Making science more open and transparent

The open science movement wants radical change: science should be made more transparent through cooperation, data sharing and publicly accessible publications.

Year after year, more than a million scientific works are published around the world: publishing activity is increasing exponentially and a reversal of this trend is nowhere in sight. But the knowledge thus accumulated is not always reliable and its accessibility is limited.

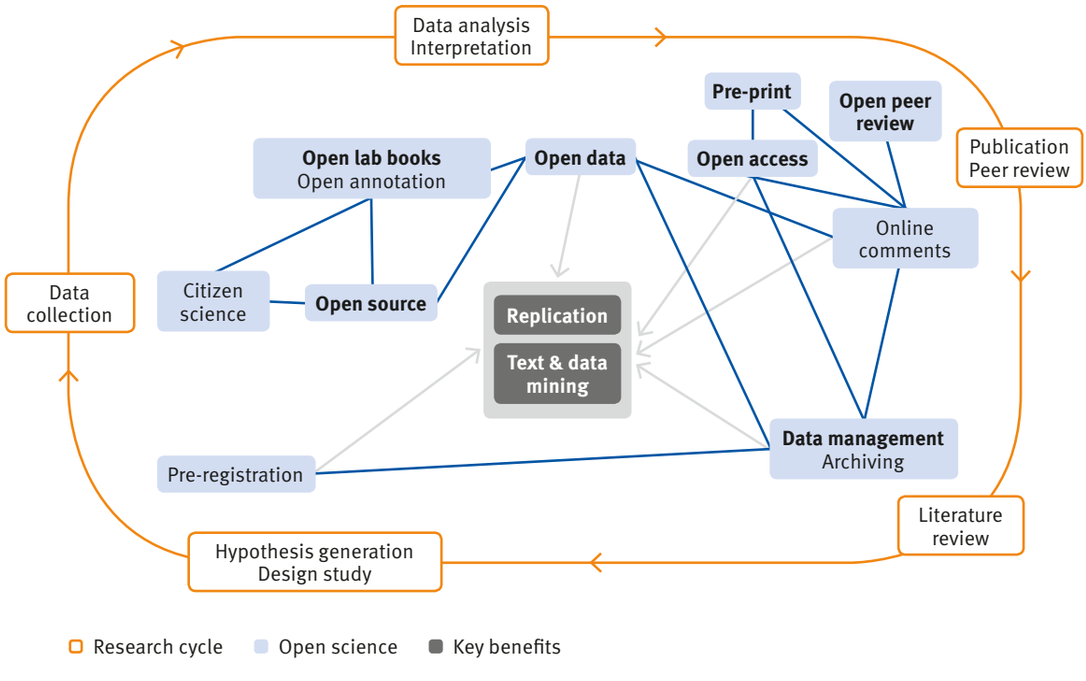
Many active observers in the world of science, among them the Swiss National Science Foundation, have come to the same conclusion: science needs to become more open, in order to increase its transparency and accessibility, as well as its efficiency. Publications ought to be made available free of charge and without delay (open access) and raw data should be shared, reused and examined (open data). This is a fundamental tenet of "open science", the new paradigm that aims to redefine scientific activity, from data collection to data analysis, interpretation and publication (see graph "Components of open science").

The basic idea is to promote scientific exchange and transparency: raw data ought to be published online and made accessible to the public; it ought to be interpreted on blogs and shared platforms and peer reviewed not by a few anonymous experts but by a large number of authors. With regard to the assessment and reuse of research results, it is also key that articles are published in open access mode along with the corresponding raw data. In this way, science will become more credible and more efficient, duplications will largely be eliminated, and research findings will be shared by the community much sooner than they are now.

