

The Prevalence of Scientific Misconduct and Principles of the Contemporary Scientists*

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Abstract—The paper analyses the types of scientific misconduct and tries to evaluate the prevalence of these practices, based on statistics and studies in social science. It is concluded that significant scientific misconduct like fabrication, falsification and text plagiarism are not spread and occur quite rare. At the same time the real problem of scientific ethics is “grey area” or prevalence of “grey methods” in science like over interpretation of results, selective reporting, study weaknesses are not described, carelessness and incompetence and others. Despite it we have no moral rights to blame scientists using “grey methods”. The author formulates the principles of the modern scientists which contain rejection of practicing fabrication, falsification and plagiarism; implementation the limitations of scientific activity and attempts to avoid “grey methods” in science. The paper also emphasizes the significance of collaboration of honest scientists.

Keywords—*scientific ethics; scientific misconduct; fabrication; falsification; plagiarism; “grey methods”*

I. INTRODUCTION

During the last decade, the cases of scientific misconduct are increasing. Many studies report about scientific misconduct or using “grey” methods in scientific publications. Among them are well-known frauds that have been widely discussed not only in scientific community, but also in social media. A good example is Woo Suk Hwang’s fraud. He was a South Korea’s high-profile cloning researcher, who fabricated the data and reported about derived stem-cells from cloned embryo¹. Usually these infamous cases are cases of fabricating data, falsification or violating people’s rights or health. Jon Sudno, a scientist from Norway also was blamed for fabrication data. His research on the risk of oral cancer in smokers and published in *The Lancet* was based on the data of 900 subjects. The problem of his study was that the database on these subjects

had not been existed yet at the time when he conducted the research². After this case the fraud was found in his earlier papers. As the result many of his publications were retracted and his doctoral degree was withdrawn. Scientific community worldwide and public opinion evaluate such kind of scientific misconduct as absolutely unacceptable. These violations of scientific ethics are punishable by law and close the door on scientific career. It seems obvious, but another fact is interesting. Sudno wrote his papers with almost 60 co-authors from different countries and nobody checked the data or informed the journals about the fraudulent data.

One of the well-known moral imperatives of Robert Merton was “Organized skepticism” that means the scientists should check new discoveries and be critical to facts and reports³. In the example above Sudno’s co-authors were not so critical at best, and were keeping in secret the fraud at worst. Their guilty was indirect, “grey”. Maybe it harmed their reputation, but it did not caused significant punishment. And these kinds of violations of scientific ethics are spreading in scientific community.

Manipulating with data according to some studies are not rare. One of the studies assessed 100 orthopedic surgery papers. 17% of the results did not support the overstated conclusions and 39% performed the incorrect analysis altogether⁴. The research was based on questionnaire and showed that in approximately 30-49% of studies a different analysis should have been undertaken⁵. According to other reviews of published clinical research there are almost 50% published articles contain statistical errors that influences on

² M. Kaiser. The integrity of science – lost in translation? Best practice and research clinical gastroenterology, Vol. 28, 2014, pp. 339-347.

³ Merton R. “The Normative Structure of Science”, *Panarchy*. Available at <https://www.panarchy.org/merton/science.html>] (19.09.2018).

⁴ M.S Thiese, et al. “Truths, lies, and statistics.” *Journal of thoracic disease*, Vol. 9,10, 2017, pp. 4117-4124, p. 4118; N.R. Parsons, C.L. Price, R. Hiskens, et al. “An evaluation of the quality of statistical design and analysis of published medical research: results from a systematic survey of general orthopaedic journals”. *BMC Med Res Methodol*, Vol. 12, 2012, p. 60.

⁵ N.R. Parsons, C.L. Price, R. Hiskens, et al. “An evaluation of the quality of statistical design and analysis of published medical research: results from a systematic survey of general orthopaedic journals”. *BMC Med Res Methodol*, Vol. 12, 2012, p. 60.

