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This paper evaluates Zotero, a reference management software add-on for the Firefox browser. The evaluation looks at Zotero's performance while installing the add-on, entering citations, organizing and retrieving citations, enhancing citations with snapshots and attachments, and using citations in papers and bibliographies from the perspective of a student using the tool to create bibliographies and citations and a researcher looking to organize their citation collection.

Headings:

Computer software – Zotero

Bibliographical citations – Zotero

Database management systems

A PRODUCT REVIEW OF ZOTERO

by  
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## **Introduction**

For many years, scholars and professionals have been faced with the problem of how to keep their research in order. Researchers read well over a hundred articles every year and with the rise of convenient electronic collections, that number is growing<sup>1</sup>.

To keep track of so much information, researchers could keep a collection of notecards containing all of their citations in a file. As personal computers became more widespread, reference management software (also called citation management software, personal bibliographic management software, reference database software, and many other names) emerged. They evolved over time to contain many features such as plug-ins to work with word processors, the ability to search online databases for literature, numerous citation styles including custom styles, and advanced searching and tagging. Software such as EndNote added online components to their desktop applications while others developed completely online solutions such as RefWorks, Connotea, and CiteULike.

Zotero, developed by the Center for History and New Media at George Mason University, tries a new approach to the task of citation management. Instead of creating a stand-alone application, Zotero is an add-on to the Firefox web browser that tries to integrate the “best parts of older reference manager software (like EndNote)—the ability to store author, title, and publication fields and to export that information as formatted

references—and the best parts of modern software and web applications (like iTunes and del.icio.us), such as the ability to interact, tag, and search in advanced ways.”<sup>2</sup>

By being part of the browser, Zotero attempts to become part of the user’s online searching workflow by being able to “sense” items (journal articles, books, etc) on the page the user is browsing. Then, when the user clicks on an icon, the citation record is saved inside of the local database. By being part of the user’s system it can also talk to other applications on the user’s machine, such as Microsoft Word as well as give you the ability to work offline.

In future releases, the developers hope to add online sharing and collaboration abilities, as well as read feeds. They also want to incorporate a recommendation system.<sup>3</sup>

Zotero has only been available since late 2006 and therefore has not had much time to be thoroughly reviewed and evaluated. The goal in this paper is to complete a thorough review from the perspective of both the student looking for a citation tool and the researcher interested in ways to organize and retrieve his collected citations.

Whereas Zotero did prove to be an effective tool for saving and organizing collections of citations and this author recommends it, there is room for improvement in several areas, including the formatting of citations and the portability of the library.

## **Literature Review**

Since Zotero has only been available since October 2006, perhaps it is not surprising there is not much literature exists that evaluates it. Most articles released on the subject deal primarily with introducing or quickly reviewing the software, such as a paragraph in “The Buzz” section of the September 2007 issue of *School Library Journal*,<sup>4</sup>

or part of a larger article, “Firefox Web Browser Introduces Campus Edition” from *The Chronicle of Higher Education* by Jeffrey Young.<sup>5</sup>

The same can be said of online articles. Dmitri Popov gives us a basic overview of Zotero in “Zotero: A seriously useful research tool” at Linux.com<sup>6</sup>. He describes the layout, the functions, and the abilities of the software, but does not evaluate it to determine how well the software performs those functions. At Digital History Hacks, William J. Turkel provides a similar overview, although he discusses more technical detail. Turkel points out that Zotero outputs in RDF/XML and imports several XML formats that are easily manipulated. Therefore researchers should be able to easily create tools to collect and process data that could then be mined. Furthermore, since Zotero is an open source project and uses SQLite and JavaScript, Turkel noted that a developer would be able to add to the project. Turkel also provided a few suggestions to the Zotero team, although he did not do a full review of the software. Overall he felt that “Zotero is already an amazing piece of software that could change the way we do history.”<sup>7</sup>

Roy Rosenzweig did a little more than just an overview in his article. Rosenzweig’s “Historical Note-Taking in the Digital Age” introduced Zotero in the August 2007 newsletter of the Organization of American Historians by comparing it with a classic reference management system: notecards. Rosenzweig, who was also the director and founder of the Center for History and New Media at George Mason University, the makers of Zotero, said that the goal of the software was to improve on notecard record keeping in “at least four major ways.” 1) “Capturing references automatically” instead of having to enter references in manually; 2) “put[ting] your notes in multiple places at once” meaning a single note, article, reference, etc. can be associated

with several folders; 3) “find[ing] it quickly” by not only being able to search on fields in the record but on your own tags; and 4) “export[ing] it seamlessly” by talking directly to programs such as Microsoft Word and Open Office, easily exporting to other formats, and even dragging references from Zotero to other programs.<sup>8</sup>

In the Fall 2007 *Library Journal*, Melissa L. Rethlefsen reviewed Zotero, along with several other reference management software packages, in the article “Product Pipeline”. Written from a librarian’s perspective, Rethlefsen felt that “Zotero ultimately will be great,” but currently is “problematic for power users.” One main concern was a lack of ability to save Zotero data to a networked drive without exporting first and the subsequent threat of losing data.<sup>9</sup>

The most thorough review of Zotero was found in the October 2007 issue of *The Charleston Advisor*. Jane Kessler gives a product description much like the other articles that I have mentioned, but she goes into deeper detail, describing the layout of Zotero and what each panel is for and what they are capable of. Kessler then goes on to give a “critical evaluation” of Zotero by first establishing for whom Zotero is intended.

