

研究提言：カナダの研究者による研究不正の分析査読論文撤回を対象とした研究

Research Brief: An Analysis of Article Retraction Cases as an Indicator of Scientific Misconduct by Researchers in Canada

平塚 広義 HIRATSUKA, Hiroyoshi

● 国際基督教大学 教育研究所 研究員
Research Fellow, IERS, ICU

Keywords 研究不正, 論文撤回, カナダ, 科学政策
scientific misconduct, article retractions, science policy, Canada

ABSTRACT

カナダでは、科学的不正行為が広がっている。にもかかわらず、有効な対応策は実施されていない。それよりも、科学的不正行為の現状を説明するための明確な定義、指標、ツールが不足している。解決策として、科学的不正行為の指標として論文撤回を利用する方法が提案されている。本研究では、bibliometricsを用いて公撤回論文のデータを収集した。収集したデータを分析の結果、生物学や医学における研究チーム間の協力が重要な課題分野であることが明らかになった。カナダにおける科学的不正行為に関する堅固な証拠基盤を確立が必要であることを示唆している。

Scientific misconduct has become widespread across scientific communities worldwide without solutions. In Canada, a need for clear definitions, indicators and tools is a challenge to describe the status of scientific misconduct. One possible solution is article retraction as an indicator of scientific misconduct. This study attempted to collect data from retracted articles through a bibliometric method. The analysis uncovered that biology and medicine in teams across institutions became a significant theme. The findings call for establishing a robust evidence base for scientific misconduct in Canada.

1. Introduction

Scientific misconduct is perceived as a widespread phenomenon globally. To respond to this growing challenge, international efforts were made. For example, the OECD (2007) organized a conference on the issue with its member countries. The Second World Congress of Research Integrity adopted the

Singapore Statement (Resnik & Shamoo, 2011). The Singapore Statement was an international attempt by the scientific community to promote responsible conduct of research among scientists around the world (Resnik & Shamoo, 2011) by emphasizing the trustworthiness of their data and methodologies (Anderson et al., 2013).

At the same time, the science community appears

to lack a good grasp of the issues of scientific misconduct or established instruments to examine it. For one, ambiguity around definitions poses a challenge for journal editors in identifying and examining potential misconduct (i.e., Fanelli, 2013; Steneck, 2006; Hesselmann, Graf, Schmidt, & Reinhart, 2017). The subtle and sensitive nature of misconduct makes it difficult to detect, which pose challenges for studying the misconduct issues for researchers; self-reporting surveys often over- or under-estimate the actual incidences, which poses challenges to quantifying misconduct (Anderson et al. 2013).

In Canada, the issue of scientific misconduct has received attention from Canadian research councils and academic associations (Council of Canadian Academies, 2010; Tri-Agency Framework, 2011). In the late 2000s, visible cases of misconduct prompted the federal research councils to review their research integrity framework. The Council of Canadian Academies carried out an assessment of mechanisms and practices that could be adopted in academic institutions. The Council made several recommendations (Council of Canadian Academies, 2010). However, there has been little research on the topic in the country. Only a few studies have focused on the issue, such as university policies (Schoenherr & William-Jones, 2011, 2016) and institutional responses to cases of misconduct (Lytton, 1996). Some have argued that this lack of evidence on the topic is a major impediment in the formulation of policies that are suited to the Canadian context (Master et al., 2012). Research is needed to characterize the nature of the problem in Canada.

This paper attempts to characterize the problem of scientific misconduct in Canada through an analysis of article retractions. Article retractions have been used as a proxy for scientific misconduct studies because the retracted articles are accessible and traceable (i.e., Anderson et al., 2013;

Grieneisen & Zhang, 2012; Hakuraku, 2011; Kuroki, 2016). Several mechanisms are also in place to detect article retractions documented in the scientific record (Farnelli, 2013). Article retractions are one of the ways in which scientific misconduct becomes potentially visible (Hesselmann et al., 2017), even though article retractions are an imperfect measure of scientific misconduct. Some retractions may result from both fraud and honest mistakes.

