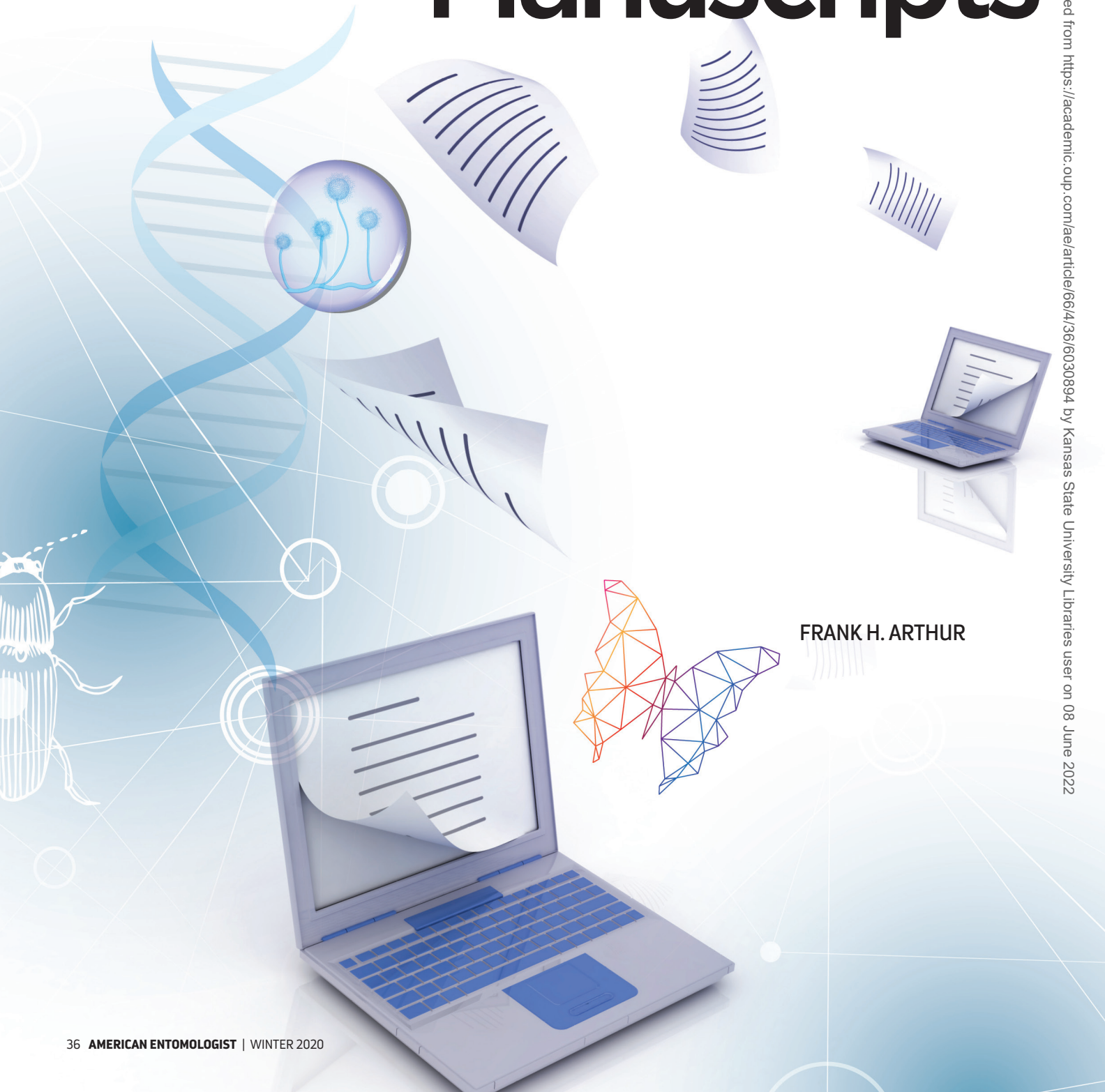
Scientific Manuscripts



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and the **Peer-Review** Process

Writing and publishing the results of personal and cooperative research is part of the requirements and expectations of professional entomologists employed by research institutions. As a 12-year editor for the Journal of Stored Products Research, and as a frequent journal reviewer, I have viewed hundreds of manuscripts, and unfortunately, I have had to reject a fair number of them. Many of these rejection recommendations could have been avoided had the authors paid more careful attention to their manuscripts during the writing process.

