

WHEN TO CITE

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Although the Modern Language Association and other style manuals describe in exquisite detail "how" to cite the literature, explicit tutorials on "when" to cite are nonexistent. Most journals provide instructions to authors but also fail to give explicit guidance on when to cite. In spite of numerous studies of citation behavior and the wide recognition by editors of the need to acknowledge intellectual debts, authors and referees need explicit reminders as to when formal references or acknowledgments are appropriate. Since referencing is both subjective and culturally based, there can be no absolutes about when to cite. Hence, it is unlikely that algorithmic documentation of texts can ever meet the competing requirements for relevance, selectivity, and comprehensiveness. What is common wisdom in one domain may be new or unique in another. A three-year experiment involving graduate students demonstrated the varying perceptions of the need for documentation of terminology, ideas, methods, and so forth. A tentative tutorial is suggested for journal editors that should be modified in each scholarly context.

In October 1994, a seemingly innocuous request for information appeared on the American Society of Information Science (ASIS) Internet bulletin board. Professor Rob Kling, at the University of California at Irvine, asked if anyone could "provide information needed for a graduate student seminar" on "when should we cite Jones?" He went on to say that a key question for an author is, "When should I cite a particular work?" "In reading Ph.D. student papers over the years, I've concluded that they try to mimic faculty behavior, but (at least in information and computer science) students are not given good explicit guidelines for when to cite materials" [1].

For several weeks, I pondered this question, searched my files, contacted many colleagues, and initially became convinced that neither I nor anyone else had ever published a "tutorial" explicitly discussing "when to cite." This is ironic considering how extensively citation be-

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havior has been discussed [2]. Undoubtedly, the classic work on that subject is Norman Kaplan's "Norms of Citation Behavior" [3], in which he indicated that "the literature has failed to turn up very many explicit normative guides for citation practices. It can be assumed that footnoting practices are passed on by word of mouth from professor to student" [3, p. 179].

When editors and scholars are asked about citation practices, they are primarily concerned as to whether authors have acknowledged intellectual debts. Such acknowledgment is widely believed to be fundamental to ethical scholarly behavior.

The title of a 1987 paper by Manfred Kochen asked, "How Well Do We Acknowledge Intellectual Debts?" [4]. However, instead of answering this question, his article was preoccupied with electronic information systems to retrieve references for the purpose of better acknowledging intellectual debts. When I reprinted his paper [5], I should have noted the key paper by Harriet Zuckerman [6] that appeared just six months after Kochen's. In 1964, my "Can Citation Indexing Be Automated?" dealt with the electronic aspect of the problem at a symposium organized by Mary E. Stevens of the National Bureau of Standards (NBS) [7]. As explained below, my introduction to the reprint of this talk in *Current Contents* in 1970 [8] explained why I changed the title to "Can Criticism and Documentation of Research Papers Be Automated?" This explanation did indeed anticipate Kling's request. The relevant paragraphs are reprinted in the concluding section below. It is relevant to state that, until now, neither objective has been achieved. And it is important to note that even if an automatic referencing system is developed, it will not solve the subjective issue of selective documentation.

A Fortuitous Experiment in Citation Behavior

The question of "when to cite" was implicit in an experiment described below, which I conducted with students at the University of Pennsylvania in the 1960s. It was made possible by a fortuitous event. In a course that I taught for several years at Penn, I introduced the students, mostly computer scientists, to the question of whether automating citation indexing was possible by assigning my article in the *Journal of Chemical Documentation (JCD)* [9] as well as the NBS paper [7], both mentioned below, as reading assignments. In the latter paper, I discussed whether a computer could supply a list of relevant references for a text submitted to a journal for publication. This question was explicitly expressed in a final examination question:

Suppose that you are given a computer with unlimited memory and any other hardware that you desire. You also have almost infinite flexibility in software. You are the editor of a scientific journal and through an on-line terminal you have access to this computer. An author sends you a manuscript for publication in your journal. Assume that the manuscript is in machine language. However, through some error or omission, the bibliography of the article is omitted. Describe the procedure whereby the computer provides the missing bibliography. To what extent do you believe the computer can substitute for the author in this process?

