



Why do retracted papers survive?

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Why do retracted papers survive?

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KEY MESSAGES

- **Publishers' websites and sites hosting references and/or full-text articles insufficiently identify retracted articles, most notably Google Scholar and Sci-Hub**
- **Unidentified retracted articles as retracted may continue to be cited without reference to the retraction and, then generate scientific error propagation**
- **Solutions exist to overcome this worrying problem. It is a collective responsibility that requires a real commitment on the part of all actors involved**

Contributors and sources

CB and FM have published articles related to bibliometrics in the past several years, especially in ophthalmology. They have also studied the difficulty involved in accessing scientific literature around the world with KH, a specialist in information science. The idea for this article came from FM who had used a retracted article in his bibliography. Zotero had identified this retracted article and FM was able to recognize it. However, after discussion with colleagues, no one was careful not to cite retracted articles. So CB and FM, in collaboration with KH, wanted to know the extent to which retraction information is made available across article available on publishers' websites and sites hosting references and/or full-text articles.

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3 32 CB and FM drafted the manuscript; CB and FM extracted data. CB analyzed data; and CB,
4 33 KH and FM revised the manuscript critically for important intellectual content. All authors
5 34 approved the final version of the manuscript. CB is the guarantor of the article.
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8 35
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12 39 discussions related to this article.
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15 40
16 41 **Patient involvement**

17 42 No patients were involved in this work.
18 43

19 44 **Conflicts of Interest**

20 45 We have read and understood [BMJ policy on declaration of interests](#) and we have no
21 46 conflicts of interest to declare.
22 47

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31 56 **Christophe Boudry and colleagues** call for better identification of retracted articles on
32 57 publishers' websites and sites hosting references and/or full-text articles.
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59 Why are article retractions so important?

60 Article retraction, which mainly results from research misconduct or errors [1], is described
61 by the Committee on Publication Ethics (COPE) as “a mechanism for correcting the literature
62 and alerting readers to articles that contain such seriously flawed or erroneous content or
63 data that their findings and conclusions cannot be relied upon” [2]. The main reasons for
64 retraction are inadvertent errors or mistakes, non-replicable findings, research misconduct,
65 and redundant or duplicate publication [3]. Although retractions are still rare, around 0.5
66 retractions per 100,000 articles published [4–6]), numerous papers have highlighted an
67 increasing rate of retractions over time – in fact, it has doubled in the last ten years – [4,7–
68 9], and the field of medicine is no exception [5] (see Box 1). It is very difficult to know if this
69 increase is a result of a higher number of suspicious papers due to a rise in fraud and error
70 [10] or if the scientific community is improving its ability to detect and report them, reflecting
71 a more self-monitoring community [4,7,8,11,12]. It has been suggested that pressure to
72 ‘publish or perish’, and its ensuing increased competition may contribute to an atmosphere in
73 which some individuals could be tempted to selectively report results, or worse, commit
74 outright fraud, both of which may lead to article retraction [13]. Moreover, time pressures,
75 such as those encountered during the COVID-19 crisis have also been the source of a
76 significant number of article retractions [11,14,15]. In the same frame, accelerated
77 publication of COVID-19 papers, [15–17] has been shown to lead to less rigorous peer-
78 review, [18] further increasing the risk of retraction.

80 **Box 1: Characterisation of retractions in biological and medical sciences**

81 The retraction rate per 10,000 publications was 0.38 in 1985, 2.03 in 2000 and rose to 5.95
82 in 2014. The maximum number of retractions occurred within 1 year of publication, then the
83 number decreased as the years went by. It took an average of 3.8 years for a publication to
84 be retracted [5]. In 2020, the most common reason for retraction was scientific misconduct
85 (62.3%), followed by error(s) in the manuscript (37.4%) and issues with the journal or
86 publisher (19.4%). Nearly 70% of retracted articles had more than 1 reason for retraction [6].

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88 Retractions “represent wasted resources incurring significant financial costs” [19]. As an
89 example, Stern et al. found that retracted articles due to misconduct accounted for
90 approximately \$58 million in direct funding by the NIH between 1992 and 2012 [19].
91 However, the greatest costs of retraction are preventable illnesses or the loss of human life
92 due to misinformation in the medical literature [19]. In the field of medicine, article retractions
93 may put patients at risk, especially when clinical papers are based on findings from retracted
94 papers [4,11,20], or when retracted articles continue to be cited without reference to the

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3 95 retraction [21–26], also in clinical trials reports [27] and meta analyses: a study was done
4 96 including 229 meta-analyses published between 2013 and 2016 that cited a retracted study.
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6 97 It concluded that “meta-analyses have a problematically high probability of citing retracted
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8 98 articles and of including them in their pooled summaries” [28].

