



## FIZnews

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## Open Science: More transparency and fairness in science

*Karlsruhe, August 21, 2024* — What significance do open standards have in science, and how can an open access policy make the scientific landscape fairer and better? We talked about these questions with our colleague Dr. Fabian Müller, who is a team leader responsible for development and systems at FIZ Karlsruhe's Berlin branch. Originally a mathematician himself, he has been helping to make mathematical information more accessible to researchers and other interested parties for a good ten years.

### **Question: What does the "open" in "zbMATH Open" stand for, and what does it mean for your work?**

Until the end of 2020, zbMATH was a fee-based service that was usually subscribed to by universities and thus made available to researchers. Since the beginning of 2021, funding for the service has been taken over by the federal government and the state of Baden-Württemberg, meaning that we have been able to provide it at no cost to users ever since. This has several advantages - apart from the obvious benefits for the community, it frees up resources for us to invest in the development of new features as we no longer have to manage customers. It also enables us to cooperate with a wide range of service providers that only make their data available for non-commercial use. Networking with such partners has been an important focus of our work ever since.

**Question: How can Open Access and open standards help promote fairness, transparency, and sustainability in science? Can you give examples of how these principles are implemented in your daily work with zbMATH Open?**



First of all, the development and production of zbMATH Open is paid for from public funds, so it is only logical that the results should then also benefit the general public - a principle that should actually also be self-evident for scientific publishing. Open access gives economically weaker countries better and fairer opportunities for participation.

Besides zbMATH Open, there is also MathSciNet, a fee-based reference service produced by the American Mathematical Society, and while many universities previously only subscribed to one of the two services for cost reasons, they can now obtain both services. Finally, all new data and links produced with zbMATH Open are made available under a Creative Commons license. Only the data that we receive from publishers under a restrictive license, for example, can of course only be offered to a limited extent. However, we are working on changing this.

## Open Access gives economically weaker countries better and fairer opportunities for participation.

**Question: When did open standards and open access help you specifically to solve a problem in your scientific work?**

My actual scientific work as a mathematician is already a decade behind me. Back then, I was lucky enough to be working in algebraic geometry, a field of research in which it was completely normal and practically good form to upload new research results to the arXiv preprint service as soon as they were submitted. In this way, I was almost always able to access all the research results that were important for my work without any effort.

Unfortunately, this is by no means the case in all areas of mathematics, and certainly not in many other branches of science, where much greater financial interests are often intertwined with scientific achievement. If I were still doing research today, it would probably be extremely helpful for me to be able to search directly for mathematical concepts using newer semantic methods instead of having to take the detour via a textual representation. Unfortunately, this is still a long way to go at the moment, although a lot has already been done in this direction.

**Question: In your opinion, what role do open standards play in quality assurance in research, but also in business, for example? Does this make it easier to carry out objective and verifiable quality assurance?**

The list is long: By smartly analyzing the profiles of authors in zbMATH Open, artificially inflated citation figures can be identified. Openly available papers or links to the associated preprints allow for automated identification of suspected cases of plagiarism. The comparison with entries in MathSciNet brings more objectivity through the multiple-eye principle - other sciences do



not have a comparable, institutionally anchored system like mathematics, where scientific errors and scientific misconduct have often only been detected by the review services after peer review. In the editorial processes of such services, publishers are regularly evaluated for quality assurance deficiencies. But this also requires links. The most reliable way to do this is through open standards, for example in the provision of bibliographic metadata. As long as these are not used everywhere, we will have to make do with artificial intelligence methods - and although these are good, they are still far from perfect.

## Artificial intelligence methods are good, but still far from perfect.

**Question: What advantages do open standards have for users outside the scientific community, for example specifically for me in the area of scientific support?**

Many subject-specific standards are of course primarily aimed at the experts within the scientific community. But they also enhance the interface to the general public. In-depth semantic links in Wikidata, for example, improve the quality of articles in Wikipedia. Interdisciplinary services can aggregate information from different fields of knowledge and databases via standardized interfaces (keyword: knowledge graphs), for example to shed light on an interdisciplinary topic from different perspectives. When different data or services are made legally and technically openly available, these effects are not additive but multiplicative – the whole is then literally more than the sum of its parts.

**Question: Let's get you dreaming: what would your ideal scientific landscape look like in terms of open science? Which services, programs, platforms, data, archives and products should or should not be openly accessible in your vision, and what would become better as a result?**

In a perfect world, all publicly funded research results would only be published open access and made available to the scientific community and the interested public free of charge or only for a small fee. This applies to both traditional publications and newer forms of scientific output such as software, simulation data, formalized mathematics and the like. These must be comprehensibly cataloged, versioned and stored in a fail-safe manner. Open standards ensure that they meet the FAIR criteria (findable, accessible, interoperable, reusable) and are therefore available to all participants in the scientific community for collaborative work. Ultimately, we will all benefit as a society from more efficient, more cost-effective, more sustainable and, not least, fairer research processes.



The interview with Fabian Müller was conducted by Franziska Kretschmer.  
For more information on zbMATH Open, click here: <https://www.fiz-karlsruhe.de/en/produkte-und-dienstleistungen/zbmath-open>

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