

## ***CrossRef Guidelines: Using DOIs in Citations Version 1.0***

Everyone has experienced the “404 File Not Found” error message while browsing the Web. URLs are not persistent identifiers and therefore are problematic when used in scholarly citations. There is a growing body of literature highlighting the fact that over time more and more links in scholarly journal article references are broken.<sup>1,2</sup> Since citation is the foundation of the scholarly communications system and journal articles are meant to be the authoritative minutes of science, broken links are very detrimental.

CrossRef DOIs solve the problem of unique identification and persistent linking because the DOI is both a unique, public identifier for content and a persistent link to that content. CrossRef member publishers have invested in assigning DOIs to over 18 million items (mostly journal articles but now a growing number of conference proceedings articles, books, book chapters and components of articles and chapters such as figures, images, etc). Almost all scholarly journal articles across all subject areas are now assigned DOIs on or before publication. However, DOIs need to be used to cite content more widely and in a more consistent manner. Therefore, CrossRef is publishing these general guidelines on using DOIs in citations.

These guidelines are for journal editors, style guide producers, scholars and researchers and publishers (editorial staff, in particular). Publishers should also provide clear instructions to their authors and readers about DOIs. More specific DOI Guidelines that address DOI formats and other issues of concern for CrossRef member publishers are available on the CrossRef website<sup>3</sup>. Consistent use of DOIs in references will benefit readers and authors and make their research more effective. Using DOIs more widely and in a more consistent fashion will increase the discoverability and visibility of authoritative, published versions of articles and will ensure that readers are able to locate the content.

There are many different reference formats so this document describes generic guidelines on DOI use. CrossRef is not concerned with the formats themselves but is concerned with making sure DOIs are used consistently in all the formats. One basic principle is that DOIs should be used in existing reference formats in addition to other bibliographic data (i.e. DOIs should not be used to replace traditional bibliographic citation elements). It is important to remember that the DOI is both a unique identifier and a persistent link and this determines how it is used in citations.

### ***1) Use of DOIs to Cite Journal Articles***

The DOI should be the last element in the citation irrespective of the format used. “doi:” should be lowercase with no space between “doi:” and the start of the DOI. This format will enable automated indexers and crawlers to pick up and use DOIs. In future, Internet browsers may automatically link DOIs in this form.

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<sup>1</sup> Wren, J.D. (2004) “404 not found: the stability and persistence of URLs published in MEDLINE” *Bioinformatics*. 20, 668-672. [doi:10.1093/bioinformatics/btg465](https://doi.org/10.1093/bioinformatics/btg465)

<sup>2</sup> Lawrence, S. et al. (2001) “Persistence of Web References in Scientific Research” *Computer*. 34, 26-31. [doi:10.1109/2.901164](https://doi.org/10.1109/2.901164)

<sup>3</sup> CrossRef DOI Guidelines - [http://www.crossref.org/02publishers/15doi\\_guidelines.html](http://www.crossref.org/02publishers/15doi_guidelines.html)

An example of a DOI in a journal citation is:

Engelhard, H. H., Egli, M. & Rozental, J. M. (1998) *Pediatr. Neurosurg.* **28**, 279-285.  
[doi:10.1159/000028665](https://doi.org/10.1159/000028665)

An alternate format is to include the DOI as a URL:

Engelhard, H. H., Egli, M. & Rozental, J. M. (1998) *Pediatr. Neurosurg.* **28**, 279-285.  
doi:10.1159/000028665, <http://dx.doi.org/10.1159/000028665>

**Note:** this form may seem to be redundant since the DOI is included twice; however, this format uses the DOI as an identifier and as a persistent link. In many contexts the 'doi:xxxx/xxxxx' may not be linked and the user would be unaware of how to link using the DOI. Including the "<http://dx.doi.org/>" ensures that the DOI will be linked or that the user can cut and paste, or re-type, the link into their browser.

### ***DOI as a persistent link***

The DOI is an alphanumeric string that uniquely identifies a piece of content - [doi:10.1159/000028665](https://doi.org/10.1159/000028665). The DOI is also a persistent link. The DOI Resolver (<http://dx.doi.org/>) is a publicly available resolution service for all DOIs. It is a distributed, scalable infrastructure supported by the International DOI Foundation, CrossRef and many other organizations.

