

Corporate Crime and the Use of Science in the Case of Asbestos: Producing Harm Through Discursive Shields

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Abstract

This article focuses on the normalization of victimization and harms caused by asbestos, a carcinogenic mineral fiber. To understand the role played by science in hiding the wounds and deaths caused by corporations, the article starts presenting the example of Brazil, where scientific discourse of foreign experts with industry ties are influencing regulation. From there, I examine the disputes for truth in six different medical journals through grounded theory. The results show that authors use some strategies to achieve credibility: avoiding to acknowledge industry funding; constructing a specific meaning for the controversy about asbestos risks; and reflecting about the consequences of research misconducts. The ways of thinking about asbestos risks and harms are migrating through the international division of scientific labor, both to spread harm and to avoid liability of powerful agents.

Keywords

Environmental crime, corporate violence, social harm, asbestos industry, research misconduct

Introduction

“Even water, ingested in excess, can lead humans to death” (Brazil, 2017, p. 4343). In August 2017, a Minister of the Supreme Federal Court of Brazil uttered this sentence. It followed an analysis of foreign scientific experts’ ideas, from a public hearing about the health risks of asbestos exposure. By a 7 to 2 vote, this motion lost, and the regulation of asbestos use was declared unconstitutional. Following other scientific experts, other Ministers decided to ban asbestos. If science was on both sides of this trial, where was the truth?

This work seeks to understand how the legitimate place of science in the regimes of truth in Western societies has been captured by industry, especially in the asbestos case, for influencing regulation and liability. According to Foucault (1989), the regimes of truth based on science are produced and transmitted under the control of a few powerful political and economic apparatuses. Some examples are militaries funded by the state, universities funded partially or wholly by the state, research often funded by powerful corporations, and mass media often owned by and allied with mega corporations. In short, ideologies and/or the funding of scientific research often influence the “truth” about what constitutes risk, hazard, and harm. This has been a recurring theme of research and denunciation in various fields (Bocking, 2004; Camargo, 2009; Egilman et al., 2014; Michaels, 2008; Michaels & Monforton, 2005).

Moreover, according to the international division of labor (Marini, 2005), “truth” is produced by scientists from the global metropole who accumulate methods and theories, leaving

for peripheral regions the role of being sources of data and reproducers of those methodologies and theories (Carrington et al., 2016; Connel et al., 2018; Goyes, 2019). Science produced in the global North can travel in time and distance, as universal knowledge; science made in the global South is seen as local, specific, and exotic knowledge (Quijano, 2005; Santos, 2014).

This article aims to comprehend more than the broader relation between science and industry, for addressing questions like: who are the perpetrators, what are the methodologies and strategies used to make this capture seem invisible, and how the scientists comprehend the global harms provoked by some of these disputes. To accomplish this, I contextualize the complex case of asbestos in Brazil as a starting point to show how these disputes for truth are being used. Then, I present the findings from a grounded theory (Charmaz, 2006), constructed through an examination of the asbestos disputes that occurred in the editorial pages and in the letters to the editors of six different international medical journals that dealt more with economic and political issues than with medical questions. The objective is to discover the main disputes over the truths surrounding the carcinogenicity of asbestos in these specialized journals.

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Talking about science is talking about power. The criminological study of the harmful behavior, socio-environmental harms, liability, and victimization related to the productive dynamics of science may be framed in the broad field of the crimes of the powerful, and specifically in the definition of occupational crime and corporate crime (Budó, 2016; Faria, 2018; Friedrichs, 2010). This work is part of broader research which seeks to comprehend how the powerful capture the legitimate place occupied by science in these regimes of truth, in the context of financial global capitalism. In addition, this work explores how the powerful, in the international division of scientific labor, promote the migration of ways of thinking and speaking about those harms in the same flow from global North to global South (Castleman, 1995).

Asbestos is a mineral easily separated into fibers. It is flexible, incombustible, indestructible, and cheap, and was widely mined and used as a raw material in industry in the 20th century. Different types of this mineral are found in nature: serpentine, a mineral of which the white asbestos, chrysotile, is the most common, and amphibole, which includes the blue crocidolite and the brown amosite (Mendes, 2001). More recently, all asbestos types have been banned from 60 countries because of its hazardous effects on human health. However, a theory elaborated in the 1980s supported that chrysotile asbestos is less harmful than amphiboles. The differentiation thesis is still delaying the ban in most parts of the world (Tweedale & McCulloch, 2004). Although global asbestos production fell from 2.1 million tons in 2012 to 1.4 million tons in 2015, more than 2 million tons of asbestos are currently consumed each year throughout the world (Asbestos.com, 2020).

The World Health Organization (2014) calculates that at least 107,000 people die every year in the world because of asbestos related diseases (ARD), provoked by the aspiration of small particles of the fiber. Furuya et al. (2018) claim that this number is underestimated and offer another one: 255,000 deaths a year. Although some countries in Europe prohibited asbestos as early as the 1990s, it was not until 2005 that the European Union adhered to this policy (Natali & Budó, 2019). In the USA, despite the absence of a legally mandated ban on asbestos, there has been a decline in its use, because of the millions of dollars in worker compensation lawsuits (Lemen & Landingan, 2017).¹

The case of asbestos in Brazil was chosen to exemplify this process as a starting point for the study about scientific discourse and harm because of at least three characteristics: the ways in which Northern scientific knowledge has historically influenced the decisions about asbestos regulation; the place Brazil occupied in the global asbestos market, as the third major exporter when the fiber was banned, in 2017; the ways Brazilian companies, with state concealment, are exporting harm to other Southern countries.

Using the frame of the crimes of the powerful means “using theories, concepts, and methods already developed by white-collar, occupational, and organizational crime scholars while studying other forms of fraud, professional misconduct, or organizational deviance” (Faria, 2018, p. 14). As

widely accepted by the authors in the field of the crimes of the powerful (Friedrichs, 2010; Rothe & Kauzlarich, 2016), the adoption of the Social Harm approach would be useful “in overcoming the limitations imposed by the fact that [research misconducts] may not be considered criminal activity” (Faria, 2018, p. 26). It allows criminology to go beyond the legal definition of crime to reach the harms caused by activities routinely developed by the powerful (Bernal et al., 2014; Hillyard & Tombs, 2005; Stretesky et al., 2013; Zaffaroni, 2010).

Starting Point: Asbestos in Brazil

The *Handroanthus chrysanthus* or yellow-Ipê trees were in bloom when I arrived in Brasília in August 2017 to watch the Ministers of the Supreme Federal Court (SFC) of Brazil judge the Direct Action of Unconstitutionality against a state law from São Paulo, that resulted in the asbestos ban. In the auditorium, on one side I had the activists from the Brazilian Association of Asbestos-Affected, elderly ex-workers with ARD, widows, etc. On my other side, I had many current workers of the chrysotile mine of Minaçu, state of Goiás, who could be easily identified by the stickers on their suits, with the words: “I am a worker. With pride. Chrysotile asbestos.”

