Scholarly conduct in the sciences: Responsible attribution and avoiding plagiarism
We were recently caught off-guard by cases involving plagiarism in the natural sciences and are working to develop more explicit approaches not only to help students avoid scholarly misconduct, but also to help them develop the sense of scholarly ownership that is at the heart of a real education. This document, developed with the input of multiple departments in the natural sciences and psychology, offers guidelines and comments that may be useful as a starting point for developing text and presentations that reflect your own understanding and originality, and, hence, avoid traps that can lead to plagiarism.

Fundamental principles:
- First, it is never, ever acceptable to use the text (phrases, sentences, or paragraphs) of another author without direct, unambiguous attribution (citation).
- Second, because quoting is not a common feature of scientific writing, paraphrasing is a very important skill to develop. It takes practice. Even experienced scientists, who must paraphrase often, find this challenging.
- Third, whenever you use an idea of an author, a colleague, indeed, any individual, even if you haven’t used that author’s wording, you must cite the source. An exception is “common knowledge”, and is addressed further below.
- Finally, it is important to recognize that these principles are not simply principles of academic honor. Achieving ownership of an idea - and ownership of the words, images, citations, and creations that communicate that idea - is the all-important outcome of a good education.

Paraphrasing.
The ability to paraphrase - to describe a result or concept in your own words - is one of the best indicators of your intellectual mastery over that concept. It is, in fact, an essential part of self-education and a direct expression of your knowledge – not just a technical aside. What can you do to avoid using other people’s words and, most importantly, to develop those all-important ‘paraphrasing’ skills?
- First and foremost, you must fully internalize the central importance of never, ever using the text (phrases, sentences, or paragraphs) of another author without direct, unambiguous attribution. It is more important to act on this moral principle than it is to meet a deadline. It is more important to act on this principle than to avoid quoting, even if you know that quoting isn’t typically acceptable.
- Second, you truly cannot summarize and/or analyze a difficult text at the last minute. It takes time and (continual) practice – you must make the time. Start the effort days ahead of the deadline.
- Third, develop a rigorous system to track the source of the text and material you use when writing. Assiduously avoid cutting and pasting text as you take notes. Rather, take notes by rewriting the concept you identified as significant into your own words. This process is an essential part of making sense of the concept, which you must do anyway – so, it will save you time in the long run. (If you must – or cannot help – cutting and pasting, you must establish a rigorous system to distinguish a ‘cut and paste’ from a
paraphrasing. Quotation marks, highlighting, bolding, or using a different text color are useful approaches. If you use direct quotes without quotation marks and citation, even if it is because you lost track of which texts were from other sources and which were your own words, this is a clear, egregious case of plagiarism.

- “When in doubt, leave it out.” If you don’t understand what is being said, don’t include it in your text or explanations. Even if you have a gut feeling that inclusion of a concept would add to the sophistication of a piece of work, don’t include it unless you fully ‘get it’ – and, therefore - can paraphrase it.

- Similarly, make sure that you can explain and defend each and every word, phrase and concept in your paper. One professor took a creative approach to encourage his students' paraphrasing skills (and, yes, to discourage plagiarism). He asked his students to write a paper with the knowledge that he would, at any time, call them into his office to discuss its content. This helped his students to recognize that they needed to be able to explain and intellectually ‘defend’ each concept and phrase - and it actually added to the enjoyment of the process – the discussions in the office were considered a positive by many.

- Even when asked to respond to or critique a single paper, try to use more than one source. This not only is intellectually appropriate and enhances perspective and understanding, but it also helps prevent a dependence on a single author's phrasing and word use.

Citations in the scientific context.

What to cite. Students are often confused about what to cite and how to do so. It is important to recognize that there are a variety of reasons for citing sources. For instance, you need to cite sources to substantiate claims you make. You also need to cite sources to give credit where it is due. Regardless, never use confusion or ignorance as an excuse to not cite a source. If you use an idea, paraphrase text, make a claim based on someone else’s previous work, you must always cite the original source. Over-citation is a less egregious error than under citation. Generosity is valued (and rewarded) in scholarly circles. Incorrectly formatting a citation is a less egregious error than failing to cite.

Format. If a science professor has a preferred citation format, by all means use this. And by all means ask your professor explicitly for their citation preferences. However, recognize that citation format is not as important in some scientific disciplines as it is in others - or as important as it is in some social science and humanities disciplines. Consistency and comprehensiveness (i.e. inclusion of all pertinent information: title, authors, journal source, page numbers, and/or url and date of post) are more important than format. For example, each of the thousands of professional journals has a distinct (but consistent and comprehensive) style. Each professor may have a distinct preference (e.g. an immunologist may prefer the citation style adopted by The Journal of Immunology, but others biologists may prefer the style adopted by Cell (both are easily accessible on-line). Biology, Chemistry, Mathematics, Physics, and Psychology scholars have distinct traditions and preferences. Ask if these are unclear, but also be flexible and use your judgment - putting a premium, again, on consistency and thoroughness.
**On-line sources:**
Primary sources such as journal articles and books are the medium through which sophisticated ideas are developed and are the standard for citation. In many cases, these resources are available online. You should ask your professor whether it is acceptable to use secondary online sources such as Wikipedia or other web pages as sources for your paper or report.