If this question seems "excessive" considering the data and the level of student sophistication, we should recall that in 1959, after I had presented the *JCD* paper at an American Documentation Institute meeting [9], Herman Skolnik, editor of the newly established *Journal of Chemical Documentation*, asked whether he could publish my talk. I handed him the manuscript for my oral presentation. Much to my surprise, over a year later, the paper was published in the inaugural issue. But the numerous references cited were not included. These were unnecessary for the oral presentation. Earlier in the course, I had distributed copies of that undocumented *JCD* version [9]. Students were asked to insert brackets at any place in the text where, as a virtual editor, they thought it necessary to add a reference. In short, I was asking them to decide when it was appropriate to cite.

The results of the experiment were quite interesting [10]. The responses of about fifty students who participated varied from fifteen to seventy-five references, while in the actual bibliography I had listed forty-one references. The types of information bracketed for citation involved a wide range of categories, including unfamiliar words, data compilations, and journal or book references implied by statements alluding to publications of other authors. I also found that what was taken for granted by more senior students was not considered common knowledge by more junior ones.

The issue of "when to cite" is closely related to questions about the "why of citation." In the NBS paper mentioned above [7], I listed fifteen major reasons for citation:

1. Paying homage to pioneers.
2. Giving credit for related work (homage to peers).
3. Identifying methodology, equipment, etc.
4. Providing background reading.
5. Correcting one's own work.
6. Correcting the work of others.
7. Criticizing previous work.
8. Substantiating claims.
9. Alerting researchers to forthcoming work.
10. Providing leads to poorly disseminated, poorly indexed, or uncited work.
11. Authenticating data and classes of fact—physical constants, etc.

12. Identifying original publications in which an idea or concept was discussed.
13. Identifying the original publication describing an eponymic concept or term as, e.g., Hodgkin's disease, Pareto's Law, Friedel-Crafts Reaction, etc.
14. Disclaiming work or ideas of others (negative claims).
15. Disputing priority claims of others (negative homage).

These categories of citation have been augmented by others and described in Blaise Cronin's *Citation Process* [11] as well as in a review by Linda Smith [12]. Note, however, that the phrase "acknowledging intellectual debts" is not specifically mentioned although implied by the first two reasons listed.

My quest for a tutorial on "when to cite" included calls to former editors of medical journals such as Steven Lock and Edward Huth, among others. In that telephone survey it became clear, as stated earlier, that journal editors were primarily concerned about the issue of "acknowledging intellectual debts." Some also mentioned plagiarism, where the author deliberately fails to acknowledge intellectual debt. Indeed, in some cases, the author has borrowed the words and phrases of the debtor. Marcel LaFollette and others have recently contributed papers to a special issue of the *Journal of Information Ethics* [13] on the subject of plagiarism.

Acknowledging Intellectual Debts

But as Kochen and others, especially patent examiners, realize, many authors or inventors are not aware of their intellectual debts. Yet others make naive assumptions about what is "common knowledge." Work that was widely known and cited a decade ago may not be familiar today. This palimpsestic memory failure of sources has been discussed at length and characterized as obliteration by incorporation by Robert K. Merton [14, pp. 310-12; 15, pp. 27-30, 35-38], as well as citation amnesia which I reviewed in *Current Contents* [16, 17].

On the other hand, consider that select group of methodological papers that turn up regularly on lists of highly cited scientific papers [18]. There seems to be a Matthew effect [19, 20] in the citation of these well-known methods. The Matthew effect describes misallocation of credit accorded senior scholars, and similar preferential citation of established methods or high-prestige journals [21].

Lowry's 1951 protein determination paper is a possible but somewhat anomalous example [22]. In 1994, it was explicitly cited over eight thousand times, bringing the total since 1951 to over 250,000. But the vast majority of method papers are cited no more frequently than theo-

retical or other types of papers. In contrast to method, instrumental, and other artifactual types of papers, the likelihood is greater that the literature about an "idea" will be unwittingly ignored. Finding the literature on a novel idea or concept may be more difficult than locating "prior art" for a method due to the variety of linguistic expressions.² Even within a particular lab or institution, it may be difficult to trace the origin of an idea. It is therefore to be expected that this obliteration phenomenon [15] occurs even more often when the worldwide community of scientists and scholars is involved.³

Varying Norms of Citation Behavior, Consciousness, and Practice

There are many studies that discuss "citation behavior." But surprisingly, they rarely include discussion of how this behavior is acquired or learned. Even the most isolated students or researchers are exposed to and refer to published literature. Sooner or later they presumably follow certain norms of citation behavior [3]. But these norms vary within scientific communities, as we have seen Kling asserting at the outset with respect to computer science. His query indicates that this old-fashioned "method" of inculcating citation practice by imitation is not sufficient. Simply relying on the implicit practice of acknowledging intellectual debts, as observed in reading refereed journal articles and books, does not by itself instill adequate citation consciousness or the need for other forms of acknowledgment [26].