Chrysanthus and *Chrysotile* have the same Greek root *chrys-ós*, which means gold (Bechara, 2009, p. 312). While the tree species’ scientific name is visually explained by the astonishing beauty of its yellow canopy, the gold in the asbestos type is related to the richness extracted from this commodity. Since the 1930s asbestos has been mined in Brazil. The first factories of asbestos-cement products were multinationals installed in the country (e.g. the French Saint Gobain, in 1937; the Swiss Eternit, in 1940) (Budó, 2016). Nowadays, one giant Brazilian company, Eternit/SAMA, dominates the process, from mining to commercialization. The asbestos production chain used to be around 70% from start to finish in Brazil Federation of Industries of the State of São Paulo (FIESP), 2009. However, when the SFC decided for the ban, the internal market was decreasing, while exportation was already increasing, representing, in 2016, 44% of Brazil’s chrysotile production. Brazil exports asbestos to India, Indonesia, Bolivia, México, Vietnam, Malaysia, Ecuador, Colombia, El Salvador, Peru, Thailand, Sri Lanka, and the Philippines. In 2018 and 2019, Brazil exported respectively 44 and 11 million dollars, and was the third major exporter, behind of Russia and Kazakhstan (Trend Economy, 2019).

Reports on asbestos related diseases (ARD) in Brazil first appeared in 1956 (Mendes, 2001). Since the seventies, scientists have been concerned with a massive underreporting (Nogueira et al., 1975). Even after the law that regulated the use of chrysotile asbestos and banned amphiboles asbestos in 1995, the exposure did not follow the regulation in many places, according to the voices of ex-workers interviewed (Amaral, 2020; Mazzeo, 2018; Silveira, 2018). The most recent epidemiological data from the Health Ministry

revealed that more than 700 people died of ARD in Brazil between 2011 and 2017 (Brazil, 2020). In the 21st century there is still a huge problem of underreporting, hampering the recognition of asbestos as a public health issue (Santana et al., 2018).

The temporalities of industry science to Brazil's asbestos ban

Said the doctor Paracelsus—a Swiss figure of the Renaissance [...] that the difference between the poison and the medicine is only in the dose. The doses to which the population is submitted are generally insufficient to trigger the diseases typically related to the product. (Brazil, 2017, p. 4346)

“But, as Canadian epidemiologist [...] said in this House, “practically every product is carcinogenic. It is a matter of dose.” In the medical field, in fact, it is an axiom that what differentiates a medicine from a poison is the dose.” (Brazil, 2001, p. 7)

Going back to Brasília, and to August 2017, the first quote above could be heard in the auditorium of the SFC. It was extracted from Minister Marco Aurelio's losing vote in judgment of Direct Action of Unconstitutionality of a state law from São Paulo that had banned all asbestos types from that state.² The vote cited foreign scientific experts who participated in a public hearing, in 2012, in the SFC (Brazil, 2017). Minister Marco Aurelio lost, as only another Minister accompanied him, Alexandre de Moraes. The verdict virtually banned asbestos in Brazil.

The second quote above was extracted from a report of a legislative committee, made by the then Federal representative Ronaldo Caiado, in 2001. The context was the parliamentary debates inside the legislative process of a bill proposed in 1996, for banning all asbestos types in Brazil. The main arguments used by Caiado to successfully reject the ban were taken from a public hearing held in 1999, where foreign scientific experts were present.

Almost two decades separate those statements, which actually cite the same idea: the use of the famous Paracelsus reasoning to support the safe controlled use of chrysotile asbestos in Brazil. Among others, one scientific expert calls the attention because his name is repeatedly cited: Dr. David Bernstein is presented in the 2001 report as a “scientist, considered the maximum authority and of international acknowledgment in studies on fibers and particles, using the cutting edge technology [...]”. The results of his work on Brazilian asbestos are described in the report as follows: “Chrysotile studies have shown that pure fibers, such as those produced in Cana Brava, which means not contaminated with other amphibolic fibers, even over twenty micrometers in length, are removed between 1.3 and 2.4 days, probably by dissolution” (Brazil, 2001). The same expert is presented in the 2017 SFC vote as “PhD in medicine and environmental toxicology at the New York University Institute of Environmental Medicine,” and his thesis is summarized in this sentence: “[...] chrysotile asbestos is much less dangerous than the amphibole form and that, given the control and appropriate use in fiber cement, it does not

present an excessive risk to the worker's health” (Brazil, 2017, p. 4320).

The documents show that this thesis supported the decision of keeping the use of asbestos for more than twenty years in Brazil. In 2010, the ties between Bernstein and the industry were already known, thanks to the organized movement of asbestos victims (ABREA, 2020; Castro et al., 2003). A dossier elaborated by a working group formed in Brazilian parliament for investigating asbestos risks in Brazil brought details about this connection (Brazil, 2010). Currently, research papers by foreign experts funded by the Brazilian mining company and other interested international organizations are translated into Portuguese and published on the website of the Brazilian Chrysotile Institute (BCI, 2020; Bernstein et al., 2004, 2006).

From the information about the internationalization of industry ties with scientific experts, I decided to better comprehend how these disputes for truth work and how they can travel hundreds of kilometers to directly influence political and judicial discourses in Brazil. This was the beginning of a research program, designed with three layers: 1) the disputes for truth inside scientific journals where the studies about asbestos risks are published, considering the themes “conflicts of interests” (CoI) and “research misconducts” (RM); 2) the influence of the scientific state of the art and industry interests in politics and litigation in Southern countries; 3) the perceptions of truth by asbestos victims. This article presents the results of this first layer of research.

Asbestos and Disease: A Disputed Connection

Asbestos-related diseases (ARD) are all long term and the effects of the uncontrolled use of the fiber in the industrial revolution of Europe only started to be acknowledged in the beginning of the 20th century (Mendes, 2001). The first published study relating pulmonary fibrosis to the exposure of a worker to asbestos dust was by Montague Murray in 1906, and the term “asbestosis” was originated in 1924 in a study published by Cooke (Mendes, 2001). Since the 1950s, studies have also proved that asbestos causes lung cancer and mesothelioma (Doll, 1955; Wagner et al., 1960).

As Ruggiero and South (2013, p. 20) explain, “one of the reasons it took so long to ban the substance was because asbestos ‘kills slowly’ and, in many cases that were ever actually brought to court, lawyers as well as pathologists could easily dismiss the association of asbestos with lethal respiratory conditions.” Nowadays, sixty countries have banned asbestos, most of them from global North, and with some important characteristics: first, all the bans were enforced many years after the studies started to show that asbestos harms human health; second, none of them were enforced while a mine was still active (IBAS, 2020). Algranti et al. (2019) inform that approximately 80% of the global population lives in countries where asbestos has not been banned, mainly from Asia. Even if the use of the fiber were to cease today, the incidence of ARD

would start decreasing only in 20 years from now (Collegium Ramazzini, 2016).

The attempt to legitimize the use of asbestos reached a pinnacle in the 1980s with the elaboration of the *amphibole hypothesis*. In the article that popularized it, the authors maintain that thanks to technological development, scientists can differentiate two kinds of asbestos: serpentines and amphiboles (Mossman et al., 1990). Tweedale and McCulloch (2004, p. 240) explain that chrysotile (or white asbestos) is the only member of the serpentine group and it was mined mainly in Russia, Canada, China, Brazil, and Zimbabwe. Chrysotile represented over 90% of the asbestos mined in the world in the twentieth century (Tweedale & McCulloch, 2004). Mossman et al. (1990, p. 298) suggest that recognizing the carcinogenicity of amphiboles was important to protect workers, but the "[...] exposure to chrysotile at current occupational standards does not increase the risk of asbestos associated disease." Accordingly, the most rare and serious disease associated with asbestos, pleural mesothelioma, could be caused by a contamination of chrysotile with amphiboles.

