Physics Writing Guide

How to write a Physics Journal Article

Dr. James G. McLean
Dept. of Physics & Astronomy
State University of New York at Geneseo
December, 2001

Introduction

This is a guide to the format, structure, and style of modern journal articles. You will note that there are significant differences between journal articles and the class lab reports that you have written in the past. There are a few matters of structure which are more rigid (e.g., how to present figures), but overall the structure is less rigid. This means that there is more freedom to put together the information in an effective way, but also more responsibility for choosing what that best way is.

Another thing to keep in mind about journal articles is that they exist in a different environment than lab reports. Most importantly, journal articles are **peer-reviewed**. When an article is submitted to a journal, it is sent out to a few other scientists (called referees in this context) who decide whether the article is up to the standards of the journal. This is somewhat like the process of grading lab reports. The biggest difference is that the "grading" is essentially pass/fail. Luckily, unless the referees find a fundamental flaw in the article, it can be revised and resubmitted.

Overview

There are five major parts to a typical journal article, each of which are handled according to their own rules. Four of these are required: the Title Block, the Abstract, the Body (the written text), and a Reference List. The fifth piece consists of figures or tables, which are almost always needed to convey the message clearly and effectively. Figures and tables do not necessarily go together in a single block, but they are definitely separate from the text, and follow their own rules of presentation.

The following sections will describe the structure and the content of each of these parts in more detail. Issues of structure are separated from those of content because they are conceptually very different. You will usually start your writing by worrying about content. What are you going to say, how will you order the subjects, what words or figures will best get your point across? This is the more creative step. Then, as you write, you will need to follow the rules of structure.

Two other optional parts are Acknowledgements (placed after the Body and before the Reference List) and Appendices (placed after the Reference List). These have the same structure as sections of the Body, even though the Appendices are separated from it by the Reference List.

Title Block

Content

The Title Block contains three items.

Title: This should convey not just what physical system or effect was studied, but also what tools or techniques were used, and at least a vague idea of what kind of conclusions are reached.

Author List: This should name the names of everyone who made a major contribution to the research. Obviously, the term 'major' is open to interpretation. One rule of thumb: no article should ever be published without getting each and every author's approval. Conversely, if

you aren't comfortable publishing the paper without consulting someone about its content, then they should probably go in the Author List. The Acknowledgements section, when used, offers the opportunity to recognize people who contributed, but not enough to be an author.

For published material, you want to choose one form of your name that you will use consistently for the rest of your life. This helps others who are trying to look up your work, and after all, the whole reason for writing an article is to get others to read it. When you are the primary author on a paper, be kind to the other authors and make sure that you get the correct form of their name, too.

What form should you choose? Anything including your first initial and whole last name is acceptable, but I would advise using (full first name) (middle initial) (last name), especially if you have a name that is common. Some journals won't let you use a full first name, and many abstract services only use first and middle initial; nevertheless, I advocate striving for full first name. Women sometimes prefer to only use initials, to avoid any discrimination issues.

Affiliations: There should be sufficient information to contact each author by mail, normally through the institution where they did the work. Sometimes, an author has moved between doing the work and the paper being published; in that case, the Affiliations section is written as if the author hadn't moved, but a footnote (or endnote, depending on the journal) is added indicating the author's current address. Often an email address or phone number for one author, known as the "corresponding author," is also included in a footnote/endnote.

Structure

Title: The title of the article should be as informative as possible, but it can't be too long. If the length exceeds one line, you should begin to wonder if you could trim it down.

Author List: Typically, people are listed in order of decreasing contribution. This should mean that the person who actually does the writing goes first. When using this ordering, a common exception is to put the name of a group leader (e.g., a professor) last. This is convenient because a group leader often makes a career out of focusing on one topic. Therefore, when looking for papers, you often might want a bunch of papers from Prof. X's lab, even though the papers were written by various grad students, etc.

There are some research groups who choose a different system, however, such as alphabetical order. Therefore, you can't reliably assume that the first author is the one who did most of the work.

Affiliations: For a journal article, the school or institution of each author must be indicated, along with an address. When different institutions are involved, there are two possible formats. One is to list all authors from place *A*, then affiliation *A*, then all authors from place *B*, then affiliation *B*, and so forth. Unfortunately, this method often conflicts with putting the author's names in the desired order. The second method gets around this. List all the authors with footnote-style superscripts after each name, one symbol for each affiliation. Then list the affiliations, prefaced by the appropriate superscript. The effect is just like footnotes, except that nothing is moved to the bottom of the page.

