

Science Means Never Having to Say You're Sorry? Apologies for Scientific Misconduct

Science Communication
2019, Vol. 41(5) 552–579
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DOI: 10.1177/1075547019860848
journals.sagepub.com/home/scx



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Abstract

Retractions of journal articles exclude fraudulent or erroneous research from legitimate science and perform boundary work. Analyzing retractions from different disciplines and focusing on their apologetic aspects, we find that these apologies shift between openly addressing emotional, normative, and social themes and concealing them in a more scientific style of communication. Their boundary work remains highly ambivalent: They alternate between scientific and nonscientific forms of speaking, portray unstable patterns of control and coercion, and avoid drawing a boundary between legitimate and nonlegitimate science. In line with the hypothetical nature of scientific knowledge, retractions thus leave boundary making to the future.

Keywords

scientific misconduct, retractions, apologies, boundary work

Introduction

Science is publically held to high standards of rationality and honesty. When cases of misconduct become public scandals, these high standards are questioned. In order to save face, the scientific community engages in boundary

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work (Gieryn, 1983) to restore an image of science that justifies the societal role of providing and certifying objective knowledge. Misconduct is portrayed as exception to an otherwise legitimate scientific practice (Keränen, 2005). As a current form of boundary work, retracted articles present a way to correct the scientific literature in cases of scientific misconduct. Retractions should adhere to a mainly technical style of communication, illustrating the mechanisms of self-correction. Their content, however, offers a more nuanced and ambivalent picture when analyzed more closely: Especially their apologetic style often breaks with the expected technical correction of the literature. So what does it mean when retraction notices offer apologies?

Most available research on the content of retractions has been published in the context of biomedicine and is focused on quantitative assessments of the prevalence and covariates of retractions (Hesselmann, Graf, Schmidt, & Reinhart, 2017). The apologetic function of retractions as a form of boundary work has not been a focus so far, even though retraction notices frequently contain apologies. Two different strands of research are relevant here: Science and technology studies highlight the importance of boundary work to maintain a scientific identity in situations of conflict but also for collective identities in general (Lamont & Fournier, 1992). Linguistics and communication studies on the other hand have analyzed apologies in different media and languages, thus allowing for deducing features of apologies and their possible form in scientific communication.

This article aims at bringing these strands together in empirically analyzing retraction notices. Since retractions are a fairly new phenomenon, they provide strategic research material (Merton, 1987) in that they represent a public crisis in which moral, emotional, and social aspects of science become visible that are otherwise black-boxed (Latour, 1999). Focusing on the apologetic aspects of retractions can bring some of these moral, emotional, and social aspects of scientific boundary work to the surface. More specifically, retractions provide a picture of science that struggles with moral issues such as how to assign blame for misconduct, with emotional issues such as how to signal trustworthiness of scientists who violated scientific norms, and with social issues such as how to legitimize the authority of the actors issuing retractions.

Retractions as Ambivalent Symbols for Misconduct

The retraction of scientific articles is most prevalent in the biomedical disciplines. The number of retractions in the main biomedical literature database, PubMed, has grown exponentially since its first use in 1978 (Fanelli, 2013; Grieneisen & Zhang, 2012), representing a share of 0.02% of all published articles in 2014 (Amos, 2014). In most other disciplines,

retractions are highly exceptional (Karabag & Berggren, 2012). Nonetheless, as visible signs of scientific misconduct, they receive considerable attention in public discourse and numerous studies have been published estimating the numbers and causes of retractions (Hesselmann et al., 2017). Retractions make good headlines, promising to reveal the spectacular aspects of science. At the same time, they can also be used to argue that the scientific process, especially its self-correcting features, is working appropriately (Gieryn & Figert, 1986). Finally, retractions offer insight into the incidence and causes of scientific misconduct, for which evidence, so far, has been mainly anecdotal (Hesselmann, Wienefoet, & Reinhart, 2014).

There exist a multitude of definitions of scientific misconduct (Faria, 2015) as well as a variety of institutions that either claim or deny responsibility for addressing misconduct. Still, there is consensus that retracting a fraudulent article is almost always a justified measure, because it addresses the issue according to commonly held scientific norms. Retractions can be said to be one of the most important reaction to misconduct contributing to how the scientific community describes itself with regard to deviance. Retractions are thus strategic research material for general questions about boundary work and quality control in science.

According to the retraction guidelines by the Committee on Publication Ethics (COPE), retracting an article shall serve as a signal to the community that the content of the article is somehow flawed and should not be relied on. A retracted article is to remain available online, but is to be marked as retracted. Retractions may be due to misconduct, but might also be caused by honest mistakes. When retracting an article, a retraction notice is published that should briefly explain who is responsible for the retraction, why the information in the original article is flawed, and if the problem is due to misconduct or error (Wager, Barbour, Yentis, & Kleinert, 2009).