International organizations, such as the World Health Organization and the International Labor Organization, have been recommending that nations ban the fiber from their territories.³ However, in the 1980s ILO followed the market's interests and adopted the thesis of the "safe controlled use" (Mendes, 2001), based on the difference between the types of asbestos. One of the theses developed in the last three decades to further support the fiber differentiation has been the *low biopersistence of chrysotile*: "biopersistence studies of chrysotile have shown that it is not biopersistent in the lung and that it does not produce a pathological response following short-term exposure in either the lung or the pleural cavity" (Bernstein, 2014, p. 368). This idea has been the key for supporting the thesis of "safe controlled use" of asbestos nowadays, assuming that patterns of regulation can be enforced in the same way in every country in the world (Castleman, 1995).

Comprehending the Disputes for Truth About Exposure to Asbestos in the Medical Literature

Departing from this background of the state of the art about the main disputes around asbestos carcinogenicity, I will next present an empirical research in specialized medical journals. The specific objective is to answer what the relationships between political interests and health interests are in the perception of those authors pursuing and disputing the scientific truth around the risks of asbestos exposure.

Research Methodology

The research corpus is composed of documents found through the search tool PubMed,⁴ using the expressions "chrysotile" AND "amphibole hypothesis" OR "chrysotile biopersistence." From the 80 results, I selected only those which had comments, letters to the editor, corrigenda or errata, resulting in 23 texts

(articles and comments), two errata and one corrigenda, organized in six cases in the Table 1.

Each case brings a set of texts related to each other. They start with one or more articles that generate the other linked texts, which can be only errata by the publisher and/ or by the authors (cases 2 and 5), or annotations/ comments by other scientists regarding the specific theme discussed in the original paper (cases 1, 3, 4 and 6).

The methodology of analysis is grounded theory, under a constructionist approach (Charmaz, 2006). As explained by Laperrière (2008), the objective of this kind of analysis is to provide a theoretical construction, but the concept of theory in this case varies between the methodologists. In a constructionist approach, theory is a social construction, so the analysis is not free of the contaminations of the external world (Charmaz, 2006). Grounded theory starts with data codification. The first part of the research, called microanalysis, is divided into different steps of codification, made through the software NVivo11 (open and axial codifications). The researcher makes the codification of the collected data line by line, then starts the selective codification. The analysis ends with the final integration between theory and a central category, through a narrative line guided to the phenomenon core, synthetizing it (Laperrière, 2008, p. 364). According to Charmaz (2006), it is time then to go back to the literature to discuss the results.

In the first categorization, the main result was an overview of the positions (against, for or in terms) regarding the use of chrysotile, related to two other categories: "the conflicts of interests" and "the main argument to maintain the position." Table 2 summarizes this first mapping.

The top row of the table indicates the number (from Table 1) of the specific text⁶ to which the categorization is related. The next row shows the case number in which the text is grouped. The texts were ordered into three blocks: in the left, the ones positioned against the controlled use of chrysotile; in the middle, the ones positioned for the controlled use of chrysotile; in the right, the ones that do not position themselves openly. The rows are also divided in three blocks: the first shows only the position (against, for, or in terms); the second shows the declaration of conflicts of interests; the third presents the main arguments to support the position about the use of chrysotile.

This summary of the corpus exposes a strong relation between the position "for" the use of chrysotile asbestos, the denial of the ARD, and the industry ties, disclosed by the authors, or detected later by the editors and published in the form of errata, corrigenda, or comments. For the position "against" the use of chrysotile, none of the authors declare to have industry ties; most declared to be free of conflicts, and some declared to appear as expert witnesses in litigation, or for consultancy. The perception about ARD in this case encompasses all types of asbestos as causing disease, with no safe exposure.

After describing the corpus and the main relations that can be detected between position about the use of chrysotile, industry ties, and perception about ARD, I start below a narrative where I detail the categories emerging from the data.

Table 1. Description of the Research Corpus.

Journal		
American Journal of Public Health CASE 1 (C1)	Author(s)/ Commented article	1. Stayner, L. T., Dankovic, D. A., Lemen, R. A. (1996, February). Occupational exposure to chrysotile asbestos and cancer risk: A review of the amphibole hypothesis. <i>86</i> (2), 179–186.
	Comments	2. Cullen, M. R. (1996, February). The amphibole hypothesis of asbestos-related cancer: Gone but not forgotten. <i>86</i> (2), 158–159.
		3. Wagner, C. I. (1997, April). Asbestos-related cancer and the amphibole hypothesis. <i>87</i> (4), 687–688.
		4. Stayner, L. T., Dankovic, D. A., & Lemen, R. A. (1997). Stayner and colleagues respond. <i>American Journal of Public Health</i> , <i>87</i> (4), 688.
		5. Langer, A. M.; Nolan, R. P. (1997). The amphibole hypothesis: Neither gone nor forgotten. <i>American Journal of Public Health</i> , <i>87</i> (4), 688–689.
		6. Mossman, B., & Gee, J. B. L. (1997). 4. The hypothesis is still supported by scientists and scientific data. <i>American Journal of Public Health</i> , <i>87</i> (4), 689–690.
		7. Cullen, M. (1997). Cullen responds. <i>American Journal of Public Health</i> , <i>87</i> (4), 690.
		8. Stayner, L. T., Dankovic, D. A., & Lemen, R. A. (1997). Stayner and colleagues respond. <i>American Journal of Public Health</i> , <i>87</i> (4), 691.
Inhalation Toxicology CASE 2 (C2)	Author(s)/ Commented article	9. Bernstein, D. M., Donaldson, K., Decker, U., Gaering, S., Kunzendorf, P., Chevalier, J., & Holm, S. E. (2008). A biopersistence study following exposure to chrysotile asbestos alone or in combination with fine particles. <i>Inhalation Toxicology</i> , <i>20</i> (11), 1009–1028.
	Corrigenda	10. Bernstein, D. M., Rogers, R. A., Sepulveda, R., Donaldson, K., Schuler, D., Gaering, S., Kunzendorf, P., Chevalier, J., & Holm, S. E. (2011). Quantification of the pathological response and fate in the lung and pleura of chrysotile in combination with fine particles compared to amosite-asbestos following short-term inhalation exposure. <i>Inhalation Toxicology</i> , <i>23</i> (7), 372–391. https://doi.org/10.3109/08958378.2011.575413 (Corrigenda. (2012). <i>Inhalation Toxicology</i> , <i>24</i> (1), 80–80. https://doi.org/10.3109/08958378.2012.655000
International Journal of Occupational and Environmental Health CASE 3 (C3)	Author(s)/ Commented article	11. Pezerat, H. (2009). Chrysotile biopersistence: The misuse of biased studies. <i>International Journal of Occupational and Environmental Health</i> , <i>15</i> (1), 102–106.
	Comments	12. Donaldson, K., & Oberdörster, G. (2011). Continued controversy on chrysotile biopersistence. <i>International Journal of Occupational and Environmental Health</i> , <i>17</i> (1), 98–99.
		13. Egilman, D. (2011). In reply. Editorial response. <i>International Journal of Occupational and Environmental Health</i> , <i>17</i> (1), 99–102.
		14. Bohme, S. (2012). Expression of concern: False claim to be free of conflicts in asbestos biopersistence debate. <i>International Journal of Occupational and Environmental Health</i> , <i>18</i> (2), 85–88.
Critical Reviews in Toxicology CASE 4 (C4)	Author(s)/ Commented article	15. Bernstein, D., Dunnigan, J., Hesterberg, T., Brown, J., Legaspi Velasco, A., Barrera, R., Hoskins, J., & Gibbs, A. (2013). Health risk of chrysotile revisited. <i>Critical Reviews in Toxicology</i> , <i>43</i> (2), 154–183.
	Comments	16. Finkelstein, M. (2013). Letter to the editor re Bernstein et al: Health risk of chrysotile revisited. <i>Critical Reviews in Toxicology</i> , <i>43</i> (8), 707–708.
		17. Bernstein, D., Dunnigan, J., Hesterberg, T., Brown, J., Legaspi Velasco, A., Barrera, R., Hoskins, J., & Gibbs, A. (2013). Response to Murray M. Finkelstein, letter to the editor re Bernstein et al: Health risk of chrysotile revisited. <i>Critical Reviews in Toxicology</i> , <i>43</i> (8), 709–710.
Current Opinion in Pulmonary Medicine CASE 5 (C5)	Author(s)/ Commented article	18. Bernstein, D. M. (2014). The health risk of chrysotile asbestos. <i>Current Opinion in Pulmonary Medicine</i> , <i>20</i> (4), 366–370. https://doi.org/10.1097/MCP.0000000000000064
	Errata	Erratum. (2014). The health risk of chrysotile asbestos: Erratum. <i>Current Opinion in Pulmonary Medicine</i> , <i>20</i> (5), 525. https://doi.org/10.1097/MCP.0000000000000092
		Erratum. (2015). The health risk of chrysotile asbestos: Erratum. <i>Current Opinion in Pulmonary Medicine</i> , <i>21</i> (1), 109. https://doi.org/10.1097/MCP.0000000000000114

