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The Multiple Challenges of Handling Scientific Integrity in the Swiss Higher Education System

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Abstract: Scientific integrity is the most important aspect that higher education institutions have to take care of, as it conveys credibility and acceptance of science to the public. Although science has a very powerful built-in self-regulation process for detecting and correcting scientific misconduct, there is a need for clear guidelines that have to be adapted on regular intervals to the rapidly changing world caused by scientific developments themselves. Outlined here are recent advances in how Switzerland increases awareness and transparency of scientific misconduct and how it handles cases of misconduct to improve the quality of science.

Keywords: Scientific integrity · Schweizerische Hochschulkonferenz · swissuniversities

Christian Leumann graduated in organic chemistry from ETH Zurich in 1986. After a post-doc stay at the University of California in Berkeley and five years of research at ETH Zurich, he became Professor of Bioorganic Chemistry at the University of Bern in 1993. In addition to his teaching and research activities, he has also held a number of other positions. For example, he was a member of the research council and President of the Division for Mathematics, Natural Sciences and Engineering of the Swiss National Science Foundation (SNSF) from 2000-2010. In 2011 he became a member of the Executive Board of the University of Bern, serving first as Vice-Rector for research and from 2016-2024 as Rector of the University. During his Rectorate he also served as President of the Delegation for Research at swissuniversities.

1. Introduction

Any independent researcher at any Swiss higher education institution, such as universities, universities of applied sciences and teaching institutions, shares the privilege of freedom in research and teaching, that is anchored in the Swiss federal constitution and in the cantonal constitutions. It is a product of the spirit of the enlightenment and was originally meant to protect research and teaching from being influenced or controlled by the political and religious authorities. This privilege calls for responsibility of each researcher, in that the research is carried out to the best of currently accepted scientific practice, that it is honestly conducted and made available to the community according to the best qualitative and ethical standards, respecting other researchers work in the same field.

The rules of transparency and reproducibility that stands behind high quality science has led to a high level of acceptance of scientific results in politics, economy, and society. It has led to a high level of trust in scientists and their higher education and research institutions, and it is thus the highest accolade that these institutions can have. Needless to say, that this has to be protected in the best possible way.

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Science is conducted by human beings, and it therefore happens occasionally that scientific misconduct occurs. The way science works intrinsically follows a process of self-regulation that has been extremely powerful in the past to detect scientific error or misconduct sooner or later. However, any fraudulent or low-quality research undermines the credibility of science and thus has to be sanctioned. This is why it is important that the scientific community maintains scientific integrity rules and adapts them at regular intervals to accommodate aspects of progress in science, technology, and society.

Interestingly, there exists a global common understanding on the basic rules for scientific integrity across all disciplines and cultures. This, however, contrasts with the lack of a global understanding on what the essence of science is. This last came to the surface after the attack by Hamas on Israel on October 7th, 2023, which impacted students and teachers on university campuses on all continents, launching a massive academic and public debate on the question of the role of science in politics and political activism. If the boundaries between science, politics and political activism disappear, there is a considerable risk that science might lose its high credibility, which ultimately can become a threat to the privilege of freedom in research and teaching, as granted by the constitution.

2. The Swiss Code of Conduct for Scientific Integrity 2021

The current *Swiss code of conduct for scientific integrity*[1] was expanded in 2021 by an expert group representing the Swiss academies of the arts and sciences (a+), the Swiss national science foundation (SNSF), swissuniversities and Innosuisse. It is an updated version of an earlier paper published in 2007 by the academies. This update was necessary as the scientific progress led to developments such as open science, an exponentially growing number of databases, as well as new digital communication tools and information retrieval systems, that were non-existent or in their infancy in 2007.

The code is intended as a basis for universities, other institutions, and funding organisations to review, further clarify and supplement their own guidelines. It describes the basic principles of scientific integrity as summarised in The European Code of Conduct for Research Integrity by the All European Academies (ALLEA) in 2017,[2] namely reliability, honesty, respect and accountability as well as the various categories of scientific mis-

conduct as *e.g.* plagiarism, fabrication or falsification of data and open questions pertaining to authorship in scientific writing. It also describes model processes for handling notifications of possible cases of scientific misconducts from arbitration to investigation to final and conclusive sanctions that should be consistent for similar violations across the different institutions.

The latter seems logical but is hard to achieve, as public institutions with different authorities (confederation, cantons) operate under different legal frameworks, which hamper or impede the exchange of information on scientific misconduct. This becomes particularly relevant when scientists with a track record of scientific misconduct move between institutions, either nationally or internationally.

3. Evaluation of the Implementation of the Code of Conduct

In order to follow-up on the impact the recommendations of the 2021 Swiss code of conduct for scientific integrity had on the different higher education institutions in Switzerland, swissuniversities conducted and published in May 2024 a survey.[3] From the executive summary of this report I cite: "*The majority of institutions reviewed and supplemented their existing regulations and/or adopted the code as a (supplementary) guiding document. Similarly, most of the higher education institutions are implementing or plan to implement various activities in connection with the adoption of the code. Approximately half of the institutions state that the code's provisions are in line with their institutional regulations; however, differences are also noticed as institutional regulations sometimes cover fewer aspects than the code. Two thirds of the institutions have a procedural organisation that complies with the code's recommendations. The procedural principles defined by the code are also reflected in institutional regulations: Depending on the procedural principles concerned, the regulations of one- to two-thirds of institutions correspond to those of the code. Regarding sanctions, the majority of higher education institutions apply the proportionality principle, but to date, only a few of them clearly classify sanctions according to the infraction's seriousness*."

