The value of the open science movement

August 29 2016, by Daniel Saraga

Credit: Swiss National Science Foundation

Research creates its own problems. Articles may be withdrawn because of irregularities, results can be impossible to reproduce, methods are often non-standardised, and publications may not be accessible (See 'Fixing science', Horizons September 2015). The search is now on for solutions.

Many observers consider that overcoming these issues will require a new paradigm: open science. The idea is to break the shackles that fetter the individual elements of the scientific production process – from the formation of hypotheses to the publication of results (See infographic, 'The elements of open science', p. 13). The watchwords are: sharing and

inclusion, collaboration and decentralisation, and transparency. By fully opening research work, it can be made useful to everyone: to scientists, industry, and members of civil society. Even computer programs will be able to draw new conclusions from old results.

Knowledge for everyone

The first pillar is open access, the aim of which is to ensure all scientific publications are accessible free of charge. "Even if people are a little impatient, we are clearly on the right track," says Daniël Lakens, a psychology researcher and practitioner of open science at Eindhoven University of Technology. According to a European study published in 2014, more than half of all the articles published since 2007 are open access. Nevertheless, the question of cost remains: even if an open-access journal can be consulted free of charge, the average cost of publishing each article is EUR 3,000. Also to be factored in are prepublication archives, such as Arxiv and SSRN, that offer free access to manuscripts submitted to journals. Tariffs for publishing articles are continually increasing, and this is a bone of contention. Science publishing has to react, as it is now also confronted by piracy: some websites make millions of articles available, and not all of them illegally.

The second pillar, open research data, involves a radical change in the attitude of scientists with regard to their raw data. "Most of them consider that it belongs to them," says Lakens. Their work revolves around the interpretation of their results and the formulation of clear and concise conclusions, not around the disclosure of primary data. This approach renders it impossible to make comparisons or to question their choice of interpretation, such as the type of statistical analysis employed. "For me, publication bias – that is, the general practice of only publishing positive results – is the biggest problem in today's science. Fixing it will require access to all data, particularly those not included in a publication," says Lakens.

Creating interest

For most scientists, there is no individual or direct interest in sharing raw data, particularly in light of the burdens of time, cost and, in some cases, the development of computer skills. Open research data therefore often continues to rely on individual initiative or top-down provisos of certain research programmes. "What's needed is new incentives, because open data today has only a minimal impact on a researcher's reputation," says Sascha Friesike of the Alexander von Humboldt Institute for Internet and Society (HIIG) in Berlin and a former doctoral student in the management of innovation at the University of St. Gallen. Things are changing, however, "particularly because a number of public and private financing bodies are introducing a requirement to share the data stemming from the research they pay for," she adds.

Greater transparency

Data is not enough on its own, however; there also needs to be precise disclosure of the methodology used in acquiring it, such as laboratory methods or adjustments made to instrumentation. Only then will it be possible for other research groups to reproduce the results and subsequently either validate or refute them.

The open-science movement aspires to a world where researchers resolve their problems in concert with each other and keep lab notebooks available to everybody on the Internet. "Science is tackling problems that are becoming increasingly complex and that therefore need greater collaboration," says Friesike. "Instead of meeting the often rigid requirements of research programmes, researchers should be more interested in organising themselves by launching calls to collaboration that are open to everyone. This would also up the pressure to share data, methods and facilities – without that there is hardly any incentive for

others to join a project."

Provided by Swiss National Science Foundation