Formal instruction in bibliographic and citation practice and awareness may be needed today since library staffs and even graduate faculty do not have the resources to provide it.

Even after such learned behavior is inculcated, it does not necessarily prevent the "pageless documentation" described by Roy Fairchild [27] wherein books or articles will be cited without giving the exact page used [28]. Such lack of precision in citation practice is deplored in style manuals or research handbooks, as illustrated by Jacques Barzun and Henry Graff's *Modern Researcher*, which discusses various details and level of citation [29].

Normal citation behavior in hermeneutics, the interpretation of Scriptures, includes exegesis, the detailed documentation of sources.

2. Webster's definition of prior art: the processes, devices, and modes of achieving the end of an alleged invention that were known or knowable by reasonable diligence before and at its dates—used chiefly in patent law [23, p. 1804].
3. There is also the fact that the growing fragmentation and specialization of science makes it harder for hidden or implicit connections to be detected; see, for example, Don Swanson's work about logically related noninteracting literature sets [24, 25].

This is also expected of lexicographers, etymologists, and encyclopedists. Similarly, law review journals provide a level of detailed documentation that might be considered pedantic in other fields. Not only are relevant cases cited, following the rule of *stare decisis* in American law, but even common terminology may be documented. *Stare decisis* is the doctrine or policy of following rules or principles laid down in previous judicial decisions unless they contravene the ordinary principles of justice [23, p. 2226].

On the other hand, in engineering journals, pageless citation of textbooks, handbooks, and data compilations is frequent. In chemistry, the specific pages are cited but complete pagination for the full article will be missing. In citation indexes this results in the artificial separation of citations to the same article. These individually cited pages are listed as separate items, inflating the size of the indexes.

In the humanities, *The Chicago Manual of Style* [30] is widely regarded as authoritative. It covers a multitude of details on "how to cite" but barely a word on "when to cite." So, too, most scientific journals publish instructions to authors and referees, but not explicit instruction on when to cite. The recent explosion of attention to fraud, plagiarism, and misconduct notwithstanding, there is little said about teaching the young scientist when it is appropriate to cite the literature. In this connection, Evan Farber, librarian emeritus of Earlham College, has referred me to the ninth edition of the *Prentice-Hall Handbook for Writers* [31, pp. 440–49], which discusses proper acknowledgment of sources in a chapter on "The Research Paper." He also sent me pages from a pamphlet that is distributed to students in the Humanities Program at Earlham College that includes a series of caveats to students preparing papers. It covers plagiarism, inadvertent or deliberate, citing all sources, whether paraphrased or not, and "when in doubt, err on the side of citing more rather than less" [32]. Students are also referred to the *Modern Language Association Handbook* for stylistic issues [33].⁴

4. Much has been said about citation chaos—the lack of standardization. There are dozens of citation styles—so many that the personal computer era has spawned a dozen or more competing software systems like ProCite for translating them from one manuscript submission to another. For example, Harvard system [34] citations can be converted to the numbered reference system, and so forth. There are dozens of variants. There may be standardization in certain disciplines, but even journals published by the same professional society may use more than one system. The use of footnotes is valued in *Science* but abhorred in most other scientific journals. Complex footnotes add a further dimension to citation complexity. See the marvelous discussion of "footnotology" in Peter Reiss's *Towards a Theory of the Footnote* [35]. When we first began the *Science Citation Index*, the complete citation "embedded" within running text was much more commonplace in science than it is today. For reasons of economy, most new journals provide a numbered bibliography or list of cited references at the end of the paper. In the social sciences and humanities, an alphabetic

In part due to the availability of the University of Chicago and MLA handbooks, by the time humanities scholars have received a Ph.D., they are familiar with citation norms. But is that equally true for scientists? The high cost of printing most physical and chemical journals has exerted pressure for maximum brevity. Hence, the "condensed" citation style eliminates not only specific page numbers but even the title of the cited article and the names of all but the first author. As a result of eliminating the title, the style of the citing sentence is affected since the author may have to include some of the title words in the text to convey meaning. In the case of *Science* and *Nature*, titles are eliminated for cited journal articles, book titles are included, but explicit citation of micro units of thought such as chapter titles are eliminated.