**Wikipedia:** In some fields, Wikipedia can provide a good overview, can enhance your understanding, and can direct you to primary sources (e.g., in the research literature). However, you must be aware that Wikipedia is not always correct. The text and ideas of Wikipedia articles are sometimes quite original. If you would like to use the ideas presented there, you must, of course, cite the Wikipedia source, using the url and date accessed.

**Journal articles accessed via the internet:** Although we often access journal articles on-line, it is not appropriate to cite the url where you accessed the manuscript. Instead, all manuscripts should be cited with traditional information: authors, title, date of publication, site (journal) of publication, page numbers.

**Blogs and on-line material.** Blogs and other non-peer reviewed material are typically not considered acceptable sources for scientific papers; however, they are becoming more sophisticated and for non-journal publications may be very appropriate and important sources of information or inspiration. They, too, must be cited with the url and the date of post, and the date you accessed the web page.

**Other information accessed via the internet:** ANY information from ANY website (including images) must be given attribution unless used 'simply' as a means to find information in another primary source or is already cited by a primary source. Url's can be used as citations if there is no manuscript source. Include the date of access.

**Conversations and communications.** Ideas come from many places – and often can come from hallway conversations or discussions between classes or after seminars. They can evolve informally as a product of multiple thoughts from multiple people. How do you cite ideas? Similarly, how do you cite a result that you heard from a colleague and has not been published yet? First, it is important to remember, again (and again), that generosity is valued. Cite whenever you can – and cite whomever deserves credit. In formal papers, conversations can be cited in two places. First, you can add a parenthetic addition to the end of a sentence identifying the statement as originating from a “personal communication” (Charles Darwin, personal communication). This is most often used to refer to a result that supports your work but is not yet published. Second, all papers include an acknowledgement section at the end. This is a site for listing not only your funding sources, but a place to thank individuals for ideas, for sharing reagents, editing a paper, etc. In an effort to develop these good habits, some professors ask students to include an acknowledgement section for every substantive piece of work. This is good practice, regardless of whether it is explicitly required.

**“Common knowledge”:** Information that is considered “common knowledge” does not need to be cited in scientific literature. However, it can be difficult to distinguish common knowledge from information and ideas that need attribution. To add to the difficulty, what is common knowledge can vary with the audience of your work. For example, the statement
“Immature CD4+CD8+ thymocytes develop into mature CD4+ helper T cells and CD8+ cytotoxic T cells” is common knowledge among immunologists, who could choose not to cite the information. However, this claim is not common knowledge for anthropologists, and if they were the intended audience, attribution would be appropriate.

Different professors follow different guidelines for identifying common knowledge. One suggested that it is anything a non-scientist would recognize as true. Another suggested that information that appears, uncited, in an instructional textbook can be considered common knowledge. Recognize, however, that textbooks can be inaccurate and, in fields that move swiftly, textbook ‘facts’ can change after publication. The ‘bottom line’ is that you must use your judgment when deciding whether information falls into this category and the best advice, again is to cite sources whenever one is in doubt about whether attribution is appropriate.

Citing a review article. Review articles (e.g. Nature Reviews Cell Biology, Annual Reviews Chemistry, even Scientific American) are excellent sources of material but are not primary sources; rather, they summarize primary sources. How do you cite them? They can often be used appropriately as references in an introduction for points that are considered general or background knowledge (and, thus, can help to solve the “common knowledge” referencing dilemma described above). It is important not to overuse them – and to directly reference primary literature that is of central or immediate importance to your ‘thesis’ or your work.

Citing secondary sources. Confusion can also arise when we encounter secondary sources that refer to previously published studies (a primary source) that is directly relevant to the work you are developing. Remember that 1) citing a source publicly indicates that you’ve truly obtained it and read it; and (2) it is always preferable to obtain and read the original source rather than a secondary account of it. In cases where you do want to say something about a source that you’ve only read about in a secondary account, there are proper citation forms. In APA format, for example, this would be "Jones, 2001, as cited in Smith, 2009", with full citations for both Jones and Smith appearing in the alphabetical reference list at the end of the paper. This format honestly represents what one has actually read.

Re-use of your own work. If you wish to re-use all or part of work you have produced for another course (at Haverford or elsewhere) or other purpose (job, nonprofit work, etc.), you must first get permission from the instructor in your current course, after fully explaining the terms of any reuse or overlap. You must reference where such work has appeared previously. (This also applies to work submitted for two courses taken at the same time.) Reusing your own text without attribution is as egregious any other type of plagiarism.

This document was developed with insights and input from Biology, Chemistry, Computer Science, Mathematics, Physics, and Psychology Departments (Spring, 2012).