“The most popular bibliographic software programs seem to fall into one of two basic categories. In the first category are those programs designed for researchers, such as EndNote... In the second category are programs designed for the needs of high school students and college undergraduates, who do not need many of the features that programs like EndNote offer.”

Kessler asserted that researchers used these programs primarily to help collect and organize large collections of citations and to hold them for long periods of time. The ability to create bibliographies in many different citation styles was also necessary.

Kessler felt that high school and undergraduate students, on the other hand, wanted to create bibliographies for particular assignments and were less concerned with the organization and storage of collections.

Zotero falls on the side of the researcher, according to Kessler. Comparable to EndNote in terms of features, Kessler found that the core of the software worked very well. Importing data went well, and Zotero's ability to sense metadata about the item "is fast and the data all ends up in the correct place in the Zotero record." She rated the organization and storage features as "excellent" due to the ease of searching and tagging and found Zotero's ability to archive a copy of a webpage to be "very helpful." Getting started with Zotero was found to be very easy and the documentation was "comprehensive."

Kessler did find some flaws in Zotero though. Along with a low number of initial citation styles, the default styles were found to be incorrect. Testing both MLA and APA styles for books and journals, she found that Zotero incorrectly italicized journal titles that should be underlined and that some information went missing, a major blow to the software. Also, having the data stored locally on the user's computer (and therefore not easily accessible elsewhere), and the fact that Zotero only works with Firefox were the "two biggest limitations."

Overall, Kessler gave Zotero three stars for content ("The software has great features, but some citation errors do occur. Works only with Firefox.") and five stars for searchability ("Excellent search feature") for a composite score of four stars.<sup>10</sup>

While the amount of literature on Zotero specifically may be low, plenty has been written on other reference management software. Librarians, historians, medical



professionals, and many other researchers have been looking for the best software management tool to help their research for many years.

In 1988, Debora Cheney and George Jenks wrote “To Pro-Cite or not to Pro-Cite. (compiling bibliography)” for the *Library Software Review*. They noticed that many reviewers of Pro-Cite at the time were “so impressed with the ability to transfer downloaded records into another software package that would format, allow revision, sort, and print that they never actually evaluated the software's ability to do these things.” They evaluated Pro-cite by creating a large collection of citations on railroads and tried to create a bibliography out of it. They encountered many problems on the way and finally concluded while ProCite did help a great deal, they had no idea how much they would have to learn beforehand to use the tool correctly.<sup>11</sup>

Many more evaluations and comparisons of reference management software were written from lots of different perspectives. “Posting Your References on the Web” by Jean-Francois Gauvin in the December 1998 issue of *Database* tested ProCite, Reference Manager, and Inmagic's DB/TextWorks to see if he could post his citations on the web using various tools and servers. They all worked as advertised.<sup>12</sup>

Leslie Nicoll, Teena Ouellette, Donna Bird, Jane Harper, and Janice Kelly reviewed EndNote 2.0, Library Master 3.0, Papyrus 7.0.11, Pro-Cite 2.2.1, and Reference Manger 6.02 for *Computers in Nursing* in January 1996. They determined the needs of a nurse in a graduate program, such as the typical format their sources would come from, typical styles they would need (the American Medical Association, for example), the ability to “generate a reference list from a word processor document,” and the ability to import records from places such as MEDLINE. They also considered setting up the

database, use of keywords, and system compatibility. In the end they decided that all five reference management software packages were good depending on the need of the user.<sup>13</sup>

Similar methods and conclusions were evident in much of the reference database management literature, although the issue was probed from several different angles. For example, Gauvin, tested the software against the Z39.50 protocol in “References to Go.”<sup>14</sup> “Retrieval Comparison of EndNote to Search MEDLINE (Ovid and PubMed) versus Searching Them Directly” by Carol Gall tested EndNote’s searching capabilities.<sup>15</sup>

The search for help with the citations, in the form of comparisons and reviews, has moved beyond the journal medium and onto the web. One can find several comparisons of modern reference database managers such as Comparison of Free Bibliographic Managers (<http://mahbub.wordpress.com/2007/03/04/comparison-of-free-bibliographic-managers/>)<sup>16</sup> and Bibliography Management Software: with a Detailed Analysis of Some Packages by Francesco Dell'Orso (<http://www.burioni.it/forum/dellorso/bms-dasp/>).<sup>17</sup> Both of these websites compare various reference managers feature-by-feature in a table format with little commentary, so they serve as good starting points for determining the best solution for the reader. Even Wikipedia contains a comparison chart for many reference database managers ([http://en.wikipedia.org/wiki/Comparison\\_of\\_reference\\_management\\_software](http://en.wikipedia.org/wiki/Comparison_of_reference_management_software)).<sup>18</sup>

However, no systematic evaluation of Zotero exists. The goal of this paper is not to create a full evaluation, but rather to create a larger product review than what has previously been done.