Editor's note: This paper is an expansion of an invited presentation, "Increasing Your Scientific Impact by Becoming a More Productive Writer: Strategies, Tips, and Pitfalls," in the symposium Advocate with Your Pen (or Keyboard): Writing about Entomology for All Audiences, presented at the 2019 Annual Meeting of the Entomological Society of America, St. Louis, MO.

The expectations of writing and publishing research are as important today for entomologists in research positions as they were 30 to 40 years ago. Scientists are expected to communicate their research through peer-reviewed journals. Communicating research in peer-reviewed journals provides validation of the quality and significance of the research to other scientists and policy makers who might ultimately read the paper. Authors need to be aware of the current journal review and submission processes and the constraints on the time of editors and reviewers. Most journal editors and reviewers now have increased administrative responsibilities that require more of their time, in addition to their research and/or teaching responsibilities.

The Paper Submission Process

Any discussion about improving scientific writing must begin with a description of a journal's submission and review process, and of the changes that have taken place during the past several decades. In the 1970s and 1980s, there was no internet, so there were no online journals, no online reviews, and no online submissions. Everything was done "by hand." Back then, a common requirement for research scientists was to obtain several internal and external reviews before submitting a manuscript to a journal. Although reviewers often contradicted one another and provided conflicting advice, manuscripts were thoroughly vetted before submission. Also, there were fewer entomological journals in the 1970s and 1980s than there are now. Many, if not most, of the submissions to journals published by the Entomological Society of America (ESA) and other major-society journals in the U.S. were by authors writing in English as a native language. Journal reviewers pored over manuscripts and, in many cases, offered detailed comments and criticisms. A common response from authors who were disgruntled by the review comments was often something to the effect of "Since the reviewers have so many comments, I'll let them write the paper for me."

The situation is far different today. For most journals, every component of the manuscript submission system is online, from initial submission to galley proofing to final publication. Pre-submission review requirements have been reduced or eliminated by most institutions, and speed of publication is emphasized by many journals. Journal reviewers are requested to provide reviews within two to three weeks. As a journal editor, I often found it difficult to find reviewers for manuscripts at all, much less find high-quality reviewers who would provide good reviews of manuscripts within the specified time frame. There are more journals today with varying levels of quality requirements, and journal metrics, such as impact factor, are

often used as an evaluation criterion for researchers. With the advent of the internet and increased globalization, there are now far more submissions from scientists who submit to English-language journals but who are writing in English as a secondary or even tertiary language.

With the proliferation of modern communications, there are many more journals today where scientists can publish their research. Authors must understand the scope of the journal to which an author is submitting a paper. Some journals are very broad-based, whereas others, including most of the journals associated with the ESA, are specific in scope. Authors must read and follow each journal's instructions for authors to ensure that the formatting of the submission is correct for the target journal. Improper formatting could give the impression that the manuscript was already submitted and rejected by a different journal.

Reviewers and editors, for the most part, are volunteers, with many time constraints outside of the manuscript review process (including their own programs, such as research, teaching, and extension). Many journals no longer have copy editors that assist with manuscript editing (although this is not the case for ESA publications). Consequently, editors and reviewers have little patience with poor-quality manuscripts. Manuscripts must be written clearly and must be easy to follow. If the paper has merit but is difficult to follow, or if there are flaws in methodology or statistical analysis, the paper may be rejected without review. Reviewers will not write the paper for you, and an important note for international scientists is that editors and reviewers will not write the paper in English for you or extensively edit for English content. Manuscripts that are poorly written and deficient in English language quality will most likely be withdrawn with a suggestion that the authors have the manuscript professionally edited by someone who is experienced in writing in English for scientific communication. It must be emphasized that it is the author's responsibility, not the responsibility of volunteer editors or reviewers, to ensure grammatical quality of the manuscript. This may present a problem for many international scientists on a limited budget, who may not have the funds to pay for an editing service. Nevertheless, neither reviewers nor editors have the time to rewrite papers not written in acceptable English. Manuscripts that are out of scope, do not have adequate replication, and show deficiencies in experimental design or statistical analysis will most likely be quickly rejected, often without review.