(continued)

Table 1. (continued)

Journal	Author(s)/ Commented article	
European Respiratory Journal CASE 6 (C6)	Comments	19. Feder, I. S., Tischoff, I., Theile, A., Schmitz, I., Merget, R., & Tannapfel, A. (2017). Correspondence regarding the article "The asbestos fibre burden in human lungs: New insights into the chrysotile debate". <i>European Respiratory Journal</i>, 50(6), 1702204. 20. Nemery, B., Nuyts, V., & Nackaerts, K. (2017). Quantifying asbestos in lung tissue: What debate? <i>European Respiratory Journal</i>, 49(6), 1700861. https://doi.org/10.1183/13993003.00861-2017 21. Oliver, L. C., Belpoggi, F., Budnik, L. T., Egilman, D., Frank, A. L., Mandrioli, D., Soskolne, C., Terracini, B., Welch, L., & Baur, X. (2017). Correspondence regarding the article "The asbestos fibre burden in human lungs: New insights into the chrysotile debate". <i>European Respiratory Journal</i>, 50(6), 1701644. https://doi.org/10.1183/13993003.01644-2017 22. Sartorelli, P. (2017). Correspondence regarding the article "The asbestos fibre burden in human lungs: New insights into the chrysotile debate." <i>European Respiratory Journal</i>, 50(6), 1702188. https://doi.org/10.1183/13993003.02188-2017 23. Feder, I. S., Tischoff, I., Theile, A., Schmitz, I., Merget, R., & Tannapfel, A. (2017). The Asbestos fibre burden in human lungs: New insights into the chrysotile debate. <i>European Respiratory Journal</i>, 49(6), 1602534. https://doi.org/10.1183/13993003.02534-2016

Results

What is a dispute for truth? Who is disputing? How is the truth disputed? What are the consequences of the disputes for truth? The documents analyzed through grounded theory generated three main conceptual categories: *the relationship between scientists and companies; the nature of the scientific controversies, and the consequences of research misconducts*. Each of the conceptual categories were divided into many types or models and they are presented in the form of a narrative in the topics that follow.

Relationships between scientists and industry. "My career has been devoted to the pursuit of truth and work in the public interest." With this sentence, Soskolne (Oliver et al., 2017, C6) presents his claim for being free of CoI while commenting on an article on chrysotile biopersistence. It gives a clue about a main object of dispute: *who may say what is the truth?*

Academic title or curriculum vitae are wrong answers here: the major dispute was about the *independence of the author regarding the subject*, the health risks of asbestos. The emerging concept of an *independent scientist* is one who has not been funded, commissioned, or hired by any governmental or non-governmental organization, or company that has national or international economic interests related to asbestos mining, use, commercialization, transportation, exportation, or litigation. Another term with the same meaning is *industry-funded scientist*. The opposite is the *non-industry-funded scientist* (Bohme, 2012—C3).

The *disclosure of the conflicts of interests* is another criterium for understanding the impact of funding in the qualification of the results. Case 3 brought important insights to this point:

Conflicts of interests do not necessarily lead to biased research, nor do they preclude the publication of research or opinions by individuals with conflicts. However, it is widely recognized that bias—economic or otherwise—can have an impact on research questions and findings, so disclosure of conflicts allows readers to interpret publications in a broader context. Falsely claiming freedom from conflicts harms readers and researchers and violates written and unwritten standards of scientific publishing (Bohme, 2012, p. 87—C3).

Hiding conflicts of interests can be considered research misconduct. Bohme (2012—C3) provides in this quote the rules violated (written and unwritten standards of scientific publishing), the authors (individuals with conflicts), the research misconduct (falsely claiming freedom from conflicts) and also the victims, although in a strict sense (readers and researchers). Moreover, *hidden conflicts can appear much later*, through different processes. The disclosures of CoI *after publication* can appear in comments (e.g. C3), but also in errata (e.g. C5) and corrigenda (e.g. C2) by the publisher or by the authors themselves, revealing a *strategy of detaching the conflict timeline from the article timeline*.

The omission of a conflict of interest later revealed can also be narrated in the journal as a mistake attributable to the authors or to the publisher. The responsibility can be extracted in the text of the errata or corrigenda by the one who apologizes.⁷ These texts bring new declarations of CoI, with a very flexible meaning, both in time and in content. This characteristic emerges from:

- a) *the use of different titles for the relationships disclosed*, which gives the connotation of degrees of conflicted

Table 2. First Categorization Considering Authors' Position About the Use of Chrysotile.

Position About the Use of Chrysotile	Against																		For						In Terms
	1 C1	2 C1	4 C1	7 C1	8 C1	11 C3	13 C3	14 C3	16 C4	20 C6	21 C6	22 C6	3 C1	5 C1	6 C1	9 C2	10 C2	12 C3	15 C4	17 C4	18 C5	19 C6	23 C6		
Col (5)																									
Disclosed industry ties (when submit)																X	X		X						
Undisclosed industry ties													X			X	X	X	X	X	X				
Declare to be free of conflicts	X	X	X	X	X	X		X			X	X		X	X			X			X	X	X		
Expert consultant for both sides inlitigation							X			X	X							X							
Witness for plaintiff workers									X		X														
Grant from an insurance institute											X											X	X		
Perception about ARD that supports the position about the use of chrysotile																									
Both Chrysotile and amphiboles increase risk of mesothelioma and lung cancer	X	X		X	X	X	X		X	X	X	X			X							X	X		
Controlled exposure to chrysotile does not provoke mesothelioma													X		X	X	X	X	X	X					
It is necessary many years of exposition to chrysotile for developing ARD													X					X	X		X				
Chrysotile has a high biopersistence and provoke mesothelioma																						X	X		
There is no safe exposure to any asbestos types	X	X	X	X	X	X	X	X	X	X	X	X													

interests, presented below in ascending order of commitment:

- a. Consulting expert⁸
 - i. For chrysotile industry
 - ii. For a specific company
- b. Expert witness in litigation
 - i. For a specific company
 - ii. For plaintiff's workers⁹
- c. Representative of a company
- b) *the disconnection between the relationships disclosed and the specific published research*, where even in recognizing the receiving of money from industry, the author claims that it did not influence the specific paper.
- c) *the nature of the payments received*, that can be understood as more or less binding to the company's/organization's interests, presented below in ascending order:

- a. *research grant*
- b. *payments for the specific paper*
- c. *payments for conducting the entire research*

As different meanings are given to each of these ties between scientists and interested organizations, *they are also in dispute*. Bohme (2012, p. 86—C5), as

deputy editor of one of the journals, published an entire comment not only revealing hiding ties between authors and industry, but also calling earlier declared conflicts into question. It is the case for Bernstein et al. (2008 - C2) and Bernstein et al. (2011 - C2), where they declared to have received a grant from Georgia-Pacific for research, but in a litigation it was revealed that "[...] Bernstein was actually paid an hourly wage pursuant to a contract with GP and all authors on at least two of these papers are identified in lawsuit 'privilege logs' as 'G-P Outside consultants'." It seems that to choose disclosing a conflict of interest *does not mean to be entirely honest with the title given to it*, seeking to distance the experts as much as possible from the role of company's employees.