However, retraction procedures remain rather obscure: Processes are mostly described as informal and case by case (Williams & Wager, 2013), and editors report low familiarity with the relevant guidelines (Wager, Fiack, Graf, Robinson, & Rowlands, 2009). Accordingly, even a cursory look at retractions and the accompanying notices reveals that the expectations of these guidelines are only partially met in practice. While retractions are in most cases recognizable as such on journal websites and in PubMed, a significant number of retracted articles remain difficult to identify for readers and researchers alike (Schmidt, 2017). It thus comes as no surprise that retracted articles continue to be cited and used in further research (Furman, Jensen, & Murray, 2012). Retraction notices exhibit a high variance in form and in content (Wager & Williams, 2011) and are far from uniformly following the format recommended in guidelines such as those

of the Committee on Publication Ethics. Likewise, many notices remain quite vague about the reasons for retraction, can denote both misconduct and error, and often fail to unequivocally indicate one or the other. Consequently, the amount of retractions due to misconduct cannot be clearly identified (Fang, Steen, & Casadevall, 2012; Grieneisen & Zhang, 2012; Wager & Williams, 2011). Here, this ambiguity is treated as an important characteristic that influences how retractions draw boundaries or avoid doing so. Besides correcting the original article, retraction notices have additional content, such as information about institutional investigations, assignment of guilt to one particular author, or apologies by the authors or the issuing journal. These apologies shall be at the heart of the present analysis as the genre of *apologia* represents the primary form of “public speech of self-defense” (Ware & Linkugel, 1973, p. 274).

Retractions as Apologies

For a long time, science considered itself almost completely free of misconduct, describing deviant practices as “extremely infrequent” (Merton, 1957, p. 651; see also Zuckerman, 1977). By claiming that misconduct was close to nonexistent, science was refraining from explicitly expressing any values or moral norms, constructing a scientific identity that rested on the general opposition of facts and values (Daston, 2014; Shapin, 2008).

This claim of minimum deviance has lost its plausibility. Highly publicized scandals fundamentally shook both the public’s and the scientists’ trust in the overall level of scientific integrity and the replicability of scientific results. As a reaction, various new institutions and measures were developed to address the arising problem of scientific misconduct: retractions, guidelines and policies for journals, replication initiatives, websites, and national organizations (e.g., Office of Research Integrity). Managing misconduct has a functional dimension, and retractions shall prevent that unreliable information continues to circulate and possibly mislead other researchers. Furthermore, instances of misconduct also particularly invite scientific boundary work (Gieryn, 1994; Gieryn & Figert, 1986), prompting the community to produce a self-description of its relevant structures and values. Retractions present widely available texts that publicly discuss issues of misconduct. As such, they have become generally newsworthy and are covered on cross-disciplinary platforms like Retraction Watch, making them critical instances where the cognitive authority of science becomes publicly threatened.

Here, science studies point out that allegations and reactions to scientific misconduct can be used to describe science from its fringes: Boundary work

refers to practices that delineate the territory of science by separating science from nonscience and thus providing a map of the scientific domain. It is the result of “immediate and dynamic interests and goals of their cartographers, and the uses to which they are put (i.e. convincing people of one’s cognitive authority or denying it to somebody else)” (Gieryn, 1994, p. 406).

Gieryn (1994) conceptualizes boundary work as something that scientists do intentionally to further their interests. An empirical analysis would therefore observe specific boundary work and look backward to uncover the interests and intentions that drive these practices. However, as Andrew Abbott (1995) insists, “We should not look for boundaries of things but for things of boundaries” (p. 857). This is to say that “boundaries come first, then entities” (p. 860). Such an interest asks how boundary work establishes new territories by drawing and redrawing boundaries. For the specific case of scientific misconduct and retractions, both types of questions are relevant. What causes accusations and sanctions of misconduct (“the Gieryn question”) has been asked in multiple studies with respect to retractions (Hesselmann et al., 2017). We chose to ask what retractions represent (“the Abbott question”) and thus how boundaries are drawn and connected with each other, (re)establishing entities such as individual incriminated scientists or collectives such as science as a whole.

In a traditional view, the identity of science relies on the opposition of facts and values. The epistemic order established in the scientific domain does not allow for normative or moral claims and constructs a “militantly policed border” (Daston, 2014, p. 586) between natural facts and moral values. After the normative claim to value the advancement of science has been accepted, no further normative or moral considerations shall interfere with reaching a scientific conclusion (Weber, 1918). In this reasoning, rules are justified as technical measures that should ensure scientific advancement. As the idea of an advancement of science suggests, science is also thought of as a dynamic, future-oriented realm that continually overthrows existing hypotheses in order to substitute them with new ones (Popper, 1959). As such, science also stands opposed to the realms of the normative or the moral that adhere to absolute ideals of right and wrong, believed to be valid independent of time. According to this view, boundaries are drawn regarding questions of validity, reliability, and other technical and rational concerns. Science also assumes that its actors are guided by universalistic and disinterested motifs (Merton, 1973b). Through the norms of communitarianism and organized skepticism, science presents itself as noncorruptible by individual interests and personal emotions (Kalleberg, 2007; Mitroff, 1974).

Presenting the whole of science from such a “traditional view” is an oversimplification, as there is substantial cultural diversity synchronically and

diachronically as well as along disciplinary lines. Many scientists accept that science is shot through with individual interests and personal emotions without judging this to be unscientific. Complete fields embrace or ignore the blurring of is and ought and continue to practice science. When it comes to scientific misconduct, however, the public image of the “traditional view” takes center stage, as it is used to defend science against the deviants from within as well as to defend scientific integrity to the public. Here, the boundary work to separate along the naturalistic fallacy becomes paramount as addressing misconduct entails an important moral dimension. Because transgression and misconduct are never normatively neutral, this may bring accusations and sanctions for scientific misconduct in conflict with the existing boundary drawn according to the natural fallacy (Daston, 2014).