2. Context: Definitions, Trends and Indicators of Scientific Misconduct

2.1 Definitions

Scientific misconduct is a significant issue in academia, but several challenges exist in the literature. Inconsistency in terms of scientific misconduct poses a research challenge. The researchers studying the subject use a variety of terminologies: academic misconduct (Ataie-Ashtani, 2017; Lytton, 1996), research misconduct (Department of Health and Human Services, 2005; Canadian Research Integrity Committee, 2009), and research misbehavior (Anderson, 2011). The literature requires a clear definition of scientific misconduct to conceptualize the issue.

Among several different terminologies available in the literature, Steneck (2006) defined “Responsible Conduct of Research (RCR)” (p. 56) as two separate but interdependent concepts: “research ethics” and “research integrity” (p. 56). Research ethics involves moral questions. Research integrity deals with professional codes of conduct and standards. Steneck (2006) created a continuum encompassing “Fabrication, Falsification, and Plagiarism (FFP),” “Questionable Research Practice (QRP),” and “Responsible Conduct of Research (RCR)” (p.56). The first two categories are classified as research misconduct (Steneck, 2006). Although some challenges exist to the use of

Steneck's definitions, these definitions have been used in several studies (i.e., Anderson et al., 2013; Hakuraku 2011; Helton-Fauth et al., 2003; Schoenherr & Williams-Jones, 2011).

2.2 Domestic and International Trends

Scientific misconduct concerns researchers in many countries. Some studies have investigated the issue in the following countries:

- the U.S. (Anderson, et al., 2013; Steneck, 2006)
- Japan (Hakuraku, 2011; Kuroki, 2015; Matsuzawa, 2013)
- Iran (Ataie-Ashtiani, 2016)
- China (Qiu, 2010)
- South Africa (Rossouw et al., 2014)

A study (Ataie-Ashtiani, 2017) indicated that there is a tendency for countries with increasing scientific publications to have the highest rates of scientific misconduct.

For example, in the United States, scientific misconduct is more prevalent than once believed. Martinson et al. (2005) conducted a survey study of two random samples from National Institute of Health grant recipients: 3600 mid-career scientists who received funding from 1999 to 2001 and 4160 early-career scientists who received funding between 2000 and 2001: a total of 3247 responses ($n=3247$). According to this survey, a third of the respondents admitted to at least one instance of misconduct. Furthermore, Fanelli's meta-analysis of the literature ($n=18$) showed similar results: a pooled average ($n=7$, 95% CI: 0.86-4.45) of 1.97% admitted fabrication, falsification or modification of data, and 33.7% admitted questionable research practices. When asked about their knowledge of colleagues' practices, 14.12% indicated they were aware of instances of fabrication, and up to 72% of questionable research practices.

2.3 Subject Area Trends

Some subject areas appear to face more challenges of scientific misconduct than others. Some studies investigated the biological and health sciences (i.e., Balhara & Mishra, 2014; De Vries, et al., 2006; Mongeon & Lariviere, 2014). Other studies found a greater incidence of misconduct in those fields (Fanelli, 2009; Hakuraku, 2011; Kuroki, 2015). Some researchers argued that the competitiveness of biological and medical sciences drives scientific misconduct of researchers (Franzen et al., 2007; Kuroki, 2015; Qiu, 2010). However, other researchers dispute these assertions (Fanelli et al., 2015). Cases of scientific misconduct occur across academic disciplines and fields in humanities and social sciences (Hakuraku, 2011; Zhang & Grineisen, 2012), including such fields as management (Banks et al., 2016), psychology (Price, 2010) and the humanities (Stenmark, et al., 2010). While some subject areas like biological and health sciences tends to receive greater attention on scientific misconduct, than other fields, the challenge appears to be across the academia.

