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Questionable Research Practices: an Introductory Reflection on Causes, Patterns and Possible Responses

Gorazd Meško, Aleksander Koporec Oberčkal

Purpose:

The purpose of this article is to discuss deviance in science due to increasing pressures on researchers and higher education pedagogues to be more effective and efficient in the 'academic production'.

Design/Methodology/Approach:

A literature review and reflection.

Findings:

The authors present a criminological view of deviance in science, discussing the perception of unsuitable scientific and research practices, questionable research practices, ethics and integrity in science, suitable behaviour of researchers in scientific work, and make recommendations for improving the ethics of scientific research in practice. The discussion on deviance in science is based on Merton's principles of science (1973): the public presentation of knowledge and sharing of ideas, leading to common ownership of scientific discoveries, in which scientists disclaim their intellectual rights to their own insights in exchange for recognition and reputation. An impartial approach and universalism, in which truth is judged by impersonal, universal criteria, rather than based on race, social and economic status, sex, faith, or nationality and other subjective categories is presented and questioned. A non-profit/selfless orientation in which scientists are rewarded for selfless activities, and planned/organized scepticism – that all ideas must be tested, subject to rigorous scientific rules and public disclosure. The authors discuss these principles and connect them with scientific and research practice in Slovenia and abroad.

Research limitations/implications:

Research results are generalisable as deviance in science occurs in all cultures and have a global impact. Deviance in science is still an under-researched taboo topic and it needs to be discussed.

Practical implications:

A useful source of information for awareness raising and the improvement of quality of research work.

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Originality/Value:

This paper extends understanding of possible deviance in science and factors related to such practices. The main value of this reflection is to facilitate understanding of factors of deviance in science and trigger a discussion on deviance among scientists.

UDC: 001.8

Keywords: science, deviance, research, academic promotion standards, strain

1 INTRODUCTION

Dealing with scientific and research activities, and membership of the scientific communities, are more complex now than they were in the past. Not only because science continues to develop and the number of researchers keeps on increasing, but also because, consequently, the knowledge base that must be absorbed keeps on growing, and the knowledge of scientists is ever more specialized, requiring increased collaboration (Committee on Science, Engineering, and Public Policy, National Academy of Sciences, National Academy of Engineering and Institute of Medicine, 1995). Science is increasingly subjected to public control, especially the part that is financed from public budgets. With an increasing number of specialist subjects in science, and scientists, the probability increases that more and more will break the rules and the norms. The behaviour of such individuals is damaging to the reputation of science, and undermines the professional integrity of scientists and public trust.

Scientists are persons who systematically pursue science, who research and seek the truth in their research, and therefore responsible behaviour is expected of them. It is also expected that they are among the first to honour values such as integrity, honesty, trust, and truth. Science is not value free, people select values that are pursued or imbedded in the science. Respecting these values and acting according to them show personal and professional integrity. Occasionally, reports appear that resonate very loudly with the public, disclosing deviant behaviour by individual scientists, prompting many questions and dilemmas in both professional and lay public. The most publicised case is that of Hwang Woo Suk, a South Korean scientist, who was found to have forged the results on a series of studies of human stem cells (Kakuk, 2009). This and other such cases directly affect opinion on questionable science integrity, and show the well-founded mistrust felt towards scientific claims. Therefore, it is necessary to emphasize that a small number of scientists sometimes cause doubt about science and scientists in general.

By using suitable sanctions against individuals, promoting science, demanding correct ethical behaviour, and using the education process, internalization of the research ethic is attempted. By performing research activities according to ethics, deviant behaviour by individual members of the scientific community is reduced, and the expected reputation is achieved not only within the scientific community but also in the broader community (Panel on Scientific Responsibility and the Conduct of Research, 1992, 1993).

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A piece of the mosaic in discussions about deviance in science is this article, which focuses on specific deviant behaviour that could be considered part of "questionable research practices" (ibid.). Such behaviour is discussed within a relatively narrow social category, namely the workplace. In particular, we are interested in workplaces manned by employees whose primary function is scientific research. We are interested in prevalence and forms of such behaviour and the measures that can be taken to avoid and prevent such behaviour. This article also discusses the categories of deviance, norms, ethics, and integrity - according to accepted norms of scientific research as defined by Merton (1973). Ethics and morality should be a constituent part of every profession. Science is not just a dry, impersonal activity, it has values as well.