MANY AUTHORS TREAT [THE ABSTRACT] AS AN AFTERTHOUGHT, ALTHOUGH IT'S THE PART OF A PAPER THAT WILL INSPIRE MOST SCIENTISTS TO READ THE PAPER IN MORE DETAIL.

Another reason for rejection is plagiarism, which unfortunately seems to occur more frequently in journal submissions made through global submission systems. Sometimes entire sections or paragraphs have been copied from previously published papers, which is unethical; if caught by the editor or reviewers, such a paper will be rejected. Another form of plagiarism is loosely termed "self-plagiarism," where large sections of text are copied from manuscripts previously published by the same author or author group. This is commonly found in the methods section, but it can occur in the introduction and discussion sections as well. Many journals now submit the papers through a "plagiarism check," and it's easy to see what has been copied from previously published papers. Copying text, whether it's from someone else's paper or from one of your own, is not good professional practice and is in violation of copyright laws. Editors will reject papers outright if they detect plagiarism, and they often notify editors of other journals as to the identity and institution of the authors.

Journal editors must respect the review process, and they usually accept the recommendations of reviewers, sometimes even if those reviewers have misinterpreted the paper, have a conflict of interest, or are just plain wrong in their comments. As an author or co-author, you should make it easy for journal editors and reviewers to accept your paper, decreasing the time and effort required for responding to reviewers' comments. You must minimize deficiencies that lead to rejection or extensive revision.

The Contents of a Scientific Manuscript

There are excellent books available that describe in detail how to write a scientific paper; e.g., *How to Write and Publish a Scientific Paper*, 8th Edition, by Barbara Gastel and Robert A. Day, 2016. The order of elements of a manuscript is standard for most entomological journals—typically title, abstract, introduction, materials and methods, results, and discussion (or combined results and discussion), acknowledgements, references, tables, and figures. Examining these sections separately, and perhaps with a new way of thinking, may lead to a better understanding of manuscript construction and how reviewers will view your manuscript.

Title—The Starting Point for a Research Paper. The title is the first item that will catch the attention of an editor, a reviewer, or a reader. It must be concise, accurately describe the contents of the paper, and follow the format for the target journal. Long, wordy titles could put reviewers on guard, so to speak. As an editor and reviewer, I have seen titles in different formats, including titles with colons, questions, and quotations. I personally never liked to read titles phrased as a question for which the obvious answer was "yes." I also responded negatively to titles that began with wording such as "Effect of…" There are no hard and fast rules for titles, and authors have the freedom to write whatever title they can defend. However, long, wordy, or rambling titles are likely to draw criticism.

Abstract—A Concise Summary of the Study. The abstract is perhaps the most important part of a scientific paper, because that's the only section many people will read. During a calendar year, a researcher

may scan dozens (if not hundreds) of titles, read some abstracts based on the title, and decide whether or not to read the entire paper based on the abstract. The abstract should describe the objectives of the experiment or study and give a general description of the methodology, a quick summary of the results, and the implication of those results. Also, the abstract should contain some specifics regarding the results of the study, not just a general description of why the study was done. Most journals have word limits on the abstract, so concision and brevity of text is important. Some journals require the abstract to be in a specific format. Many authors treat this section as an afterthought, although it's the part of a paper that will inspire most scientists to read the paper in more detail. Many authors (including myself) write the abstract last, after the rest of paper is finished.

Introduction—Why You Did the Study. For the introduction, you need to provide background information about your subject; e.g., a specific species, an agricultural system, basic biology, or genetic research. However, the introduction is not a literature review; it should focus on a short review or text discussion of published research that is relevant to your paper. Most authors write introductions that begin with general information and then narrow the subject to the specifics of the study. Presumably, you are addressing a data gap, so make it clear to reviewers what those gaps are and how your study is addressing those data gaps. The length of the introduction should match the complexity of your study. In most cases, four to six paragraphs are sufficient, but if more paragraphs are needed, make sure they are tightly focused. Your concluding paragraph of an introduction should state the objectives of your study so that they are clear to reviewers and to editors. Although reviewers may skim through an introduction, they will usually focus on the data gaps and how your objectives address those data gaps. Sometimes the introduction will be patterned after a project proposal for a grant (internal or external funds) or an agreement with an industry partner or contractor. Thus, authors can easily draft the introduction while the study is in progress, rather than waiting until the end.