The disputes in some cases appear also through *reciprocal accusations of bias*. This process is more common when the accusation is first proffered toward an expert linked to pro-asbestos organizations, criticizing methodologies and results, but also pointing to the funding as one more argument to support the accusation of bias. Therefore, a strategy of defense is also contra-attack:

Finally, Finkelstein refers to the funding of the Bernstein et al. review by the Canadian Chrysotile Association, stating that "they have

published a document to support the interests of the International Chrysotile Association.” In his own Declaration of Interest, Finkelstein declares that “The author has appeared as an expert witness in litigation concerned with alleged health effects of exposure to chrysotile.” What Finkelstein has left unstated is the frequency with which he works for the plaintiff’s lawyers who would benefit from publication of his Letter to the Editor (Bernstein, 2013, p. 713—C4).

The independent scientist, as one who can dispute for truth, is both an ambiguous and disputed concept. There seem to be an “author-type” to which many subtle strategies can be used to approach or avoid distancing, even if it is necessary to abuse journals’ CoI policies.

Nature of scientific controversies. Scientific controversy itself is also an object of dispute. Disputing the existence and the nature of controversy presupposes that science is the product of questioning, doubting, and, at the same time, realizing historicity and the absence of neutrality. Simultaneously, to admit that some theories are consensual in a determined field permits new problems of research to emerge, making science move forward. In the subject of the health risks of asbestos, it is possible to read a dialectical use of the meanings of consensus and controversy. Some of the consensuses from which all texts started were: 1) the mineralogic, toxicologic, and epidemiologic differentiation between amphiboles and serpentines, and 2) the causation of all types of ARD by amphiboles asbestos. However, the consensuses finish at this point. The use each scientist or group will make of these assumptions will vary, depending on time and scope of the pieces. *Denying further controversies* seems to be a shared strategy between many of the actors.

a) Out of date: asbestos risk is a thing of the past. The use of the word *chrysotile* instead of *asbestos* is a strategy to avoid dealing with the heavy load of scandal and fear associated with the mineral. It could also be seen as a strategy of denial, as in the excerpt that follows: “The word asbestos is associated with health risk and controversy. However, it is a poorly attributed term, as it refers to two very different minerals with very different characteristics” (Bernstein, 2014, p. 366—C5). This sentence is the starting point of a literature review in which the author sustains that *controversy is over*. Some of the discursive tools used can be seen from the beginning: *detaching the word asbestos from the object is a procedure for reframing it with another meaning*. If chrysotile is a “completely different mineral,” then the words *controversy* and *risk* cannot be linked to it.

Another strategy comes from *the use of a sense of temporality and historicity to deny controversy and risk*. An argument is made that controversy remains in the past and credible research papers constitute the most current knowledge shared in the field. This is actually said in a comment that advocated for the amphiboles hypothesis: “[...] ‘critical reviews’ and annotations should be written by scientists with *up-to-date knowledge of recent papers* in the literature and in the mainstream of relevant panels and scientific meetings” (Mossman & Gee, 1997, p. 690—C1). Another statement dealing with

temporality exemplifies this category: “[...] although today chrysotile is the only type used commercially, the *legacy of past use of amphibole asbestos remains*” (Bernstein, 2014, p. 366—C5).

Describing articles that associate chrysotile to risk with verbs conjugated in the past tense helps the author to sustain that they are out of date, as in the following sequence: “Although *early studies correlated* severity of illness in ‘asbestos’-exposed workers with the dustier jobs [...]” (Bernstein, 2014, p. 366—C5). Here, the word “asbestos” is used with quotation marks, to ensure that the reader will not associate it to chrysotile and will associate the “outdated” argument of studies on “asbestos” with the adjective “early.” Contrasting to the past studies, other *temporal labels* appear when the authors are describing their own and their allies’ research studies: “*Recent studies* have shown that chrysotile fibers [...] do not result in a pathological response in either the lung or pleural cavity” (Bernstein, 2014, p. 2014—C5).

b) It is fiction: industry-funded research does not count as science. “There is no ongoing debate about the biopersistence of chrysotile asbestos among independent, credible scientists.” By making this statement, Oliver et al. (2017—C6) synthesize one of the tools used for denying credibility of an academic piece. Pezerat’s quote below will give a clue of the sense of this category:

Although it is widely accepted that exposure to any asbestos type can increase the likelihood of lung cancer, mesothelioma, and non-malignant lung and pleural disorders, manufacturers and some chrysotile miners’ unions contend that chrysotile either does not cause disease or that there is insufficient evidence to reach a conclusion (Pezerat, 2009, p. 102—C5).

In this sentence, Pezerat uses a language strategy of *linking the controversy to people who are not scientists and come from socio-economic fields*. He uses this tool for disqualifying other research papers that he has been commenting on and denying the scientific character of. When labeling these research papers as non-scientific or not credible, the commenters also specify the criticisms pointing especially to the *state of the art* and the *methodology* of the papers.

About the state of the art, the main accusation comes from omissions of the scientific literature that contradict the main argument of the article (Finkelstein, 2013, p. 708—C4; Oliver et al., 2017, p. 01—C6). Moreover, citing the results of other research papers that are knowingly written by industry-funded authors is also an object of doubt about the credibility (Oliver et al., 2017, p. 01—C6).

About the methodology, there are accusations both on the procedures adopted for experimentation and on the conceptual definition of keywords used in the theory construction.

Discussions of the relevance of “long and short” fiber lengths and “biopersistence,” *absent any consistent definition of these terms* or any *discussion* of the duration of deposition required to cause a

health effect, is closer to the fiction of Lewis Carroll than science. Complete omission of the evidence showing the impact of changes to surface properties on fiber toxicity is *bad science*. *Failure to explain preparation methods* in an asbestos animal study, in face of multiple studies over many decades that show that these are a key determinant of toxicity, is a reason to question the credibility of a scientific paper and/or studies on the issue (Egilman, 2011, p. 101–102—CASE 3).

In this section, I have described types of strategies used for denying controversy on the health risks of asbestos. On the one side, *controversy is denied by the idea that studies linking health risks and controversy to asbestos are out of date*; on the other side, *controversy is denied when industry-funded authors support theses of safe controlled use of chrysotile through misleading references and methodologies*. But what does it mean to say that there is controversy on the health risks of asbestos? The following statement will provide an insight emerging from the data: “*The phrase ‘chrysotile debate’ is not neutral*” (Nemery et al., 2017, p. 02—C6). The sentence points to an interpretation of the word “debate” that goes beyond the healthy environment of scientific doubt. In this context, when abusing the basic principles, guidelines and rules, *controversy promotes a breach of power, and constructs a space of anomy*. When anything is science, then nothing is science. *The controversy appears as an object of denunciation*.