2 CATEGORIZATION OF SUITABLE BEHAVIOUR IN SCIENCE

In order to regulate life in society, norms are required that regulate people's behaviour. Therefore, categories should be used which show that people in this stimulus-rich world orientate, judge, evaluate, and compare. One such categorisation (Vec, 2007) is the distinction between right and wrong. Including norms, such as social, ethical, legal etc., we can distinguish two categories of people: those who act according to the norms, thereby acting in the "right" way, and those who do not, and consequently act in a wrong, deviant, and questionable way.

The above categorisation of people is simple at a visible (manifest) level: we either act rightly or wrongly, while at a hidden (latent) level, there are complex nuances and variations. ''Correct behaviour" is desirable and the goal of the whole of civilisation[5], whereas incorrect, deviant behaviour is considered to be more or less important, with minor or major consequences. Selgelid (2007) describes the dilemma in the context of national security risks: should certain biological research be published at all, if there is the possibility that it will be abused for criminal purposes?

The basics for suitable behaviour by scientists were set by Merton (1973) and divided into four categories:

- publication of insights/sharing of ideas (i.e. communalism) – this means that insights are shared with others, and scientists disclaim intellectual rights of their own findings in order to gain recognition and reputation;
- impartiality/universalism – truth is judged by universal, impersonal criteria, rather than based on race, social and economic status, gender, faith, nationality, or other subjective categories;
- non-profit orientation/ impartiality (i.e. disinterestedness) – scientists are selfless and the prevailing motive for scientific work is not acquiring material gain;
- planned/organised scepticism – all ideas must be tested and subjected to rigorous scientific and public disclosure rules.

Ethical behaviour by scientists and adherence to ethical norms and codes of conduct is important. In Slovenia, there are the Code of ethics of the University of Ljubljana (Etični kodeks Univerze v Ljubljani, 2009), Code of university professors in Slovenia (Kodeks univerzitetnih profesorjev Slovenije, 1991), and Public servant

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code of conduct (Kodeks ravnanja javnih uslužbencev, 2001), all of which can be positioned in scientific and research work.

Resnik (2010), starting from the goals of ethical norms and standards, lists the following reasons for correct behaviour: (1) promotion of goals in science, (2) promotion of values that are crucial for collaboration, (3) enabling determination of the responsibility of scientists, (4) help with norms for acquiring public support for research, and (5) promotion of other important moral and social values.

Ethics in research, according to Baarts (2009: 423) is nowadays no longer a question of internalised values of ethical codes, but rather is integrated into the higher educational practice of teaching and research work and is largely dependent on the qualities and abilities of the researcher, particularly in regard to discernment, imagination, and personal authenticity. Conscious implementation of ethical behaviour requires researchers to perceive and understand scientific and political interests and be aware of the most recent scientific insights of a certain area of research, as well as political debate and controversy arising from the theme with which they are dealing. Discernment includes the ability of the researcher to foresee the consequences of their decisions and activities, as knowledge and highly specialised professional experience alone are insufficient to produce ethically suitable behaviour. One needs ability of imagination as well (ibid.: 433). It is possible that these "traits" might be in conflict with one another.

Partiality refers to scientific politics, as researchers can argue a viewpoint that differs markedly from the generally accepted truth in a certain field, based on their knowledge. Even though science considers neutrality as an ideal, in practice life can be too complicated for general, clearly defined and neutral positions. Therefore, it often occurs that scientists argue a viewpoint, causing them to become partial (ibid.: 434). Personal authenticity in decisions and activities is also connected to partiality, depending on the scientist's ability and will-power to include facts that do not fit their own convictions and values (ibid.: 435).

3 INTEGRITY IN SCIENCE

Lately, the concept of integrity is used with increasing frequency in public service and other social activities. The Act on Integrity and Prevention of Corruption (Zakon o integriteti in preprečevanju korupcije, 2010) defines integrity as: "*expected behaviour and responsibility of individuals and organisation in preventing and abolishing risks that power, function, authorisation or other competencies for decision-making that would be used contrary to the law, legally acceptable goals, or ethical codes*". Slovar tujk [Dictionary of foreign words] (Bunc, 1998: 196) defines integrity as *"wholeness, completeness, coherence, totality"*, whereas Slovar slovenskega knjižnega jezika [Dictionary of the Slovenian Language] (2002) defines it as *"completeness, cohesion: a person's internal integrity; personal integrity: integrity and completeness"*. A more complete discussion on various uses of the concept of integrity can be found in the *Stanford Encyclopaedia of Philosophy* (2001). This source has a different use of the concept. Namely, this concept can be used as a value; in this case it means a quality of character or personality of an individual. If this concept is used in

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the sense of the integrity of a person (not a personality), its use is based on two basic premises, namely: the formal relationship to one's own inner-self or the relationship between parts or aspects of an individual's inner-self (integration of inner-self); or integrity has an important connection with the moral behaviour of an individual. Furthermore, the concept can be used in the sense of maintaining one's own identity, as a standpoint towards something, or as a moral goal. It is necessary to emphasize that integrity has many meanings, social, psychological, transactional, political, interpersonal, and others. Often integrity is assessed on 1) the characteristics of a particular individual as understood by others, or 2) the actions taken by an individual judged on some external criteria imposed as representing integrity.

