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POLICY BRIEF

RESEARCH INTEGRITY

Background: Growing concern over research integrity

Over recent decades, we have been able to witness growing concerns over research integrity within national research systems, diverse research institutions, as well as in the European research area in more general terms. Recent fraud scandals and other transgressions of what counts as good scientific practice have challenged “the assumptions about the efficacy of self-policing in the scientific community, often resulting in the imposition of new regulations, procedures and oversight bodies” (Martin 2013). The first World Conference on Research Integrity held in Lisbon in 2007, co-organised by the European Science Foundation (ESF) and the US Office of Research Integrity (ORI), is one of many signs for the growing awareness that both principles and practices of research integrity need a better understanding and more explicit policies. In the years following this conference, the work of the ESF Member Organisation Forum on Research Integrity together with All European Academies (ALLEA) resulted in a consensus document, “The European Code of Conduct for Research Integrity” (ESF & ALLEA 2011). The document was presented at the Second World Conference on Research Integrity in 2010. The Code addresses questions of good practice and identifies what should count as unacceptable conduct in science, which in turn is meant to offer a basis for trust and integrity across national borders (ESF 2010). Simultaneously, expert groups at the European level addressed issues of ethics and integrity in research (e.g., EC 2007; Felt et al. 2007; 2013), expressing a range of different concerns about developments in this domain. In the meantime, *Responsible Research and Innovation (RRI)* has been established as a cross-cutting theme for the EC’s Horizon 2020 programme (EC 2012; Owen et al. 2012) and can be regarded as another indicator of the awareness that action is needed to improve the way values define research and how it is practiced.

With regard to research integrity, Commissioner for Research, Science and Innovation, Carlos Moedas, stressed in a recent speech that “time has come for a European initiative on research integrity [...] with clear standards and mechanisms to tackle scientific misconduct”¹. Alongside this process of awareness creation on the policy level, research agencies and institutions of research and higher education also started to set up offices dealing with research integrity, as well as to publish codes of conduct which, at least in some places, students and new employees have to sign.

How to move forward from here is at the core of this policy brief, in particular considering what would be needed to actively promote, and care for, research integrity.

¹ http://europa.eu/rapid/press-release_SPEECH-15-5243_en.htm

What are the indicators supporting this concern over research integrity?

Numerous analysts have pointed at a growing number of cases in which the rules of good scientific practice are transgressed when proposing, performing, or reviewing research, as well as in reporting research results in publications. These transgressions range from major fraud cases (e.g. misconduct by J. H. Schön, D. Stapel) involving the fabrication and falsification of data, over failure to meet ethical and legal requirements, plagiarism and duplication of publications, to data “adjustments”, embellishment of visual representation and other dubious practices (ESF 2010). Sometimes the transgressions include instances such as the invention of co-authors, in order to gain credibility for the published article, or stealing ideas from projects in the process of evaluation. As the research and publishing systems change (e.g. by going digital), we are also observing new forms of transgressions, as for example a recent case investigated by SAGE. When investigating a suspected author, the publisher discovered that the author “had created various aliases on SAGE Track, providing different e-mail addresses to set up more than one account” and thereby managed “to form part of a peer review ring” together with other co-authors and colleagues², thus to control the outcome of review processes.

One way to capture the dynamics at work is to carefully investigate the retraction of scientific papers from quality journals (see figure 1; Steen et al. 2013)³. We can see a clear increase in retractions, yet there is no clear consensus as to what degree one should interpret this rise of retractions as a growth of deviations from research integrity, and to what degree as a sign of better detection possibilities and more rigorous policies by journals and institutions to openly discuss such cases. While compared to overall publishing, the number of retractions still seems to be low, the retractions nevertheless point to serious **vulnerabilities of the research system**, and indicate a potential lack of a **culture of research integrity**. Understanding the retraction dynamics is all the more important since research builds on the mutual trust of researchers as well as on the use of other researchers’ knowledge to advance one’s own ideas, and retractions represent major disruptions in these trust relations.