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10 99 In order to document retractions, the Committee on Publication Ethics (COPE) [2] has
11 100 published specific recommendations related to article retraction. These recommendations
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13 101 explain in detail which publications should be retracted (e.g. redundant publications,
14 102 unreliable findings), what form a retraction should take (e.g. clearly identifying retracted
15 103 articles in all online sources), who should issue the retraction, who is retracting the article
16 104 (e.g. one author, the publisher) and the reason for retraction (e.g. fraud, error). These
17 105 recommendations are meant to help publishers facilitate and standardize their management
18 106 of the retraction process.
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24 108 **Survival of retracted articles: preprint servers, publishers’ websites,**
25 109 **bibliographic databases, academic social networks or, illegal black open**
26 110 **access websites such as Sci-Hub insufficiently identify retracted articles**

27 111 References and/or full text articles can be hosted on different websites. Because copies of
28 112 the indexed references or available full texts may be unidentified retracted versions of an
29 113 article, it is possible that retraction information is not updated on some of these websites
30 114 [21,22,27,29,30]. Furthermore, retractions may sometimes occur years after the publication
31 115 of articles. If sites hosting references and/or full texts do not periodically check their
32 116 database of articles, unidentified retracted articles will appear. Because of these gaps with
33 117 identifying retracted articles, authors may not be aware that they are reading and citing a
34 118 retracted article, and this may be exacerbated by the site from which authors are sourcing
35 119 their references. Some sites do not have any clear policy or guidelines regarding retracted
36 120 material. Whilst these sites may not be the primary source of information for all researchers,
37 121 some of them, especially Sci-Hub, are indeed widely used by researchers in developing
38 122 countries due to limited institutional access to published material [31]. Thus, authors may
39 123 continue to cite retracted articles without reference to the retraction [21–27] and,
40 124 unknowingly participate in scientific error propagation. We argue that this worrying problem
41 125 is not sufficiently taken into account by much of the scientific community. We also support
42 126 that the persistence of this problem is as much incomprehensible that simple-to-implement
43 127 solutions exist to overcome it (see above).

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45 128 Preprint servers are online archives, or repositories, containing scholarly articles that are not
46 129 yet peer reviewed or accepted by traditional academic journal. The number of preprint
47 130 servers having biomedical and medical scope is estimated at 44 [32] and their number has

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3 131 grown dramatically over the past few years [33]. One study has shown that, among the 30
4 132 preprints linked to retracted journal publications present on Research Square, bioRxiv, and
5 133 medRxiv, only 16 (53.3%) included an indication of the retraction on the preprint [30].
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8 134 Information on the retraction of articles should in principle appear first on the publishers'
9 135 websites. Past literature has shown that flagging retractions on publishers' websites is
10 136 insufficient [23,34–36] - some publishers are still not identifying retractions correctly on their
11 137 websites. There was no information on retractions in 20.8% of references and in 18.1% of
12 138 full texts of retracted articles (Table 1).
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17 140 **Table 1: Publishers' websites and sites hosting references and/or full-text articles**
18 **insufficiently identify retracted articles**