Thus, it emerges that the awareness to act along the general lines of the code has rapidly grown, but it also shows that the question of how and in which measure to apply sanctions for scientific misconduct is still far from being consistent across the institutions.

4. Prevention, Identification and Sanctioning Scientific Misconduct at the University of Bern

Having been at the University of Bern for 31 years, this is the institution where I can best give some insight on how scientific integrity is handled.

Obviously, the best measure to be taken first is prevention. To this end, the University of Bern offers online courses on research integrity to all members of the university.[4] The courses teach the basic principles of good scientific practice, provide discipline-specific knowledge, and give an overview of international standards of conduct. In addition to this, the rules for scientific integrity and the expectations of the institution are addressed in all hiring interviews for new professor positions and are included in the minutes of these interviews.

Most higher education institutions in Switzerland have their own scientific integrity offices. The integrity office of the University of Bern[5] is the contact point for all members of the University in matters of scientific integrity and is currently run by two integrity officers that are independent of the bodies of the university. After verification of scientific misconduct, sanctions are defined in close contact with the legal office of the University.

Most reported cases appear in the context of plagiarism in BSc and MSc thesis and range in weak cases to repetition of the work and in more severe cases to conditional or full exclusion and expulsion from the field of study. Also on the PhD level, most of the cases of scientific misconduct are due to plagiarism, which results in severe cases in the retraction of the academic degree by the senate of the University.

What we also see is a very limited number of cases where scientific data is falsified or fabricated in publications or scientific proposals. Investigating such cases is extremely demanding and needs sophisticated methods of forensic data analysis, which ends up in misconduct reports of several hundred pages. In these cases, we follow a strategy of zero tolerance which implies measures such as retraction of academic titles and/or loss of job.

5. National Centre for Research Integrity

Given the mosaic of partial solutions to the problem of the governance of scientific integrity throughout Swiss higher education institutions, the question emerged, whether there should be a national coordination centre for this. While most European countries have a national institution, Switzerland does not. Therefore, the board of swissuniversities mandated in 2021 Prof. E. Constable of the University of Basel, who was also a lead author in the development of the code, to prepare recommendations for a Swiss National Competence Centre for Scientific Integrity to be proposed to the Schweizerische Hochschulkonferenz (SHK).[6] The imminent benefits of such a centre for the Swiss research community would be (i) minimization of cases involving scientific integrity, (ii) insurance that cases are handled in a fair and transparent manner and (iii) protection of the reputation of institutions, disciplines and the national research sector.

Consequently, the SHK validated the necessity for a Swiss centre for scientific integrity and worked out the details of its functioning. As the core element, the creation of a council of scientific integrity, consisting of a minimum of three eminent scientists, amongst them also international scientists, of different domains and cultures is foreseen. This council reports and consults regularly to the SHK on the status of the quality of scientific integrity in Switzerland. It runs an administrative office, which, based on the Swiss code of conduct for scientific integrity, collects all cases of scientific misconduct of all accredited Swiss higher education (HEI) institutions in an anonymous way, gives advice and support to HEIs and provides training courses on request. Most importantly, it does not perform investigations in their own right.

This proposal is now up for consultation until the end of July 2024 and will then hopefully start to become operative by 2025. This will be a major achievement in providing nationwide information on the number of cases and types of scientific misconduct as well as on the sanctions that the respective institutions have seized. In the best case scenario, it will lead to a fair and equilibrated system on how the Swiss HEI control and secure the quality of scientific integrity.

6. Conclusions and Outlook

Although this code of conduct was finalised only three years ago, it is already obvious that the next challenges are waiting round the corner. Two of these challenges that have the potential to transform the scientific integrity rules significantly are from recent technological advances. The first challenge is associated with artificial intelligence (AI). It is needless to say that Chat-GPT has already started to change the way in how we teach at HEIs, on how we control the learning outcomes of our teaching lessons and how we advise our students to use it in a responsible way in their work. But the future of AI will be much more than just a text generator like Chat-GPT. Future AI will be highly integrative and will be able to propose innovative research experiments, to interpret scientific data and draw conclusions out of it, and it will be able to write the corresponding scientific papers. How should we deal with this?

Another challenge is that of dual use of research. Although this is not new, the dimensions of potential misuse of science have exponentially grown. This is particularly the case in the medical, natural and engineering sciences. Let me take as an example robotic devices, such as drones that can make our lives easier, but have the potential to lead to devastating effects on humanity when used as weapons, as recently seen in the Ukraine war and in the conflict zones in the near east. This is even more the case if such devices are operating independently using AI in the cockpit. How is this compatible with the ethics of science? Can and should we regulate the use of scientific advancement? Should this be integrated in the code of conduct of scientific integrity?

One does not need to be a clairvoyant in order to define the open questions to be dealt with in the next update of the code of conduct for scientific integrity. We probably need to start working on it now.

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