The concept of integrity can also be used so that it relates to objects (e.g. unspoiled nature, untouched by man). In that case, it means wholeness, impeccability, and pureness of an entity. The concept is also frequently used as an attribute of certain parts, or aspects of, human life, such as professional integrity, intellectual integrity, and artistic integrity. There are many versions of integrity, among them standards of scientific replication, which assure that the results attained in one inquiry can be tested in others.

4 DEVIANCE IN SCIENCE

Deviant behaviour in science can be divided into 3 categories, according to their intensity and impact: fabrication, falsification, and plagiarism. Fabrication is when a scientist fabricates data or results. Falsification is when data or results are falsified; and plagiarism is using other people's ideas and words without quoting them properly[6] (Panel on Scientific Responsibility and the Conduct of Research, 1992: 27). This is similarly stated by Swazey, Anderson, and Louis (1993), and Fanelli (2009), who further broke down falsification of data to: (1) shaping data with the aim of increasing the importance or validity of data, (2) using questionable statistical correlations between variables, and (3) selective publication of only that data supporting expectations of a researcher, or the sponsor of research.

Other deviant activities is behaviour that can be construed as deviation from moral or legal norms and which are not directly linked to research practice (Swazey et al., 1993) or represent *unacceptable behaviour which is specific not only to behaviour in science, even though it can occur in the research environment and is subject to general legislation and penalisation* (Panel on Scientific Responsibility and the Conduct of Research, 1992: 29).

De Vries, Anderson, and Martinson (2006) further describe deviant behaviour in science in certain research environments. These represent unethical conduct which is, nevertheless, necessary to allow scientists to face the dilemmas regarding correct behaviour, uncover violations, and set the foundation for new norms and rules of research, and ensuring a higher degree of integrity of scientific and research work, according to the principle that every bad thing has some good aspect.

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5 REASONS FOR DEVIANT OF BEHAVIOUR IN SCIENCE

There are several ways of explaining deviance in science. Resnik (2010) quotes two main theories. The first is the rotten apple theory, according to which most researchers are highly ethical in their work, while only a few corrupt, economically desperate, or psychologically disturbed researchers do not adhere to research ethics. The other is the theory of a stressful or incomplete working environment, which states that it is the various institutional pressures, stimulations, and limitations, that push researchers to break the rules of professional ethics. These pressures include deadlines for publishing articles, contracts, career ambitions, material gains and fame, bad management of students, and bad control of researchers. Such pressures are everywhere in the modern world, so they do not differ from pressures in scientific research. This theory also includes the idea that peer review is far from perfect as it allows various inconsistencies and fallacies. For that reason, articles based on fabricated or partially fabricated data are published. Taylor (2009) finds that part of the reason for these inconsistencies is the inefficient self-regulation in science. He further states that the large number of standards, committees, and academies, make self-regulation non-functional and unsuccessful in reacting to deviant behaviour by scientists, particularly because it is fragmented, poorly interconnected, and does not include scientific and public consensus.

Sovacool (2008) states that reasons for deviant behaviour by scientists can be explained in 3 ways, and presents solutions for individual types of deviance. Deviance in science can be understood as a *psychological problem of corrupt individuals*, where selfish motives by these individuals are the cause. He sees the solution for such causes in suitable monitoring and evaluations that ensure correct conduct by the scientists. Then, there are reasons within the *scientific control system*, where the main reason lies with institutions that pressure scientists to increase their research in order to achieve advancement and, thereby, recognition of their work. The solution, as envisioned by Sovacool (ibid.), is in improving the quality of monitoring scientific and research work in universities and on editorial boards of peer-reviewed journals. The third reason is a structural problem of society – *ineffectiveness of scientific institutions in promoting suitable values.* Motivation of scientists can be different at a personal level (personal-psychological or personal-economic), whereby accepted structural values and norms that should be promoted by science represent a problem.