In a sensitive subject like the one studied in these academic pieces, *the nature of controversy is also aligned to the field of medicine in which the author is working*. The controversy comes from what use can be made of each study that seeks to demonstrate, for example, that chrysotile has a low biopersistence in human body.

Thus, *subjects of scientific interest are not necessarily subjects of public health interest*. Case 1 brings an interesting debate on this idea. Stayner et al. (1996—C1) wrote a literature review concluding that the amphibole hypothesis should not be accepted by science. The article received six comments, and was most attacked by a criticism that also frames the debate: “Moreover, the thrust of the amphibole hypothesis, as reemphasized recently by the McDonalds and Wagner, among others, is mesothelioma and not lung cancer” (Mossman & Gee, 1997, p. 690). So, the object of the debate is moved to another scenario: it was not about how hazardous chrysotile is to human health; but how it is hazardous compared to amphiboles, and only regarding a specific disease, mesothelioma. A further comment will be the link between this part of our narrative to the next one:

A key point of our paper is that irrespective of mesothelioma, exposure to chrysotile asbestos should be viewed as a significant carcinogenic hazard. [...] The excess of lung cancer is generally far larger than the excess of mesothelioma in most epidemiologic studies of asbestos-exposed workers [...]. (Stayner et al., 1997, p. —C1)

This debate is fruitful because it means that the two consensus we talked about above—the hazardous nature of

amphiboles, and the fiber type differentiation—have more than one way to be developed. Therefore, I move to the last category by asking: what are the consequences of choosing one or another way?

Consequences of research misconducts. In this category, more than representing the deviant behavior, or the methodology used for it, the authors represent harm and victimization, directly or indirectly, intentional, or unintentional, resulting from that.

“As is often the case with environmental issues, the implications of the debate are not just scientific” (Nemery et al., 2017, p. 01—C6). This statement is useful for understanding an important result emerged from the data: the idea that *research papers can influence political decisions around the world*. There appear to be two possible harms produced by political decisions based on *bad science*: “*separate standards for the different forms of asbestos*” (Stayner et al., 1996, p. 184—C1); and the assumption of a possible *safe controlled use of chrysotile* (Pezerat, 2009—C3).

The international economic interests of creating uncertainty are also objects of concern. The relationship between science and political decisions in the global sphere appear with the idea of an international division of the labor, in the sense that it is easy for corporations and chrysotile institutes from the global North to influence the decisions in the South. The avoidance of a global asbestos ban by governments, organizations and corporations is also described.¹⁰ This changing situation in the national and international regulation of asbestos opens another analysis: there are temporalities of the consequences of science misconduct on asbestos risks. When talking about the impact on political decisions of banning or not banning the fiber, the actors are representing *consequences of projecting harm to the future*. When talking about judicial decisions that can be made inside litigation for injured workers, they are representing *consequences of denying harm produced in the past*.

In both temporalities *there are also victims constructed in the discourses*. They are “workers in developing countries where living and working conditions, combined with inadequate health care, add to morbidity and mortality from exposure to chrysotile” (Pezerat, 2009, p. 105—C2). They are also “workers whose jobs involved handling asbestos or asbestos-containing materials, but also for their families and people living close to facilities handling asbestos, as well as for future generations of workers and the general public who might come into contact with the legacy of the widespread usage of asbestos” (Nemery et al., 2017, p. 1700861—C6). In both descriptions, vulnerable people are characterized: the first reaches workers from global South. In the second, the number of victims is expanded, encompassing the past, present and future, and increasing the exposure beyond the walls of the factories or the limits of a mine.

The consequences for the future are more linked to political decisions in the global South. When talking about the consequence for the past, regarding compensation of ex-workers, the victims are described more often as workers from the global

North who were injured during a time when asbestos was still legal. This topic is articulated by Cullen (1996, p. 159—C1):

Many otherwise well-informed physicians and scientists worldwide continue to believe that chrysotile is a “good” form of asbestos, if only it could be separated from contamination. And judging from personal observations, *many victims of this “good” form have had compensation claims controverted or denied because they were exposed to “only” chrysotile.*

Twenty years after this quote, this idea is still strongly highlighted: “[science] will influence outcomes in the adjudication of asbestos-related disease in the legal system and that, as a result, *the injured worker will suffer unfairly and unjustly*” (Oliver et al., 2017, p. 2—C6).

Together with the human victims, *another victim of this process appears to be science itself*: the chrysotile lobby is influencing regulation and the legal agendas involving lawsuits for avoiding compensation, undermining the very integrity of science and environmental health practice (Cullen, 1996, p. 158—C1). The idea that *science has been directly impacted by liability issues* is a frequent lament. Actually, there is already a category for this type of work: litigation-driven research (Bohme, 2012—C3).

Simultaneously, there is a recognition that the impacts of lawsuits in science also provide good results. First, in the case of the United States, “[...] manufacturers’ recognition of the potential for direct product liability led, in the 1970s, to the explosive growth of occupational medicine clinics, enhanced interest in environmental health among worker groups, and rapid substitution of alternative products for most asbestos uses” (Cullen, 1996, p. 158—C1). Second, *the sworn truth that a witness has to pronounce in court has allowed lawyers and people who struggle for a global asbestos ban to discover the nefarious ties between science and industry in the history of asbestos use.*

Discussion: Micro Disputes Inside Macro Disputes

This empirical study aimed to contribute to the literature about the alliances between science and industry by providing insights on the ways in which the disputes for truth on asbestos risks to human health have taken a path that diverts studies from the route of specific engagement with medical topics, to find other languages: economic, legal and political ones. The shared representations about the consequences of these disputes resonate with what we already know about the massive harms, victimization, and impunity associated with the crimes of the powerful (Barak, 2015; Faria, 2018; Tombs & Whyte, 2015). Bringing some subtle insights of this dispute helps to understand the universe where the experts themselves represent the relationship between science, industry funding, and many consequences.

According to Friedrichs (2002, p. 243), scientific misbehavior could be inserted in the category “occupational crime,”

that refers to “[...] illegal and unethical activities committed for individual financial gain—or to avoid financial loss—in the context of a legitimate occupation.” Faria (2018, p. 46) studies the CoI inside a greater category of research misconduct, as one type of possible deviant behavior of scientists. CoI is present when the authors or organizations that develop research have primary or secondary interest in the result of the investigation, at the point that it “may strongly predispose an individual or organization to exploit a professional or an official capacity in some way for personal or organizational benefit” (Claxton, 2007, pp. 558–559).

In a study that examined the declaration of CoI in 1140 research articles, Bekelman et al. (2003, p. 453) concluded, “[...] industry-sponsored studies were significantly more likely to reach conclusions that were favorable to the sponsor than were nonindustry studies.” This result corresponds with the one described in Table 2. The authors also suggest as a good political practice for dealing with this problem that investigators and sponsors should also make available all research results in a comprehensive, publicly accessible registry (Bekelman et al., 2003, p. 464).

The disrespect with journals’ ethics guidelines was an object of discussion in the data analyzed (Bohme, 2012—C3). One interesting example was the corrigenda published in 2012 in the *Journal of Inhalation Toxicology*, about three articles by Bernstein and his colleagues, from 2008, 2010, and 2011, in which they did not declare their CoI. The paper circulated for at least four years without any information of interests, making use of a strategy that I called *detaching the conflict timeline from the article timeline*. Bernstein’s case is remarkable, because from the 80 papers of the larger corpus of articles of this research, 11 were by him, many times with co-authors.