## **Methodology**

As mentioned earlier in the Kessler review of Zotero, there are two groups that use reference management software: 1) researchers such as professors who need organizational and searching capabilities as well as a wide range of citation styles, and 2) students, mostly undergraduate and high school, who need it mostly as a tool to cite sources correctly and to automatically create a formatted bibliography.

For this evaluation, I felt that I had to take on a little of both roles. Simply creating citations and a bibliography could not do, as there were many features of Zotero worth exploring. I also did not have the time to gather the hundreds of articles that would be necessary to approach the evaluation from a long-term researcher's perspective.

Therefore, I took a middle-of-the-road approach by collecting a smaller number of records, citing them, and creating a bibliography, but at the same time making sure to use the records with the various features of Zotero.

Partly inspired by Gauvin, I made the topic of my research whale hunting. It was a board topic and was recently talked about in the news, so it was likely that I would find a diverse group of sources.

Starting with a clean copy of Firefox 2.0.0.13 on Mac OS X 10.5 (Leopard), I inspected seven aspects of Zotero that I felt a user would come across while collecting literature while writing a research paper. First I covered the installation and "getting started" with the software. Next, I set about entering records using several different methods: "automatic detection" for a single entry and multiple entries, manual entries into the software, and importing data from another source (EndNote). I used several

sources for gathering the records, including several online repositories for scholarly articles, commercial websites such as Amazon.com, news sites, and blogs.

After entering the data, I tested Zotero's ability to organize and tag the records. Next I took a look at Zotero's notes, annotations, snapshots, links, attachments, and related records features. Then I tried to retrieve data from the database followed by exporting said data.

Finally, I took the collection of records and tested Zotero's ability to create citations and bibliographies in Microsoft Word and in other programs.

## **Evaluation**

### **Installation and Getting Started**

Not wanting to risk any conflicts, I created a new alias for my copy of the browser that was clear of all other add-ons. Going to [zotero.org](http://zotero.org) and clicking on the download button installed Zotero. Firefox gave me a warning and made me add [zotero.org](http://zotero.org) to a list of safe sites to install software from, but other than that there were no glitches.

After restarting the browser I was presented with a "quick start guide" on Zotero's website that provided some video and some introductory text describing Zotero's main features.

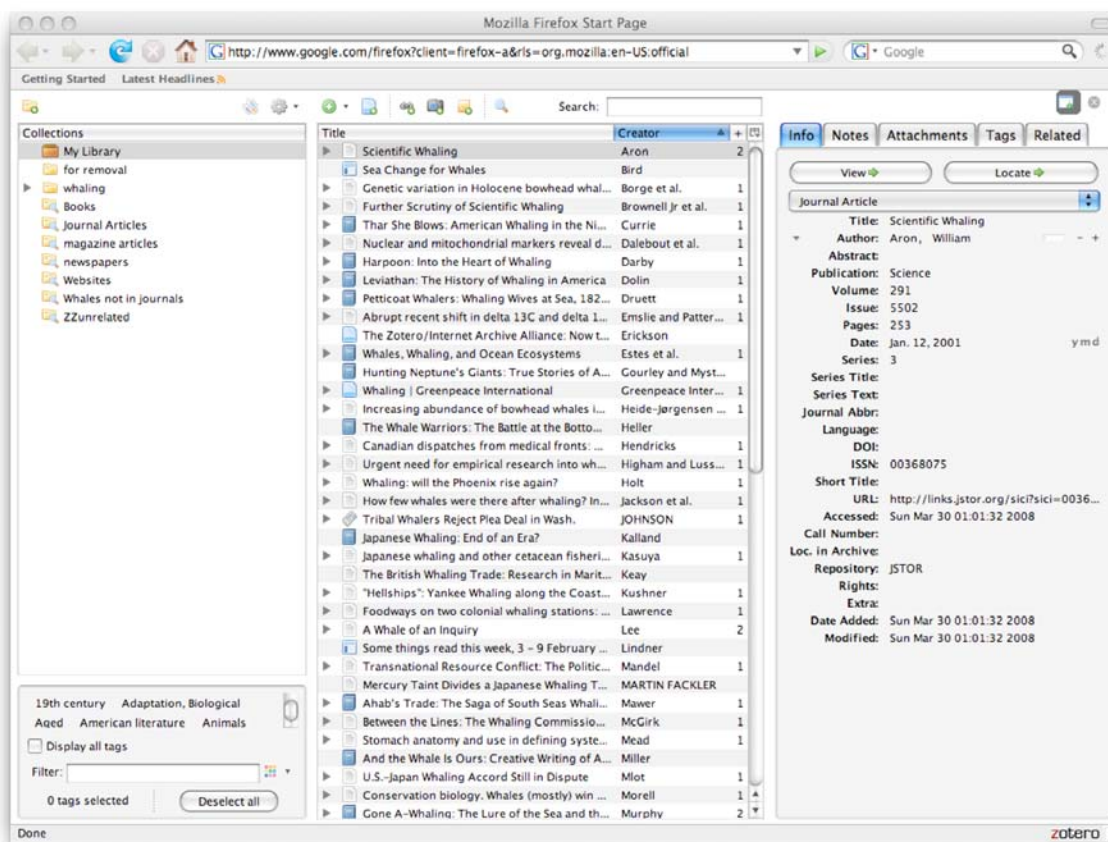
The software itself was hidden, with the word "Zotero" on my status bar being the only thing different (see Figure 1). Clicking on that word revealed three panels. The left panel contained the library that holds every record and resource collected by the user. The middle pane held a list of records and the right panel showed information on the