The distinguished humanist Jacques Barzun has discussed at length why the "when" of citation cannot be prescribed in an absolute sense. Common or assumed knowledge in analytical chemistry differs from common knowledge in the field of chemical information science or the history of chemistry. His most telling remark comes toward the end of the book [26, p. 337]:

Quoting other writers and citing the places where their words are to be found are by now such common practices that it is pardonable to look upon the habit as natural, not to say instinctive. It is of course nothing of the kind, but a very sophisticated act, peculiar to a civilization that uses printed books, believes in evidence, and makes a point of assigning credit or blame in a detailed, verifiable way.

Accordingly, the conventions of quoting and citing should be mastered by anyone whose work makes him a steady user of these devices. Citing is in fact so stylized and yet so adaptable to varying needs that we shall devote to it most of the next chapter.

It would appear that the tutorial Kling asked for is tersely stated in the following quotation from my introductory remarks in *Current Contents* in 1970:

Scientific tradition requires that when a reputable scientist or technologist publishes an article, he should reference earlier articles which relate to his theme. These references are supposed to indicate those earlier researchers whose concepts, methods, apparatus, etc. inspired or were used by the author in developing his own article. Such references state the precedents for a current activity and provide the reader with bibliographic information needed to find an article if he wants to know more about some aspect of the subject.

Some scientific articles have hundreds of references; others have none at all. Most contain from ten to twenty. Part of the reason for such disparity in the number of references is the great difference in quality, not only in articles

arrangement of the bibliography is often combined with the name and date (Harvard) system of citation [34]. In humanities journals, footnotes with embedded references are still quite common.

but also in the journals that publish them. Many authors, editors, and referees are quite meticulous in ensuring that an article includes a comprehensive set of references. On the other hand, especially in the less scholarly journals, the references may be adequate or non-existent.

As the publisher of the *Science Citation Index*[®], I was constantly concerned about the inconsistency in the application of the reference tradition.⁵ Long before the *SCT*[®] became a reality, I and my colleagues were hopeful that an automatic system might be devised in which the computer could read an article and determine not only if the references provided were appropriate, but also what references were missing.

In conclusion, the tutorial on "when to cite" that is implicit in the preceding remarks needs to be elaborated in each situation. The requirements for citation vary considerably from journal to journal and according to the types of material involved. In a short letter to the editor, only the most essential and immediately relevant works are needed. Even, at the other extreme, a lengthy critical review paper will not cite everything that has been published in a field since it is the author who has subjectively defined the field under review.

Authors and editors should carefully determine whether all appropriate antecedents have been cited, but cultural style and tradition dictate how comprehensive the list of references will be. This is the critical issue behind the variation in perceptions of when to cite. Scholars should examine their manuscripts to see whether they have considered each of the fifteen major reasons that I assembled above. Referees should carefully consider what combination of these ways of paying intellectual debts to one's pioneers or peers is warranted, but, in the end, this can only approach verification by having the author state the parameters of the literature search. For example, as with this article, the *Social Sciences Citation Index* for 1956-95 was searched under headings such as citation, footnote, and so forth. Inevitable limitations on space, even in an electronic environment, may force choices leading to "obliteration by incorporation." These choices will include the very normal practice of citing review articles that serve as surrogates for long lists of relevant works.

Finally, memory is fallible, perhaps increasingly so with advancing years, and as with much else in the world of learning, scientists and scholars need support from colleagues. They should be consulted to take advantage of the collective memory, preferably before the paper is submitted for official refereeing.⁶

5. An important contribution to this literature appeared recently in Thomas Langham's "Consistency in Referencing" [36].

6. Thanks to Robert K. Merton, I am reminded that the term "collective memory" is derived from the work of Maurice Halbwachs [37].

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