2.4 Individual Characteristics

Another approach to analyzing the issue of scientific misconduct focuses on individual characteristics. In Japan, Hakuraku (2011) reviewed newspaper articles reporting on misconduct and found that the researchers involved were mostly male, at the rank of full professor, and in their 50s. One study sought to identify the individual traits of scientists who engage in scientific misconduct (Anderson et al, 2013). Grieneisen and Zhang (2012) identified 15 "repeated offenders" (para. 28) who committed scientific misconduct by fabricating data in these publications. The authors (Grieneisen & Zhang, 2012) also explained that these repeat offenders in their study disproportionately skewed, and inflated overall data on individual publication years, countries, disciplines and journals. The

authors suggested analyzing the repeated offenders separately from the overall misconduct studies.

2.5 Social Factors

Social factors are a consideration of scientific misconduct studies. Hakuraku (2011) argued that misconduct could be explained by a combination of professional socialization and organizational influences (i.e., policies, norms, institutions, and cultures). One focus group study ($n=51$) (De Vries et al., 2006). found that the participants explained scientific misconduct as connected to everyday problems in the workplace environment, including:

- feeling uncertain about data management
- overwhelming rules of science (i.e., managing animal and human subjects, funding, hazardous materials, and the IRB requirements)
- managing relationships with their colleagues and bosses
- pressure of scientific production

Xie (2014) identified additional challenges, including inequality of research resources, research outcomes, and monetary/non-monetary rewards in the current scientific community. Inequality of resources in a research organization emerged in another correlational study (Martinson et al., 2005). The researchers found that scientists' misbehavior was correlated with early career scientists' perceptions of unfair distribution and procedures of organizational resources.

2.6 Article Retractions as a Scientific Misconduct Indicator

Some researchers have been using article retractions to identify scientific misconduct. According to Fanelli (2016), one of the first retractions recorded occurred by Goldstein and Micou in 1966 in the *Journal of Cell Biology*; article retractions were rare, and only one in five

journals had a retraction policy (Fanelli, 2016). In PubMed, the earliest retracted article appeared in 1974 (Fang et al., 2012). Retraction cases began to increase around the 2000s (Fanelli, 2013; Hakuraku, 2011). The phenomenon emerged dramatically more recently (Fang et al., 2012; Van Noorden, 2011). The number of article retractions had tripled in the same period (Fanelli, 2016). Marcus and Oransky (2014) reported article retraction increased ten times from 2001 to 2010 in the journal *Nature*.

Among diverse methodologies available, a bibliometric method received attention as a method to collect and analyze article retractions and to examine scientific misconduct. In one of the first comprehensive studies on article retractions, Grieneisen and Zhang (2012) reviewed 4449 retracted articles from 42 databases. Their study identified three main reasons for retraction:

- research misconduct (20%)
- publishing misconduct (47%)
- questionable data/interpretations (42%)

The study concluded that article retractions occurred in a wide range of disciplines and fields. The study also emphasized that the overall proportion of retracted articles in scholarly journals remains small.

Other studies also have employed a bibliometric method to analyze retraction cases for scientific misconduct (i.e., Van Noorden, 2011; Fang et al., 2012). In the biological and health sciences, one study (Fang et al., 2012) identified 2047 retracted articles in PubMed, and reported that 67.4 % were attributed to scientific misconduct:

- suspected fraud (43.4%)
- duplicate publication (14.2%)
- plagiarism (9.8%).

Van Noorden (2011) also found:

- 44% involved misconduct including fabrication or falsification (11%)

- self-plagiarism (17%)
- plagiarism (16%).

Fang and Casadevall (2011) found that the retraction rates correlated with journals' impact factor.

3. Method

This study was a qualitative analysis. The main method was a Bibliometric Method (Grieneisen & Zhang, 2012) to describe the status of article retraction phenomenon. The method collected retracted articles from journal databases to identify publications and individual characteristics of researchers in Canada. The Bibliometric Method uses a systematic collection of published articles in bibliographic databases, major academic websites, non-publisher journals aggregators and search engines (Grieneisen & Zhang, 2012). The method uses a keyword search to identify data. The method required reviewing multiple library databases for two reasons: the databases' selective indexing and retroactive retraction notation policies (Grieneisen & Zang, 2012). The study attempted to overcome the previous studies' limitations by consulting both medical and non-medical biographical databases.