Moral aspects of misconduct are particularly visible in the frequent use of apologies in retraction notices because apologies emphasize normative, social, and emotional aspects. Apologies pertain to moral dimensions (Robinson, 2008), and their task is to restore a moral order that was violated by specific acts (Tavuchis, 1991). Hence, they are “morally important” (Thompson, 2008, p. 33). Moreover, they feature a significant emotional dimension, which is present in the topic of forgiveness apologies connect to. Emotion also plays a strong part when apologies are conceptualized as the expression of remorse (Lakoff, 2001; Weisman, 2009). In fact, the presence of the appropriate emotion is often identified as the most important precondition for the interpretation of an utterance as a real apology (Bennett, 2006; Govier & Verwoerd, 2002; Tavuchis, 1991; Thompson, 2008). In the sociological literature, the expression of emotions according to normative expectations is conceptualized as emotional management or emotional labor (Hochschild, 2012; Wharton, 2009). Last, the apology is also framed in terms of a social process, its function being the reparation of social relationships (Bennett, 2008). In this sense, apologies can be considered to be rituals (Bennett, 2006) that are directed not just at the two parties of the apologizer and the victim of the transgression but at the entire community whose norms have been violated. Rule-breaking behavior does not only attack the victim, but it is also offensive against the entire community that lives by the rules (Durkheim, 1980/1895; Tavuchis, 1991), and it communicates explicit contempt to this group. Therefore, transgressions are very unsettling for the entire community, and these feelings of insecurity need to be addressed in some way. Here, ritual apologies shall restore the community’s trust in its own rules (Braithwaite & Mugford, 1994; Wenzel, Okimoto, Feather, & Platow, 2008).

It seems, then, that apologies in science create conflicts between a technical and scientific sphere and a moral and emotional sphere. Science does not

acknowledge factors such as the divine love or a mysterious magical force that would make the apology effective. The reparation of previously damaged social relationships through an apology presupposes that actors are responsive to moral and emotional communication, which scientific ideals demand they are not. Apologies belong to a sphere that is historically placed explicitly opposite of the sphere of science, with any inferences between the two spheres prohibited (Daston, 2014). Hence, the discrepancy from scientific ideals to moral and social ideals should appear particularly pronounced in apologies. They thus present exemplary cases to examine how conflicting aspects of boundary work might play out.

Data and Method

Previous studies of retraction notices focus mainly on the life sciences, and particularly on retractions indexed in the database PubMed (Hesselmann et al., 2017). Here, a broader range of disciplines shall be considered. For the analysis, retraction notices were sampled from three different databases¹: Web of Science (WOS; 53), EconBiz (41), and JSTOR (33), resulting in a total number of 127 notices. The sample is meant to reflect the exploratory nature of this research. Different search strategies were employed, depending on the characteristics of the databases: Notices in the WOS were identified by searching for (title = retraction, doctype = Correction or doctype = Correction, Addition), based on a search strategy developed by Fanelli (2013; see also Schmidt, 2017). EconBiz and JSTOR were both searched for (title = retraction*). All results were manually checked for false positives, before drawing a random sample stratified by period for JSTOR (1980-1989, 1990-1999, 2000-2014), and for WOS (1990-1999 and 2000-2014), while all notices identified in EconBiz were used.²

Being a relatively new format, retraction notices have received little attention from a discourse analytical perspective (but see Hu & Xu, 2018). To provide an overview of the characteristics of this emerging textual format, we employed a genre-based perspective on English for Academic Purposes as a “workable way to make sense of the myriad communicative events that occur in the contemporary English-speaking academy” (Swales, 1990, p. 1). As a first step, we performed a move analysis as suggested by Upton and Cohen (2009), who built on Swales (1990), identifying units of communicative functions within the texts. Retraction notices are rather short (with the notices in the sample comprising 250 words on average) and densely written. As a result, lexical markers were particularly important for determining the communicative function of moves as well as for demarcating different units from one another. Moves were mostly defined

on the level of sentences and sometimes single clauses, and only rarely spanned multiple sentences.

The present article is concerned with apologies for scientific misconduct and hence focuses on the 55 passages coded as apologies,³ which were the moves (mostly sentences) identified by the lexical markers *apology/apologize*, *sorry*, and *regret/regretfully* (Harris, Grainger, & Mullany, 2006; see also Kampf, 2009). There is considerable disagreement about how to identify an apology (Harris et al., 2006; Meier, 1998; Renner, 2011). In this case, the relatively strict delimitation of lexical markers seemed necessary as an analytical tool to structure the dense and often equivocal texts of retraction notices.

Subsequently, moves were analyzed for lexical and grammatical characteristics (Swales, 1990), such as grammatical agent, voice (Rundblad, 2007; Swales, 1990), metonymies (Hyland, 1996; Rundblad, 2007), hedging (Bennett, 2006; Govier & Verwoerd, 2002; Tavuchis, 1991; Thompson, 2008), narrative mode, and authorial references (Harwood, 2005; Hu & Xu, 2018; Hyland, 2002). Additionally, we coded the notices by reason for retraction, implications for originally reported results, and authors of the retraction, using a content analytical approach (Mayring, 2010).

To reconstruct the meanings of the apologies, we used a semiotic perspective (e.g., Manning, 1987). Meanings were not understood as the speakers' communicative intentions (Gottdiener, 1995). An attempt to reconstruct individual intentions and meanings from the texts seems problematic, as notices are typically produced by multiple authors and so the text cannot be attributed to a single speaker's internal state. The interpretation focused on the questions of how and where apologies might draw a boundary of legitimate science, who draws this boundary and who gets excluded, and how moral communication and scientific communication are balanced in retraction notices.