Abstract

Content

First: the things you wrote for Analytical Physics I and II at Geneseo were very likely ***not*** appropriate as abstracts for journal articles. They may have been called Abstracts, but often they

might more properly be described as Brief Reports, providing more detail about the experiment than a journal article abstract needs.

The primary purpose of the Abstract is to summarize your conclusions. What new and interesting thing are you telling the world? If the whole point is that you have improved the accuracy of some measurement, then you would include the numerical result and uncertainty. Otherwise, you probably wouldn't include the uncertainty. In fact, the best experiments often lead to Abstracts with no numbers at all! A qualitative conclusion that is interesting enough to be published is usually of wider interest and application. (Note: This does not mean that you can improve an experiment by leaving numbers out of the Abstract, of course!)

Along the way, you usually give some description of your equipment or experimental technique. However, this need not be detailed if it is not the focus of the paper. On the other hand, if the point of your paper is that you have designed a new apparatus or made an improvement to some experimental technique, then it should be featured.

There is also an element of marketing in Abstracts. The Abstract is your advertisement enticing anyone doing an abstract search to read your full article. As a result you often refer to previous work or common assumptions of the past that contrast with your results. Or you might explain in one or two sentences why the field is vitally important.

Whatever the focus of your paper is, it should be clear by the second sentence of the Abstract. If you leave it until the end of the Abstract, it will loose all of its impact.

Since the Abstract is a summary, nothing should be in it that is not also in the main text. An Abstract is **not** an introduction; the paper should be complete even without the Abstract. One way to ensure this is to leave writing the Abstract until after you have written the rest of the paper.

Structure

The abstract is almost always required to be a single paragraph. It has to be self-contained (i.e., understandable without reading or looking at anything else). It can not have or refer to any figures or tables – it's just straight text. On rare occasions it is appropriate to include a citation to another published work; in that case, you put the bibliographic entry right in the text, not as a footnote.

In some sense, the abstract is not part of the paper. It is an abstract *of* the paper, which implies that the paper was there first, then a summary was *abstracted* from it. As such, the Abstract often doesn't have a section title, but instead uses a slightly different format to distinguish it from the Body.

Body

Content

What to include

It is very important to decide who your intended audience is. This is the controlling factor that determines what you need to explain, and what you can assume that everyone knows. When publishing, this is determined by which journal you are submitting to; for *Classical & Quantum Gravity* you can assume that everyone knows what a 'metric tensor' is, while *Physical Review Letters* and *Nature* are intended for a general scientifically literate audience.

Quantify everything you can. Why describe something as "small" when you could use "1 cm"? This doesn't mean that you have to be highly accurate; if the size wasn't terribly important, you can use "roughly 1 cm." And the way in which you quantify something might vary; in my example

maybe "10% of the total length" would be more appropriate. The general idea is to describe things in the way that is most clear to the reader, and non-quantifying words like 'small' require interpretation.

Give an indication of the reliability of any numerical final results. Normally, this is done by specifying an uncertainty. Note that this does not mean that every single measurement you make needs to have an uncertainty. The rules of uncertainty combination often mean that only some of the measurements contribute significantly to the uncertainty of the final result. Also, some types of graphical analysis can produce an uncertainty without having uncertainties for the individual data points.

You do not need to be very explicit about how you calculated the uncertainty. You are at a level now where we assume that you know what you are doing. There should, however, be some indication of the sources of uncertainty, and the general methods used (obtained from a graph fit, propagated using a particular equation, …).

Equations should be treated as part of the text, extensions of the English language (more on that in Structure below). If you use equations taken from another source (with a proper reference, of course), then it is not necessary to repeat a derivation that is in the referenced work. You must, however, explain where the equation comes from; what assumptions or relations are at the origin of the derivation. This is best if you can actually identify parts of the equation, e.g., "the second term comes from the relativistic correction…"

Figures and Tables, however, are **not** part of the text. As will be explained below, they are accessories to the text. Therefore, whenever you refer to a Figure or Table in the Body text, you should be clear about what you conclude from it and why. The Figure or Table forms a justification for what you say, but you still have to say it in the Body. A reader without access to the Figure or Table should still be able to follow the text.