Changing the system

The principles of open science stand in stark contrast to many established academic incentives: in order to forge a career, researchers are supposed to publish as many articles as possible in high-ranking journals that are not free of charge. Exchang-

Components of open science



Open science glossary

Citizen science → Research conducted by non-scientists
Open access → Scientific articles published without paywall
Open annotation → Research data (genomics, editions, etc.) that can be commented on and completed
Open data → Unprocessed research results that are made available to other researchers
Open lab books → Lab books that are published and discussed online
Open peer review → Non-anonymous and public peer review of an article before publication or before a funding decision
Open source → Software and hardware that can be freely used and modified
Pre-registration → Advance announcement of a research plan (to exclude the possibility of changes at a later stage)
Replication → Reproduction or invalidation of old results
Text & data mining → Use of algorithms to derive new results from accessible data

ing research data eats up a lot of time and money as it involves the creation and long-term maintenance of new databases. Another contentious issue concerns the publication of raw data: even researchers who are in favour of open access are worried by the prospect of colleagues criticising their data or using it to publish ahead of them. In addition, sharing data collected with the help of industry partners gives rise to questions about intellectual property rights. "In principle, all researchers are in favour of open science," says Ayşim Yılmaz, open science officer and head of the Biology and Medicine division at the SNSF Administrative Offices. "But it can only be successfully implemented if researchers believe that it will benefit them."

Despite these difficulties, open science is making headway, thanks mainly to grassroots support for the idea: many researchers are already collaborating online and making their data available in a wide range of disciplines from particle physics to genetics to digital humanities. Others are exploring new ways of communicating, evaluating and publishing. Those involved in setting research agendas also play an important role in the change process, especially funding agencies such as the SNSF, which defines the parameters for research funding. SNSF grantees already need to offer free public access to publications produced in their research projects (see article on open access, p. 8). In the medium term, the SNSF wants to make freely accessible data and publications the rule rather than the exception. In this context, it will be important to evaluate not only the publications, but also the quality of the data on which they are based.

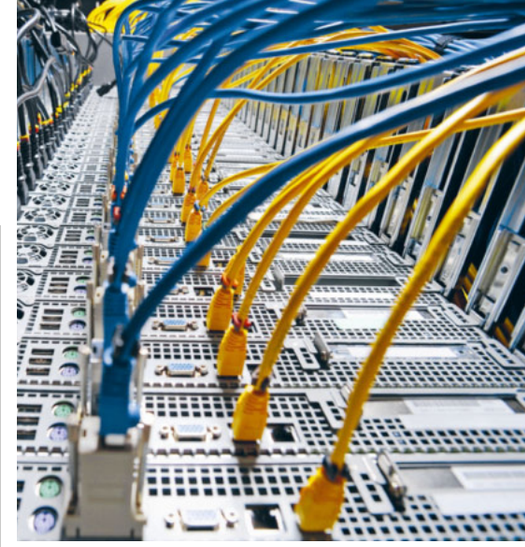
Changing the culture

Open science is a global movement: the League of European Research Universities (LERU) and the European Union have launched programmes to address open science issues and facilitate implementation. Research funders such as the World Health Organisation (after the Ebola crisis in Africa) and the National Institutes of Health have defined a set of open science criteria. Various funding organisations (e.g. in Norway and the Netherlands) already require open access by default in certain programmes.

A harmonised, universal set of rules should not be the aim, however, as every research area has its own culture and its own challenges. Each must decide by itself what constitutes data and how best to regulate confidentiality issues. Solutions should therefore be developed by each research area, without too much red tape and without generating more work for researchers and institutions. The successful implementation of open science depends on whether the scientific community is able to change its way of thinking, before it hands over to a more open generation that will be instrumental in shaping new forms of collaboration.

"There is too much trusting, and not enough verifying."

Benedikt Fecher



Workshop

Implementing open science

The SNSF invited a dozen organisations to present initiatives for promoting open science at a workshop held on 14 September 2015. The Norwegian research funding organisation has already taken measures to include a data management plan in some schemes. The National Institute of Health in the United States is thinking about prescribing data sharing, while the World Health Organisation and the Wellcome Trust are campaigning to make epidemiological data and data collected in clinical studies freely available. Paul Ayris presented the initiatives of the EU and the League of European Research Universities (LERU).