currently selected record (see Figure 2). This layout worked really well for the task although the unlabeled buttons running across the top of the three panes seemed confusing for new users of the software. If I wanted to make a new item out of the current page, should I have clicked the big plus sign or the paper with the plus sign? To help ease the confusion, tool tips were wisely used.

Overall though, getting the software and getting started with the software was quite easy.



**Figure 1. The Zotero Button**



**Figure 2. Zotero's Three Panels**

## Entering records

Records can be entered into Zotero in several ways. The fastest, easiest, and best way to do this is letting Zotero “auto-detect” a resource and then telling the software to download it. Many sites have the ability to talk to Zotero this way, including many libraries and online databases as well as some commercial and news sites. In this evaluation EBSCOHost was tested first. I did a simple search for “whaling” and came across a book review called “HARPOON: In to the Heart of Whaling.” When I landed on the page, an icon of a piece of paper appeared in the location bar. Clicking it saved HARPOON into the Zotero database. Unfortunately, it skipped the author’s name, but all the other information that was available fell in the correct place. I had similar results at other repositories, including PubMed and JSTOR.

I moved on to test entering books into the database by going to Amazon.com and entering “whaling” into a search for books on the site. After choosing *In the Heart of the Sea* by Nathaniel Philbrick, an icon of a book appeared in the location window instead of a piece of paper. Clicking on the book icon entered in the information from the product description into the Zotero database.

This was all very quick and easy. No downloading of citations to import into the software, just click the icon and you have a new record in your library. It is unfortunate that I could not find any more booksellers who did the same thing. Libraries, on the other hand, all seemed to be able to talk to Zotero. I had no problems with the University of North Carolina at Chapel Hill’s library, nor did I encounter any problems at North Carolina State University, the North Carolina Central University Law Library, the

Library of Congress, the New York Public Library, or the Wake County Public Library. Zotero claims that because they it relies on “common library standards” and that many libraries use common software packages and technologies, the software can already be used in many library systems.

Unfortunately, this trend did not extend to newspaper websites. Only a couple of the sites visited, *The New York Times* and *BBC News*, imported their articles into Zotero well. The newspaper icon that appeared in the location bar while I was at the *Times* did not show up in many other sites. Yahoo! and Google News, *CNN*, *Fox News*, *MSNBC*, *USA Today*, and the *Wall Street Journal* did not recognize Zotero at all, while the *Los Angeles Times* did recognize Zotero but threw an error when I tried to import the record.

Magazine articles and blog posts also did not fare well in terms of auto-detection. Manual entry of websites, however, is not very difficult. I had to only click the “Create New Item from the Current Page” button and Zotero helped out by filling the title, the URL, and the date accessed fields.

For the sites that did a good job of auto-detection, such as Amazon.com, the libraries, and the journal repositories, the option to import several entries at the same time was usually available. After doing a search for “whaling” in the book section of Amazon, a folder icon would appear in the location bar on the following results page. Clicking on it brought a menu containing all the available citations from my search results.

The group import function also had the ability to parse reference lists in certain circumstances. While I could not automatically grab the references from a page in the ACM Digital Library, I noticed that in the entry for whaling in Wikipedia gave me

different results. The folder icon would appear in the location bar and clicking it would list part of the references at the bottom of the entry. It was not entirely clear why Zotero only picked some of the references.

Grabbing multiple sources with the group import function was very convenient when gathering lots of material to peruse at a later time, but it also presented a few problems. If I only wanted a subset of what came up in the result list, it became difficult to determine which records were good since I could only see the titles.

Moving around from repository to repository using mainly the group import can lead to duplicates in the library since Zotero does not check for them. Zotero also tends to treat everything from the same place as the same record type, so even though EBSCOHost will mix scholarly articles with other articles, Zotero cannot tell the difference and labels them all as journal articles.

Using the group import function also raises the risk that you will not notice that the record Zotero created was incorrect or incomplete. In the *Washington Post's* case, they included their recent top stories in a sidebar, so they were picked up in the group import although they had nothing to do with my query (that's funny, I didn't know Barack Obama was a whaler).

One final way to get data into Zotero is by importing the data from other reference management tools I had used before. I attempted to take the collection from EndNote and import it into Zotero by exporting the EndNote library into BibTex, but the result was not very good. All items that were not labeled as a journal article were relabeled as a book. One good thing that occurred was when I imported another library, Zotero made a new folder automatically and placed the new records in it. Therefore they



were easy to find if I wanted to do something to them, such as giving them all the same tag or deleting them immediately. Importing zotero-rdf exports into another instance of Zotero worked as well.