General Style

It is OK to use the first person ("I" and "we") in your writing. However, if you find that you are using the first person a lot, it is almost certainly an indication that the focus of your writing is wrong. Chances are good that you are focusing on what actions you took while doing the experiment, rather on what physical relationships were revealed by what happened. Note that the problem is **not** the use of the first person itself; you could rewrite all those sentences in the passive voice, thus getting rid of the "I"s and "we"s, but the incorrect focus of the writing would still be there. Another indicator of a problem with focus is excessive use of words like "first," "next," "then," "afterwards," and the like, which again reveal a focus on the process instead of the results.

It is not acceptable to use the second person ('you') to refer to the reader.

It is **never** appropriate to declare that an experiment was successful or unsuccessful. The reason is that the reader has absolutely no interest in what your original goal was; they just want to know what you did. In your past, it may have been somewhat appropriate to note successful or unsuccessful, because you could compare what you did to instructions in a lab manual. (Although, even there, I don't know why you would need to tell your instructor what the expectations were; the instructor *wrote* the expectations.) However, in real research, *there is no lab manual*. In this class, there often isn't much of a lab manual, and even when there is, the equipment might not cooperate. In both real research and this class, you just work on a problem as best you can, then report what you

accomplished. You might set goals for yourself; in fact, that's a valuable way to keep motivated. But those goals are for your own benefit, and readers of your papers just don't care.

Organizing your thoughts

Often the Body is split into sections (see Structure below). Even when you don't use sections, thinking in terms of sections can help to organize the paper. How you split it is up to you, but here are a few section titles that are frequently seen: Introduction, Equipment (or Setup, Apparatus, …), Results, Theory, Discussion, and Conclusion.

Note that a section that I ***did not*** list is Procedure. Back when you were writing lab reports for prepared experiments, it made sense to have separate Procedure and Results sections, because the procedure was determined well in advance. But that often results in needless repetition. (E.g., "Each mass was weighed." in Procedure and later "The masses were found to weigh 1, 2, and 3 N." in Results.) If there is a special measurement technique you used, explain it when you describe the applicable equipment. Otherwise, just include any methods when you give the results.

Note that I ***did not*** list an Uncertainty section. Any calculations or equations for uncertainties on specific quantities should appear at the point where you discuss the quantities themselves. Any problems that you had with the equipment should be discussed in the Equipment and/or the Conclusion sections.

The order of the sections should be governed by two principles: (1) You shouldn't write something that requires knowing something else that comes later in the article; and (2) Try to get the ideas to flow naturally one into the other. For instance, if you can't describe the results without reference to the theory, then the theory had better come first. On the other hand, putting theory after results often flows well into a discussion (i.e., comparison of theory and results).

The Introduction virtually always starts by putting your experiment into a context. That could be a historical context (even if the 'history' happened last year), or it could be a context of related problems or industrial needs. This is also where you put references to background work on the problem, so that a reader with less knowledge than your intended audience could read them to get up to speed. The Introduction often concludes with an outline of the rest of the paper. Note that the Introduction is **not** about what you did for your experiment. Nor is it about the theory one needs to understand your experiment. It is about the general concept that you are exploring, and how it fits into the bigger picture.

In both the Introduction and Theory sections, make sure that you stick to things that are reasonably relevant to your experiment. Everything in the Theory section should be useful in your data analysis. In the Introduction, making connections to things that you don't use is good, but don't let them overshadow the purpose of your paper.

Most of the time you end with a "Conclusion" section. This is **not** where you put results; i.e., the title does not mean "what I/we conclude based on the experiment." Rather, the title means "wrapping up (concluding) the paper." The Conclusion summarizes the article; in that respect, it is similar to the Abstract. The difference is that you are allowed to assume that the rest of the paper has been read. The conclusion may also include speculation based on your results, suggestions for future experiments, or suggestions for improving your current experiment.

Use paragraphs. Splitting the paper into sections will only give it a large-scale structure. On a smaller scale, you need to group together concepts.

Words

Don't confuse 'uncertainty' and 'error.' There is a long tradition of confusing these words in physics, but there is no need for you to continue that tradition. Reserve the word 'error' for a mistake, or the actual disagreement between two sources of the same quantity.

Describing a number as 'calculated' is usually not very helpful. There is often a temptation to try to use 'calculated' to distinguish between experimental and theoretical. However, in reality both experiment and theory require calculation. In another case, you may want to distinguish between a value given to you and the value you measured. In that case, 'nominal' is the adjective you need. For example, "For the circuit with a nominal resistance of 100 kΩ, the measured resistance was 98.3 kΩ."

When referring to graphs, do not use the generic *x* and *y* to refer to the horizontal and vertical axis. You used the graph to show the relation between two physical quantities, which almost surely have a variable to represent them; use those variables instead.