One of the studies on reasons for deviance in science was made by Davis, Riske-Morris, and Diaz (2007). They analysed various documentation of the Office of Research Integrity. Based on multi-dimensional scaling and classification into groups, they defined seven clusters that describe the reasons for deviant behaviour of scientists:

- *personal and professional stressors* – stress due to publications, cognitive deficiency, stress and pressure in general, superior expectations, lack of support systems, overworked/insufficient time, pressure on self/over-committed, personal insecurity, bad judgment of results and carelessness, personal problems, psychological problems, denial of an injury, denial of negative intent, stressful job, an insecure position, and the desire to succeed;

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- *organizational climate factors* – professional conflicts, insufficient supervision and a lack of mentoring, non-collegial environment, sub-standard lab procedures, poor communication and coordination, lost, stolen or discarded data, reliance on others and condemnation of condemners;
- *job insecurity* – inappropriate responsibility, poor supervision, competition for a better position, and language barriers;
- *rationalizations A* – jumping the gun and lie to preserve the truth;
- *rationalizations B* – fear, apathy/dislike/desire to leave, avoiding degradation, and slippery slope;
- *personal inhibitions* – difficult job/tasks;
- *personality factors* – impatience, public good over science, amnesia, laziness, character flaws, recognition.

6 QUESTIONABLE FORMS OF RESEARCH PRACTICE

Questionable research practice is defined by the Panel on Scientific Responsibility and the Conduct of Research (1992: 28), which states that the following conduct is problematic:

- Failing to retain significant research data for a reasonable period;
- Maintaining inadequate research records, especially for results that are published or are relied on by others;
- Conferring or requesting authorship on the basis of a specialized service or contribution that is not significantly related to the research reported in the paper;
- Refusing to give peers reasonable access to unique research materials or data that support published papers;
- Using inappropriate statistical or other methods of measurement to enhance the significance of research findings;
- Misrepresenting speculations as fact or releasing preliminary research results, especially in the public media, without providing sufficient data to allow peers to judge the validity of the results or to reproduce the experiments.

Resnik (2010) enlists more examples of questionable research practices. The scientists employing such practices are mostly guilty of the following conduct:

- Publishing the same paper in two different journals without telling the editors in submitting the same paper to different journals without telling the editors;
- Not informing a collaborator of your intent to file a patent in order to make sure that you are the sole inventor;
- Including a colleague as an author on a paper in return for a favour even though the colleague did not make a serious contribution to the paper;
- Discussing with your colleagues confidential data from a paper that you are reviewing for a journal;
- Trimming outliers from a data set without discussing your reasons in paper;
- Using an inappropriate statistical technique in order to enhance the significance of your research;

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- Bypassing the peer review process and announcing your results through a press conference without giving peers adequate information to review your work;
- Conducting a review of the literature that fails to acknowledge the contributions of other people in the field or relevant prior work;
- Stretching the truth on a grant application in order to convince reviewers that your project will make a significant contribution to the field;
- Stretching the truth on a job application or curriculum vitae;
- Giving the same research project to two graduate students in order to see who can do it the fastest;
- Overworking, neglecting, or exploiting graduate or post-doctoral students;
- Failing to keep good research records in Failing to maintain research data for a reasonable period of time;
- Making derogatory comments and personal attacks in your review of author's submission;
- Promising a student a better grade for sexual favours;
- Making significant deviations from the research protocol approved by your institution's Animal Care and Use Committee or Institutional Review Board for Human Subjects Research without telling the committee or the board;
- Not reporting an adverse event in a human research experiment;
- Wasting animals in research;
- Exposing students and staff to biological risks in violation of your institution's biosafety rules;
- Rejecting a manuscript for publication without even reading it;
- Sabotaging someone's work;
- Stealing supplies, books, or data;
- Rigging an experiment so you know how it will turn out;
- Making unauthorized copies of data, papers, or computer programs;
- Owning a substantial number of stock in a company that sponsors your research and not disclosing this financial interest; and
- Deliberately overestimating the clinical significance of a new drug in order to obtain economic benefits.

De Vries et al. (2006: 48) present similar behaviour. However, they classify it into four categories:

1. Meaning of data
   - Dropping observations or data points from analyses based on a gut feeling that they were inaccurate;
   - Inadequate record keeping related to research projects;
   - Cutting corners in a hurry to complete a project;

2. Rules of science
   - Ignoring minor details of materials-handling policies (biosafety, radioactive materials, etc.);
   - Using funds from one project to get work done on another;

3. Life with colleagues
   - providing an overly positive or overly negative letter of recommendation;

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- Using one's position to exploit others;

4. Pressures of production in science
   - Changing the design, methodology or results of a study in response to pressure from a funding source;
   - Withholding details of methodology or results in papers or proposals;
   - Using another's ideas without obtaining permission or giving due credit.