Coincidentally Ruff (2015) cites this exact case to discuss the failure in the enforcement of the policies regarding CoI. The author cites many other asbestos research papers in which known ties between authors and industry never were acknowledged, or they were much later, after the scientific community had pressured editors and publishers. After disclosing the CoI by exposing five different journals, Ruff also exhibit their CoI policies. Both the non-compliance with the policies, and a certain complacency on the part of publishers when scientific misconduct is disclosed are discussed by the author, who claims an attitude of control from the scientific community concerned with the serious repercussions for public health (Ruff, 2015, p. 7).

Faria (2018, p. 46), when talking about the social control mechanisms in science, mentions that authors have questioned the *peer-review* system. Some of the questioned practices are: “[...] potential bias in the publishing and grant-awarding processes, coercive self-citation from journal editors, ethical transgressions by reviewers, and even instances of fake peer review.” The study of research misconduct must pay attention to all these problematic places while thinking on ways of avoiding their harms. “In sum, social control by the scientific community is not free from bias or from loyalty and power

networks and the promotion of non-scientific interests” (Faria, 2018, p. 46).

The empirical study brought here showed that industry-funded authors are well aware that their papers will be considered more suspicious the more they clarify their ties with industry. It seems to be the only possible motive for them not to acknowledge these ties unless they are in some way obliged. When I say “some way,” it is because the ethical guidelines provided by the journals where these research papers are published seem not to have a strong engagement, or a control. The failure in making the policies effective also makes part of what Camargo (2009, p. 1080) called “knowledge industry,” inside which editors of journals develop roles to make it easier for them to spread biased knowledge. The author says, “Commercial interests have the control of all the production cycle and medical knowledge distribution with terrible consequences” (Camargo, 2009, p. 1082). Finding effective mechanisms of social control not only of authors and peer reviewers, but also of editors and publishers in science seems to be of most importance. Many suggestions are brought by Ruff (2015), one of them being to include contraventions of CoI disclosure requirements in the impact factor of journals. The main proposal is the creation of a practical mechanism for providing transparency, oversight, and accountability. As Camargo (2009, p. 1082) notes “[...] knowledge is as much an essential to public health as vaccines or screening tests are and should thus be treated accordingly.”

Swearing to Tell the Truth: Discovering Industry Ties Through Litigation

In the grounded theory I presented, there is a perception that litigation interests are setting the scientific agenda. On the other hand, these lawsuits permit some information to come to light. Many of the statements made by Bohme (2012—C3) and Ruff (2015) were possible only using *sworn in court* to ask scientists about their ties with industry and to collect old corporate documents.

One example was Johns-Manville, a North American company that had their concealment strategies undressed in a lawsuit in the United States. Based on internal communications from 1933, Lilienfeld (1991) revealed that the knowledge about asbestos carcinogenesis brought only one documented apprehension: the increase of the costs of production and the payment of compensations for workers. Once-secret documents show that this was not an isolated case (Chowkwanyun et al., 2018). Facing the deadly properties of asbestos, industry found a way out of the controversy by funding researchers to create methodologies and theories for supporting the continued use of asbestos and avoiding liability (Rosner & Markowitz, 2017).¹¹

The North American context of the 1970s is particularly useful for comprehending this process. The financial compensation of asbestos victims increased public attention to the harms caused by asbestos exposure, as did the governmental regulation of the fiber with the creation of the Occupational

Safety and Health Administration. OSHA in turn created another institute, The *Asbestos Information Association/North America*. AIA/NA had the objective of producing scientific discourse compromised by industry interests (Markowitz & Rosner, 2016). Bocking (2004) explains that this was a strategy first used by the tobacco and chemical industries as a means of mitigating the negative impact of industry research funding. Other institutes created with this objective are *International Chrysotile Institute*, *Canadian Chrysotile Institute*, *Brazilian Chrysotile Institute*, among others.

Another revelation extracted from these studies is that some of the scientists who were considered threats to the asbestos industry in the 1960s-70 s became their allies in the 1990s (McCulloch & Tweedale, 2008). According to Tweedale (2017), the scholar who first demonstrated the relationship between asbestos exposure and mesothelioma was one of these scientists (Wagner et al., 1960). Wagner started testifying in lawsuits as a well-paid expert on behalf of the asbestos industry, and as McCulloch (2006, p. 613) notes, contributed to keeping “alive doubt regarding the causal link between chrysotile and mesothelioma.”

Denying Controversy for Obtaining Controversy

The disputes for truth about the meaning of the controversy led to a classification inside a main category called *denying further controversies*: on one side, affirming the consensus around all types of asbestos carcinogenicity; on the other side, affirming the consensus around fiber differentiation, and then absolving chrysotile. The strategies are different, and in the case of supporting that chrysotile is not harmful to human health, the denial of CoI come together with the strategy of *not citing opposing studies* or labeling the opposite positions as *out of date*. *The use of a sense of temporality and historicity to deny controversy and risk* also dialogues with the idea of progress and of up-to-date knowledge.

The representation of this denial of controversy by the authors who accuse industry-scientists of bias is the one that *they deny controversy for producing controversy*. This finding is also connected to the literature that shows how industry funding leads to a process called “manufacturing doubt” (Michaels, 2008) or “manufactroversy” (Camargo, 2009, p. 1079).

Behind the production of a supposed artificial controversy lies the social representation shared by the experts of what are the consequences of the use of all these strategies. Thus, the authors have the perception that: 1) assuming that there is controversy is ideological, because it reopens the possibility of removing or avoiding the ban (about the future); 2) acknowledging that there is controversy is also a strategy of defense for not being accountable for the harms caused to real people in the lawsuits (about the past); 3) affirming that there is no controversy because chrysotile can be safely used can cause controversy, and this is the desirable product (Michaels, 2008).

More than understanding these processes, comprehending the representation of what are the harms and who are victims

of these misconducts can make them visible. As Faria (2018, p. 58) notes, “one way to address the need to prevent, regulate, and sanction RM [research misconduct] is to try to understand its harmful consequences.” The temporalities pointed out above in which I address the representations about the consequences of research misconduct are interesting when thinking about harm and victimization (Hylliard & Tombs, 2005; Faria, 2018). These theoretical definitions also approach the subject of green criminology, particularly when the scientific misconduct creates pollution and toxic contamination, exposing a wide spectrum of possible environmental victims (Beirne & South, 2013; Natali & Budó, 2019; Wyatt, 2017). Political consequences in regulation are often linked with harms guided to the future, and the victims are represented as workers from the global South, mainly from places where access to health is not universal and qualified. Judicial consequences in trials are related to the past harms, both in places where asbestos was already banned, or where asbestos is being substituted for other fibers. The victims in this case are represented both as those who suffered an occupational exposure to asbestos, and the whole society.

As Friedrichs notes, “victimization caused by the different forms of white-collar, occupational, and organizational crime is hard to estimate. While violent consequences, for instance in the environment or people’s lives, may be easy to assess, many other harms are not” (Friedrichs, 2010). In the case of asbestos, it is not so difficult to identify human victims of the research misconducts caused by CoI, as the use of biased studies are openly used both to formulate public policies (to the future), and to decide in the trials (to the past). However, many social processes are needed to get to the point in which an environmental or occupational victim recognizes himself or herself as a victim. This is what I found in other work regarding to victimization by asbestos in the Italian and in the Brazilian case (Natali & Budó, 2019; Silveira, 2018). This aligns with the most well-known literature in green criminology and in white collar crime (Hall, 2018; Natali, 2015). Ambiguities are permanently found in these studies, in regard to the workplace (Tombs, 2005, p. 41) and the living territory (Böhm, 2020; Natali & Budó, 2019). The construction of victimization in this theme also dialogues with those described fields, as it is not interpersonally provoked, and may be geographically or temporarily distant from the action, as part of an ongoing process (Whyte, 2018). Because of this invisibility, it is almost always treated as collateral damage of capitalist economic development (Barak, 2015). Disinformation is the product that contributes to this invisibility, constructed for keeping profit at any cost.