Results and Conceptual Analysis

As detailed above, it is the explicit purpose of retractions to correct the scientific record. Still, retraction notices exhibit a number of communicative functions that are related to this primary purpose to varying degrees (see Table 1). The move analysis highlights that retraction notices are weakly standardized texts: Only the discussion of problems of the original article and the actual implementation of the retraction can be considered obligatory moves in that they appear repeatedly and predominantly (Mirador, 2000; Sadeghi & Samuel, 2013). All other moves must be considered optional. The order in which these moves appear also seems highly flexible.

Table 1. Moves in Retraction Notices.

Moves	Examples	Documents	Percentage of documents
Problems of original paper	"Most of the data in our letter to the editor [reference] cannot be verified."	123	96.9
Retraction	"This article has been retracted at the request of the Editor and the Publishers."	109	85.8
Apology	"We apologize that this was not detected during the peer review process in 2009."	49	38.6
Blaming	"[. . .] The first author of the paper takes full responsibility for these inaccuracies."	32	25.2
Introducing quotation	"For the article [reference], the undersigned authors note the following:"	20	15.7
Disapproval	"[. . .] We have determined that indeed this manuscript clearly violates our policy of originality of all material submitted for publication and the generally accepted ethics of scientific publication."	19	15.0
Further steps	"Contributions from all authors will now be published separately in the next available issue of [journal], linked to the page of the retracted article."	15	11.8
Links to other documents	"Please see the accompanying Editorial [reference] in this issue for further details."	10	7.9
Authors' positions	"The first two authors declined to sign this Letter of Retraction."	8	6.3
Defenses	"My lack of familiarity with the growth characteristics of <i>M. tuberculosis</i> in the organs of mice was responsible for my failure to be suspicious of the large numbers of bacilli present on those days."	7	5.5
Publication history	"I met Dr [name] for the first time in Australia in 1975 when he was on his sabbatical leave. At that time we discussed a number of problems, one of which forms the content of our paper. A year or so later, based on our discussions, I wrote this paper under the joint name and incorporated many of the referee's suggestions in subsequent revisions."	3	2.4
Acknowledgments	"I thank [name] for politely persuading me that my program must have been in error."	3	2.4

In this context, apologies are especially interesting, not only because they are the most frequent optional move but also because they introduce a second type of communicative function in addition to the technical function of correcting the literature. Retraction notices can be understood as accounting behavior for failure events (McLaughlin, Cody, & O’Hair, 1983). As such they show, on the one hand, properties described in “individualist-centered rhetoric” (Hearit, 1995, p. 1), for example, when authors use strategies for “self-exoneration, self-absolution, self-sacrifice, self-service, or self-deception” (Downey, 1993, p. 42). On the other hand, they also employ “managerial rhetoric,” for example, when journals or publishers as organizational actors try “to purify their damaged images through a negative strategy of dissociation and a positive strategy of corrective action and reaffirmation of public values” (Hearit, 1995, p. 1). Additionally, retraction notices are often the outcome of a negotiation involving different parties and can even involve legal actions (Oransky, 2014). As a result, the specific linguistic styles and ways of speaking in academic language (e.g., Swales, 1990) and apologetic speech (e.g., Kampf, 2009; Lakoff, 2001; Meier, 1998) are very different, and apologies are rare in the typical scientific literature.

The retraction notices at hand clearly exhibit such a stylistic incongruity, with specific stylistic breaks between more “scientific” and more “apologetic” passages of the texts. To flesh out and make sense of the stylistic incongruities and their symbolic and social implications, the subsequent interpretation primarily focuses on the 55 passages coded as apologies. The literature identifies a number of different steps or strategies that are typically contained in an apology (Harris et al., 2006; see also Brazeal, 2008). Most apologies in the sample are rather short, and many of those strategies are either realized in other parts of the texts, such as giving an account of the transgression, or remain implicit, such as expressing the willingness to correct the damage, which arguably is implied in the publication of a retraction. What is striking, however, is that no notice in the sample contains any implicit or explicit commitment to refrain from breaking the rules in the future. Such promises of future forbearance typically form crucial parts of apologies (Harris et al., 2006; Holtgraves, 1989). There are a number of additional discrepancies between typical apologies and the apologies in retraction notices. Following these discrepancies reveals the fundamental emotional, normative, and social ambivalence of scientific apologies.

Emotional Ambivalence

While retraction notices feature a range of different agents, such as original authors, editors, publishers, universities, readers, and other researchers, apologies

are exclusively expressed either by authors or by journals (including editors and publishers). Typically, apologies are delivered in first person (Meier, 1998). The data feature a total of 29 apologies by authors and journals that directly address the reader by a first-person speaker:

We apologize to the Journal and its readers for reporting these results. (WOS56)

The scientific community takes a very strong view on this matter and we apologize to readers of the journal that this was not detected during the submission process. (ZBW11)

In the second example, which can be found in eight notices all from the same publisher, the journal directly addresses the readers by use of the first-person pronoun “we”. However, the entire rest of the retraction notice uses a third-person speaker and third-person pronouns to refer to the editors. As a result of this change, it is not completely clear from the context who “we” is actually referring to. It also creates a break between this personal communication and the rather impersonal and formal utterances found throughout the rest of the retraction notice. The sudden personalization of the communication might be a result of the intended function of the apology to restore a damaged social relationship (Bennett, 2008; Cunningham, 1999). While a first-person speaker is more in line with the traditional format of apology, it is rather unusual in scientific communication (Harwood, 2005; Hyland, 2002). The stylistic incongruity it causes is indicative of the general incongruity between a traditional apology and the scientific context.