Therefore, it is not so much the mere number of papers retracted which is the core issue at stake, but rather how researchers perceive their colleagues and their own work from the perspective of research integrity. In this sense, it is highly alarming how researchers themselves assume that “questionable research practices” are quite wide-spread and, as an interview study with researchers revealed (Fanelli 2009; see Fig.2.), one third of the interviewees would admit to having used such practices themselves. This means that the number of actual transgressions might be much higher than those currently identified, and closer attention needs to be paid to the way research is practiced in everyday contexts. Thus developing and implementing formal regulations and rules of good scientific practice might not suffice for addressing these developments.

² For the SAGE statement see: <https://uk.sagepub.com/en-gb/eur/press/sage-statement-on-journal-of-vibration-and-control>. By putting such a system in place, an author could review their own paper.

³ For following some of the debates see <http://retractionwatch.com/>, a webpage dedicated to discussing retraction cases and other policy issues related to research integrity.

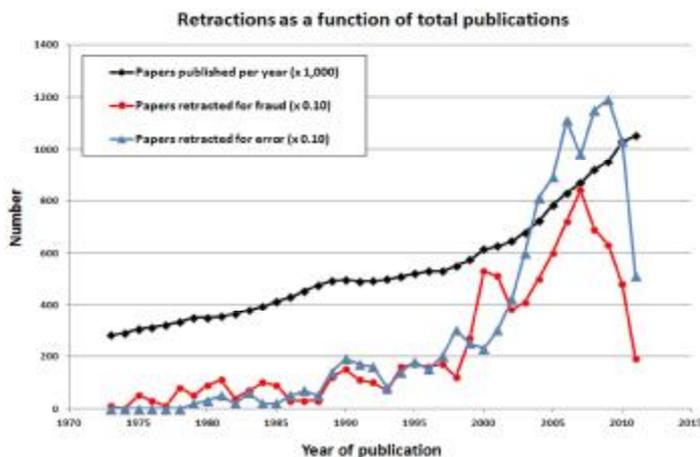


Fig. 1. Papers published and retracted per year since 1973.

Note that the multipliers are different. For the sake of simplicity, error here includes all infractions except fraud (e.g. scientific error, plagiarism, duplication, other). Apparent declines in recent years must be interpreted with caution as additional papers may be retracted in the future, thereby reversing this decline.

(Steen et al. 2013)

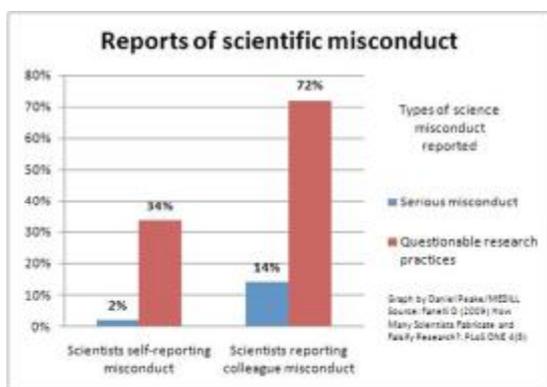


Fig. 2. Reports of scientific misconduct by researchers

(Source of graphic representation: <http://news.medill.northwestern.edu/chicago/news.aspx?id=15726>)

(Fanelli 2009)

Why is research integrity a key concern for the science system?

For quite a while, neither scientists themselves nor policy makers, institutional leaders or publishers publicly admitted that integrity was a serious problem in the research and innovation system. Most of the time transgressions were (and partly still are) pictured as exceptions which would not need to create too much concern; the focus was on the fraudster – the “a few bad apples” argument – and the system level which allowed the fraud to happen was rarely reflected. Furthermore, it was often stressed that discovering fraud was proof that the system was able to detect problems and correct them. All these arguments served the purpose with the aim to keep investment in addressing research integrity low, not to invest too many resources into addressing issues of research integrity.