Therefore, the DOI is a persistent link when in the form:

<http://dx.doi.org/10.1159/000028665>

### ***Use of DOI as a URL***

When used in electronic, online documents (HTML and PDF in most cases) the DOI should always be linked using <http://dx.doi.org/> - e.g. <http://dx.doi.org/10.1159/000028665>. Where possible, systems should automatically link DOIs. The full URL need not be displayed but a DOI can be shown with "<http://dx.doi.org/>" hidden in the link - e.g. [doi:10.1038/35057062](https://doi.org/10.1038/35057062). In HTML this would be

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<a href="http://dx.doi.org/10.1038/35057062">doi:10.1038/35057062</a>.
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Many publishers allow DOIs to be used in their own incoming link specifications but these publisher-specific URLs **should not** be used in citations since they may break if the journal changes ownership.

*A note on using DOIs in print publications:* the DOI should be included in print publications printed as outlined above. However, it is important that the journal provide instructions in the preliminary pages to readers on how to link DOIs using "<http://dx.doi.org/>". As some reference lists in printed publications may not have enough space, DOIs are not expected in all printed reference lists but should be included where possible.

**Warning:** DOIs should *never* be replaced with a URL that bypasses the DOI and points directly to the online content. If the URL is ever changed by the publisher or transferred to another publisher, a reader will not be able to access the article.

### ***Variant for Publish Ahead of Print Articles***

In some cases articles are published online ahead of print and traditional bibliographic metadata such as volume, issue and page number are not available. In these cases the DOI can be used in conjunction with the authors, article title, journal name, and year to cite the article.

The basic recommended format for citing a publication ahead of print is:

Veazey, RS, et al. Protection of macaques from vaginal SHIV challenge by vaginally delivered inhibitors of virus–cell fusion. *Nature* (2005). [doi:10.1038/nature04055](https://doi.org/10.1038/nature04055)

**Note:** In cases where the pagination is not known, CrossRef recommends including the year but not the volume number because in some editorial styles the number may not be immediately distinguishable from a single page number.

Some publication styles do not include the article title. For example:

Veazey, RS, et al. *Nature* (2005). [doi:10.1038/nature04055](https://doi.org/10.1038/nature04055)

### **Publication and Access Dates**

Publishers may include a date of publication or access when citing online articles.

If an item is cited shortly after online publication, the publication date can tell the reader the immediacy of the information in the absence of pagination information. CrossRef does not recommend including the online publication date for references that are fully paginated. Note that the first date of online availability is not necessarily considered the date of "online publication" by all publishers.

The following examples show how an online publication date can be added:

Veazey, RS, et al. Protection of macaques from vaginal SHIV challenge by vaginally delivered inhibitors of virus–cell fusion. *Nature* (Published Online November 3, 2005). [doi:10.1038/nature04055](https://doi.org/10.1038/nature04055)

Veazey, RS, et al. (2005) Protection of macaques from vaginal SHIV challenge by vaginally delivered inhibitors of virus–cell fusion. *Nature*. Published Online November 3, 2005. [doi:10.1038/nature04055](https://doi.org/10.1038/nature04055)

**Note:** CrossRef recommends the DOI always appear as the last item in a reference to aid in accurate recognition by automated indexers and crawlers.

Publishers may include an access date for online references. This date can be important because the content of an article may change from pre-print to online-publication to final print version.

The following example shows how an access date can be added:

Kitajima TS, Kawashima SA, Watanabe Y. The conserved kinetochore protein shugoshin protects centromeric cohesion during meiosis. *Nature*. 2004;427:510-517. Accessed February 26, 2004. [doi:10.1038/nature02312](https://doi.org/10.1038/nature02312)

### **2) Use of DOIs to Cite Books and Conference Proceedings**

The same guidelines that apply to journals apply to citing books and conference proceedings. The DOI should be formatted as shown for journal citations and it should appear at the end of the reference.

The following examples show how a DOI can be used for a book or conference proceeding:

Corrigan, John. *Religion and Emotion - Approaches and Interpretations*. New York: Oxford University Press, 2004. Oxford Scholarship Online. Oxford University Press. 2005. [doi:10.1093/0195166248.001.0001](https://doi.org/10.1093/0195166248.001.0001)

M. Peacock, I. Collings, and M. L. Honig, "Asymptotic SINR analysis of single-user MC-CDMA in Rayleigh fading," *Proc. IEEE Int. Symp. on Spread Spectrum Systems and Applications (ISSSTA'02)*, pp. 338-342, Sep. 2002. [doi:10.1109/ISSSTA.2002.1048560](https://doi.org/10.1109/ISSSTA.2002.1048560)