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20 142 We conducted research in order to complete data from existing scientific literature, especially for sites such as
21 143 Google Scholar, ResearchGate and Sci-Hub, for which there is currently no data available. A search for retracted
22 144 articles was done on PubMed on April 8th 2021. As done in previous studies [5,37], PubMed was used as a
23 145 baseline because it shows the best performance in adhering to procedures for documenting and updating
24 146 retracted publications, and is considered by the International Committee of Medical Journal Editors (ICMJE) as
25 147 the authoritative source for information about retractions [38]. A total of 8559 retracted articles were retrieved
26 148 from which 500 were randomly selected. As done previously [23,35,39], a check for the presence of any
27 149 information allowing identification of retraction in references and full-text articles was performed for each of these
28 150 500 retracted articles on the overall sites studied. All analyses were conducted between April and July 2021. Full-
29 151 text paywalled articles on publishers' websites were searched using the institutional access of our universities.
30 152 Searches using Sci-Hub were performed using non-university internet access. No university or institution
31 153 affiliated with the authors of this article were therefore involved in downloading articles via Sci-Hub.
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		Number of references available (%)	Number of references unidentified as retracted (%)	Number of full text articles available (%)	Number of full text articles unidentified as retracted (%)
Publisher	Publishers' websites	476 (95.2)	99 (20.8)	403 (84.7)	73 (18.1)
Subscription-based bibliographic databases	Scopus	403 (80.6)	220 (54.6)	N/A	N/A
	WoS	420 (84)	176 (41.9)	N/A	N/A
Free bibliographic database	Google Scholar	499 (99.8)	331 (66.3)	N/A	N/A
Academic social network	ResearchGate	497 (99.4)	114 (22.9)	176 (35.4)	144 (81.8)
Black open access (illegal)	Sci-Hub	437 (87.4)	330 (75.5)	435 (99.5)	310 (71.3)

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N/A means that the number and percentage of full texts articles unidentified as retracted could not be assessed because full texts were not hosted directly on the website.

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3 158 Unfortunately, no significant improvement on publishers' websites regarding retraction has
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5 159 been observed in the last years. This clearly shows that most publishers continue to ignore
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7 160 the specific recommendations from COPE related to article retraction [23]. This is
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9 161 problematic because references and full texts of scientific articles are commonly found by
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11 162 researchers using publishers' websites [22]. Furthermore, if articles are not corrected on
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13 163 publishers' websites, other sites hosting references and/or full-text articles may collect these
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15 164 uncorrected references and full texts. Reasons why publishers are inconsistent in how they
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17 165 report retractions and fail to alert readers to retractions remain unexplained: is it fear for their
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19 166 reputation or ignorance of the seriousness of the problem of retractions?
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21 167 Multidisciplinary databases such as Scopus and the WoS are also popular with researchers
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23 168 in biology and medicine. These two subscription-based bibliographic databases do not
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25 169 always clearly and consistently display retractions [35], and have been singled out as failing
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27 170 to correctly identify of retracted articles references [23,35,39]. Scopus and the WoS still
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29 171 poorly identify retracted articles' references: there was no information on retractions in 54.6%
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31 172 and 41.9% of the references hosted by these two databases, respectively. This confirms
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33 173 results recently published by Suelzer et al. [39]: 50% for Scopus and 40.6% for the WoS.
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35 174 Google Scholar is considered as the most comprehensive source of scientific information
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37 175 [40], but is also well known to lack quality control and clear indexing guidelines [41]. There
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39 176 was no information on retractions in 66.3% of the references hosted by Google Scholar. For
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41 177 example, two high-profile articles related to COVID-19 published in *NEJM* [42] and in *The*
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43 178 *Lancet* [43], survived as non-retracted articles in Google Scholar five months after their
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45 179 retraction [18]: the *NEJM* article in 19 versions, and 59 versions for *The Lancet* article.
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47 180 Academic social networks such as ResearchGate, which is mostly oriented towards the
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49 181 science, technology, and medical fields, is one of the largest scientific article databases in
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51 182 the world [44]. There was no information on retractions in 22.9% of the references and in
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53 183 81.8% of the full texts hosted by ResearchGate.
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55 184 The black open access website Sci-Hub allows subscriptions to be bypassed to access full
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57 185 text 'paywalled articles' and is massively used by researchers [31]. However, it is very
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59 186 worrying to note that there was no information on retractions in more than 71% of full texts
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187 downloadable on Sci-Hub. This site is widely used, especially in low income countries having
188 less efficient institutional access to full text "paywalled articles" [31]. It has been shown that
189 Sci-Hub allow clinicians in these countries to obtain essential information and respond
190 appropriately to patient care needs [45]. Researchers in those settings thus have the double
191 burden of not having good access to full text articles, and also using a potentially biased
192 subset of articles that does not account for retractions. Improving access to full text articles
193 by enhancing open access to publications should be a priority to overcome this worrying and
194 unfair situation.