Yet more recently we can observe a rising awareness that violations of research integrity might put in danger the basic foundation on which our research systems rests. In an exemplary manner, four such moments can be identified where commitment to shared norms and values in research matters. First, collaboration in the production of knowledge and innovations for solving the challenges of contemporary societies has become an essential prerequisite for success. This often entails the crossing of boundaries between national research systems, disciplines and institutions, but also between science and society (e.g. by including societal actors in research). Cases of collaborations between industry and academia (e.g. Somerville 2002), but also between researchers from different cultural backgrounds have sometimes proved more problematic than admitted. Therefore more

efforts need to be made to address potential differences in values and norms at work, and to explicitly make this an issue of debate and agreement in any collaboration. Furthermore, it is essential to clarify the role of collaborators and co-authors when it comes to responsibility for the results presented in a shared publication. It is very often left unclear how far this responsibility goes.

Secondly, the quality of knowledge and innovations resides in the agreement on rules and norms in their production. Currently, considerable investments are dedicated to making data openly available for the research community. This is done, on the one hand, to avoid duplication of research and thus to better invest the funding available. On the other hand, through the process of collecting and sharing data, new types of research – “big data” research – can be performed, offering innovative ways of studying phenomena. This means, however, that new forms of control zones have to be established which facilitate the identification of the “provenance of scientific data, thereby ensuring data integrity and providing the foundation for credible science” (Lagoze 2014).

Thirdly, the research system can only function in an optimal way if researchers can trust each other’s work, if they share the values that guide assessments, and if they can count on the fair behaviour of their peers. A recent study performed for the Austrian Research Fund (FWF) (Neufeld et al. 2014), however, has demonstrated that this trust is by far not as great as one might wish/think. As Figures 3 and 4 show, considerable parts of the scientific community see the danger that reviewers might steal their ideas in the review process and believe that the system has a tendency to support those researchers who can better sell themselves and their research.

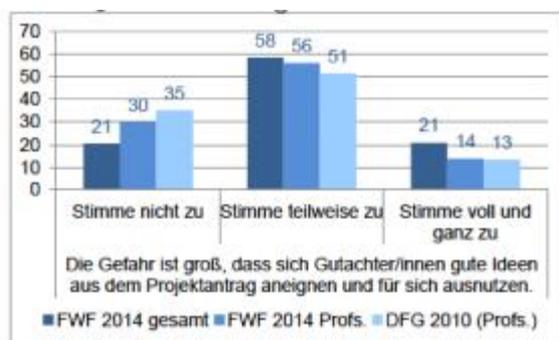


Fig.3. The danger is high that reviewers appropriate an idea from the proposal and use it for their own purposes;

DFG = German equivalent of the FWF

(Scale: don't agree – partly agree – completely agree)
(Neufeld et al. 2014)

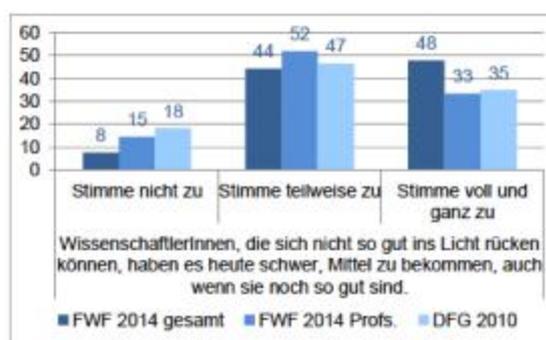


Fig.4. Scientists who cannot sell themselves well have difficulties today to get funding, even if they are very good

(Scale: don't agree – partly agree – completely agree)

(Neufeld et al. 2014)

Finally, scientific misconduct has a deep impact on the way science is perceived by societal actors and the trust people have in knowledge and interpretations proposed by scientists. In this sense, the major concern of the research system should not be people’s poor understanding of science. It is much rather essential to improve research integrity, and to clearly demonstrate that the science system is capable of addressing and handling well problems that arise when research practices are judged as unacceptable.