In my student role, I was very pleased with the way Zotero helped me gather all of these articles in such a quick fashion. While the group import function sometimes cluttered my library, it was still a great time saver as long as I was fairly sure about my search results.

In my researcher role, I was concerned over the import ability. Moving my data over to Zotero seemed like it would involve a lot of time figuring out how to get data imported correctly or fixing incorrectly imported data.

### **Organizing the Records**

Now that I had some data, I needed to organize it into usable groups so that I could find it later. I also needed to establish relationships that might be useful when writing my paper later. Zotero has a couple of methods to deal with organization, folders, and tagging.

Under “My Library,” one can make new “collections” that act like folders. You create a collection and you can put records inside of it. You can create sub-collections under each collection and put records inside of them. The downside is that if you have a record that is easily described by two or more of your folders, you have to drag and drop it from “My Library” over and over.

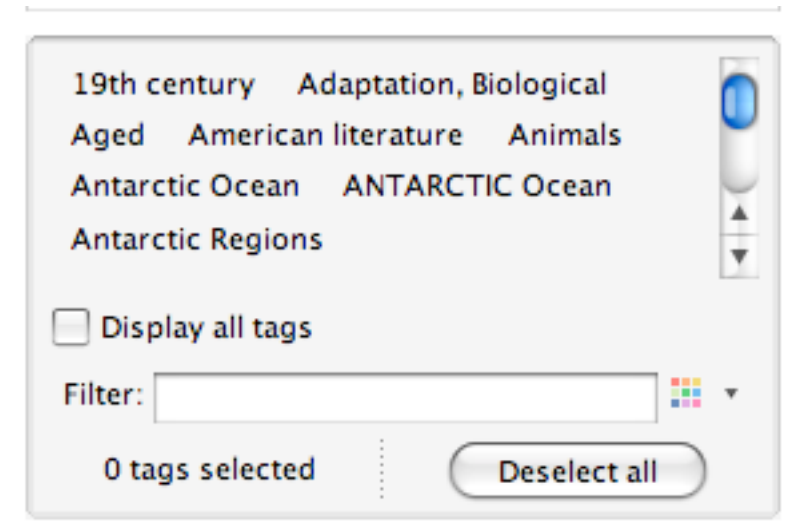
A way around having to do this is to use the type of folder called “Saved Searches”. Instead of just being a folder, saved searches match search terms and populate

the folder with matching records. The folder auto-updates, so if you find another book during your research it would immediately go into that folder. No need to keep drag-and-dropping stuff to the correct folder while doing research.

The other useful organization tool is tagging. These are words you can add to your record to describe it even further. I assigned tags to a few records by selecting them in the middle panel and clicking on the tag tab in the right panel. Clicking the add button will open up a tag slot. You can only do one tag at a time, however, which is a little frustrating when in other applications you can separate different tags with commas or spaces, but it did allow me to be more expressive with the tag naming.

That is, if they are not tagged already. Many records, mostly the ones extracted from journal repositories, tend to have some extra description data attached to it that Zotero automatically turns into tags.

Once I had several of the records tagged with good descriptions, I could then search on them in the search box, organize them in saved searches, and use the tag selector in the bottom of the left column to filter the records list (see Figure 3). By clicking or typing in one tag you remove all the records that do not use that tag and you can keep clicking until you are down to one record.



**Figure 2. The tag selector.**

The tags work very well, but I did wish it were more convenient to tag things in Zotero. As mentioned above, you can only add one tag at a time, and you cannot tag multiple records at one time.

This many tools to organize records may be overkill for a student who is only looking for a tool to help create a good bibliography. They may only need to tag them with a few things to help remind them what they wanted to cite or what issue they plan to discuss using that specific article. A researcher, on the other hand, might welcome these tools with open arms. With multiple ways to find things, they might be able to finally keep track of the all the literature they read and will still be able to find an article if they forget the name of the author.

## **Snapshots, Annotations, Notes, Links, Attachments and Related Records**

### Snapshots

Snapshots take a webpage and archive it inside of Zotero. Especially useful for webpages that might change later, it makes a full HTML copy of the page you want to work with and includes all dependant files such as the images, stylesheets, and scripts. They are often automatically saved when you use Zotero's auto-detect feature, but can also be manually created and associated with a record or just stand alone.

The snapshot works quite well for keeping a Wikipedia page in the form you want to refer to before it gets changed, but it becomes even more useful when combined with the annotations and highlighting features.

### Annotation and Highlighting

Snapshots by themselves do not seem that useful, but it is just the first step in marking up your record. After taking the snapshot of your resource, you can then load it into the browser by double clicking it in the middle pane or selecting it and clicking the "View Snapshot" button in the right pane. A new toolbar will appear above your tabs with, unfortunately, more icons that do not convey their purpose (see Figure 4). Tool tips continue to help, but three speech bubbles in a row that only differ slightly from each other will confuse someone new to the software. The two pencils (highlight text and unhighlight text) are not much clearer though they do seem like opposites.



