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Suborning science for profit: Monsanto, glyphosate, and private science research misconduct

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Highlights

- Monsanto engaged in ghostwriting and other types of research misconduct to disrupt regulatory oversight of one of its most profitable products.
- Although public-science organizations have sanctions in place to punish research misconduct, private-science organizations do not. At least one Monsanto employee boasted about research misconduct in promotion materials.
- Journal editors who oversaw decisions in which Monsanto manipulated the peer review process did not disclose their conflicts of interest.
- Scientific misconduct by private firms threatens the integrity of public science and the public's trust in science.

Abstract

Using documents from a lawsuit filed against the agricultural chemical and biotechnology firm Monsanto (now Bayer), we document a private firm's efforts to distort the scientific peer-review process through ghostwriting, to orchestrate campaigns to retract journal articles, and to influence editorial decisions. The firm's apparent goal was to manipulate the regulatory process so that it could continue selling a product that the firm's own research indicated might be dangerous. The long-term impact has been to threaten the integrity of scientific peer review and public trust in science. The findings have implications for public-private research collaborations, the validity of private-science research, scientific journal policies on conflict-of-interest disclosures, and policies governing the role of private science in regulatory oversight.

Introduction

During the summer of 2018, after determining that Monsanto had failed to disclose potential cancer risks from its Roundup herbicide, a California jury awarded \$289 million to a man who claimed that his cancer was caused by Roundup (Brodwin,2018). The award was later reduced to \$78.5 million, but it was just the beginning of a series of lawsuits that has damaged the stock value of Bayer Corporation, which purchased Monsanto in June of 2018 (Shabanand Heath,2019). As of June 2020, Bayer was preparing to pay \$10 billion to settle tens of thousands of claims that Monsanto failed to disclose information indicating that Roundup could be linked to non-Hodgkin's lymphoma (Cohen,2020).

It is now generally recognized that Monsanto engaged in research misconduct to distort the scientific record with the goal of preventing proper regulatory oversight by the US Environmental Protection Agency (EPA) (Donleyand Gillam,2019). We provide a systematic inquiry into the nature of that misconduct, the broader impacts of that misconduct on the institution of science, and the potential impacts on the public's trust in science.

Two recent studies examine how commercial or market-oriented logics generate a context that is conducive to research misconduct when economic interests conflict with scientific goals of advancing knowledge for its own sake (Halland Martin,2019; Berggrenand Karabag,2019). Beyond providing a conducive context, some research even indicates that private firms actively engage in and promote scientific misconduct in pursuit of their business interests (Sismondo,2018; Honigetal., 2014; Sternand Lemmens,2011; Fugh-Berman,2010).

Many proponents of private-public research partnerships claim that these partnerships enhance social welfare by promoting efficient knowledge and technology transfers (Etzkowitz and Leydesdorff, 2000; Beesley, 2003; Jain et al., 2009; Perkmann et al., 2013; Gianiodis and Meek, 2020). However, others note that collaborations with the private sector might cause unintended harms, such as diverting attention from public-interest science (Dasgupta and David, 1994; Glenna et al., 2011; Czarnitzki et al., 2015; Glenna (2017); Marks, 2019; Usula et al., 2019). Some have found that public scientists with links to the private sector are more likely to do biased research, to restrict publications and data sharing, and to be involved in higher rates of research misconduct (Bekelman et al., 2003; Krinsky, 2003; Martinson et al., 2005; Martinson et al., 2009; Edwards and Roy, 2017). Although this evidence links private science to research misconduct, there is still a tendency to portray misconduct as the result of ethical lapses by individual scientists or as the result of inadequate university policies to manage such relationships.

Since private-science firms rely on research outputs to generate profits, however, those firms have conflicts of interest that could ultimately harm the broader institution of science. For example, Sismondo (2018: 12) describes how pharmaceutical firms “ghost-manage” the process of generating medical research:

...they shepherd the key opinion leaders (KOLs) who disseminate the research as both authors and speakers, and finally they orchestrate the delivery of continuing medical education (CME) courses. In so doing, they position themselves as the ultimate sources of the information physicians rely on to make rational decisions about patient care. In this we can see the importance of pharma's hegemonies over medical knowledge.