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¹ D. Cyranoski. “Stem-cell pioneer accused of faking data 16.12.2005”, *Nature*, from 16 of December, 2015. Available at <https://www.nature.com/news/2005/051215/full/news051212-14.html>. (11.04.19).

findings⁶. The numbers of cases of scientific misconduct often embarrass researchers in different scientific fields. Compromising rules of publication ethics seems to become usual. Journals not rare consider some kinds of violations of publication ethics like plagiarism paraphrasing strategy or self-plagiarism as something appropriate⁷. Sun Y.C., Yang F.Y. analyzed 71 articles in peer-reviewed journals and detected 2982 attempts of plagiarism⁸. Among them copying verbatim and substitution were the most frequent.

In order to evaluate the prevalence of scientific misconduct nowadays and to formulate the principles of the modern scientists, it is necessary to define scientific misconduct and to describe its types. Only having a definition we will be able to consider the prevalence of scientific misconduct. And then it will help us to find the possibility to develop principles to avoid scientific misconduct, at least, to reduce cases of scientific misconduct.

II. DEFINITION OF SCIENTIFIC MISCONDUCT

Plagiarism, fabrication and falsification are often recognized as the core elements of scientific misconduct⁹. The first one can be attributed to misconducts in publication ethics. There are several types of plagiarism: from text plagiarism to self-plagiarism and unintentional plagiarism when the author has remembered and wrote an idea or an educated guess, but he has not checked the who has put forward this idea before. Today text plagiarism is easily detected by technologies and online services like Turnitin, while plagiarism of ideas and paraphrasing strategies are hardly can be detected such a way. This type of scientific misconduct is more prevalent in linguistics and humanities¹⁰. There are also many cases of suspected plagiarism or possible plagiarism — when it is not clear if this type of misconduct takes place. Committee on Publication Ethics (COPE) describes these cases and develops guidelines for reviewers and journals for the purpose of prevention of such “light” cases of plagiarism¹¹.

Data fabrication is a sin of studies that work with big data, cases and statistics. It is not so spread as plagiarism but fabrication and falsification usually destroy scientific careers of dishonest scientists. The study conducted this year showed that coauthors of fraudulent scientists that did not know about the fraud of their colleagues and published scientific

papers or articles with them and had not connections with misconduct cases, were cited 8-9% less often afterwards¹². It means that fabrication affect even innocent scientists whose names have been near liars. Sometimes cases of fabrication and falsification are even more frequent than plagiarism. The executive editor of the *Lancet*, a well-known biomedical journal, reported COPE about 212 articles about which he had concerns. 163 papers contained misconduct and among them “19 were related to falsification and fabrication” and only 17 to plagiarism¹³.

However, text plagiarism, fabrication and falsification (PFF) are not spread in scientific practice and usually cause scandals that are discussing not only inside scientific community, but also are subjects to dispute in society. Other types of scientific misconduct that are not so significant are duplicated publications, conflicts of interests, over interpretation of results, selective reporting, study weaknesses are not described, carelessness and incompetence, distortion of design, raw data is not provided, unnecessary self-citation, reciprocal citations¹⁴. These methods form “grey area” of scientific practices and publications; they occur much often than PFF. Finally, according to the mentioned studies¹⁵ the prevalence of grey methods is underestimated and these kinds of scientific misconducts can be found in much more publications than 5% of published papers. Some studies listed show that “grey methods” can be met in 30-50% of analyzed papers and even more often.

III. LIMITATIONS OF SCIENTIFIC ACTIVITY

Besides the described methods of scientific misconduct there are other limitations in scientific activity that usually are not considered as misconduct, but they are gross violation of scientific ethics.

One of the typical examples is the case of He Jiankui, a young Chinese scientist¹⁶. He reported about the first case of

⁶ M.S Thiese, et al. “Truths, lies, and statistics.” *Journal of thoracic disease*, Vol. 9, 10, 2017, pp. 4117-4124. P.4118.