Before the data collection, a codebook was developed in an Excel spreadsheet to organize and analyze data. The data collection developed the master database with the collected information about the journal disciplines/journals and individual researchers who were involved in the article retraction across Canada.

The study included the following databases:

- PubMed
- Web of Science
- ProQuest
- IEEEExplore.

The study collected articles which are explicitly identified as retracted or withdrawn in editorial expressions and notices that explained reasons for retractions as results of suspected scientific misconduct. Some articles that included "retracted," "withdrawn," or the related terms in their titles (Grieneisen & Zhang, 2012, para. 7) were eliminated from the data collection because they were the studies of retraction articles like this study. The data collection also identified some duplicated articles and unrelated titles in the search; these were deleted after a clarification procedure. The study excluded the retracted articles before 2000 because there is only a small retraction number to contribute to the

Table 1
Databases and Search Terms

Journal publisher databases	Methods
JSTOR	TI=retract*
IEEEExplore	(violation AND ieee AND principles); retracting; retracted; withdrawn
PubMed	[A] "retracted publication" [pt] or "retraction of publication" [pt] or "retraction" [it] or "retracted" [ti]; [BJw ithdrawn [ti]; [CJ "withdrawal" [ti]
Webo fSc ience	[A] TI= retracted*; [BJT I=(withdraw* and (article* or paper* or publication* or manuscript*)) NOT (TI=retract*) AND (CU=Canada)

study.

After screening the databases using the bibliometric method, a master database was constructed. The study collected the 628 listed researchers in Canada in 190 retracted articles between 2000 and 2017. Once the master database was developed, the researchers organized the data descriptive for descriptive analysis by using SPSS.

This study attempted to examine the characteristics or attributes of the individual academic and professional researchers at the Canadian institutions in the retracted articles: rank, subject areas, gender, institutional types, and provinces. The study also performed cross-tabulation to examine some tendencies from the publication characteristics and individual characteristics.

The analysis from this study attempted to identify the following characteristics of the retracted articles in Canada:

- journal fields/disciplines
- publication years
- individual or group authorship
- inter-institutional collaboration

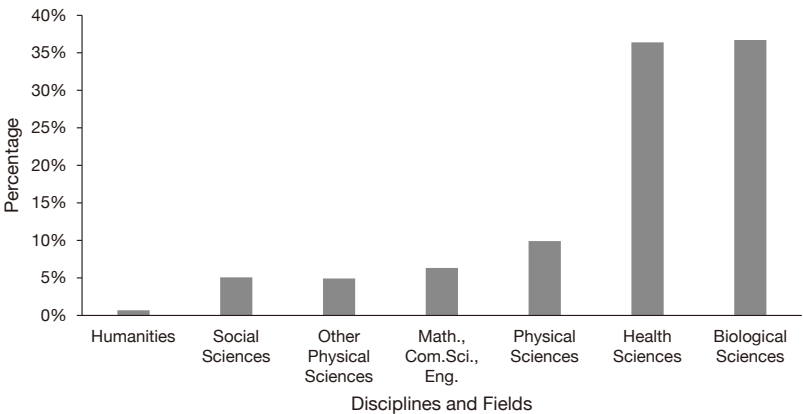
This study acknowledged several limitations throughout the project. First, limited consensus on

theoretical frameworks was available for the study design. The current discourse on scientific misconduct is only available in the science policy framework. The existing literature was unable to frame the issue beyond the policy framework in Canada (Anderson et al., 2013). A solution was to adopt a potential application of new theoretical frameworks specific to the Canadian context. Steneck’s internationally accepted definition of scientific integrity served as our conceptual framework. Methodological limitations included a lack of analytical methods appropriate for this study. While some researchers indicated common methodologies and their limitations (Anderson et al., 2013; Fanelli et al., 2015), a Bibliometric Method (Grinerisen & Zhang, 2012) was one appropriate option for this study’s topic since this method was gaining acceptance.