Structure

For journals with the word "Letters" in their names (e.g., *Physical Review Letters*), the Body may not be subdivided into sections. These journals also usually have strict length limits (e.g., 4 journal pages for *PRL*).

For other journals, the Body usually is divided into sections with titles. The sections may or may not be numbered. Subsections are usually allowed, but they aren't common.

Notes commenting on the text (footnotes and endnotes) are rarely used, except for references to other work (discussed under Reference List below).

One special issue for technical writing is how to show mathematical equations. Here are some rules, which you may recognize from textbooks:

1. Variables should be in italic typeface. Units and numbers are in normal (roman) typeface. Vectors are in bold typeface, and matrices are in a bold sans-serif typeface (Arial font is an example of sans-serif).
2. Explicitly define all variables when they are first used. This is true even when you think the context makes it painfully obvious. The definition should still be in the form of a grammatically correct sentence. When a variable immediately follows its description, do **not** surround it with commas. For example, use "the initial velocity v_i is near zero", **not** "the initial velocity, v_i, is near zero".
3. Small equations may be placed in the text just like a word. Use of an equation editor is strongly encouraged. That will automatically italicize variables, fine tune the spacing, and prevent equations from being split by line breaks.
4. Large equations, important equations, and equations to which you need to refer later should be "displayed." That means the text breaks off and the equation gets a line of its own. Although not required, it is good practice to number every displayed equation. Use a number in parentheses aligned to the right margin. You can then refer to the equations, as in "We now combine Eqs. 4, 5, and 8 to obtain…"
5. Regardless of whether an equation is displayed or not, the equation is treated as if it were grammatically part of the text. This is why you will often see punctuation, such as a comma or

period, at the end of a displayed equation; the equation is *part* of the sentence. Normally the equation plays the role of a noun; even though relation operators are often thought of as verbs (e.g., "$A = B$" translates to "*A* is equal to *B*"), the relation operator may not supply the verb for the main clause of the sentence. For a subordinate clause, however, you sometimes can get away with the equation supplying the verb.

Example	Comment
Thus, $p = nkT$.	Not acceptable; no main clause verb.
The pressure p is thus given by $p = nkT$.	This is fine. The equation is a noun.
The pressure p is thus given by $p = nkT$. (24)	As above with the equation displayed. I like to put some space between the equation and the punctuation.
Thus, we find that $p = nkT$. The pressure is given by $p = nkT$, where $n \equiv N/V$.	Examples of equations supplying the verb for subordinate clauses.

Figures and Tables

Structure

Unlike the other sections, I will describe the structure of these before the content. That is because the structure of Figures and Tables is very likely much different from what you are used to, and the structure controls the content to some extent.

The overriding fact about Figures and Tables is that they must "float." When you submit an article to a journal, you control the content, but *they* control the layout. This means that you can't count on a figure appearing immediately after a particular sentence. Maybe that sentence will be near the bottom of a page, and there won't be enough room for the figure there.

The solution is to make figures and tables somewhat self-contained objects that can move, or "float," to the best place on the page. For this reason, Figures and Tables are also referred to as "floating material." Usually they float to the top of the page, but sometimes to the bottom. They must appear on the same page as the first time they are mentioned in the text, or as soon after that as possible. Note that in the above example, with the first reference to the figure coming near the bottom of the page, it is impossible for both the floating item and the first reference to it to appear on the same page.

When submitting a paper to a journal for review, a second organization is acceptable. Since Figures and Tables are going to be floating about anyhow, it is also accepted practice to put them all at the end of the article, one per page. You then let the journal worry about where they will actually appear. In fact, you will still sometimes see a format where the rest of the paper goes first, followed by a separate page with the captions for the Figures and Tables, followed by the Figures and Tables themselves. This format is handy for typesetters, but it is a pain to read because you have to keep flipping between different pages.

A Table is information arranged in columns or on a grid, with column labels and possibly row labels. Anything that is not a table is a Figure. This includes graphs, drawings, pictures, diagrams, etc.

Both Figures and Tables must have captions, which explain their content. Tables have their captions above the actual table, while Figures put their captions at the bottom. The captions always start with the word 'Table' or 'Figure' followed by a number, e.g., "Table 3: …" or "Figure 4: …". This is, of course, how you refer to the Figure or Table in the text (e.g., "As we see from the entries in Table 3, …"). Figures and Tables are numbered by separate sequences.