Eight apologies by journals are delivered in third person, thereby evading a change of speakers within the text:

The editors regret this error. (JSTOR16)

The Editors of special issue 34.4, the Editor of [journal], and [publisher] wish to apologize for an article published in [journal]. (ZBW49)

Phrasing the apology as a report by a noninvolved speaker generally takes away from the apology’s social and emotional qualities. Because there is no direct interaction between the apologizer and the addressees, evaluating the sincerity of the apology and hence the emotions of the apologizer (Bennett, 2006; Tavuchis, 1991) becomes difficult. In the apologies by journals, the editor acts as a spokesperson for the journal, representing an entire organization, his or her personal emotions regarding the matter are of little importance, and problematic articles can hardly be attributed to a

personal failure of the editor alone. The matter under debate is a problem in the organizational procedures that warrants very little emotional redress.

Using a third-person speaker in the apologies also appears in eight apologies by authors. In the example below, the main part of the notice consists of a direct quote from authors giving a first-person account of the events that led to the retraction; however, in the apology, the authors are suddenly addressed in third person:

During efforts to extend this work, we have been unable to replicate the data [. . .]. This calls into question a conclusion of the paper. The authors therefore regretfully retract the paper. (JSTOR32)

By this change of narrative mode, the evaluation of the emotional state of the apologizer is de-emphasized. The apology in the notice does not exhibit heightened efforts to demonstrate the good intentions and the sincerity behind the apology; it rather draws attention to the fact that a formulaic expression has been uttered, regardless of any underlying sentiment. The emotions and intentions of the author are portrayed as irrelevant, which constitutes an important deviation from the traditional concept of apology.

These apologies illustrate the tension between the value orientations underlying apologies and the orientations underlying science. Often, the apologies break with the tradition to focus on feelings and internal states and instead adhere to science's rejection of emotions. This, at times, results in a breach of stylistic conventions, when the narrative mode abruptly changes within the text. This abandonment of the traditional apology's claim to sincerity, remorse, and voluntariness might in fact render the given apology mostly meaningless in its intended sense. Apparently, demonstrating allegiance to the scientific disregard of all things emotional is more important here than keeping the function of the delivered apology intact.

Normative Ambivalence

Typically, apologies address the specific person or the group wronged by the transgression (Renner, 2011). This can be found in seven apologies in the sample:

The articles were published prematurely, as a result of an oversight, for which [publishers] apologise to the Authors and Editors. (ZBW48)

I hereby publicly apologize to [plagiarized authors] for this unfortunate coincidence. (JSTOR1)

Most of the apologies, however, address other researchers, colleagues, or the scientific community in general rather than the directly wronged parties, such as the following:

We deeply regret these irregularities and apologize to the scientific community for any inconvenience this might cause. (WOS61)

As an especially prominent group, “readers” are mentioned in 18 apologies:

The authors would like to apologize to the readers for this error on their part. (WOS41)

[W]e apologize to readers of the journal that this was not detected during the submission process. (ZBW11, ZBW16, ZBW51, WOS39)

Victims are not naturally or self-evidently given, but they are constructed by social processes of labeling and ascription (Walklate, 2012). Definition processes can label people victims who had not been considered wronged parties before, possibly not even by themselves. Addressing people supposedly affected by misconduct is meaningful because many forms of misconduct are typical forms of victimless crimes. The apologies at hand can be interpreted as performing a kind of retrospective victimization. The apology, then, alters the character of the transgression by constructing an identifiable group of people that were harmed. Constructing victims conceptualizes the behavior as causing harm to people and hence provides an implicit justification of why it needs to be addressed by a retraction (for a conception of scientific misconduct as social harm, see Faria, 2014). Creating victims pertains to social values and moral commitments that are not usually considered to be part of the scientific norms.

Here, the specific passage mentioned above stands out: It is used almost verbatim in eight notices across disciplines in the sample, all from the same publisher and all pertaining to copyright infringement:

As such this article represents a severe abuse of the scientific publishing system. The scientific community takes a very strong view on this matter and we apologize to readers of the journal that this was not detected during the submission process. (ZBW51)

In general, apologies appear slightly more often in retractions for plagiarism and copyright issues than they do in the overall sample. Plagiarism is a form of misconduct with an easily identifiable victim, and hence it might

seem both more straightforward and more appropriate to apologize in these cases. In the above example, however, plagiarism is still constructed as an offence against the entire community, despite there being an identifiable victim. Increasing the range of people who are potentially affected by the behavior also increases its moral importance.

In the example above, a relatively strong rhetoric of moral denunciation is combined with various evasive strategies that disguise the speakers (see also section “Social Ambivalence”) that are apologizing and taking the blame. These passages feature strong invocations of blame but fail to tie this blame to particular persons. The construction of blame involved in the apologies thus seems quite awkward. However, avoiding to directly blame specific persons is a typical strategy of expressing criticism in scientific discourse (McKinlay & Potter, 1987). Such a free-floating blame thus illustrates the tensions involved in a scientific way of apologizing.