4. Findings and Discussion

This study uncovered some themes and thematic relationships to frame scientific misconduct phenomenon in Canada through the retraction articles. Three distinctive and inter-related patterns were identified. First, biological and medical

Figure 4.1
The Percentage of Retracted Articles by Fields and Disciplines



sciences retracted most articles. Second, these retracted articles were products of the biological and medical scientists in team-based research projects. Third, these teams were also in inter-institutional collaborations.

First, this analysis found that the biological and medical sciences retracted more articles than other subject areas in Canada. From this analysis, more than a third of article retractions in Canada were concentrated in these two subject areas, although the study identified that article retraction occurred all subject areas in the country.

This finding in Canada is relatively consistent with the international literature (i.e., Anderson et al., 2013; Fanelli, 2009; Fang et al., 2012; Grieneisen & Zhang, 2012; Hakuraku, 2011). The high concentration of Canada's article retraction phenomenon in biological and medical sciences indicated that issues specific to the subject areas might confront these scientists. For example, this high concentration could be a manifestation of collective problems for the researchers. Possible explanations of collective challenges could include biological/medical sciences' high competitiveness and pressure to publish (Franzen et al., 2007; Xie, 2014). These unique challenges in the biological

and medical sciences in Canada require further investigation.

Second, this analysis uncovered that the article retractions were products of team-based research projects in Canada. Contrary to the public discourse on single researchers' independent misbehavior in research, the finding uncovered that the group authors produced more retracted articles than single authors in the country. A group of two to five authors and a group of five and more authors

Figure 4.2

Authorship by Numbers and Disciplines

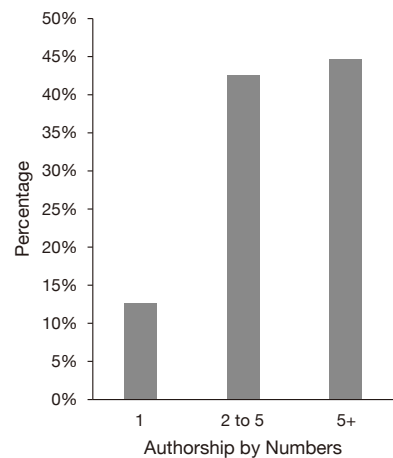
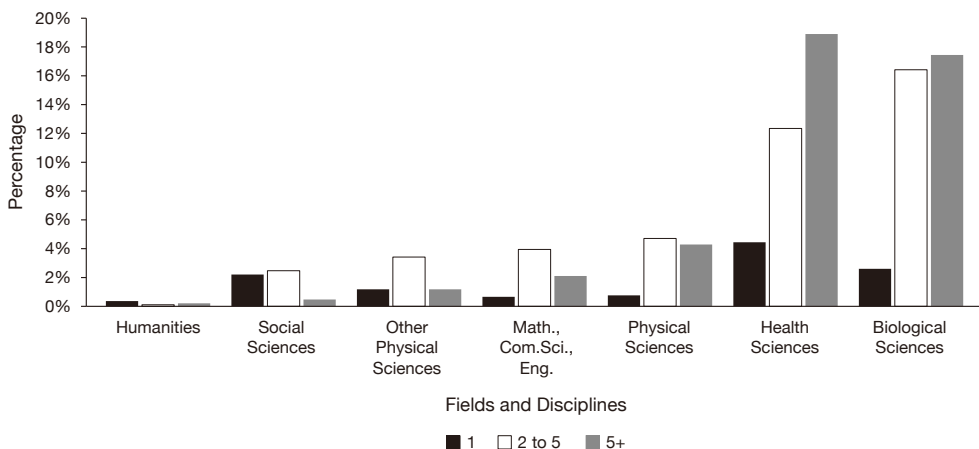