Final Thoughts

From the polemic between the interpretations on the harms provoked by asbestos to human health and to the environment, attempts are being made to successfully develop a discursive shield that goes through scientific discourse and spreads to political and judicial discourse. This study aimed to contribute

to the visibility of the strategies used by scientific experts to deal with the CoI and the sense of who may dispute for truth, by what means, and with what consequences. The paper was also an exercise in jumping from a microanalysis of harmful behavior and representations about victimization to a macroanalysis of where we can also see the power of globalized capital and the way in which the spreading of asbestos harms has only been changing the flows, but not being actually threatened. Further studies could also better understand the ways in which editors and publishers contribute to this spreading of harmful ways of thinking about hazardous substances; the dimension of the consequences in a victimization and social harm approach; and the reception of scientific discourse in a deeper analysis of political and judicial discourses.

In 2017, after the Supreme Federal Court (SFC) prohibited asbestos throughout Brazilian territories, the decision was not actually enforced, and some appeals are still pending judgment (Clemens, 2020). In 2018, Brazil was the third highest exporter of asbestos in the world. Only in 2019 SAMA mining started a process called “hibernation,” firing 400 employees and suspending the activities of the Canabrava mine in Minaçu-Goiás. However, in February 2020, the company published a note stating that it would restart processing the minerals already extracted before the suspension of the mining activities.

What allowed the company to violate the SFC decision was a state law approved by the parliament of the state of Goiás, permitting the extraction of asbestos exclusively for exportation (Goiás, 2019). Ronaldo Caiado, the then federal representative in the parliament who wrote the report not to approve the law for banning asbestos in 2001 is also the author of the state law of Goiás, where he is currently the governor. Ronaldo Caiado is known in the Brazilian political scene for his leadership in the agribusiness lobby that dominates the National Congress and that has been supported by extreme right-wing President Jair Bolsonaro. The way in which Caiado is defying the Supreme Federal Court symbolizes the current political context in Brazil, as the SFC has also been strongly attacked by Bolsonaro and his supporters, who recently threatened Ministries and the democratic political regime (Romero et al., 2020).

Evidently the economic interests are huge, and science here is used as a way of justifying political decisions already made based on money. But since 2017, many companies have been forced to replace asbestos with other less harmful fibers and to spend a lot of money on compensation for collective. Economically, asbestos is no longer so important to the internal market, having been restricted to the region of the Canabrava Mine in Goiás, for the purposes of export. As long as the SFC decision is not actually enforced, the country seems to be following the same pathway that some countries of the global North went through: exporting harm, but now from the global South to other parts of the global South. This is a study still to be done in academy, but the social movements for the global asbestos ban are already mobilized to denounce it (IBAS, 2019).

The migration of harms through externalizing risk, disease, and violence (Böhm, 2020) is accompanied by a migration of

ways of thinking about the risks and the harms that are constructed through scientific discourses (Castleman, 1995). Because asbestos is an industrial cause of widespread injury, the examination of all its dimensions provides a salient illustration of the crimes of the powerful worldwide. In this case study, industry is showing its capacity to assimilate the costs of the deaths, consciously provoked, by funding scientists to construct theories to legitimize their activities.

From this point of view, scientific discourse is clearly spreading these harms, through research misconducts. Dialectical reflection reveals the power of science to stop social harms and, at the same time, to spread them. More than that: the way in which the international division of scientific labor and a colonial sense about who can internationally dispute the truth has been used as a strategy for denying CoI and supporting harmful decisions. The method is the migration of ways of thinking and speaking about the health risks of asbestos from the global North to the global South. The migration of harms in this context is not only about exploring an abstract place of production of truth, that is science, but mainly exploring the concrete place of exercise of power occupied by science produced and published in the global North, inside an international division of labor.

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Notes

1. However, experts have criticized the last document published by the Environment Protection Agency (EPA) because it relativizes asbestos risks to human health, mainly to environmental exposures. Rosner and Markowitz (2017) also advert that the EPA has been threatening to be undercut along with other federal agencies.
2. According to the National Confederation of Industry Workers, the state law violated the competence of the Union for legislating about mineral resources. They argued that it also contradicted the current Federal law which banned, in 1995, only amphiboles asbestos, and regulated the mining, use, transport, and commercialization of chrysotile (Brazil, 2017).
3. "Exposure to asbestos, including chrysotile, causes cancer of the lung, larynx and ovaries, and also mesothelioma (a cancer of the pleural and peritoneal linings). Asbestos exposure is also responsible for other diseases such as asbestosis (fibrosis of the lungs), and plaques, thickening and effusion in the pleura" (WHO, 2014).
4. Pubmed is a research tool developed by the US National Library of Medicine. In their website they declare: "PubMed comprises more than 29 million citations for biomedical literature from MEDLINE, life science journals, and online books. Citations may

include links to full-text content from PubMed Central and publisher web sites." The website is available at: <https://www.ncbi.nlm.nih.gov/pubmed>.

5. The block "CoI" admits more than one mark, because some of the articles have more than one author or bring different information about CoI at the time of publication and in later errata or corrigenda..
6. The errata (Case 2) and corrigenda (Case 5) are not numbered as texts because they do not bring any content beyond the information about CoI. So, this information is considered for marking the option for CoI regarding the text the errata refers to.
7. e.g. "The publisher apologizes for this error" (Erratum, 2014, p. 109 -C5), e.g. "[...] [the author] apologizes for overlooking this disclosure in the previous erratum" (Erratum, 2015, p. 525- C5); "The publisher would like to apologize on behalf of the authors" (Corrigenda, 2012, p. 80 - C2).
8. Organizations cited: International Chrysotile Association, Zimbabwe National Chrysotile Taskforce, Canadian Chrysotile Institute, Québec Chrysotile Institute, Chrysotile Institute. Companies cited: Honeywell; Georgia-Pacific; Dupont; Union Carbide Corporation.
9. "Disclosure: [...] The Editor in Chief of IJOEH, David Egilman, has served as a consultant for plaintiffs and defendants in asbestos-related litigation" (Bohme, 2012, p. 88—C3). Belgian Foundation against Cancer (Nemery et al., 2017—C6); personal fees from insurance, personal fees from court German Social Accident Insurance (DGUV) (Feder et al., 2017—C6). "Dr. Baur has testified as an expert in asbestos-related litigation at social courts and has prepared expert opinions on request of accident insurance institutions. Dr. Egilman serves as an expert witness in asbestos tort litigation at the request of companies that manufacture and sell asbestos containing products and people who have been injured as a result of exposure to asbestos. Dr. Oliver has testified on behalf and at the request of asbestos victims and their families." (Oliver et al., 2017—C6).
10. "[...] Russia protested when health experts at the 2007 World Society Security Forum in Moscow called for a global asbestos ban because of the health risks associated with asbestos exposure. Russia is the top global asbestos producer" (Pezerat, 2009—C3).
11. Recently, it was found that the strategies for avoiding liability are far from merely paying scientists. In 2016, one of the greatest global asbestos victims' movements was being object of espionage by industry. For details, see Kazan-Allen (2019).

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