What do current codes of conduct aim to do?

When looking at the different explicitly formulated calls for research integrity in the European context and beyond, expectations generally are:

- an agreed set of methods to be followed when proposing, performing and assessing research;
- that researchers follow the rules, regulations and guidelines when reporting on their research;
- and, more broadly speaking, that researchers embrace the wider sets of values of the respective scientific community.

Honesty, objectivity, independence and impartiality are mentioned as basic values guiding research integrity, together with the obligation to care for the next generation. In this sense, it is often also described as the duty of supervisors and mentors to identify and correct minor misdemeanours which might remain undetected and nevertheless harm the system. Furthermore, not being socialised to think and act in terms of research integrity could lead to more serious forms of misconduct. This means conveying information as openly as possible and acknowledging the contributions of others, reporting on research in a careful manner trying to avoid mistakes, using resources in a balanced manner (which is often an issue when it comes to the use of animals for research), as well as to storing and presenting data in a mode to allow others to perform independent interpretations (see e.g. ESF/ALLEA 2011).

While there is widespread agreement on these values, the situation is more complex when it comes to proposing and implementing processes and structures to support and foster research integrity in practice. What most suggestions have in common is that they propose to implement prevention programmes through education and awareness-raising activities, as well as through training in good practices of data collection and storage. Furthermore, exchange of experiences and good practice is seen as a central element. All this should be accompanied by the creation of governance structures which care for research integrity, and transparent procedures for handling cases of transgression. Governance is mainly conceptualised on the national level, even though global agreements are seen as the ultimate goal.

While all these propositions seem highly adequate and do address the core of the problem, this brief argues that broader considerations are needed to achieve a more sustained adoption of good scientific practice.

What are the current conditions for good scientific practice?

When thinking about the prevention or the punishment of violations of research integrity, the problem is predominantly addressed at the level of individuals. Yet this brief argues that it is essential also to reflect the ways in which contemporary research systems change, how they implement a core logic, and how this potentially prepares the ground for scientific misconduct. Drawing on studies investigating how researchers perceive their lives in research and the values which guide the research system, we can identify at least three changes on the system level which need to be considered when dealing with research integrity (e.g., Fochler et al. forthcoming).

First, **temporal structures** of research have undergone considerable change. Today the logic of projects structures research (and the questions that can be asked). Knowledge is thus produced in the three-year rhythms of projects, structured by road maps, milestones, work packages and a flow of papers; careers have become fragmented, often in junks of very few years, in particular in the post-doc phase; assessment exercises and publication cycles are yet another time structure organising research. Outputs of whatever kind are expected to be produced with a relatively high frequency. Thus researchers describe a feeling of constant pressure, an acceleration of research, as well as a growing number of different timelines impinging on their lives and their work (Felt 2015). They describe it as being in a state of constant readiness to have all the assets needed for the next contract extension, the next job interview, or the next assessment exercise (Felt 2009).

Second, the **reward systems**, or more commonly what gets valued in research, has undergone considerable change. Indeed, more and more young researchers say that in research and in the competition prevailing, the only thing that counts is what can be counted (often described as being part of new public management logic). As a consequence, they focus much of their attention on producing as many publications as they can quite early in their career. This, together with the fact that only being first matters, leads to the researchers publishing results earlier, and checking them less, than would be desirable.

The founder of the retraction watch web-site expressed this clearly by stating that the transgressions of good scientific practice “are just symptoms of a wider issue with the reward system of academic research: publications are the only way to accrue scientific merit, so they take on a sanctity that academics are reluctant to disrupt with corrections or retractions. If researchers could afford to view scientific output more as a continuous stream, rather than a punctuated series of publications, revisions would carry less of a stigma, he says.” (cited in van Noorden 2011).