Materials and Methods—How You Did the Study. In this section, you should describe how you did the experiment or study and give specific details regarding the experimental design and the procedures. Writing the text to follow the order in which you did the various components of the experiment will help in organization. Think of describing verbally to someone how you did the experiment: you will most likely follow the order in which the components of the experiment were done. The methodology must be clear to the editor or reviewer. Many authors subdivide materials and methods, and although this may be acceptable, excessive subdivision is distracting, especially when these divisions are comprised of one or two sentences. The statistical analysis must be clear as well, and must include specific software packages and versions, what procedures were used, the type of analyses, and how significance was determined. The experimental design must be clearly explained to ensure that the statistical analyses were appropriate for the design. Reviewers will focus on the statistical design and interpretation, so if these are not clear, editors and reviewers will comment, and the paper may be returned without review. In many cases, researchers write an experimental protocol before the research is conducted, which can be the basis for the construction of the materials and methods. This section, like the introduction, can be drafted or written while the experiment or study is in progress.

Results—What You Found. Describe in the text the results of your study, or what you found in the course of your experimentation. It helps to describe the results in the order in which you listed your objectives. Avoid extensive text about statistical data (e.g., entire paragraphs of F, df, and P values). Most of the time, that information can be placed in tables or table footnotes, making the text more readable. Authors must ensure that the text description of the results matches the data presented in tables and figures, because reviewers will concentrate on those areas. Your statistical analyses will be important here as well, because both reviewers and editors will have varying opinions about the appropriateness of your statistical tests. If you disagree with a reviewer about your statistical approach, you may be able to provide appropriate rebuttal or defense of your methodology in this section. Most journals emphasize making the results section readable and easy to follow without a lot of statistical jargon or acronyms. Numerous authors over the years have told me that they prepare their tables and figures first, then write the results. As an author, I usually print out or view the tables and figures as I write the results and then repeatedly proofread to ensure that my text matches the tables and figures, particularly when significance of treatments is described. It is easy to make mistakes, and even good reviewers will miss them, so here's where authors need to be very careful about expressing the results in text.

Discussion—What Your Results Mean. This is, perhaps, the most difficult section for most authors to write. This section is best considered as an interpretation of your results, or an explanation of what your results mean in the larger context of the relevant literature related to your study. The discussion section should also expand on what was previously known, how the results support the literature, or possibly how the study differs from what is in the literature and why the authors' results might differ. Although authors are expected to cite references that support the text, the discussion is not a literature review, nor is it strictly a comparison of your results with the results of similar research (although that may be a component of the discussion). I emphasize that the discussion section is not a discussion of the results. I have reviewed many papers as an editor or reviewer in which the discussion essentially repeats the results, merely stated in a different way. Worse, I have reviewed many papers in the last few years in which there is a combined results and discussion section that is all results with no discussion! As an editor, I have withdrawn those papers without review and returned them to the authors for additional work. I also have reviewed papers with two to three paragraphs of results, a couple of accompanying tables or figures, and four pages of discussion. The length of the discussion section should be appropriate for the content of the results. In most cases, four to six focused paragraphs are preferable to three to four pages of rambling literature review. If authors are "stuck" while writing a discussion, it may help to focus on one paragraph at a time. Write a paragraph, put the paper aside, write another paragraph the next day, and repeat until the discussion is complete. Authors should also avoid undue or excessive speculation in the discussion, and not go too far beyond what can be supported based on the data. The amount or level of speculation allowed varies among reviewers. Some accept speculation, whereas others seek cited references for any speculation, conjecture, or conclusion that cannot be supported by the results in

the paper. Authors must often strike a fine balance on the issue of speculation. Some reviewers object to general statements like "further research is needed on this subject," because it seems like an apology for weak data.

Conclusion—A Short Summary of the Main Results. Some journals require a conclusion section; others do not. In many cases, the conclusion is a repeat of text from the abstract and/or discussion, and may be considered extra "fluff" for a paper. Many papers that end with a general discussion paragraph could form the basis for a conclusion section, if one is required. If a journal requires a conclusion section, provide one, but don't repeat the discussion, and make sure the conclusion is different from the abstract.