**Figure 3. Annotation and Highlighter toolbar.**

Highlighting the text on the snapshot is easy and straightforward. Just click on the “Highlight Text” icon and then select text as you normally would on your computer. To unhighlight the text click on “Unhighlight Text” and select any highlighted text.

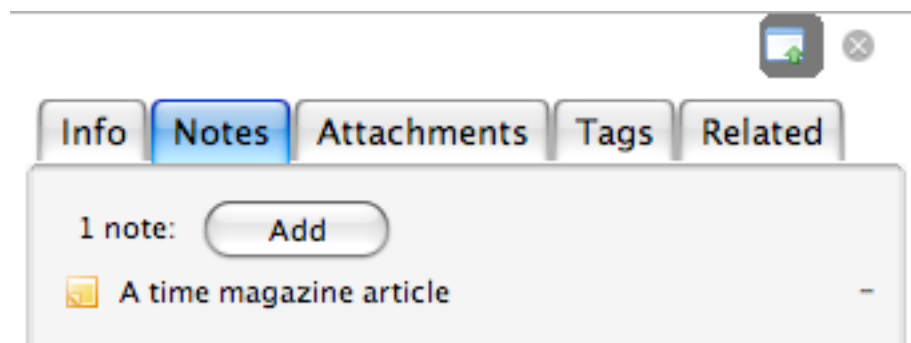
Making annotations should be just as simple. Just click on the “Add annotation” icon and then click somewhere on the page where you want to annotate. A translucent sticky note appears. You can enter as much text as you want. If you go below the bottom edge, scroll bars will appear or you can resize the note by grabbing the bottom right corner and dragging it with your mouse. Unfortunately, sometimes this action becomes broken and the note will do strange things like expand to the right no matter where you are trying to drag it. I have not been able to determine what might cause such a bug.

If you find that the annotation is getting in your way, you can collapse it into a small speech bubble by clicking the bubble in the top right corner of the annotation or by clicking the “Collapse All Annotations” icon in the toolbar above. If you need to move the annotation, there is an arrow on the annotation that claims that it will allow you to move it. I have yet to be able to get the annotation to move at all.

Highlights and annotations could be useful to both the student and the researcher to mark important quotes and key points to use in their research. It is unfortunate that the annotation apparently has some bugs to work out.

## Notes

The versatile note can be added to any record and filled with any text you want. Like an annotation, you can use it to remind yourself of good points in the article or anything else you want to remember. If you have a note open and you select text in your browser, right click that text and Zotero will let you place the text directly in the note. To add one you just pick the record and click on the “Note” tab in the right panel (see Figure 5). Once the note is added, tags can be used to describe it and you can relate it to other records. The note and the tags can then be searched in either the normal or advanced search fields. Unlike an annotation however, a note can be separate from a record and it can be tagged and related to other records in the library.



**Figure 4. The notes tab.**

Both the student and the researcher could use to the note to capture ideas while reading one of their collected articles or to capture some information they can find and use later.

## Attachments

Attachments are resources such as PDFs, images, and even the aforementioned snapshots that you can associate with a particular record or just have stand alone. For example, my copy of Firefox did not have Adobe Reader on it, so I downloaded the PDF files from the various article repositories. I would attach them to their corresponding records by dragging and dropping them right into Zotero. Zotero actually makes a copy of the file and stores it within the Zotero folder.

Just like notes, they can be tagged and related to other records in your library and therefore can be included when searching for items in the software.

Attachments can be useful to both of the personas we are using in this paper.

## Related and Links

Records, notes, snapshots, links and attachments can all be related to other records in the library. They serve as a cue that other material has information relevant to this item. Once set up, it will also create a link to the related item.

Links refer to URL links that go back to where a record was originally extracted. The link will contain the URL and the last time the site has been accessed.

A long-time researcher could find use in relating records to one another as a way to create a narrative between the various pieces of literature that build upon each other. A student, on the other hand, would probably feel that relating sources would be unnecessary.

## **Exporting and Portability**

To test Zotero's ability to export its data in a usable form, I attempted take the export and try to use it in another application, EndNote, and into another instance of Zotero. Exporting the library was easy. Zotero offers Zotero RDF, MODS, BibTeX, RIS, Refer/BibIX, Unqualified Dublin Core RDF and Wikipedia Citation templates. For exporting/importing from Zotero to EndNote I used Refer/BibIX.

EndNote appeared to have no problem with the file format at first, but upon closer inspection some of the records, especially the websites, were missing authors, and URLs ended up in the wrong fields. They were also often mislabeled as "Generic" file types.

Unfortunately, the ability to export its library is about as portable and accessible as Zotero can get. There are no features to keep your library in a web accessible location and no way to share your collections. The only solution for keeping your library of records on hand is to install portable Firefox on a flash drive and install Zotero on it.

Zotero's developers have been planning on portability and accessibility since the beginning of Zotero's development, and hope that in the next update they will have the means to backup the library remotely, access the library from anywhere, create a recommendation engine and rss feeds, and share collections.<sup>19</sup>

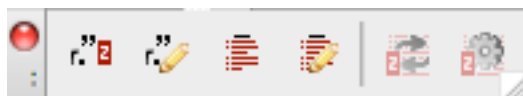
Until then, I'm afraid that the student and the researcher will have to keep their laptop on hand to keep their libraries nearby. Sharing the library among several computers, while possible, would be a hassle.