Sismondo (2009, 2008) acknowledges that these firms often do serious scientific research, but their goal is to create a commercial solution to a medical problem and to generate free advertising for their products in medical journals, not to enhance society's medical knowledge. Some firms are even willing to promote falsehoods and poorly justified claims to advance their business interests (Sismondo, 2018).

Agricultural biotechnology firms engage in similar efforts. These firms provide materials and funding to university scientists with the goal of building a body of independent, peer-reviewed publications to demonstrate that their products are safe and efficacious when it comes time for regulatory review (Glenna et al., 2007). Marks (2019) and Lessig (2011) describe similar examples of how health, food, and pharmaceutical firms use public-private partnerships to shape the scientific record according to their interests.

Using documents from a lawsuit, Fugh-Berman(2010) shows how pharmaceutical firms hired professional writers and communication companies to generate ghostwritten manuscripts for medical journals to promote hormone replacement therapy, even after evidence emerged to indicate that the therapy might harm patients. Such findings support concerns that research misconduct may be causing “real physical harm” (Biagioli et al., 2019: 411)

Fugh-Berman (2010: 1) claims that the number of ghostwritten publications in peer-reviewed journals is not known, but that “the practice may be extensive.” A systematic review of six top medical journals found that 7.8% of the 630 articles published in 2008 were ghostwritten (Wilson and Singer, 2009). Stern and Lemmens (2011) argue that ghostwriting and related marketing strategies are common enough, and harmful enough, that lawmakers should consider criminalizing these practices.

Scholars have found that some industries, such as tobacco and fossil fuel industries, have long been involved in planting misinformation in the scientific literature to cause confusion (Aho, 2017; Oreskes and Conway, 2011). In Australia, the lead industry worked for nearly a century to distort the scientific literature surrounding the health effects of lead (Silbergeld, 1995). Industries often fund university research or generate their own publications directed at “preventing, delaying, or weakening government regulations of their products” (Aho, 2017: 698).

Proctor and Schiebinger (2008) refer to these efforts to distort and misinform as the social construction of ignorance. Proctor (2012) developed this theory after studying how the tobacco industry perpetuated ignorance by hiring a firm to produce a propaganda film, which fostered public confusion on the link between smoking and cancer.

Kleinman and Suryanarayanan (2015, 2013) and Suryanarayanan and Kleinman (2011) describe how the Bayer Corporation used established rules and scientific norms for toxicology research to obfuscate and to undermine research on the link between agricultural chemicals and bee deaths. They note that Bayer's money and power are important in this effort, but they claim that the “social organization of science,” and Bayer's ability to manipulate that social organization to their advantage, is also important (Kleinman and Suryanarayanan, 2015: 184).

Researchers studying the social construction of ignorance claim that the perpetrators often manipulate the social organization of science by imitating the discourses, styles, symbols, and images to make their work appear to be genuine, just as a magician uses illusions (Allchin, 2012; Toumey, 1977). As Allchin (2012: 661) explains, science has cultural authority, so “it should surprise no one that those seeking power or profit try to mimic it.” Those pushing ignorance often point to tangentially relevant scientific credentials, adopt the rhetoric of critical thinking and reasoned skepticism, and carefully

select and present data to appear professional (Allchin,2012). These insights help to explain why Monsanto engaged with the scientific peer-review process to generate journal articles that would mislead and confuse.

Publishing journal articles provides a halo effect for private science because scientific-peer review is widely recognized as providing legitimacy within scientific professions, in regulatory agencies, and among the public. As Cronin (2005: 25) contends, peer review is “the instrument for ensuring trustworthiness.” Peer review is typically connected to academic science, and academic science is commonly associated with public trust in science. In an experiment that asked laypeople to evaluate the trustworthiness of research depending on the publicness or privateness of the research, Besley et al. (2017) found that people became progressively less trusting in the research findings when they were told that there was industry funding or that there had been research collaborations with industry.

Scientific peer review is also important for regulatory oversight. Although peer review does not catch all cases of research misconduct (Martin,2012), and although there are concerns about bias and partiality in the peer-review process, there is still widespread support among scientists that peer review is “necessary for vetting knowledge claims” (Lee et al., 2013: 10). Because of its trustworthiness, many governmental regulatory bodies and non-governmental organizations use peer-reviewed journal articles to make legal and regulatory decisions (Bornmann,2011; National Research Council(NRC) (1998)).