If someone else has already published just the figure you want to use, you may do so as long as you get the consent of the original author (and/or the journal it was published in, depending on the specific journal). If this is done, your caption must contain a reference to a citation for the original publication (see the Reference List section for details).

Because Figures have captions, it is rare to put titles on graphs. The caption serves that purpose. In fact, you should avoid having words in the figure at all. Instead use labels (A, B, C… for instance) that are explained in the caption. The one exception is that you should still put labels on the axes of graphs.

Often, you will want to have several pictures or graphs that are very closely related. It is perfectly acceptable to group them together into a single Figure with a single caption. Use (a), (b), (c)… to label the parts. You can then use those labels to refer to the parts in the caption, and also in the Body text, e.g., "Comparing Fig. 8a to Fig. 8b, we see that…".

Color is rarely used in Figures. It is costly to print in color, and usually the journal will require you to pay for the extra expense. We're talking thousands of dollars here. So unless color is absolutely crucial to get the point across, don't use it.

Content

Figures and Tables are supporting items. The reader should be able to understand the Body even if they can't see them. This doesn't mean, however, that the Body needs to be completely convincing without reference to them.

Floating material should never be included in the article unless they are referred to in the Body. If you don't need to refer to it in the Body, what good is it doing?

Tables are used much less than you might think. The reason is that there is very often a graphical way to present the results that is easier to understand and/or more persuasive. If you show your results in a graphical way, then there is no need whatsoever to also give them in a table of data. At this level, the reader will trust you to have made the graph correctly.

The caption (for either Table or Figure) should very briefly (a few sentences) state what is being shown. It is OK to refer to things that are described in the Body. However, somebody who read your paper three weeks ago should be able to have their memory jogged *without* looking in the Body. The caption should also explain or define any abbreviations or symbols used in the Figure or Table itself.

Reference List

Content

You will always need to refer to other people's work. (If you think you don't, that means that you haven't done enough background library research.) There are five possible sources for anything you write in your paper:

1. You observed it directly yourself.
2. Everyone in your intended audience knows it from previous experience.
3. It follows logically or mathematically from other things you have said.
4. You made it up (e.g., you came up with a hypothesis to explain the observations).
5. You learned it from someone/somewhere else.

Anything that falls into category 5 **must** be referenced: you need to indicate the source. Note that the boundary between 2 and 5 is not very well defined. As discussed in the Body section, you must determine who your audience is, and that will imply where the boundary falls.

Why should the reader believe what you write? The first four sources are justified either within the paper (1 and 4), or by a vast amount of common experience (2 and 3). When you reference a source, the reader needs some reason to believe that the source is reliable. In a journal article this is almost always accomplished by referencing *previously published* work. This justifies the source in two ways. First, the previously published work has been through a peer review process, so several knowledgeable people besides the original author have given it the stamp of approval. Second, if your reader doesn't believe it, they can go back to the previous paper to get more details. (There is also the added benefit that if the reader doesn't understand it, they can go back to the previous paper to learn more.)

On rare occasion, you will see a citation something like "Private communication with Dr. I. M. Smart." This lacks the first justification, but at least the reader can contact Dr. Smart to ask questions. Obviously, you would need to get Dr. Smart's permission before you used a reference like this. This citation type is only appropriate when you are writing about other people's experimental observations, but those observations haven't been published. This is **not** appropriate when you learned something from someone else; if you learned it, then you should be able to explain it in your paper. In general, the person must be the sole source of the information.

I have never seen a reference to a World Wide Web page in a journal article. Not only are web pages not peer reviewed, but they may disappear at any time (we've all had the experience of following broken links), leaving the reader with nothing to fall back on. So, while the web is a great place to find information to get started on a topic, it's not authoritative and it's not permanent.

Structure

References to other work are handled by endnotes. (Endnotes are like footnotes, except that they are collected at the very end of the paper.) A number is put in the Body text where you make the reference, and in the Reference List section you associate the number with something previously published. I will use the following terminology: the number in the text is "the reference," and the item in the Reference List is "the citation." The citations must be numbered in the order that they are referred to in the Body.

There are various formats for the reference numbers. Currently, the most fashionable method is to enclose the numbers in square brackets. Usually, the reference numbers will appear in such a way that the sentence would make perfect sense even if the references were removed, e.g., "This effect

has been studied thousands of times [2, 4-10]." Or "As pointed out by Smith [8], the deely has a bopper." Occasionally, the number will be a necessary part of the sentence, in which case you prefix it with "Ref.", e.g., "It was shown in Ref. [14] that this is utterly negligible."