## Citations and bibliography

For our student at least, all is for naught if Zotero cannot produce a good citation and bibliography. Testing with Microsoft Word 2004 for the Mac (ver 11.3.8), I set out to see how easy it was to use Zotero while writing. I set up five lines and gave them all citations using two books, an article from a scholarly journal, a newspaper article, and a website. From those citations, bibliographies were created in the three following styles: the Chicago Manual of Style (note with bibliography), Modern Language Association (MLA), and the American Psychological Association (APA). They were also given footnotes depending on whether the style dictated it as such.

The act of citing a record in Zotero could not have been easier. I installed a plugin for Microsoft Word that Zotero provided. It added another toolbar to Word that allowed me to insert a citation, edit a citation, insert and edit a bibliography, and change the document preferences for citations (see Figure 6). Clicking on the “insert a citation” button takes me over Firefox where, if this is my first citation, the document preference pane pops up and asks me to choose a style and a format. Then another pop-up window appears listing all the items that are currently listed in the middle pane, but you are able to navigate between all your collections and saved searches as you wish. This pane also has options for multiple authors and an editor, so if the citation in the preview window is incorrect, you can correct it before it is inserted into your document.



**Figure 5. Zotero Toolbar in Microsoft Word.**

Unfortunately, the edit feature may be needed, since all of the styles tested had a few problems, although not all of them could be blamed on Zotero. MLA style calls for citations to be labeled with the author's name, and page numbers for phrases that do not mention the author's name. For phrases that do mention the author's name, just the page number should be used. A correct citation should look like the following:

"If the existence of a signing ape was unsettling for linguists, it was also startling news for animal behaviorists" (Davis 26).

Since Zotero has no way of knowing what page a particular quote came from, the above citation would appear like this:

"If the existence of a signing ape was unsettling for linguists, it was also startling news for animal behaviorists" (Davis).

The user must add the page number in the pop-up screen in Zotero when picking their reference.

Beyond the citation, Zotero has a few problems handling an MLA bibliography. Since the entry for the journal article was for an article from an online repository, MLA required that the entry list the name of the database vendor, the database subscriber, the date the database was visited, and URL of the subscriber. The Zotero-produced citation omitted all of these.

The website entry omitted the website's sponsoring organization, the last updated date, and the author of the page, and the title was not underlined. The entry for the

newspaper was only missing the name of the database and the book entry had no problems.

Using APA style, the entries for the book and the newspaper had no problems, but the journal article omitted the last accessed date and from which repository it was retrieved. In the website entry, the title needed to be italicized and the date of publication was left out, although this was due to a user error (the publication date was never entered into the record). Inline citations for this style inserted without a problem.

Using the Chicago Manual of Style, the book entry left out the location of the publisher, but once again the entry was not complete due to an error by the record's source, Amazon.com. Therefore, a second book was tested which printed the publisher's location correctly. All the other entries also printed correctly. The website did print the title twice, but this was due to the user entering too much information in the record. Inline citations were inserted without a problem.<sup>20</sup>

Citations can be used outside of Microsoft Word as well. To enter citations into Google Docs, blogging software, and many other applications, I only had to drag the citation out of Zotero and drop it where I wanted the citation to go. Zotero will also make a bibliography out of any records you select and export it out in RTF (rich-text format) to HTML, copy it to the clipboard, or even print it.<sup>21</sup>

For both the student and the researcher, the problems with the citation styles could be the source of much frustration. The student, if they find they have to tweak the style too much, loses the main reason to use Zotero. Many of the errors found were due to the user or the supplier not giving enough information. If the student is careful and checks the entries for completeness, errors in citation styles can be kept to a minimum.

The researcher has the same problem, but they may also run into trouble with the relatively low number of default citation styles available (this author, in fact, was upset to find that Zotero does not support Turabian). More styles can be found and installed on Zotero's website, and the user may make their own if they have knowledge of XML and Citation Style Language, although not every researcher will have the time or motivation to do so.

## **Conclusions**

For anyone who needs to keep track of numerous of citations and does much of their research in a Firefox browser, Zotero is a good choice among many to keep track of all of the literature that they read and cite.

Zotero's ability to sense potential items on the page currently being viewed and to be able to enter that information into the database without the user having to do it manually could be quite a timesaver, especially if the group import function is used. The user should be careful though, as not all automatically entered information will be complete or correct. Also, since Zotero does not check for duplicates when entering data, the user will have to make sure that their library does not become cluttered.

Once the citations are entered, the folders, tags, and saved searches give the user the ability to retrieve and organize cited materials in a way that makes sense to them so important information does not get lost over time.

Zotero moves a little toward being a larger research tool with the ability to archive, annotate, and highlight web pages, attach related documents to records, and to relate items to each other.