Most journal publication retractions happen because of scientific misconduct, according to one analysis (Fan et al., 2013). However, industries also seek to discredit publications and pressure journals to retract publications. When a publication appeared in the Journal of the American Medical Association about industry influences on sponsored drug trials, a pharmaceutical company responded by attacking the integrity of the researchers and eventually charged the researchers with scientific misconduct (Gornall,2009).

Peer review does not elevate a paper beyond criticism. However, there is an assumption that, even if a bad paper is published, subsequent journal articles and scientific deliberation will expose the flaws (Albert et al., 2015). Prominent sociologists and philosophers of science, including Merton (1973) and Popper (1963), therefore describe peer review as having a self-correcting capacity that may be more rigorous than any other field of activity (Albert et al., 2015). Therefore, evidence of private firms being involved in manipulating a journal's peer-review process or orchestrating campaigns to retract articles threatens the integrity of that peer-review process. Considering the many perverse incentives that affect academic scientists, Edwards and Roy (2017: 51) question whether science is being pushed to a “tipping point” where “the scientific enterprise itself becomes inherently corrupt and public trust is lost....” We question here whether

mounting evidence of industry manipulation of the scientific peer-review process presents a similar tipping point for public trust.

Private firms, especially those in the agricultural biotechnology-chemical industry are widely recognized as benefiting from very strict intellectual property laws that they use to avoid information sharing and to prevent independent scientists from evaluating the efficacy and safety of their products (Wright,2007; Waltz,2009; Pollack,2009; Glennaetal., 2015). Because of this secrecy, scholars studying research misconduct or other scientific research topics in the private sector often must rely on opportunistic events to gain access to data, such as lawsuits. For example, Fugh-Berman(2010) relied on documents made public during litigation to demonstrate widespread ghostwriting in the pharmaceutical industry. We have taken a similar approach, using Monsanto's internal documents, primarily company e-mails and text messages, that were made publicly available in 2016 by Baum, Hedlund, Aristei & Goldman, the law firm that represented the plaintiff in the first case against Monsanto. This presented a rare opportunity to access the written records that revealed a private firm's research misconduct.

Using this kind of qualitative data creates challenges because, unlike conducting intensive interviews, the documents do not allow for follow-up questions or clarifications from the people who produced them (Hodder2000: 703). In our case, the use of that data in ongoing lawsuits, the sensitive nature of the material in the documents, and the secrecy of the firm involved in the scandal make it very unlikely that we would be able to conduct follow-up interviews with the authors of those texts. However, Ginzburg(1989) has argued that such involuntary textual evidence may be superior to intentional evidence, such as evidence provided in interviews, because it is like the evidence mistakenly left at a crime scene.

To analyze the data, we use what Hodder(2000) refers to as the hermeneutical techniques of coherence and correspondence. Coherence refers to the process of seeking contradictory evidence or conflicts within the texts (Hodder,2000). In our case, for example, we found an e-mail exchange where a scientist objects to being a ghostwriter, thus providing internal confirmation of the practice we labeled as ghostwriting. Correspondence refers to the process of finding other sources of material that confirm or undermine a particular interpretation (Hodder,2000). In our case, correspondence emerged in the form of our interpretation being consistent with the law firm's interpretations and with interpretations in numerous newspaper articles. We use the correspondence technique when we interpret the e-mails and text messages within the context of previous and subsequent e-mails and text messages, as well as within the broader political and economic contexts.

Although our broad categories for coding the e-mails and text messages are consistent with the law firm that gathered and released them, we take a different approach to analyzing the data. First, we are not trying to document whether an action was criminally or civilly liable. Rather, we seek to first assemble the documents into a coherent timeline of events. This enables us to identify the research practices and scientific misconduct by employees of the firm and by people they collaborated with. We then use social theories to evaluate how the activities fit within broader social trends related to private science and science policy. For instance, we identify and focus our analysis on the practices of ghostwriting and manipulating the peer review process. Our analysis explores the context in which these practices were used with the goal of understanding the situations and motivations driving these actions. Furthermore, by analyzing the context in which the science misconduct took place, we shed light on the institutional arrangements and potential weaknesses that made these activities possible.