Figure 4.3

The Number of Researchers in a Team



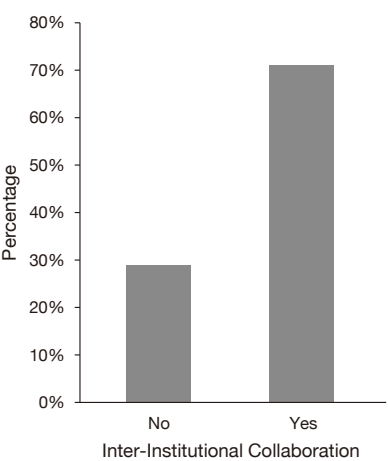
retracted their articles than single authors. Cross-tabulation between subject areas and authorship further characterized this phenomenon. The group authorship in the biological and medical sciences retracted four times more articles than any other subject area. Some researchers suggested possible social factors to explain the issue (Anderson et al., 2014; Hakuraku, 2011). The retraction phenomenon in Canada could be characterized by a high concentration of biological and medical sciences in team-based projects.

Some studies found that junior researchers and graduate students were concerned with such social factors as unfair resource distribution procedures in an organization (Martinson et al., 2006), uncertainty about data management, rules of science, relationship management with their colleagues, and pressure of scientific production in the workplace (De Vries et al., 2006). No study in the literature has explained a relationship between these factors and their misbehavior.

Third, the article retraction issue in Canada occurred in the biological and medical sciences across the institutional boundaries more often than within the institutional boundaries. This analysis found that more than twice of the retracted articles included institutional collaboration across the institutions' structural boundaries. From this analysis, the retraction issue in Canada is an inter-institutional phenomenon. More than twice as many articles were retracted by the authors affiliated with different research institutions. Cross-tabulation between inter-institutional collaboration and subject areas detected an additional pattern. When examined, the biological and medical sciences with inter-institutional collaboration retracted three times more articles than the articles without such collaborations. However, this analysis did not distinguish these inter-institutional phenomena between domestic and international affiliations.

The retraction phenomenon in the country

Figure 4.4
Inter-institutional collaboration



suggested that the problem was unbounded by the institutional structures. The existing literature is limited to contextualizing this aspect. An inter-institutional collaboration dimension of the article retraction issue in Canada confronts Canadian research institutions with its regulatory and monitoring capacities and policy instruments. One study explained that the institutional policies and regulatory standards among Canadian research institutions for handling scientists' research were inconsistent (Schoenherr & William-Jones, 2016). Some institutions have been hesitant about internal investigations of their members for legal, reputation, and cost reasons (Lytton, 1996). The inter-institutional dimension might complicate Canadian institutions' attempts to regulate misconduct issues for jurisdictional reasons.

5. Lessons Learned for Administration and Governance of Research Misconduct

This study's findings depicted different pictures from the existing literature: Article retraction issues as concentrated in the biological and medical

sciences in teams across institutional boundaries. The analysis of article retraction issues through a Bibliometric Method led this study to characterize possible themes of scientific misconduct in Canada. The method allowed the analysis to explore the retracted articles in academic journals as a manifestation of scientific misconduct in the country. The existing conceptual frameworks at the policy level were only partially sufficient to explain the scientific misconduct problem. The current public discourse framed the misconduct issue focused on individual scientists' extreme misbehavior, but the findings were contrary to the current assumption by the public.

These findings suggested that future studies need to examine specific factors in the biological and medical sciences, team dynamics, and institutional capacity to regulate, govern and monitor scientific research. For example, article retraction research could benefit from applying conceptual frameworks to articulate a collective dimension by focusing on scientists' social behavior in relational terms within the team and institutional contexts. Theoretical frameworks from organizational and industrial psychology and sociology would allow future studies to reframe the misconduct issue in specific social contexts. Employing mixed methods approaches also would allow future studies to investigate the complexity of internal norms and the customary practices of the two subject areas more articulately. Future studies require a methodology to address group-level issues.