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3 195 **Unidentified retracted articles continue to be cited without reference to the**
4 **retraction**
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6 197 Theoretically, citations should stop as soon as articles are retracted. In fact, retractions have
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8 198 little or no impact on the total number of citations, showing that researchers continue to cite
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10 199 retracted articles without reference to the retraction [21–27]. As an example, a paper
11 200 published in Plos One analysed 54 retracted papers related to radiology-imaging diagnostic
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13 201 method: in 30 (55.6%) of 54 articles the number of post-retraction citations was higher than
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15 202 the number of citations before retraction [3]. Of the 559 post retraction citations of these 54
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17 203 articles, 546 (97.7%) were cited without reference to the retraction, suggesting that the
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19 204 majority of citing articles were either not aware of the retraction, or they were aware of the
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21 205 retraction and cited it anyway. This phenomenon also involves the most cited articles and the
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23 206 most prominent journals: a paper published in 2010 in the high profile journal Cell [46],
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25 207 continued to be widely cited in 2016 despite its retraction in 2014 [26]. Of the 33 post
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27 208 retraction citations, 31 (94%) were cited without reference to the retraction.
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32 210 **What solutions should be considered and possibly implemented to prevent**
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34 211 **citation of unidentified retracted articles?**
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37 213 From the standpoint of a publisher

38 214 First of all, improvements in adherence to COPE retraction guidelines [2] are urgently
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40 215 needed [11], especially unmistakably identifying retracted articles as such. As suggested by
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42 216 Suelzer et al. and Frampton et al., systematically adding the prefix of ‘retracted’ to the title of
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44 217 retracted articles [39] and diagonally watermarking each page of the full text article stating
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46 218 “retracted” or “withdrawn” [11] should be urgently considered.

47 219 Secondly, journals should avoid publishing articles citing retracted articles without reference
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49 220 to the retraction. In order to achieve this objective, in 2006 the members of the ICMJE
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51 221 changed the Uniform Requirements for Manuscripts to specify the author’s responsibility to
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53 222 check their manuscripts for references to retracted articles [38,47]: ‘Authors are responsible
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55 223 for checking that none of the references cite retracted articles except in the context of
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57 224 referring to the retraction’. Unfortunately, these recommendations are not necessarily known
58
59 225 and applied by the authors, so do not prevent them from citing retracted articles without
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226 checking for retraction. Thus, publishers could systematically require authors, through the
227 ‘instructions for authors’ submission guidelines, to attest that they have checked their
228 submitted manuscripts’ references and that no retracted articles are included unwittingly [39].
229 Unfortunately, in the best of our knowledge few publishers have included such statements in

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3 230 their submission guidelines (current exceptions are Plos One or Visualized Cancer
4 231 Medicine).

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6 232 Manuscript submission platforms could also be an unavoidable step to help authors to
7 233 identify retracted articles in their reference list. Some platforms have developed reference
8 234 check tools to track retracted article during manuscript submissions, such as Editorial
9 235 Manager thanks to a partnership with scite.ai. Unfortunately, one must note that, all journals
10 236 hosted by Editorial Manager do not use systematically this tool. In our opinion, it is absolutely
11 237 necessary that all manuscript submission platforms set up and use these reference checker
12 238 tools for all journals they hosted.

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14 239 Reviewing is the last possible means of detecting retracted publications in reference lists of
15 240 submitted articles. However, even though the reviewers and editors involved are experienced
16 241 researchers, they depend on the same information sources as the authors [22]. Moreover,
17 242 the reviewing process is sufficiently time-consuming for reviewers as it is. Having reviewers
18 243 undertake this task could dissuade some of them and, in the end, make it more difficult for
19 244 editors to find reviewers for their manuscripts. In our opinion, for this reason this solution
20 245 would be difficult to apply.

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22 247 From the standpoint of sites hosting references and/or full-text articles

23 248 Databases and sites hosting references and/or full-text articles insufficiently identify retracted
24 249 articles because most of them do not implement any monitoring mechanisms to alert readers
25 250 to retractions (e.g. Google Scholar or Sci-Hub); or implement inefficient monitoring
26 251 mechanism (e.g. Scopus or the WoS). This explains their failure to correctly identify retracted
27 252 articles. However, there are no insurmountable difficulties (financial, technical, etc.) of any
28 253 kind that can explain this, as proof, some do (e.g. PubMed). It seems that this problem is not
29 254 considered important enough to be recognized by these sites, and therefore has remained
30 255 largely underestimated for some time. Hence, as a priority, all databases or sites hosting
31 256 articles that have been pointed out in this analysis to insufficiently identify retracted articles
32 257 should urgently set up a system to identify retracted articles over time to keep their article
33 258 databases up to date or improve methods they used.