This leads seamlessly to the third aspect, **the publication system**, which has been changed by these trends, while simultaneously being an actor in driving this change. A former editor-in-chief of *Science* magazine together with co-authors argued that “the inflated value given to publishing in a small number of so-called ‘high impact’ journals has put pressure on authors to rush into print, cut corners, exaggerate their findings, and overstate the significance of their work” (Alberts et al. 2014: 5774). Indeed as the pressure to publish rises and space in highly visible journals becomes increasingly scarce, this does not only transform when, what and how people communicate their results, but also how publications are read and cited (which is the other side of the reward system). The visibility of any single publication is further reduced as more and more literature is available and a smaller percentage of articles and journals are actually cited (Evans 2008). This is closely connected to concerns raised with regard to what is being published and how this is framed. Studies have pointed to the fact that under conditions of scarce space, there is a strongly declining number of papers recording negative results (Fanelli 2011). They are seen as hardly publishable in highly ranked journals, which in turn might have consequences on the ways in which results are presented. Moreover, the importance to position science in society leads to the question of how scientists reconcile caution “about their results with the demands of the media for headlines and the growing emphasis placed by funding agencies on the economic impact of research” (Jones 2008). This might lead to an “economy of promise” which might invite researchers to stretch their imagination beyond what their research can actually offer. This calls for a thorough reflection on how publication possibilities and venues also frame what

can be published, and in what ways research gets tacitly directed. Finally, growth itself also needs reviewing, as it is becoming an increasing burden for researchers and points to the limits of the system – and to the fact that probably quite some sloppy research remains undetected.



Fig. 5 A researcher who is completely open and honest in their application will not always have the best chances

(scale: don't agree – partly agree – completely agree)
(Neufeld et al. 2014)

Conclusions and recommendations: Guidelines and institutional “integrity infrastructures” as answers?!

The policy brief started out by diagnosing growing concerns over integrity both within national research systems, diverse institutions, as well as in the European Research Area. The response so far has mainly been the development of guidelines to assure that the basic values on which scientific inquiry should rest are respected, as well as the establishment of institutions meant to govern good scientific practice. In some cases education programmes, mainly for early stage researchers, have been put in place.

While it is surely essential to further develop all these responses, they might not be sufficient when the aim is to impact research practices in a sustainable manner. The policy brief therefore suggests potentially fruitful directions to foster good scientific practice.

First, there is evidence that incoming (graduate) students do not possess adequate knowledge concerning the responsible conduct of research. Embracing the ideals of good scientific practice needs their explicit integration into the **socialisation and mentoring processes**. Furthermore, research integrity cannot be achieved through one-off training, but it needs to be achieved throughout the researchers' careers, as researchers' roles change, new situations emerge (e.g. through new technological possibilities) and rules/policies are updated. This demands regular investments in terms of time and financial resources for ensuring the quality of research conduct – which is notoriously difficult in times of tight research budgets.

Second, putting in place codes of conduct must **reflect more explicitly the current dynamic of the research system** and address the prevailing tensions between the ideal of good scientific practice and the competitive situation researchers are in. The focus of attention therefore must be on the whole process of knowledge production, on understanding the social structure of contemporary research, career policies, and the time structures which form contemporary research environments. The single most important question is therefore how any measures are embedded in, and adapted to, daily life within contemporary research

institutions. To achieve such an embedding, any training offered cannot remain on a purely abstract level, but must be as close as possible to the actual practices and experiences of researchers.

Third, many measures supporting research integrity often rest solely on personal experiences and perceptions of scientific actors and not on systematic investigations of the situations (Anderson et al. 2013). Yet, given the complexity and dynamics characteristic of contemporary research, it seems essential to **strengthen the implementation of research integrity measures by the creation of knowledge on actual research behaviour and the everyday realities of researchers**, within and across disciplinary, institutional and national boundaries.

Beyond such measures, some developments in the system (e.g. the decrease of publishing of negative results, the narrowing of the number of key journals) would need systemic counter action in order to assure the quality of research.

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