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LETTER TO THE EDITOR

Ethics in Science – Unconscientious Scientists

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INTRODUCTION

Scientific research activities are in general built on trust that the results published by other researchers are performed without bias, *i.e.,* correctly and honestly, considering primarily the facts. Such scientific behaviour enabled the enormous scientific productivity, which resulted in the fast progress of mankind.

Misconduct in research is a serious obstacle to this progress but, fortunately, misconduct tends to be a unique rather than a routine event in most scientific institutions. It is therefore to be expected that scientific institutions are not prepared and do not know how to deal with scientific misconduct. In the USA, the Office of Research Integrity (ORI) is prepared to provide technical assistance to any institution that wishes to respond to an allegation of research misconduct through its *Rapid Response Technical Assistance Program*.

Efforts to respond to scientific misconduct and promote responsible conduct in research are being made by several countries around the world. Web sites have been developed by organizations in some countries to deal with these subjects. Some articles describing typical misconduct cases can be found in the *ORI Newsletter.*

MISCONDUCT IN RESEARCH CAN OCCUR IN MOST PRESTIGIOUS WORLD INSTITUTIONS

Nobody is perfect. In ethical sense, scientists are not perfect either, but the public expects the highest standards just from them. Extreme cases of irresponsible behaviour of scientists are fabrications of scientific results, falsifications and plagiarism are rare, though they can occur even in leading world institutions. This, *e.g.,* happened in 1955, during the stay of the author of this article at the University College London where a young lecturer, whom the University considered excellent, published »experimental results« which he never performed. As a good theoretician, he anticipated how his reaction system should behave and he published the fabricated results wishing to have as many publications as possible. But, his colleagues in the lab did not see him actually perform the described experiments, and he could not provide any evidence of having done them. He had to leave the University College London. I did not hear about him for several years. Then, I heard that he got a position at a minor scientific institution in the USA. Some 30 years later I met him at an international chemical conference, and we talked. I tried to appear as relaxed as possible, having a feeling that he had suffered enough and that, after so many years, it was time for oblivion.

Such events are more frequent than we usually think. One example came to light a couple of years ago when it was discovered that, according to Sophie L. Rovner, *Chem. Eng. News*, April 26, 2004, p. 34, a Bell Labs physicist (the Journal quotes his full name) working in the field of molecular electronics, had apparently fabricated data.

In further discussion of ethics in science, S. L. Rovner made a most important and very concrete point telling us that »what you publish, what you present, can really impact the working lives of other people«. This is why the ethical responsibility of a scientist is of paramount importance.

In the article entitled »*Scientists behaving badly*« by B. C. Martinson, M. S. Anderson and R. de Vries, *Nature* **435** (2005) 737 (13 references), the authors pointed out that »our evidence suggests that mundane »regular« misbehaviours present greater threats to the scientific enterprise than those caused by high-profile misconduct cases such as fraud.«

In 2000, the *US Office of Science and Technology Policy* defined research misconduct as »fabrication, falsification, or plagiarism in proposing, performing, or review-

ing research, or reporting research results.« Findings of the above-mentioned authors have shown that US scientists are involved in a range of behaviours extending far beyond fabrication, falsification, or plagiarism. An anonymous survey, done in 2002 by B. C. Martinson, sponsored by the National Institute of Health, involved scientists at the University of Minnesota in Minneapolis and St. Paul. Survey respondents were asked whether or not they were engaged in questionable research practices. In the article, *Naughty Scientists, Chem. Eng. News*, June 27, 2005, p. 50, the author, Ron Dagani, concludes that the modern scientist faces intense competition and is burdened by various social and managerial demands. These demands create pressure on the scientist to accept compromises of scientific integrity.

The report of Martinson *at al.* in the mentioned article in *Nature* is based on anonymous answers of 3247 US scientists, aged between 35 and 44, who admitted being involved in actions regarded as misbehaviour. Furthermore, it is very probable that the scientists' behaviour was worse than Martinson *et al.* reported, because the worst offenders were probably reluctant to participate, in spite of the fact that the survey was anonymous, conclude the authors in *Nature*. Many researchers admitted that they were engaged in questionable activities within the previous three years, which can be ranked as sanctionable. Some of the questions and answers, considered most interesting by the author of this article, are quoted:

• Falsifying or »cooking« research data, – about 0.3 %

• Using another's ideas without permission or giving due credit, – about 1.3 %

• Unauthorized use of confidential information regarding one's own research, – about 1.5%

• Failing to present data that conflict one's own previous research, – about 6 %

• Changing the design, methodology or results of a study in response to pressure from a funding source, – about 15 %

• Publishing the same data or results in two or more publications, – about 5 %

• Inappropriately assigning authorship credit, – about 10 %

• Withholding details of methodology or results, – about 10 %

It could have been observed that the scientists tend to back away under pressure from a funding source.