34 259 These sites could potentially add a mechanism whereby researchers, authors, research
35 260 support staff, and librarians are able to flag retracted articles in much the same way as they
36 261 already are able to request author mergers and/or attribution to authors where the attribution
37 262 is missing.

38 263 Considering partnership with the Retraction Watch DataBase (RWDB) and/or refereeing to
39 264 PubMed to identify retracted articles could also improve this situation. RWDB has been
40 265 specifically developed to report retracted articles [48]. It has identified 24140 retracted articles

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3 266 in all disciplines. It is the most comprehensive and largest database of retracted articles and
4 267 its content is regularly updated [4].
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8 269 From the standpoint of researchers

9 270 To prevent themselves from retrieving unidentified retracted articles, researchers should
10 271 favor the PubMed database as a source for discovering new articles. Authors can easily
11 272 identify retracted articles by searching PubMed for “Retracted publication [pt]”, where the
12 273 term “pt” in square brackets stands for publication type, or by going directly to the PubMed
13 274 list of retracted publications
14 275 (<https://pubmed.ncbi.nlm.nih.gov/?term=retracted+publication+%5Bpt%5D>) [38].
15 276

16 277 To prevent themselves from citing retracted articles, researchers should not add retracted
17 278 articles to their stored articles, whether in paper or digital format, when using reference
18 279 manager software. Reference manager software such as Zotero and EndNote could be an
19 280 efficient way to avoid citing retracted articles [22]. Contrary to other reference manager
20 281 software services (e.g., Mendeley), Zotero and EndNote have built-in capabilities for
21 282 monitoring retractions by checking databases for documents that have been retracted. This
22 283 feature was developed in partnership with the RWDB in 2019 for Zotero and in 2021 for
23 284 EndNote. As an example, retracted publications stored in Zotero, present in the RWDB, are
24 285 flagged in the article list, and a warning informs the user that the stored article is retracted
25 286 (Figure 1). In addition, each time the software is run, all articles are checked for retractions in
26 287 the RWDB allowing an automatic update over time.
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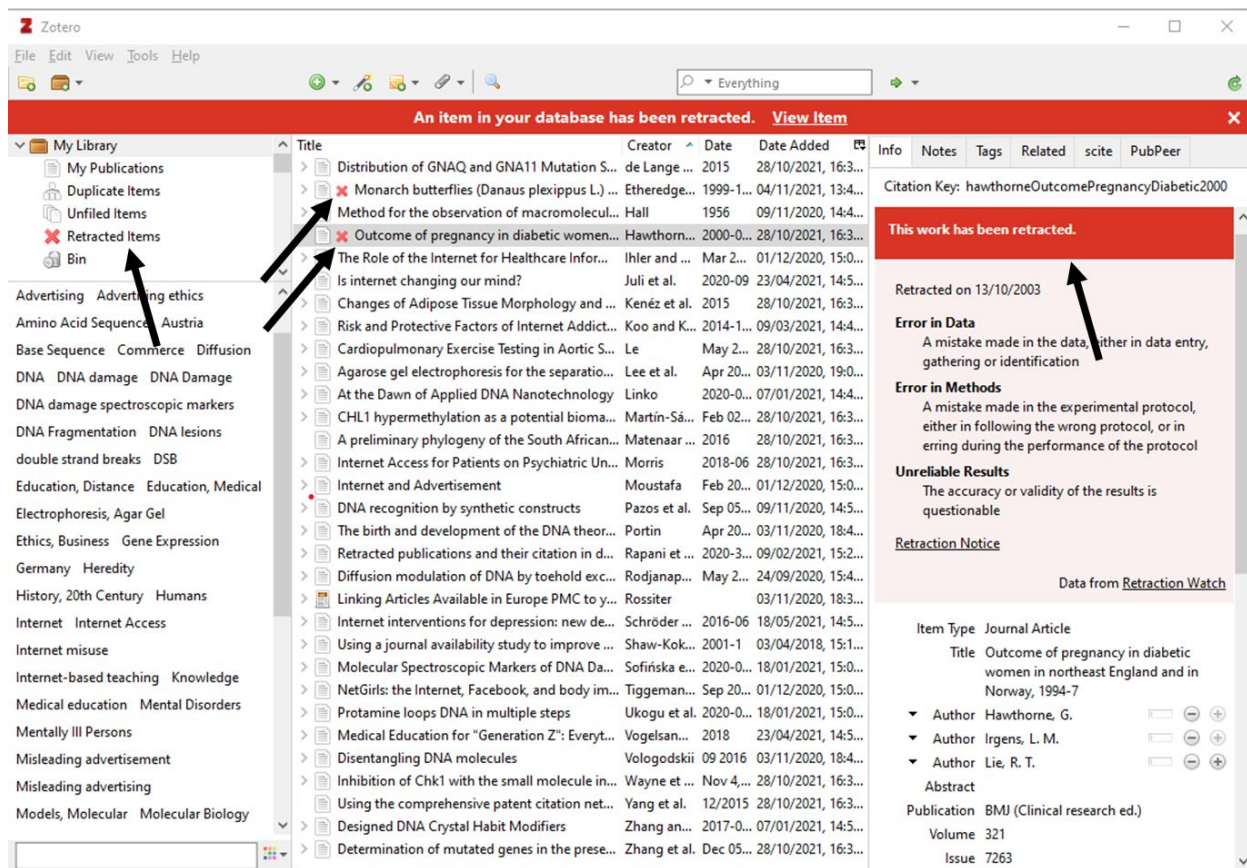