Ambivalence around the construction of responsibility and blame can also be seen in the way notices address consequences of the wrongdoing, which can be found in 17 apologies:

We regret the situation and apologize for the time researchers may have lost.
(JSTOR22)

We apologize for any inconvenience this may cause. (WOS57)

Particularly, “inconvenience” appears in 12 out of the 17 apologies mentioning negative consequences. Apologizing for the consequences of one’s own behavior, instead of the behavior itself also constitutes a strategy to diminish responsibility and to downplay the seriousness of a transgression (Kampf, 2009). In doing so, the speaker deflects attention away from the behavior under his or her direct responsibility and unto consequences that may very well be influenced by other factors the speaker has no control over. Further denial of responsibility is achieved by the use of metonymies:

The authors apologize for the erroneous information that may have misled other investigators. (JSTOR25)

Here, the grammatical agents are not the authors themselves, but the erroneous information presented by them, implicitly denying responsibility (Brazeal, 2008; Hyland, 2002; Rundblad, 2007). The use of “may” as a device for hedging (Hyland, 1996) further downplays the consequences: It appears as uncertain whether researchers really were misled. This expression of uncertainty by use of subjunctive forms can be found in nine notices. Such

“conditional regrets” (Holtgraves, 1989) are a very typical evasive strategy sometimes seen as turning the apology into a nonapology (Bavelas, 2004). The apologies featured in retraction notices thus construct uncertainty about whether the behavior in question really did cause any harm and should consequently be considered a transgression at all.

At the same time, the reference to negative consequences frames misconduct as being wrong because it causes problems, which can be seen as a utilitarian line of reasoning. Behaviors are prohibited because they hinder the advancement of science, not because they are morally reprehensible. This serves to transform moral reasoning into technical considerations, weighing costs and benefits against each other and arriving at a single “correct” solution for rule making. The apology is presented as more congruent with the epistemic orientation of science than a traditional apology.

In short, to avoid the naturalistic fallacy and to conform with a professionalized understanding of science, apologies stress possible harm caused instead of the intrinsic morality of misconduct, in a way that impairs the traditional function of apologies by formulating “conditional regrets” (Holtgraves, 1989). However, they also call on moral values when constructing groups of victims, producing ambivalent allegiances to either science or morality.

Social Ambivalence

Referencing victims of scientific misconduct not only alludes to the moral but also implies a specific social community. The rhetorical constitution of particular groups and communities is an important strategy in scientific boundary work (Derkatch, 2012). Here, the apologies often name multiple persons or potentially large groups of people as addressees, as in the case of “readers” or “researchers,” creating a large group that stands vis-à-vis isolated wrongdoers:

Here, we express our apology to the reviewers, the editors of [journal], and the readers especially for any inconvenience caused by publication of this paper. (WOS59)

This way, the wrongdoers are symbolically removed from the relevant community, which may not only be considered to have a humiliating and sanctioning effect on the wrongdoers but which might also create a heightened sense of community and belonging among those who stand as blameless (Durkheim, 1895/1980). It is this function of apologies to serve as a redress for an entire surrounding community that is highlighted here: Only a minority

of the apologies explicitly address direct victims, and even these apologies, by addressing the victims in third person, implicitly acknowledge the presence of a third party. Hence the apology's effect on the scientific community is not just a side action but its primary function.

The apologies also offer a view on how this social community controls deviance, namely, through reputation. Addressing the consequences of misconduct, rather than the misconduct itself, constitutes a strategy to avoid the blame and negative costs associated with apologizing. As such, the apologies are good examples of image restoration strategies (Benoit, 1997). Image restoration strategies seek to counter a loss of reputation and are typically employed by corporations (Benoit, 1997), politicians (Len-Ríos & Benoit, 2004) or public organizations like churches (Bavelas, 2004) when faced with negative publicity. For these actors, reputation represents a valuable resource. The same holds true for science: Allocation principles in science are mainly reputation-based and not only is reputation a major reward in itself, but it also forms the basis of further acquisition of employment, funding, opportunities for collaboration, and the like (Latour & Woolgar, 1986; Merton, 1957, 1973a).

In fact, evasive strategies constitute some of the most common features of the apologies at hand, indicating that the scientific community these apologies portray strongly relies on reputation as an allocation principle. Besides the deflection of responsibility through the rhetorical strategies discussed in the previous section, another common feature is the use of the passive voice:

Apologies are offered to readers of the journal that this was not detected during the submission process. (ZBW26)

The use of the passive voice detracts from the apologizing agent and de-emphasizes their agency (Bavelas, 2004), and in fact, in the above example the agent is not even mentioned. Hence, the apology and the responsibility cannot be attributed to a specific actor. This tendency of apologies to blur the actual speakers mirrors the tendency of retractions to cloud their own authorship (Hu & Xu, 2018), which is also very prominent in the present sample.

Another strategy is the use of *regret* instead of *apologize*. This term implies an expression of sorrow or empathy without explicitly acknowledging responsibility for a transgression (Cunningham, 1999; Harris et al., 2006; Kampf, 2009):

The editor greatly regrets the misrepresentation of authorship in [article]. (ZBW20)

In this example, the denial of responsibility appears very pronounced, as the editor is expressing regret for a transgression committed by somebody else that lies outside the responsibility of the journal: False claims about authorship are transgressions on the part of the (alleged) authors that the journal probably has little control over. Furthermore, the example also illustrates a general feature of retraction notices: The use of potentially broad and vague terms to describe the problems of the original article, which is another prominent way of avoiding or softening blame (McKinlay & Potter, 1987). Many phrases used in this sample, such as “misrepresentation of authorship” (ZBW20), “improper authorship in its writing” (WOS64), or “inappropriate data arrangements” (WOS33), are highly unspecific and do not identify the reasons for retraction in an unequivocal way. They also contribute to blurring the line between misconduct and error (see also Hesselmann, 2018).