If research institutions in Canada continue to be unwilling or inadequately equipped to respond to the retraction issues or regulate their researchers' misbehavior (Anderson et al., 2013; Lytton, 1996), their lack of responsiveness to the issue could worsen the scientific misconduct phenomenon in Canada. The first step is improving the data availability to better illustrate the Canadian research institutions' capacity challenges. Future studies

could focus on regulatory coordination and capacity-building issues.

References

- Anderson, M. S., Shaw, M. A., Steneck, N. H., Konkle, E., & Kamata, T. (2013). Research integrity and misconduct in the academic profession. In M. B. Paulsen (Ed.), *Higher education: Handbook of theory and research* (Vol. 28, pp. 217-261). Springer Netherlands.
- Anderson, M. S. (2011). Research misconduct and misbehavior. In *Creating the ethical academy: A system approach to understanding misconduct and empowering change in higher education*. Routledge.
- Ataie-Ashtiani, B. (2017). World map of scientific misconduct. *Science and Engineering Ethics*, 24, 1-4. doi: 10.1007/s11948-017-9939-6
- Banks, G., O' Boyle, E. H., Pollock, J. M., White, C. D., Batchelor, J. H., Whelpley, C. E., Abston, K. A., Bennett, A. A., & Adkins, C. (2016). Questions about questionable research practices in the field of management: A guest commentary. *Journal of Management*, 42(1), 5-20. <https://doi.org/10.1177/0149206315619011>
- Balhara, Y. P. S., & Mishra, A. (2014). A study exploring attributes and nature of the retracted literature on mental disorders. *Indian Journal of Medical Ethics*, 12(1), 30-42. <https://doi.org/https://doi.org/10.20529/IJME.2015.007>
- Chubin, D. E. (1985). Research malpractice. *BioScience*, 35(2), 80-89. Retrieved from <http://www.jstor.org/stable/1309844>
- De Vries, R., Anderson, M. S., & Martinson, B. C. (2006). Normal misbehavior: Scientists talk about the ethics of research. *Journal of Empirical Research on Human Research Ethics*, 1(1), 43-50.
- Department of Health and Human Services. (2005). Public health service policies on research misconducts. https://ori.hhs.gov/sites/default/files/42_cfr_parts_50_and_93_2005.pdf
- Fanelli, D., Costas, R., & Lariviere, V. (2015). Misconduct policies, academic culture and career stage, not gender or pressures to publish, affect scientific integrity. *PLOS ONE*, 10(6). <https://doi.org/10.1371/journal.pone.0127556>
- Fanelli, D. (2009). How many scientist fabricate and falsify research?: A systematic review and meta-analysis of survey data. *PLOS ONE*, 4(5). <https://doi.org/10.1371/journal.pone.0005738>
- Fanelli, D. (2013). Why growing retractions are (mostly) a good sign. *PLOS Medicine*, 10(12), 1-12.