7 PREVALENCE OF DEVIANCE IN SCIENCE

Based on a study including 2000 doctoral students and 2000 university employees, Swazey et al. (1993) find that deception in science is anything but rare. They report that 6 to 9 percent of students and university employees disclosed that they know students and professor who published plagiarised articles or falsified data, whereas university employees report an even higher percentage of such conduct among students (approximately 30 percent). Conversely, Resnik (2010) states that there are relatively few violations in science and this is a difficult issue to research. Those that were examined and proven amount to only 0.01 to 1 percent of questionable research practices annually. A somewhat higher percentage of violations in science was found by Fanelli (2009) based on a meta-analysis. Taking a sample of 18 studies, he found that the percentage of researchers with at least one major violation of scientific rules was 1.97 %, while 33.7 % were guilty of "*other questionable research practice*" at least once. An even higher percentage of violations was found in responses to questions about such behaviour in colleagues. The proportion of at least one major violation of scientific rules was 12.95 %, while the percentage of other questionable practices was 72 %. This study also showed that when reviewing deviant behaviour, it was most often reported in medical and pharmaceutical research circles.

Swazey et al. (1993), also found that 43 % of all university employees knew of colleagues who inappropriately, or incorrectly, used university resources for their personal needs, while nearly one third know others who inappropriately assigned authorship in research contributions. Furthermore, 22 % of university staff believed that their colleagues used data in a sloppy manner, while 15 % of university staff knows of cases where the same authors interpreted the same results in different ways in different publications. Approximately half of the sample of students and university employees reported exploitation of others, and approximately a quarter of the sample of both groups reported sexual harassment and discrimination, based on the personal characteristics of individuals.

8 IMPROVING INTEGRITY IN RESEARCH ACTIVITY

The Panel on Scientific Responsibility and the Conduct of Research, committees, and academies, published 2 brochures (Panel on Scientific Responsibility and the

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Conduct of Research, 1992: 145-155; 1993) which are also available on the internet and contain recommendation for responsible research practice, as follows:

- Scientists and officials in research institutions should assume responsibility for ensuring the integrity of the research process. They should encourage the development of a suitable working environment, and a reward system and training for responsible research practice.
- Scientists and research institutions should include training programmes that stimulate awareness of students and university staff regarding the integrity of the research process.
- Acceptance of formal guidelines for research gives universities and research institutes a chance to define suitable research practice.
- Research institutes and government agencies should accept the definitions for distinguishing between inappropriate conduct and questionable research practice and other forms of inappropriate conduct in science that is based on fabrication, falsification, and plagiarism. Government agencies should review their definitions of inappropriate conduct in science in order to remove ambiguous categories, such as "other serious deviations from accepted research practice."
- Government agencies should establish clear policies and procedures for handling complaints on inappropriate behaviour in science. Such agencies should accept the definitions of inappropriate and inacceptable practices and the procedures for those that violate them. Research institutions and government research agencies should have procedures in place that ensure suitable and immediate response to accusations of inappropriate behaviour in science. Research institutions must encourage efficient and acceptable methods for determining and handling incidents regarding inappropriate behaviour in science and must strengthen the enforcement of policies of suitable conduct in science and execution of procedures.
- Scientists and their institutions must act in such a way as to deter researchers from questionable research practices through formal and informal monitoring practices in the research environment. They should also accept the responsibility for making decisions for which questionable research practices are severe enough to require punishment. Methods used by individual scientists and research institutions when handling questionable research practices should be separate from those that are used for handling inappropriate behaviour in science and other inappropriate behaviour (note by the authors: irregularities are not always intentional deviant behaviour but can also be caused by lack of experience, lack of knowledge and inadvertent mistakes).
- Research institutions should have procedures in place for handling other negative behaviour – such as theft, bullying, and vandalism that can occur in a research environment.
- Government research agencies must define their role in handling inappropriate behaviour, and other inappropriate behaviour and questionable research practices. Even though government agencies have specific responsibilities for handling inappropriate behaviour in science, their role in handling the issues on research practices should be in the role of support for the efforts made by

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scientists and research institutions to deter such practices through educational processes and peer review.

- The scientific community and research institutions should form an independent consulting institution for scientific integrity and ethics that will deal with handling ethical issues in research practice, designing model policies and procedures regarding inappropriate conduct in science, and other inappropriate conduct. Furthermore, they should collect and analyse data on inappropriate conduct in the research environment and perform continuous evaluations of suitability of public and private systems for handling inappropriate behaviour in science, and facilitate exchange of information and experience with policies and procedures for handling accusations regarding inappropriate behaviour in science.
- The important role that is played by individual scientists in disclosing incidents of inappropriate conduct in science must be supported. Individuals who, in good faith, report suspicion of inappropriate conduct in science, deserve support and protection. Their efforts, as well as the efforts of those collaborating in the procedure, can be invaluable in preserving the integrity of the research process.
- The scientific community and journals should continue ensuring and disseminating information and forums that encourage responsible research practice and react to irregularities in science and questionable research practice.