HANDLING MISCONDUCT – ALLEGATIONS

The most useful advice comes from medical circles. The *Public Health Service* provides an overview of responses to allegations of research misconduct in biomedical research or research training. The role of two major figures in the process are discussed first – the »whistleblower« and the respondent. In principle, research misconduct tends to be a unique rather than a routine event. This is the reason why very few institutions have any significant experience in responding to allegations.

Because of the likelihood of retaliation against the whistleblower, the Public Health Service regulation obligates institutions to protect »to the maximum extent possible the privacy of those who in good faith report apparent misconduct«. According to the Office of Research Integrity, »A *good faith* allegation is made with the honest belief that scientific misconduct may have occurred. An allegation »is *not in good faith* if it is made with reckless disregard for wilful ignorance of facts that would disprove the allegation.« Allegations are made to the institution where the research misconduct has occurred. The institution's deciding official usually makes the final assessment. If this assessment differs from that of the investigation committee, the deciding official (usually the dean of the faculty) needs to explain, in the written form, the reasons for rendering a decision different from that of the investigation committee, and forward the report to ORI.

Many problems were encountered in scientific practice and American Congress created the *Commission on Research Integrity* in 1993, in response to continuing controversy concerning the apparent inability of the scientific community and the Federal Government to deal adequately with misconduct in scientific research. The Commission's 12 members, chaired by *Dr. Kenneth Ryan* of the Harvard University Medical School, were selected so as to include scientists, research misconduct investigators, and administrators of research institutions, attorneys, and ethicists. The Commission held public meetings monthly from June 1994 through October 1995, primarily in the Washington, D.C., area, and public hearings were held in San Francisco, Chicago, and Boston. These meetings brought up a range of opinions regarding weaknesses in the current institutional and federal policies and practice related to ethics and misconduct. Suggestions of improvements are of special importance. It was concluded that individual scientists, research institutions and professional societies have the primary responsibility for preserving research integrity and prosecuting research misconduct. The role of the Federal Government should complement and enhance that of institutions and societies, and federal intervention should occur only when institutional processes fail. It is said that developing and disseminating clear standards of behaviour best foster research integrity, whether by professional organizations or by research institutions or both. These standards should be reinforced through education at all stages of scientific development, and at all levels of research administration.

Recommendations of the Ryan Commission

The commission recommends that professional societies each adopt a code of ethics in research and encourage their members to use these codes as a framework for considering emerging ethical issues in science. In addition, professional societies should consider initiating activities that will further promote the ethical conduct in science.

It is also suggested that the societies should adopt a statement about integrity and misconduct in research, and teach scientific integrity through conferences, seminars, workshops, and classes at all educational levels.

It is also suggested that the professional societies should develop roasters of professionals from which institutions can draw unbiased members for investigatory bodies that consider allegations of misconduct. Finally, societies that publish journals might encourage publication of articles on research ethics and criteria for responsible authorship and publication practice.

Editors of scientific journals have a duty to report allegations of misconduct to the relevant institutions, to assist in the resolution of allegations of misconduct and, where appropriate, to correct the literature by publishing retractions that are clearly linked to the fraudulent publications.

The 46 pages Report of the Ryan Commission (see on *Internet*, under *Ryan Commission Report*) was addressed to The Secretary of Health and Human Services, The House Committee on Commerce and to The Senate Committee on Labor and Human Resources.

Everybody engaged in problems of ethics and misconduct in science should study this *Report.*

ETHICAL GUIDELINES TO PUBLICATION OF CHEMICAL RESEARCH
American Chemical Society
(Contact Internet under the above title)

Editors of the Publications Division of the American Chemical Society revised the guidelines embodied in this Document in January 2000. Editors of journals published by the American Chemical Society presented a set of ethical guidelines for persons engaged in the publication of chemical research, specifically for: Editors, Authors, and Manuscript Reviewers. It is believed that high ethical standards are so vital to science that a definition of those standards should be communicated to all concerned.

Ethical Obligations of Editors of Scientific Journals. – This section is divided in 9 paragraphs. Paragraph 1, *e.g.*, states (in shortened form) that an editor should give unbiased consideration to all manuscripts offered for publication, judging each on its merits only. An editor may, however, take into account relationships of a manuscript under consideration to other previously or concurrently offered by the same author(s).

