and transdisciplinary research methods, especially by participative approaches. Self-reflection and discussions about social responsability / ethical values, integrity, diversity, complexity and uncertainties have to be integrated in their curriculum and in education at all levels.
– Institutional and structural barriers to inter- and transdisciplinary research needs to be dismantled such as rethinking current academic evaluation (e.g. h-index, lack of incentives for team-science), and relativized by additional criteria such as teaching, outreach activity, intermediary work, and by signing the Dora-declaration.
– We need a new definition of relevance and responsibility (beyond economic issues) and linking them to scientific excellence. Academies could play an important role how these new criteria are implemented. A consolidation at international level is important.