The ambiguity of the apologies and their tendency to cloud responsibility and blame might also partially be a result of (anticipated) legal repercussions of retractions: In the past few years, journals have seen a number of high-profile defamation lawsuits involving retractions and might hence be careful about what information they disclose in retraction notices (e.g., Oransky, 2014). Still, these lawsuits testify to the importance of reputation as a vital resource for researchers and journals alike.

Reputation actively uses the capacities of the community, informal flows of information, and the resources of personal ties to sanction transgressions. Reputation as a community-based mechanism of social control aligns well with science’s claim to be self-correcting and autonomous from any central oversight authority. However, there seems to be an inconsistency between the alleged foundation of scientific reputation (i.e., scientific excellence) and the foundations of reputation addressed in an apology, such as personal integrity, sincerity, morality, and empathy. Science is seen as self-governed through impersonal norms or institutions like peer review. Reputation in science itself carries the contradiction of reintroducing the person into an impersonal domain; and this contradiction remains salient in the way these apologies deal with misconduct.

Apologies also deliver an ambivalent picture of how self-correction is accomplished. Because of their traditional function of signaling a voluntary commitment to rules (e.g., Govier & Verwoerd, 2002), apologies are of particular importance in situations when rules are not fixed, when they are in flux, or when different involved groups hold different norms and values (Wenzel et al., 2008). Apologies are also relevant when rules cannot be monitored effectively (Brodocz, 2005). This also seems to be the case with scientific misconduct: Rules of good scientific practice are not fixed but evolving, and effective control of scientists’ behavior does not appear to be feasible,

neither by an external authority nor by fellow scientists. The fact that apologies constitute a possible reaction to scientific misconduct principally highlights this situation of precarious control, in which scientists are mostly trusted to avoid transgressions through exerting self-control.

However, the apologies often come in forms that connote external control instead of voluntary commitment. As detailed previously, many of the apologies downplay emotional aspects. They point to the mere fact that an apology has formally been given, without much of an attempt to show underlying sentiments of sincere remorse. This becomes particularly clear when looking at the few notices that do make a textual effort to convey sincerity:

Re-examination of [. . .] showed it, to my absolute horror and embarrassment, to be immature [. . .]. Many apologies to Stan Beesley. (JSTOR9)

In the vast majority of apologies, such efforts are missing. These apologies do not seem to stem from an emotional, personal commitment by the speaker, but appear as something the speaker has been forced to deliver. Rather than expressing that the wrongdoer genuinely feels sorry, they seem to express that the wrongdoer was made to feel sorry. The notion of enforcement is present both in the apologies by journals and by authors, but appears more markedly in apologies by authors:

The authors have expressed to me [i.e., the editor] their apologies to [plagiarized author], the scientific community, and the publisher. (WOS30)

The expression of some form of coercion is also emphasized by the very publicity of the notice. The presence of a third party, such as the audience, has a sanctioning effect on the apologizer (Kampf, 2009), who is publicly humiliated. Tavuchis (1991) also interprets these “one-to-many” apologies as humiliating, indicating the use of force to coerce the apologizer into behavior that should actually be voluntary.

It might be argued that these apologies take such a hybrid form between voluntariness and enforcement because they are given in a situation of transition. Journals exhibit an increasing propensity to retract articles (Fang et al., 2012; Grieneisen & Zhang, 2012; Wager & Williams, 2011), and might gradually become the go-to organizations to address misconduct. Therefore, they might take the place of a central supervising authority to ensure compliance with good scientific practice. Scientific conduct is not solely the responsibility of the involved parties anymore but it is increasingly placed in the hands of professional, external actors. The apologies in retraction notices then indicate a transition from a weak norm consensus that is regulated primarily in

informal or personal ways to a norm consensus that is safeguarded by an external authority.

However, the interpretation of journals as a formal authority is somewhat at odds with the fact that journal apologies also contain references to external enforcement although more seldom than apologies by authors. Use of a third-person speaker reporting on an apology can be found in eight journal apologies:

The editors offer their unreserved apologies. (ZBW31)

If journals are to be considered the emerging authority forcing scientists both into rule abiding and apologizing, then the question remains who in turn forced the journals to apologize. The source and the workings of the coercion altogether seem rather obscure. This ambiguity likely both results from, and contributes to, the overall idiosyncrasy and lack of transparency of procedures behind retractions (Williams & Wager, 2013). Together with the overall vagueness and opacity of retraction notices, this stands as a marked contrast to the ideal of transparency so often brought forward in science. Table 2 presents an overview over the frequencies of all the strategies discussed in the section “Results and Conceptual Analysis.”

Discussion: Banishing Misconduct by Keeping It Close

As a reaction to transgressions, apologies in retraction notices offer an insight into the values and the means employed to uphold these values in the scientific community. The apologies analyzed here exhibit a range of strategies to attune the display of moral expectations to the traditional image of science as free of normative judgments. First of all, they avoid the overt expression of emotions. Moreover, they tend to refer to the negative consequences of scientific misconduct, that is, the hindrance it presents for the general advancement of science. This changes moral judgments into matters of technical evaluation that can be addressed without normative assumptions. The modes of control employed to limit deviance are also partly in line with traditional scientific ideals: A reputation-based, informal control mechanism employed by the entire community supports the notion of an autonomous, self-correcting science.

However, these apologies also appeal to the moral. They are personalized communication, referring to personal relationships between actors. These personal relationships serve as a justification for censure: Scientific misconduct is presented as causing harm to victims, referring to social as well as

Table 2. Rhetorical Strategies in Retraction Notices Apologies.