Some researchers used the aforementioned recommendation as a starting point for their studies. Resnik (2010) suggests emphasising the importance of education and training on research ethics, while Iverson, Frankel, and Siang (2003), stress that scientific associations have been actively encouraging training for scientific and research work and promotion of ethics. They find that the effects of their efforts have not been monitored. Hansson (2000: 79) finds that in the first place, internal control should be emphasised, and only then should external control be attempted. Internal control means relying on the usual procedures of ensuring quality of research and the willingness of the individual to perform their work according to ethics. External control means reliance on repressive actions in order to affect undesirable behaviour by punishment. Mitcham (2003) proposes development of social co-responsibility between scientists and citizens. He does not only focus on scientific integrity as a research process within science, but in the context of the science – society relationship. He starts from the unpredictability of social roles and states that the important social role of scientists has always been present. However, scientists should, rather than assume individual responsibility, try to respect the collective responsibility of their social role through professional associations and in collaboration with institutions, such as universities, research institutes (where they work), scientific journals (where such work is published), government institutions (which support and fund research activities), media (which popularise scientific results) and courts (which occasionally sentence major violators). In academia, there is a strong belief that creative scientists always deviate from accepted practice and, therefore, in the opinion of academia, ethos encompasses such creativity rather than just strict schematic use of methods. In the philosophy of science, one must

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consider that each scientist plays multiple roles (which can occasionally conflict one another). They also see unwanted consequences of their work as a stimulus for forming new general principles, for building bridges between human rights and science. They must also assume the responsibility of the role which is not just passive acceptance of the role but rather active deliberation on creating their own roles at the same time as the roles create them (e.g. professional development, education in science and public policy, and the inter-weaving of these elements). Evans and Packham (2003) propose that, in the context of collaboration between science and economy, and in the context of conflict of interest, internationally accepted guidelines be created which would represent protection of the basic purpose of universities and schools and ensure their independence. Demšar and Boh (2006) propose a concept of the "invisible hand of the public" in a case study of the Slovenian Research Agency, where they argue for transparency at all levels of the science and research system.

9 DISCUSSION

Even though deviance in science is a very interesting subject, research is very limited. Ben-Yehuda (1986) speaks of the idealisation of science within Merton's principles and its planned approach to studying various problems. Institutionalization of science brings certification of knowledge (Merton, 1973). The central norms in science are *universalism*, which concerns validity and truthfulness of research findings, which are not affected by the personal characteristics of researchers; *publication of findings*, which concerns sharing scientific insights with others, and which considers confidential research as the antithesis of scientific research. *Non-profit orientation* applies to the fact that research should not be a matter of the researcher's gain (as in material gain) but a matter of the researcher's wish for furthering knowledge; and *planned scepticism*, which is based on the idea of scientists honestly, publicly and truthfully, judging each other's work. Following these norms should prevent deviance in science, but on the other hand, such norms contribute to the problems of control in science. As stated by Storer (1977), these norms were created in order to be maintained and strengthened by the scientists' need for acknowledgement of their work and the organisation of knowledge.

Deviance, including deviance in science, is, according to theory on public control, a consequence of the loss of the preventive power of social institutions. It is necessary to consider the power of control mechanisms that prevent deviance. Theories of public control are usually directed at two mechanisms. The first is internal control or internalised norms and socialisation processes. The others are external mechanisms – family, community, and control institutions. Mechanisms of social control in science work in the same way as controls in other areas. Training and educating scientists (researchers and university staff) is a long-term process in which, in addition to learning very specialised skills and the dissemination of knowledge, norms and methods of scientific research are internalised. Scientists are taught how to use various scientific methods and that the highest ideal of their work is seeking the truth. Cheating, lying, and similar violations are considered

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to be unacceptable or even incomprehensible in the scientific community. The first loyalty of the scientist is their professional ethics (Zukerman, 1977).

What are the external forms of control in science? The first is the *publication of knowledge*, while the second is *planned scepticism*. These two mechanisms stress public control, the publication of knowledge that is accessible to all, and the ability of scientists to be sceptical regarding their work and that, despite their knowledge of methodology, they doubt the power of methods used in their research. The third factor is *replication* which allows the research to be replicated in the same way as the authors did in their publication. Nevertheless, science is based on trust, as currently, there is no police force that would deal exclusively with criminality and deviance in science. The scientific community police themselves. There are, however, ethical committees, which decide on the acceptability of research in certain areas and monitor the progress of research (Ben-Yehuda, 1986).