The Baum, Hedlund, Aristei & Goldman law firm sorted, coded, and organized those internal documents in three ways. The first involved sorting the raw documents, including e-mails, memos, PowerPoints and talking points, journal manuscripts, and reports, into 75 categories based on themes. They then aggregated the documents into eight general thematic areas, described the relevance of the documents for litigation, and explained how the documents would be used in the trial. Their sorting, coding, and legal commentary made it easy for us to read and make sense of the documents. Combining their analysis with ours also served as an inter-rater reliability check.

The firm then grouped the documents into four general areas of relevance:

- Ghostwriting, Peer-Review & Retraction
- Surfactants, Carcinogenicity & Testing
- Absorption, Distribution, Metabolism & Excretion
- Regulatory & Government

Since the emphasis of our paper is on scientific misconduct, we focus on the “Ghostwriting, Peer-review & Retraction” category. We summarize elements from the other categories only to highlight why Monsanto engaged in ghostwriting, peer-review, and retraction activities, and how they leveraged those activities to achieve their goals.

We did not edit quotations that we include in this paper because we want to be transparent in presenting what was in the documents. Misspellings, errors in grammar and punctuation, and informal phrases were in the original documents. Furthermore, in some instances, the informality of the exchanges reveals the closeness of the

relationships between Monsanto executives and external scientists, editors, and regulators.

Section snippets

The regulatory context for the Monsanto and glyphosate case

Monsanto was the first to release glyphosate in a commercial product, called Roundup, in 1974. Roundup is known as “the world's most widely used herbicide,” and it has been used in agriculture, turf management, and other industries for four decades (Zimmer,2018). Roundup accounted for roughly 10% of Monsanto's approximately \$1 billion in profits in 2008 (Cavallaro,2009). Furthermore, many of its major seed sales are connected to this herbicide, since farmers buy Monsanto's Roundup Ready corn, ...

Analysis of Monsanto documents

Faced with the IARC's decision, and with the possibility of other agencies re-evaluating glyphosate, Monsanto mobilized to prevent that re-evaluation by generating peer-reviewed articles downplaying glyphosate's carcinogenicity, by attacking articles claiming that glyphosate is carcinogenic, and by appealing to journal editors to help them achieve these outcomes. ...

Conclusion

Ghostwriting is common in the pharmaceutical and medical device industries (Sismondo,2018; Sternand Lemmens,2011; Fugh-Berman,2010). Firms hire professional writers to write the papers and then solicit academics to agree to be listed as the authors. Since the listed authors contribute little or nothing to the actual manuscript, they could be called fake authors.¹ ...

CRedit authorship contribution statement

Leland Glenna: Conceptualization, Methodology, Formal analysis, Writing – original draft. **Analena Bruce:** Conceptualization, Methodology, Writing – review & editing. ...

Declaration of Competing Interest

Neither author has a conflict of interest. ...

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References (71)

L.G.A Beesley

[Science policy in changing times: are governments poised to take full advantage of an institution in transition?](#)

Res. Policy (2003)

M. Biagioli *et al.*

[Academic misconduct, misrepresentation, and gaming: a reassessment](#)

Res. Policy (2019)

H. Etzkowitz *et al.*

[The dynamics of innovation: from national systems and ‘mode 2’ to triple helix of university–industry–government relations](#)

Res. Policy (2000)

L.L. Glenna *et al.*

[Commercial science, scientists’ values, and university biotechnology research agenda](#)

Res. Policy (2011)

J. Hall *et al.*

[Towards a taxonomy of research misconduct: the case of business school research](#)

Res. Policy (2019)

S. Jain *et al.*

[Academics or entrepreneurs? investigating role identity modification of university scientists involved in commercialization activity](#)

Res. Policy (2009)

M. Perkmann *et al.*

Academic engagement and commercialization: a review of the literature on university-industry relations

Res. Policy (2013)

S. Sismondo

Pharmaceutical company funding and its consequences: a qualitative systematic review

Cont. Clin. Trials (2008)

B. Aho

Disrupting regulation: understanding industry engagement on endocrine-disrupting chemicals

Sci. Publ. Policy (2017)

B. Alberts *et al.*

Self-correction in science at work: improve incentives to support research integrity

Science (2015)



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Defining and conceptualising the commercial determinants of health

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2021, Rural Sociology



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