Fig 1 | Display of a retracted article in Zotero

Using Zotero or EndNote, and therefore the RWDB, would result in automatically identifying 477 retracted articles among the 500 (95.4%) considered in this analysis. This clearly indicates that free and simple-to-implement solutions exist that can dramatically limit the storage, and consequently the citing, of retracted articles by researchers. As said by Suelzer [49], the failure to use such tools “is a disservice to the readers and researchers”, and “inappropriate citations of retracted articles are hard to excuse”.

Box 2: Top 3 changes needed and recommendations to prevent the citation of unidentified retracted articles

1. Improvements in adherence to COPE retraction guidelines for retractions by publishers are urgently needed, especially unmistakably identifying retracted articles on their websites
2. To prevent themselves from retrieving unidentified retracted articles, researchers should favor PubMed database as a source for discovering new articles
3. Researchers should use reference manager software such as Zotero and EndNote to prevent storing retracted articles in their bibliography and thus avoiding citing them in their articles

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3 307 In conclusion, scientific error propagation, by citing retracted articles without mentioning
4 308 retraction, may have potential consequences for the quality of research, and in medicine
5 309 for patient health. Unfortunately, as shown in this analysis, the persistence of unidentified
6 310 retracted articles is still very high on sites hosting references and/or full-text articles, which
7 311 favour the citation of retracted articles without mentioning retraction. However, it seems
8 312 that the solutions mentioned in this article have so far not been sufficiently taken into account
9 313 by the entire scientific community. Given that retractions are relatively uncommon, they are
10 314 also still considered by the vast majority of the scientific community as an epiphenomenon.
11 315 This has greatly limited awareness of the deleterious consequences of persistent unidentified
12 316 retracted articles on almost all of the sites used by researchers for documentation. This is all
13 317 the more true since retractions also represent the dark side of scientific research, which most
14 318 actors involved in scientific publication (publishers, sites hosting references and/or full-text
15 319 articles, researchers) prefer to ignore rather than face up it... It is also possible that the
16 320 resolution of this problem, dependent on these multiple actors, has experienced an effect of
17 321 dilution of their individual responsibility, limiting the motivation of each to take action. This
18 322 sentiment is likely accentuated by the fact that the COPE guidelines do not provide any
19 323 specific recommendations for tracking and deleting unlabelled retracted articles present on a
20 324 multiplicity of websites and sites hosting references and/or full-text articles once a decision
21 325 has been made to retract an article. The COVID-19 crisis has, along with other
22 326 consequences, placed the issue of scientific retractions at the forefront of scientific and
23 327 public debate. We certainly hope that this will rapidly lead to heightened awareness of the
24 328 importance of treating article retractions appropriately. As pointed out in this article, simple-
25 329 to-implement solutions exist to overcome this worrying problem (see Box 2). It is a collective
26 330 responsibility that requires a real commitment on the part of all actors involved in scientific
27 331 publication.

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