When it comes to creating citations, Zotero has room for improvement. The tool merged well with Microsoft Word, but the citations themselves were not always accurate. Zotero would also benefit from additional citations in the default installation, although the developers encourage users to add to the project.

Finally, the developers will have to follow through on their goal of adding online capabilities to their project in the next release. Having the library attached to single copy Firefox is frustrating to users who have multiple machines and would like to be able to access their up-to-date library wherever they happen to be. Even so, students and researchers should find Zotero to be a useful tool.

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<sup>1</sup> Donald W. King, Carol Hansen Montgomery, and Sarah E. Aerni, "Patterns of Journal Use by Faculty at Three Diverse Universities," *D-Lib Magazine* 9, no. 10 (October 2003), <http://www.dlib.org/dlib/october03/king/10king.html>

<sup>2</sup> "About," *Zotero: The Next-Generation Research Tool*, October 2, 2006, <http://www.zotero.org/about/>

<sup>3</sup> Ibid.

<sup>4</sup> "The Buzz.," *School Library Journal* 53, no. 9 (2007): 28-29.

<sup>5</sup> Jeffrey R. Young, "Firefox Web Browser Introduces Campus Edition - Chronicle.com.," *Chronicle of Higher Education* 54, no. 2 (2007): 40.

<sup>6</sup> Dmitri Popov, "Linux.com :: Zotero: A seriously useful research tool," *linux.com*, October 27, 2006, <http://www.linux.com/articles/57841>.

<sup>7</sup> Willam J. Turkel, "Digital History Hacks: A First Look at Zotero," Weblog, *Digital History Hacks: Methodology for the Infinite Archive*, September 7, 2006, <http://digitalhistoryhacks.blogspot.com/2006/09/first-look-at-zotero.html>.

<sup>8</sup> Roy Rosenzweig, "Historical Note-Taking in the Digital Age," *OAH Newsletter* 35, no. 3 (2007): 1-8.

<sup>9</sup> Melissa L. Rethlefsen, "PRODUCT PIPELINE.," *Library Journal* 132 (Fall2007 Net Connect 2007): 14-16.

<sup>10</sup> Jane Kessler, "Zotero," *The Charleston Advisor* 9, no. 2 (October 2007): 52-56

<sup>11</sup> Debora Cheney and George Jenks, "To Pro-Cite or not to Pro-Cite. (compiling bibliography)," *Library Software Review* (November 1, 1988), <http://galegroup.com/>.

<sup>12</sup> Jean-Francois Gauvin, "Posting Your References to the Web.(bibliographic databases)," *Database* (December 1, 1998), <http://galegroup.com>.

<sup>13</sup> Leslie H. Nicoll et al., "Bibliography Database Managers A Comparative Review," *Computers in Nursing January/February 1996* 14, no. 1 (1996): 45-56.

<sup>14</sup> Jean-Francois Gauvin, "References to Go." (Information Today Inc., October 1999), EBSCOhost, <http://search.ebscohost.com>.

<sup>15</sup> Carol Gall and Frances Brahmi, "Retrieval Comparison of EndNote to Search MEDLINE (Ovid and PubMed) versus Searching Them Directly," *Medical Reference Services Quarterly* 23, no. 3 (Fall 2004): 25-32.

<sup>16</sup> S. M. Mahbub Murshed, "Comparison of Free Bibliographic Managers « Beyond My Mind," <http://mahbub.wordpress.com/2007/03/04/comparison-of-free-bibliographic-managers/>.

<sup>17</sup> Francesco Dell'Orso, "Bibliography Management Software: Analysis and Comparison of some packages," text, <http://www.burioni.it/forum/dellorso/bms-dasp/text/index.html>.

<sup>18</sup> "Comparison of reference management software - Wikipedia, the free encyclopedia," [http://en.wikipedia.org/wiki/Comparison\\_of\\_reference\\_management\\_software](http://en.wikipedia.org/wiki/Comparison_of_reference_management_software).

<sup>19</sup> "About."

<sup>20</sup> See Appendix 1 for citation samples.

<sup>21</sup> See Appendix 2 for a full bibliography.

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## Appendix 1: Sample Citations

Chicago Manual of Style (Full Note with Bibliography)

Citation 1 – Ross article.<sup>1</sup>

Citation 2 – Mawer book.<sup>2</sup>

Citation 3 – Onishi newspaper article retrieved from online version.<sup>3</sup>

Citation 4 – Greenpeace website.<sup>4</sup>

Citation 5 – Miller book (with publication location).<sup>5</sup>

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<sup>1</sup> Ross, “A Whale of a Find..”

<sup>2</sup> Mawer, *Ahab's Trade*.

<sup>3</sup> Onishi, “Whaling.”

<sup>4</sup> Greenpeace International, “Whaling | Greenpeace International.”

<sup>5</sup> Miller, *And the Whale Is Ours*

American Psychological Association

Citation 1 - article (Ross, 2008).

Citation 2 - book (Mawer, 2000).

Citation 3 – newspaper article retrieved from online version (Onishi, 2007).

Citation 4 – website (Greenpeace International).

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**Appendix 2: Full Whaling Bibliography (MLA style, exported into RTF format)**

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