There are occasions where the placement of the reference is inconvenient. For instance, what if you want to give a reference for a displayed equation? The best solution is to put the reference at the end of the text that immediately precedes the equation. What if you want to put a reference in a caption, or maybe on a specific entry in a table; what number should you use? Journals have various arcane rules for this situation.

In the Reference List, we must worry about the format of the citations. They always start with the reference number in the same format that is used in the Body. After that, the format varies between journals, but here are some typical formats. For a citation to an article in a journal, give the authors' name(s), the name of the journal, the number of the volume that the article is in, the page number on which the article starts, and in parentheses the publication year. For example,

> [5] James G. McLean, Peter Kruse, and Andrew C. Kummel, Surface Science v. 424, p. 206 (1999).

Note that the article title most often is **not** included. For a book, give the authors' name(s), the book title, in parentheses the publisher, the publisher's address, and the publication year, and after the parentheses the page range of interest. For example,

> [8] N. W. Ashcroft and N. D. Mermin, *Solid State Physics* (Holt, Rinehart, and Winston, New York, 1976), p. 389.

For other references, a similar amount of info should be given. It should be enough for an interested reader to locate the cited material without reading a lot of extraneous material.

For this course…

General

Please double-space everything. Actually, you also have to do this for initial submissions of journal articles. The idea is to leave space for comments.

Neither an Acknowledgements section or Appendices are likely to be appropriate for the papers written in this class.

Title

Note that the words which we use to describe the various experiments in this course are very abbreviated, for convenience. As in, "This week you'll do the *Hall Effect* experiment." These same words would not make a suitable title for your paper. A title needs to be more informative.

Author List

The writer should always be the first author. The course instructor need not be included.

Body

You should write for an audience of junior-level college physics students. Thus, anything commonly covered in a first-year college physics course would probably not need to be repeated. However, something from sophomore year might need a quick review; not everybody understands everything after one semester, and reading it again certainly won't hurt.

Write in the style where the Body is split into sections with titles.

Figures and Tables

You may reuse Figures and Tables from other sources without getting permission from the author. However, you must modify them if they contain aspects that are inappropriate for your paper (white-out is handy). You must write your own captions, which must include a reference to a citation for the original source.

Use the following format for Figures and Tables: place them at the end of the paper, one page for each, with the caption on the same page as the floating item. This way you won't have to worry about inserting them at the correct place in the text, and it will reinforce this new idea that they are somewhat separated from the text.

Make all Figures and Tables in "portrait" orientation. That is, the top of the floating item should be in the same direction as the top of the text.

Reference List

For this course, you get a special dispensation for some web page citations. This is because (1) you have limited time to complete the labs, so you can't always do a proper literature search, and (2) web pages will most likely not disappear before the end of the semester. Two kinds of web citations are allowed, corporate and identifiable individual. If a company has published something on the web, then that is fair game. Companies are more reliable than individuals because their business is on the line, and usually they have published the same information on paper (which you would track down and reference if you were submitting your paper to a journal). Web pages by individuals may be referenced if you can give the author's name and institutional affiliation. If you can't get that information, then you need to find another source to reference.

If you want to put a reference in a caption or on a specific entry in a table, simply continue your numbering as if the Figures and Tables were after the Body.

For this class, please **do** include the title in your citations, putting them right after the author names. Otherwise, use standard a bibliographic format for your references. For web citations only (for which there is no standard), use the format

[5] Author Names, Company or Organization Name, *Title*, full URL.

Note that the full URL is required, not just the web server's Internet address. I should be able to type the URL into my web browser, and immediately see the information that you used.

Check List

Here's a checklist you can use to make sure that you aren't making some of the most common mistakes.

- ❑ All equations are justified by one of these three reasons: obvious (Analyt III level or simpler), derived from previous equations in paper (which ones should be mentioned), or reference to a citation.
- ❑ Equations justified by reference to a citation should still have a qualitative description of the concepts and assumptions behind their derivation.
- ❑ All Figures should have captions.
- ❑ Some idea of reliability of result is given, preferably numerically.
- ❑ Major sources of uncertainty are identified.

- Abstract is there, and makes clear what the focus of the paper is.
- Near the beginning of the Body, there is an explanation of why the subject of study is important/useful. If the reason is just "it's interesting," include some historical background justifying that (e.g., demonstrating that other people have thought so too).
- All results from your work that are mentioned in the Conclusion section are also mentioned before that. This includes uncertainties, problems encountered, etc.