The first Merton norm is *universalism or impartiality.* The perception of truth in science is not always separate from the personal characteristics of an individual. The procedure for discovering the truth and innovation depends on the personal characteristics of the researcher. It is important to be aware of a fact that the truth is a difficult concept in science. Objectivity, clarity in method and finding are aspects of science that give confidence to results – but truth remains elusive. Moreover, in science where interpretation is prevalent, such as in sociology, interpretation can be negotiated, and such negotiation is based on the reputation and the views of the scientist presenting their "truth". Differences in perception and interpretation of truth is also found among representatives of various schools in scientific disciplines, making it possible for interpretations of the same problem to be diametrically opposed.

The second norm – *the publication of knowledge* – is certainly suitable from a control point of view. However, scientists tend to hide their ideas. The most typical example is confidential research. In addition, scientists conceal their research results because of competition and the fear that somebody may steal their ideas. Accessibility of data used by researchers in their work is an important problem that is linked to replication of studies and comparison of data between the studies. Furthermore, exchange of ideas is costly. The delay between research, presenting a paper, and publishing an article, can be up to two years. Conferences, congresses and informal meetings have become the prevalent form of exchanging new ideas. Networking and informal exchange of data present an opportunity for more intense and faster contribution to science. However, attending international meetings and participating in international networks, is expensive, and institutions and individuals who cannot afford to participate in such meetings and networks are left outside the mainstream, have no influential publications, and are not members of elite research teams.

Planned scepticism is a significant challenge for scientists. Older, respected, and established scientists have a markedly better position than their younger colleagues in cases of criticism, as many are sufficiently frustrated by harsh criticisms at the beginning of their careers as to be deterred from scientific work. The next element of scepticism is reviews of articles, which should present constructive criticism, but are, in practice, often aggressive, insulting, or impertinent. An author submitting

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their paper to a journal will be given feedback by an anonymous reviewer who, as a rule, will get the article without any data on the author. This means that the author and the reviewer cannot meet and discuss their differences[1]. Critical remarks often cause anger and aggressiveness in authors who do not agree with the reviewers' findings. In addition, qualified reviewers of a certain field are few, making it easy for them to recognize others. Some authors know each other, and even though the editor deletes author data, the reviewer that is pursuing a similar or same theme can recognise the author from a few sentences or thoughts. This is especially typical of smaller or more focused research communities. An advanced paper being reviewed by a conservative reviewer is bound to attract critical response and thereby possibly frustrate the author. The choice of reviewers is critical, as reviewers in their writings often project their views of a certain theme. Qualified reviewers are relatively few and the editor can pick a reviewer who will probably eliminate a certain article or pick another who likes the articles. Reviewers' comments can be encouraging, full of advice for improving a paper, and constructive, but can also be nonsensical, full of pre-judgements, impertinent, and useless. Therefore, the role of the editor is very important. It is quite often that editors have become referees, they do not often exercise appropriate editorial prerogatives.

The next norm is the *non-profit orientation*, which is difficult to achieve as the modern consumer society is primarily concerned with earning, having, and spending. The rewards scientists expect for their work vary. There are two common types of rewards – personal psychological, and personal financial. The first is about prestige, glory, recognition, respect, international renown, and awards and honours. These are far from being non-profit oriented, as the scientists depend on government representatives who include them into constructing policies and discussions on national, international, social, and several other matters. Some scientists thrive on media appearances and are willing to alter their research results or appropriate the work of others for fame and popularity. In some cases, being a media figure also brings large fees. The other motive, personal financial gain, is evident from intense efforts by scientists to be socially secure and, in some cases, have a luxurious life. Several scientists travel across the world based on their research work, and trips sponsored by pharmaceuticals, energy companies, are particularly interesting. There are also scientists who are on a government payroll and perform several projects, including those for which they have no references. In that case, they find an expert and pocket commission and obtain co-authorship.