⁷ V.A. Tsvyk, O.V. Savvina “Publication ethics in the context of scientific ethics”, in *Proceedings of the 3rd International Multidisciplinary Scientific Conference on Social Sciences & Arts SGEM*, 2016, pp. 791-797.

⁸ Y.C. Sun, F.Y. “Yang Uncovering published authors' text-borrowing practices: Paraphrasing strategies, sources, and self-plagiarism, *Journal of English for Academic Purposes*”, Vol. 20, 2015, pp. 224-236.

⁹ M. Kaiser “The integrity of science — lost in translation?”, *Best practice and research clinical gastroenterology*, Vol. 28, 2014, pp. 339-347. P. 341

¹⁰ V.A. Tsvyk, O.V. Savvina “Publication ethics in the context of scientific ethics”, in *Proceedings of the 3rd International Multidisciplinary Scientific Conference on Social Sciences & Arts SGEM*, 2016, pp. 791-797.

¹¹ Committee on Publication Ethics. Official site of COPE. Available at: [https://publicationethics.org/guidance/Case \(11.04.19\)](https://publicationethics.org/guidance/Case (11.04.19)).

¹² K. Hussinger, M. Pellens “Guilt by association: How scientific misconduct harms prior collaborators”, *Research policy*, 48, 2019, pp. 516-530.

¹³ S. Holm, B. Hofmann, P. Laake “Ethics and scientific misconduct. In *Research and Biological Sciences*”. Elsevier Ltd, 2015, p. 45.

¹⁴ M.S Thiese, et al. “Truths, lies, and statistics.” *Journal of thoracic disease*, Vol. 9,10, 2017, pp. 4117-4124, p. 4118; M.A. Zaggl. “Manipulation of explicit reputation in innovation and knowledge exchange communities: The example of referencing in science”. *Research Policy*, Vol. 46, Issue 5, June 2017, pp. 970-983.

¹⁵ M.S Thiese, et al. “Truths, lies, and statistics.” *Journal of thoracic disease*, Vol. 9,10, 2017, pp. 4117-4124; N.R. Parsons, C.L. Price, R. Hiskens, et al. “An evaluation of the quality of statistical design and analysis of published medical research: results from a systematic survey of general orthopaedic journals”. *BMC Med Res Methodol*, Vol. 12, 2012, p. 60; V.A. Tsvyk, O.V. Savvina “Publication ethics in the context of scientific ethics”, in *Proceedings of the 3rd International Multidisciplinary Scientific Conference on Social Sciences & Arts SGEM*, 2016, pp. 791-797; Y.C. Sun, F.Y. “Yang Uncovering published authors' text-borrowing practices: Paraphrasing strategies, sources, and self-plagiarism, *Journal of English for Academic Purposes*”, Vol. 20, 2015, pp. 224-236.

¹⁶ A. Regalado “EXCLUSIVE: Chinese scientists are creating CRISPR babies”, *MIT Technology review*. Available at:

gene modified designer babies — Nana and Lulu. It is expected that the girls' organisms are resistant to HIV due to the artificial mutation. He Jiankui modified the embryos *in vitro* by CRISPR/Cas9 method before the implantation into their mother's womb. Almost immediately after the announcement of the scientific new, more than 100 Chinese researchers in medical and biological sciences recognized this trial as dangerous and unethical. He Jiankui has presented his results on the Second international summit on Human genome editing where scientific community also evaluated his work as inappropriate from the ethical viewpoint. CRISPR/Cas9 often causes undesirable and unpredictable mutations; moreover, these mutations can be inherited by the girls' descendants. Since the end of the Second World War and the Nuremberg Code benefits from the experiment must outweigh the risks for the experimental subjects. According to the Nuremberg Code, paragraph 4 "The experiment should be so conducted as to avoid all unnecessary physical and mental suffering and injury" and paragraph 7 "The degree of risk to be taken should never exceed that determined by the humanitarian importance of the problem to be solved by the experiment"¹⁷. He broke the taboo putting the health and lives of girls at risk. As it would be known after He fabricated the results of ethical committee, lied to patients — the girls' parents, to the clinic where the research took place and did not inform his university about the trials he was conducting.