Acknowledgments—Whom Should You Thank? This section is often glossed over or even ignored by authors, but it's an important part of the paper, because here is where you thank people and personnel who are not co-authors, but who were an important part of the research. They may be technicians or student workers who collected the data for you, outside entities that fully or partially funded the research, or clerical personnel who helped with the processing of the manuscript. Many federal and state institutions also require disclaimers, which can be included in the acknowledgments section. Some journals have expanded this section to include detailed descriptions of the input provided by each author (sometimes labeled "author contribution" on a multi-authored paper).

Tables—Presenting Your Data in Tabular Form. Tables must have clear headings and present data in a clean, readable format. Do not use a font two sizes smaller than the text so that you can fit all values in the table; doing so will be flagged by the journal editor or the reviewers. Editors and reviewers may insist on limiting the number of significant digits in table values; for example, 4.498 ± 0.689 is not really that different from 4.5 ± 0.7, and the latter is much easier to view in tables with many values listed in rows and columns. In most cases, the values given in tables are calculated averages, not measurements. There may be instances when more than two significant digits are necessary, but a justification should be provided. In some instances, the numbers can be converted to smaller units (e.g., converting from grams to milligrams). Do not present results of mean separation tests by providing the means with no standard errors of the mean (preferred over standard deviation); otherwise, the paper might be rejected without review. Authors must follow journal style and format for showing the significant differences among treatment means, usually using lower-case letters to denote differences in treatments when they are in columns. As an example, ESA journals generally use the format 45.4 ± 1.3c, rather than 45.4 ± (1.3c), 45,4 ± 1.3c, or 45,4 ± 1.3c. If data are presented in columns and rows, lowercase letters can be used to denote significance between rows within a column, and uppercase letters used to denote significance between columns within a row. Tables and figures need to be able to stand alone, incorporating enough detail that readers do not have to go back to the methods section in order to understand them.

Figures—Presenting Your Data in Graphs and Figures. Single figures and composite figures must be clear and easy to read and comprehend. For line graphs, authors should not use multiple lines of the same color/style. Although many journals now allow color graphs in the online version of a manuscript, black-and-white graphs are required for the print version (if the journal has a print version), unless authors are willing to pay extra for color graphs. The graphs must be large enough to be easily read and understood. Font sizes for axis labels and headings must be large and easy to read. Regardless of which software package is used, poor-quality graphs can lead to major revision or outright rejection. Most journals require figure legends for all figures included, and the text in the legend must precisely describe what is depicted in the figures and sub-figures. The x and y axes must be discernable, and font sizes must be large enough to be read. The target journal may also have specific instructions for creating graphs, such as size and dimension, one versus two columns, and other layout parameters.

References—Support and Justification for the Study. The references section is another area for which authors often fail to follow journal formatting requirements. It is also a section in which inconsistencies in formatting are common (e.g., mixing journal abbreviations with full titles, or mixing formats for listing volume and page number). If the references section is sloppy and disorganized, reviewers may assume that the rest of the paper is disorganized as well. Authors must ensure that the references and the citations in the text are in the proper format for the journal. Some journals require DOI information; others do not. Know the requirements for the journal to which you are submitting the manuscript. If the references are in the wrong format, it gives the impression that the manuscript was initially submitted to a different journal, rejected, and resubmitted. This is easy to spot when the references are formatted for a journal other than the one to which you are submitting your paper. Editors and reviewers will not take the time to correct reference text, other than to point out errors to the authors and expect them to make the necessary corrections.

Additional Considerations

This article describes the manuscript publication process as it is today, provides some brief guidelines for constructing the components of the manuscript, and lists methods for minimizing the potential for rejection or major revision by journal reviewers. A good tip for early-career scientists is to think like a reviewer when you construct a manuscript. Volunteering as a manuscript reviewer will improve your own writing and ability to design appropriate experiments and analyze data, but remember that it is ultimately the responsibility of authors (not volunteer editors or reviewers) to ensure the quality of the paper. Editors often have difficulty finding reviewers for journal submissions, and, in turn, reviewers are frustrated when they receive poor-quality manuscripts to review. In my experience, nothing angers a reviewer more than being asked to review a manuscript that should have been rejected by the editor. Authors must understand the time constraints of editors and reviewers and realize that a manuscript may be quickly rejected by editors if it does not follow journal guidelines. In today's world, editors and reviewers may quickly scan a manuscript and decide to reject after a cursory reading, and they will rarely take the time to improve the manuscript. The ultimate responsibility for preparing the manuscript and leading it through the submission process rests with the authors.

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