Replication of research is unfortunately not very highly regarded in social science, as it is only checking the findings of previous studies using the model someone already used in the past. In science, innovation is very important, thus reducing the worth of replication. Nevertheless, replication is an essential research approach in longitudinal research and inter-cultural comparisons, as each replication adds something new. Perfect replication based on articles and other publications is very difficult to achieve, as these do not usually contain all details necessary to perform the study. Very few scientists wish to be known as

1 *Of course anonymity is also a safety instrument, preventing a priori discrimination because of the reviewer's feeling towards the author. This does not apply to small scientific communities where communication between scientists is open and constructive.*

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mere replicators of studies done by others (Weinstein, 1979). It is also known that complete replication is, in most cases, impossible as the original data has either been lost or is inaccessible. Replication is primarily concerned with experimental disciplines, as replication in interpretative disciplines (sociology, anthropology etc.) is mostly impossible. In addition, cheating when entering the data into the database should be considered, as it is almost impossible to determine false entries once the data is entered. There are known cases when researchers targeted a certain number of respondents in a studied sample and, in case of a bad response, simply doubled the entered data to obtain a sufficient "sample" size (Craig & Reese, 1973).

A decision on breaking the rules depends on an individual's evaluation of how likely they are to be caught, and the severity of punishment. In science, the possibility of either is very small. The high degree of specialisation is another reason that deviance in science is difficult to detect. When a police officer suspects a crime, they adhere to the provisions on the Criminal Procedure Act and start gathering evidence. Whom should a scientist notify if they suspect a colleague is cheating? Who should perform the procedure, considering the fact that the procedure for discovering falsifications in science is very difficult and complicated? The key question that should be asked at this point is who is the victim of deviance in science, who should report it, and to whom they should report. In addition, there is victimisation to consider, especially secondary victimisation – is the person that reports such an act judged more harshly than the perpetrator? There are ethics boards, institutional review boards and even funding agencies which take complaints about scientific work so several previous questions can be considered rhetorical.

Punishing scientists who break the rules is a very rare occurrence. In most cases, the investigation is not followed by court proceedings. The representatives of research institutes usually have no problem reacting to dishonest and incorrect work by a researcher. Usually, dismissal from work is the result, except in very public cases involving large frauds and large-scale falsification of data, followed by sanctions outside the institution, including the existing (penal) legislature. In comparison to other frauds (Kanduč, 2009), punishment of fraud in science is less strict (Ben-Yehuda, 1986). Some agencies started using blacklists of untrustworthy project contractors. The usual practice for responding to inappropriate behaviour is to convene a court of honour as prescribed by various codes. Such courts evaluate the work of individual specialists in case there is a question regarding honesty and professional conduct.

In Western countries, especially Great Britain and the USA, the expansion of research work started in the 1970s. The characteristics of that period are reminiscent of the current state in Slovenia, particularly regarding marked pressure to publish in international journals and acquiring references for candidature in national and international research projects. Ben-Yehuda (ibid.) stresses the fact that inability to publish research results meant an exclusion of an individual from the scientific environment. Researchers who were unable to publish the results of their research quickly enough and not in good relations with the editors, were in trouble. On one hand, they could not advance in the academic environment and acquire high-ranking titles and, on the other, they were excluded from national financing. The

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'publish or perish' mentality stems from that period. Sket (2006) published an article with a similar title in which she states the position of Slovene criminologists when publishing in international journals with Social Science Citation Index. Deviance in science became a subject of the so-called criminology of science in the mid-1980s (Ben-Yehuda, 1986), and an important part of some textbooks from the field of methodology of criminological research (Hagan, 2003). The Hagan textbook is one of the few that dedicates a large portion of the content to a critical view on various forms of deviance in science, informing under-graduate and post-graduate students of criminological research methods about the interesting thematic of deviance in science. In addition, Hagan states that even at undergraduate level, more attention should be paid to personal growth of the students and less to memorising facts and competitions that lead to 'ingenuity' of some students.

What can be done to reduce deviance in science? Preparing students for research work, responding to plagiarism during study, and developing the values of a critical academic environment is, in addition to well-coordinated team work, an important contribution to the criticism of deviant behaviour in science. This article shows the causes and the forms of deviance in science and the possible responses to it. In Slovenia, the rules of the game in science should be re-considered, as it is more and more oriented towards 'academic production' and quantitative measurement of scientific success, which can lead to scientists using tricks to achieve this goal. In addition, evaluation of the success of scientists should be reconsidered. There is another problem, which exceeds the purpose of this writing, regarding the influence of scientific research results in the international and national environments. Due to the ever-increasing role of international impact and publication, in international journals and other publications, certain researchers are less well known at home than in the international environment.

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About the Authors:

Gorazd Meško, Ph.D., is Professor of Criminology and the Dean of Criminal Justice and Security faculty at the University of Maribor, Slovenia.

Aleksander Koporec Oberčkal, Ph.D. in Organisational Sciences and B.A in Psychology. He is employed with the Police Directorate in Kranj, Slovenia.

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