- Fanelli, D. (2016). Set up a "self-retraction" system for honest errors. *Nature*, 531, 415.
- Fang, F. C., Steen, R. G., & Casadevall, A. (2012st). Misconduct accounts for the majority of retracted scientific publications. *PNAS*, 109(42), 17028-17033.
- Fang, F. C. & Casadevall, A. (2011). Retracted Science and the Retraction Index. *Infection and Immunology*, 79. <https://doi.org/10.1128/iai.05661-11>
- Franzen, M., Rodder, S., & Weingart, P. (2007). Fraud: Causes and culprits as perceived by science and the media. *EMBO Reports*, 8(1), 3-7.
- Grieneisen, M. L., & Zhang, M. (2012). A comprehensive survey of retracted articles from the scholarly literature. *PLOS ONE*, 7(10), 1-3. <https://doi.org/10.1371/journal.pone.0044118>
- Government of Canada. (2016). *Tri-agency framework: Responsible conduct of research*.
- Hakuraku, R. (2011). Cases and ethics of scientists: Kodansha.
- Helton-Fauth, W., Gaddis, B., Scott, G., Mumford, M., Devenport, L., Connelly, S., & Brown, R. (2003). A new approach to assessing ethical conduct in scientific work. *Accountability in Research*, 10(4), 205-228.
- Hesselmann, F., Graf, V., Schmidt, M., & Reinhart, M. (2017). The visibility of scientific misconduct: A review of the literature on retracted journal articles. *Current Sociology Review*, 65(6), 814-845.
- Hickling Arthurs Low Corporation. (2009). *The state of research integrity and misconduct policies in Canada* (<http://go.utlib.ca/cat/8963452>). Hickling Arthurs Low Corporation. http://www.nserc-crsng.gc.ca/_doc/NSERC-CRSNG/HAL_Report_e.pdf
- Kuroki, T. (2016). *Kenkyuu fusei [research misconduct]*. Chuokoron-Shinsha, Inc.
- Lytton, H. (1996). This is how it's always been done: the treatment of academic misconduct in Canada. *Canadian Journal of Sociology*, 21(2), 223-235.
- Marcus, A., & Oransky, I. (2014). What studies of retractions tell us. *Journal of Microbiology & Biology Education*, 151-154. <https://doi.org/http://dx.doi.org/10.1128/jmbe.v15i2.855>
- Martinson, B. C., Anderson, M., & De Vries, R. (2005). Scientists behaving badly. *Nature*, 435(9), 737-738.
- Master, Z., McDonald, M., & Williams-Jones, B. (2012). Promoting research on research integrity in Canada. *Accountability in Research*, 19, 47-52.
- Mongeon, P., & Lariviere, V. (2014). *The consequences of retractions for co-authors: Scientific fraud and error in biomedicine* [Conference Presentation Proceedings]. Retrieved from <http://www.ost.uqam.ca/en/publications/the-consequences-of-retractions-for-co-authors-scientific-fraud-and-error-in-biomedicine/>
- Price, M. (2010, August). Sins against science. *Monitor in Psychology*, 41(7), 44.
- Qiu, J. (2010). Publish or perish in China. *Nature*, 463, 142-143. <https://doi.org/10.1038/463142a>
- Resnik, D. B., & Shamoo, A. E. (2011). The Singapore statement on research integrity. *Accountability in Research*, 18(2), 71-75.
- Rossouw, T., Zyl, C. van, & Pope, A. (2014). Responsible conduct of research: Global trends, local opportunities. *South African Journal of Science*, 110(1/2), 1-6.
- Steneck, N. H. (2006). Fostering integrity in research: Definitions, current knowledge, and future directions. *Science and Engineering Ethics*, 12, 53-74.
- Stenmark, C. K., Antes, A. L., Martin, L. E., Bagdasarov, Z., Johnson, J. F., Devenport, L. D., & Mumford, M. D. (2010). Ethics in the Humanities: Findings from focus groups. *Journal of Academic Ethics*, 8, 285-300. <https://doi.org/10.1007/s10805-010-9120-1>
- Schoenherr, J., & Williams-Jones, B. (2011). Research integrity/misconduct policies of Canadian universities. *Canadian Journal of Higher Education*, 41(1).
- Steneck, N. H. (2006). Fostering integrity in research: Definitions, current knowledge, and future directions. *Science and Engineering Ethics*, 12, 53-74.
- The Council of Canadian Academies. (2010). *Honesty, accountability and trust: Fostering research integrity in Canada*. Retrieved from https://cca-reports.ca/wp-content/uploads/2018/10/ri_report.pdf
- Van Noorden, R. (2011). Science publishing: The trouble with retractions. *Nature*, 478, 26-28.
- Xie, Y. (2014). "Undemocracy": Inequalities in science. *Science*, 344(6186), 809-810.