There was a consensus among participants that the culture of science needs to change. However, Benedikt Fecher from the Alexander Humboldt Institute for Internet and Society dampened the mood of expectation by pointing out that researchers had misgivings about open data because they feared others would benefit from data they had collected. He argued that open science can only be achieved if we respect the unique nature of each discipline. It also became clear that not everyone agreed on the best way forward: some scientists, like Daniël Lakens from the University of Technology in Eindhoven, favour a bottom-up approach that would enable researchers to develop open science principles as freely as possible. At the same time, the organisations want to create a framework for clarifying a number of technicalities and legal issues.

"Openness and transparency are core values in science. Share more!"

Daniël Lakens

Open access: free access to all publications by 2020?

Efforts to transform the publication system into an "open access" (OA) system are gaining momentum at European level. Switzerland, too, is moving in this direction, with the SERI commissioning swissuniversities and the SNSF to develop a national OA strategy.

Since 2008, the SNSF has been asking researchers to make their SNSF-funded research results available to the public free of charge. In 2006, it signed the Berlin Declaration that demands free global access to publicly funded research results as well as their usage in accordance with copyright law.

The initiative lies elsewhere

The SNSF is currently pursuing a progressive OA policy comparable with that of other leading funding agencies in Europe and the US (see box). However, at the Berlin Conference on Open Access held in December 2015, it became obvious that Switzerland had lost some of its momentum in the drive for open access to publications. The current frontrunners are the Netherlands, the United Kingdom and Austria. They have recently introduced offset agreements with publishers that take into account the current subscription fees so that more journals can offer open access to research articles. However, there is a danger that such agreements could lead to separate OA practices in some countries.

The Netherlands takes the lead

In its EU presidency year, the Netherlands has launched a fully fledged OA campaign. For instance, the NWO in the Netherlands has become the first research funding agency to offer immediate and full access to publicly funded research results of NWO-approved projects. The Netherlands is aiming for almost 100% open access to scientific publications within the EU research area by 2020. But this will depend on how fast European countries are able to transform the publication system on the basis of synchronised national OA strategies. Given the increasing concentration of power in large publishing houses and their interest in maximising profits, this will not be an easy task. In any case, universities, libraries and researchers will continue to feel the brunt of rising publication costs. The Max Planck Digital Library has calculated that the 7.6 billion euros injected into the publication system every year via subscription fee payments would be sufficient to complete the changeover to OA.

Where does Switzerland stand?

At a meeting in November 2015, the SERI, swissuniversities and the SNSF identified the need for specific measures aimed at achieving OA. They agreed to pursue the following lines of action:

- Negotiations with publishing houses at national level
- Market transparency (disclosure of finances and payments)
- Enshrining the right to republish in the soon to be revised copyright law
- Monitoring of OA publications and of their financing
- Informing and raising awareness about OA among researchers

The SERI subsequently asked swissuniversities and the SNSF to develop a national OA strategy. In addition, the SNSF commissioned a financial flow analysis together with SUK P-2 (a swissuniversities programme). The analysis will serve as a basis for estimating the overall funding requirement and formulating proposals for changing the Swiss system. The SNSF will continue to follow international developments with regard to OA and make the necessary adjustments – true to the slogan of the League of European Research Universities statement it signed: "Christmas is over. Research funding should go to research, not to publishers!"

The OA policy of the SNSF

The SNSF supports the principle of open electronic access to scientific knowledge along two paths:

Green road to OA

Researchers supported by the SNSF are obliged to grant open access to their articles in a repository at the latest six months after their publication in a journal (except if there are insurmountable legal or technical obstacles).

Gold road to OA

The SNSF supports the gold road to OA by allowing researchers to finance direct publications in pure OA journals from their initial project budgets (up to a maximum of CHF 3,000).

The worldwide share of gold OA articles currently lies at 13–14% and continues to rise by about one percentage point per year. After validation, the share of gold and green OA publications based on SNSF-funded research comes to around 40% (not counting the personal websites of researchers).

In the OAPEN-CH pilot project, launched in 2015, the SNSF and the participating publishing houses are becoming more experienced in publishing OA monographs and collecting data on the use, sale and production costs of printed and digital books. The SNSF supported 27 books that were published in OA mode within the scope of the first call. An interim report on the pilot project is expected to be published in summer 2016.