Summing up, there are taboos that scientists never should break: 1) endangerment of people taking part in scientific trials without very significant reason; 2) violating human rights; 3) endangerment of humankind or planet. The last one, the endangerment of the planet's environment is reflected in the concept of sustainable development. Under this concept we (present generation) must be responsible for the planet's ability to regenerate, maintain and improve planetary resources for use by future generations¹⁸.

There are also many notes on scientific ethics regarding the impact of the scientific and technological progress on human society. These discussions often refer to cloning, designer babies and invention of atomic and biological weapons. There is an opinion that scientists should think about the effect their discovery or invention can bring to humankind and how it will be able to transform our society. I argue that these considerations should not be taken into account because our society is transforming all the time and there are always advantages and disadvantages of new technologies. We are responsible for creating practices that are able to destroy the planet and ecology.

IV. MORAL PRINCIPLES OF THE CONTEMPORARY SCIENTISTS

Modern scientists have to be honest not only because scientific misconduct can destroy their career in the contemporary information society, but also because compromising quality of scientific research facilitates the loss of social trust to scientists, degrades the status of scientific institutions.

There are simple principles of scientific ethics that can be derived.

- Avoid fabrication, facilitation and plagiarism in any case;
- Endeavour to avoid "grey methods", search for collaborations with other scientists that never use these methods;
- Remember about limitations of scientific activity: a) never violate other people's rights; b) take care of mental and physical health of people during the trials; c) comply with the principles of sustainable development (environment).

If the first and the third principles are quite clear, the second one is more difficult in connection with the prevalence of "grey methods". I argue that we cannot totally prohibit these methods in the light of some situations. For instance, a student is guarded by his academic adviser that uses "grey methods" but also can give basic and needed knowledge to his students. Minor researches usually have no choice to conduct their own projects and they also should learn from major colleagues whom they sometimes cannot choose. These problems are morally dubious and we need a systematic approach to solve them.

V. CONCLUSION

The derived principles are basic and can be practiced by researches in different scientific fields, but it does not mean that they are universal and need not additional norms. Different types of scientific misconduct have their own levels of prevalence in different scientific fields. For example, endangerment of lives and health of people is more typical for medical and biological research. In journals on arts and humanities plagiarism can be met more often than in journals on natural sciences. "Grey methods" in publications cause very significant problems despite the fact that they are not so harmful for scientific research and scientific careers. The prevalence of such methods decreases the belief in the importance of scientific mission. Watching their elder colleagues using paraphrasing strategies or unnecessary reciprocal citations young scientists may be disappointed in scientific research. Moreover, the problem of "grey area" in science cannot be solved only by promoting principles of scientific ethics. This is the complicated problem, and the biggest difficulty in its solving is that scientists benefit from using "grey methods". It still provides opportunity to win in the competition among scientists and in order to solve the problem of "grey methods" we must rebuild the world's system of evaluating scientific impact of each researcher.

<https://www.technologyreview.com/s/612458/exclusive-chinese-scientists-are-creating-crispr-babies/> (7.12.18)

¹⁷ The Nuremberg Code. Available at: https://globalhealthtrainingcentre.tghn.org/site_media/media/medialibrary/2011/04/BMJ_No_7070_Volume_313_The_Nuremberg_Code.pdf (11.04.19)

¹⁸ R. K. Turner "Sustainability, Resource Conservation and Pollution Control: An Overview". In Turner, R. Kerry (ed.). *Sustainable Environmental Management*. London: Belhaven Press, 1988.

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