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Monday, October 11, 2010

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October 10, 2010

### A Modern Scholar's Ailments: Link Rot and Footnote Flight

Plenty of Web content is the information equivalent of a bag of potato chips, created to be consumed and forgotten. Not for scholars, though. Authors and journal editors link to Web-based resources in citations meant to last, but the phenomenon of "link rot"—when links, or URL's, stop working—can undermine the usefulness of those references. If a URL leads nowhere, another researcher might not be able to find the source material. In the case of, say, medical studies, a dead link could have deadly consequences, if a health-care provider can't locate information needed for a treatment plan.

That's a worst-case scenario, but link rot can also have routinely troublesome consequences for scholarship. In this column, the first of two on the topic, I'll look at some research that highlights the problem. Next time, I'll focus on some of the mechanisms publishers and others use to minimize the risk.

For Michael J. Bugeja, director of the Greenlee School of Journalism and Communication at the Iowa State University of Science and Technology, link rot is a major concern. He and his colleague Daniela V. Dimitrova have a new book out, *Vanishing Act: The Erosion of Online Footnotes and Implications for Scholarship in the Digital Age* (Litwin Books/Library Juice Press, 2010), expanding on [research](#) first described in *The Chronicle* six years ago.

Mr. Bugeja and Ms. Dimitrova studied online footnotes used over a four-year period, from 2000-3, in nine journals in their field, communication studies. Although the rate of "footnote flight" varied from journal to journal, the researchers write that they came up with "a collective half-life rate of 3.95 years, as only 1,083 (47 percent) of the 2,305 citations worked when checked in late 2006."

Mr. Bugeja does not think the situation is getting better. "If anything, our research has shown that footnotes are disappearing at ever-faster rates," he told me. He points to Web-site redesigns as a large part of the problem.

#### Solid Sources Over Servers

One example Mr. Bugeja points to is *The Chronicle* itself. A frequent contributor, he discovered that our redesign killed links he'd used in some of his *Chronicle* essays. "That this could happen in 2009 at *The Chronicle of Higher Education*, cited in this book and thousands of journal articles and Web sites, is a case in point," he and Ms. Dimitrova write in *Vanishing Act*. (I talked to our Web producers and was told that there are layers of issues here and that they have been working to fix broken links.)

"Solid sources rather than servers" is Mr. Bugeja's mantra. He says research on link rot amounts to "a warning shot that if we don't figure out a way to preserve original sources, we are going to

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erode scientific method and peer review." He believes that scholars and their publishers ought to keep copies of source material and that libraries need to step up and remember their role as preservers of information, not just disseminators of it.

When I talked to Cassie Wagner, an associate professor and Web development librarian at Southern Illinois U. at Carbondale, I heard some similar concerns, albeit from a librarian's perspective. "I'm the Web person, and link rot is something we're always concerned about," she said.

With Meseret D. Gebremichael, a public-services librarian at McKendree University, and Mary K. Taylor, associate professor and natural-sciences librarian at Southern Illinois, Ms. Wagner did a study of URL decay in the top five healthcare-management journals. That study, which focused on links cited in articles published between 2002 to 2004, resulted in a paper, "Disappearing Act." It ran last year in the *Journal of the Medical Library Association*.

#### Links Don't Last

Ms. Wagner and her colleagues reached a conclusion very similar, she says, to what many studies of journals in other health-related fields have determined: Links don't last. The "Disappearing Act" authors found that "49.3 percent of the original 2,011 cited resources could not be located at the cited URL," according to the paper's abstract. "The older the article, the more likely that URL's in the reference list of that article were inactive."

As part of her study, Ms. Wagner did a literature review of about 95 other link-rot studies across all disciplines, including a few in the humanities. (If you know of humanities-related work on link rot, please let me hear about it.) The universal conclusion: Too often "the stuff was just not there anymore," she told me. "It is a problem that affects all fields."

I asked her what we (meaning authors, publishers, or librarians) can do about link rot. She said that the Internet Archive, a nonprofit online library set up to preserve Web content, has turned out to be a good place to find source materials cited in some journal archives, even if the citations no longer work, but it's not a perfect solution.

Ms. Wagner thinks a better long-term bet is for journals to do their own backup archiving if possible. She encourages authors to make use of institutional repositories as a place to store source material, now that more repositories are up and running.

Ms. Wagner also favors using document object identifiers, or DOI's, which gather and preserve metadata unique to a specific digital object such as a journal article. They're persistent, meaning that they don't stop working even if a Web site or system changes, and the idea is that they work with but are not dependent on the Web

Mr. Bugeja is also an advocate of DOI's, although the main services that provide them, like CrossRef, are registration- and membership-driven, and so not freely available to everyone. (More on DOI's in my next column.)

Last but not least: Keep a copy yourself, "just because you can't count on these other systems being there for you after a certain amount of time," Ms. Wagner said. "That is the one constant we saw in all of the link-rot studies—this stuff just goes away."



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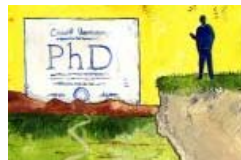
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