	Apologies
Lexical markers	
Apology/apologize	41
Regret	14
Active voice	45
Authors	25
Journal	17
Both	1
Unclear	2
First person	29
Third person	16
Passive voice	6
Noun phrases	4
Addressees	
Readers	15
Victims (plagiarized authors and copyright holders)	8
Scientific community	4
Other researchers	4
Editors	4
Publisher	1
Others	3
Consequences	17
Metonymies	11
Subjunctive forms	10
Documents	49

emotional motifs. Also, the modes of control presented here are not purely community based, but seem to denote some form of coercive force exercised by an authority. It, however, remains unclear who or what should constitute this scientific authority.

The apologies hence create ambivalence on three different levels: First, notices create a fundamental ambivalence as to the emotional qualities of the apologies. This ambivalence between emotional involvement and emotional detachment (Mitroff, 1974) cannot be resolved. A second level of normative ambivalence of scientific apologies is their oscillation between the personal and the technical. Apologies usually call for personalization, again introducing social values and moral commitments into scientific discourse. On the other hand, apologies for misconduct also diminish moral and emotional aspects, transforming normative into technical reasoning. Last, apologies

evoke the image of a social community that is affected by transgressions. However, the internal organization of this community remains ambivalent: Apologies not only portray mechanisms of self-control and autonomy, such as reputation, but also imply the presence of a sanctioning authority, which intervenes to force transgressors to apologize.

The way science is described in these apologies is multifaceted and partly contradictory. Despite the efforts to cover up the emotional, moral, and personal values expressed in apologies, traces of these motifs cannot be eliminated from the texts entirely. The community's reaction to deviance reveals the normative expectations that underlie the normal business of science, a breaching of which provokes emotional responses.

Even though this exploratory analysis allows relating apologies in retraction notices to general features of scientific culture, conclusions about the general issue of how boundary work separates misconduct from regular scientific work must remain tentative. Retraction notices perform this boundary work in combination with other types of parascientific texts (Kaplan & Radin, 2011), to which they sometimes explicitly refer: policies by journals and publishers, debates on online platforms, media reports, and informal talk among scientists at conferences or during everyday cooperation that all shape the way misconduct is framed. The analysis is limited to one type of textual representation of this boundary work and cannot satisfactorily address the interplay between them. Further research should expand the analysis to more diverse data, accordingly. Still, the analysis allows a theoretical reframing to conceptualize boundary work not just as a spatial but also as temporal process to inform future work.

Conclusion: Moving Boundary Work From Space to Time

It seems, then, that retractions invoke not only one but two “things of boundaries” (Abbott, 1995, p. 57): a technical, factual, and value-free science and a social, emotional, and ethically bound community. While these two things and their boundaries might at times coincide, more often than not they contradict each other, producing ambivalent interventions that fail to draw a clean line and instead create borderlands with uncertain rules: Whether behaviors fall outside the scientific community or not is not clearly stated in these retraction notices, but readers are rather left to their own devices and must come to their own conclusions. Such an interpretative flexibility is also characteristic of the entire practice of retraction itself: Affected articles are marked as retracted but nonetheless remain available, so that researchers can continue to treat them as valid parts of the literature, reading them, citing them, or using them as starting points for their own research.

At first sight, retractions might thus appear to be situations that cannot provide the basis for boundary work: Neither do they offer a way to fence off science in a factual way nor can the apologies they provide clearly demarcate a moral community. They are indicative of a way of talking about misconduct that “does not aspire to clean up the mess in any complete or final way” (Keränen, 2005, p. 106). However, retractions do enjoy exceptionally high levels of support among scientists and their use is increasing (Grieneisen & Zhang, 2012). Both are signs that retractions are considered successful at what they do. The gray area of science that retractions create seems to be not as problematic as classical theories of the natural fallacy suggest.

On the contrary, producing a gray area in which science and nonscience are not clearly distinguishable appears as a specific strategy of boundary work, which relies not on space but rather on time to produce demarcations. In creating an ambivalent fringe of science, retractions lay the groundwork for future boundary making: In time, retracted publications might cease to be cited and disappear from the collective memory of science, or be kept alive through continuing use; likewise, implicated researchers might be forgiven and be able to rebuild their career after a retraction or might continue to be shunned, but these future outcomes cannot be foreseen at the moment of the retraction itself. Such is also implied in the absence of any promises of future forbearance: Scientific apologies do not fixate rules that extend into the future, and they do not assert that what is wrong today will also be wrong tomorrow. By opening up ambivalences, retractions create space for movement in the present while entrusting time with cleaning up afterward: resolving the conflicts of interpretation and drawing a then permanent and equivocal line between true and false.

Acknowledgments

The authors would like to thank Marion Schmidt and Natascha Trutzenberg for their help with data collection, and Verena Graf as well as the anonymous reviewers for their thoughtful comments on earlier versions of this article.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This research was partly supported by the Bundesministerium für Bildung und Forschung, grant no. 01PY13009.

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Notes

1. A preliminary survey of 14 disciplinary literature databases revealed that only those three databases indexed more than five retractions, mirroring the low prevalence of retractions outside the life sciences. The other databases surveyed were Sociological Abstracts, Gesis SOWIPORT, Historical Abstracts, Historische Bibliographie online, International Bibliography of Art, Periodicals Index Online, IBZ online, Bibliography of Linguistic Literature, MLA International Bibliography, Project MUSE, PsycINFO, and OLC SSG Philosophie.
2. Data from EconBiz courtesy of ZBW—Deutsche Zentralbibliothek für Wirtschaftswissenschaften.
3. These 55 passages were found in 49 documents.

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