Ethical Obligations of Authors. – This section has 11 paragraphs, but let us quote only paragraphs 1 and 4 for illustration:

Paragraph 1: An author's central obligations are to present an accurate account of the research performed as well as an objective discussion of its significance.

Paragraph 4: An author should cite those publications that have been influential in determining the nature of the reported work and that will guide the reader quickly to the earlier work that is essential for understanding the present investigation. …..An author is obliged to perform a literature search to find, and then cite, the original publications that describe closely related work. For critical materials used in the work, proper citation of sources should also be made when these were supplied by a non-author.

Ethical obligations of reviewers of manuscripts. – This section has 11 paragraphs and should be studied by every researcher. In this way, many potential conflicts of interests would be avoided.

Educational Program on Responsible Conduct of Research in Croatia

It is generally believed that *excellent science follows excellent ethics – bad science follows bad ethics.* Therefore, by neglecting teaching ethics at colleges students will receive incomplete education.

The author of this article talked to colleagues at the Faculty of Science of the University of Zagreb. It appears that presently there are no activities (lectures, seminars, *etc.*), in which scientific ethics would be taught to students at the undergraduate or graduate level. But, in the past there were at least some activities in this respect. According to a private communication from Professor Nenad Trinajstić, the late professor of physical chemistry at the mentioned Faculty, Božo Težak, held in 1962/63 a two-semester post-graduate course (25+0; 25+0), under the title *Methods and Techniques in Research.* His lectures were partly concerned with ethics in science. *E.g.*, he stressed that every research has *roots in the past, therefore earlier results must be quoted, which contributes to the mutual confidence among scientists and is morally justified*; he did not use the term *scientific ethics* but it was obvious that he talked about ethical behaviour of scientists. Professor Težak held a similar course for undergraduate students, as well. After Professor Težak's deaths in 1980, Professor Trinajstić took over his lectures for a short time at both undergraduate and graduate levels. Afterwards, the associate professor Đurđica Težak started her lectures on *informatics*, while Professor Trinajstić delivered only a few lectures on the *methodology of research,* talking shortly *on misconduct in research*, warning, *e.g.*, students that, according to the book by A. Kohn, *False Prophets*, Blackwell, Oxford, 1986, the ethical tres-

passers will be penalized sooner or later, at least by losing their prestige in the chemical circles.

It appears that there are currently no formal lectures on scientific ethics to students at the leading chemical faculty of the University of Zagreb – the Faculty of Science. According to the recommendation of the Ryan Commission Report, addressed to The House of Representatives, Washington, D.C., on November 3, 1996, integration of the explicit teaching of ethics of science into the classroom, laboratory and other research sites should be encouraged.

Regarding ethics in science and authorships, the book by A. Simonić, *Znanost* (Science), University of Rijeka and Vitagraf, Rijeka, Croatia, 1999, pp. 483 (ISBN 953–6059–28–2), is recommended.

The Author's Personal Experience Regarding Ethics in Science (at his Alma Mater, the University of Zagreb)

Croatia declared its independence from communist (»socialist«) Yugoslavia in 1991 and, after several months of fighting, was recognized by the European Community and other countries in 1992. Thus, the author of this article lived the greatest part of his scientific activity in the communist system, where physical private property was not protected. Regarding intellectual property, the situation was not defined, but the European and world norms and standards were actually followed, since the majority of Croatian scientists were educated in the United States or at the leading European universities. Indeed, the author's personal experience regarding ethics in science was satisfactory, with only one exception when two of his collaborators, working on his research project (endorsed and financed by the Ministry of Science of the Republic of Croatia) published an unfinished and inconclusive part of this project, without permission of the research-project author. This misconduct was an exception and could not change the author's belief that the scientific ethics in Croatia, even during the communist system, was satisfactory.

As we have seen, some leading chemical journals found it necessary to discuss ethical problems in science. There is a well-known saying that it is very important what was said, but it is even more important who said it. Consequently, scientific institutions should invite their leading scientists, professors of high scientific reputation, highly respected for their integrity, to talk to students on ethics in science.

It is to be hoped that this article will stimulate discussions on ethics in science and thereby contribute to the scientific progress of Croatia. Finally, the author of this article would like to suggest to the Editorial Board of *Croatica Chemica Acta* to include ethical guidelines into the journal's *Instructions for Authors*.