

## STRUCTURING YOUR PAPERS (CALTECH RULES)\*

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All papers that you write for the next five years, and possibly the rest of your life, should have the following basic format. While different contexts require alterations, you should deviate only with good reason. Alter or leave out some component only when you're convinced it is necessary. Like all rules of thumb, these guidelines have useful purposes, but they should not be treated as iron laws.

The format that follows is appropriate for a paper that applies a theoretical idea to a particular question. Other types of papers (e.g., pure theory) require some adjustments. Part of the point of these rules is to get you to think about the design and structure of your papers wholly apart from the arguments in them. With rare exceptions, papers do not write themselves. Transforming a good idea into a good paper is a difficult process. A clear understanding of what each part of your paper must accomplish is essential to this process.

The philosophy underlying this format is that papers are often their own worst enemies, that their structure and content impede rather aid the reader's understanding of the main point. This is especially true in circumstances where most readers do not read the paper carefully.\*

The first rule of all papers is therefore:

**Papers must focus on one main point.** Do not attempt to enrich your paper with many asides. Comments meant to suggest implications not essential for the development of the central point should be avoided. It is far better to have a narrow, focused, and useful paper than a rich one that is ignored.

### The Structure

**Part I: Introduction.** From a design point of view, the introduction to a paper is one of its most important parts. A reader that is confused by the introduction ) or who fails to see that the paper deals with an important or interesting issue ) is not likely to read the rest. And, if she does read on, she is less likely to get the main point. As a consequence, every introduction must consist of four parts:

- (a) State the problem to be solved.

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I call these Caltech rules because I learned them while a graduate student at Caltech from the remarkable group of young professors: Bob Bates, John Ferejohn, Mo Fiorina, and especially Roger Noll. As they learned to articulate principles of good writing, they taught them to their graduate students. These notes represent a modest continuation of that tradition.

Put another way: Thinking of your reader as a graduate student who will pore over and over your paper is a mistake. In order for your paper to get onto reading lists in courses, it must first be read by your professional peers who rarely read a paper in this manner, especially if it is from someone they have never heard. And referees for professional journals *never* read papers in this manner.

- (b) Discuss the state of the art (i.e., previous work) and explain why, despite/because of this literature, there remains: (i) confusion; (ii) misunderstanding; (iii) errors; or (iv) some unresolved problem. Alternatively, present an empirical puzzle that the existing literature fails to explain.
- (c) State the essence of your contribution, that is, your solution to the problem or puzzle. Give the reader a sense of how you solve the problem; provide some confidence that if she reads the rest of your paper, she has a chance of learning something.
- (d) The last paragraph of your introduction should always be a "road map" paragraph; for example: "This paper proceeds as follows. In section 1 ..."

**Part II. Theory.** Express the basic logic of your approach. This need not have any reference to the problem that motivated your study. Often short examples or illustrations are useful.

Applied papers should not develop a theory for its own sake. Rather, the purpose is to develop just as much as needed to solve the problem posed in the introduction (the actual solving takes place in the next section). As a consequence, this section should not contain *all* the implications of the approach you've derived; provide only those needed to make the main point of the paper. Even if your theory is very rich, be sparse with your asides and additional implications.

**Part III. Application.** This is the heart of an applied paper. Here you must show why your theory is relevant to the problem and demonstrate its analytical leverage. Put simply, this section resolves the problem stated in the introduction.

**Part IV. Conclusions.** State the main point of the paper. This can be in question/answer form or simply a short discussion of the problem and your answer. "In this paper, we have shown that..." Summarize for the reader what your main insight is and why you were able to do something that no one else has. You may also wish to point out some of the limitations of your argument or some of its additional implications.

#### Further notes

- (1) A good test of whether you're sufficiently focused on one main point is to see whether you can summarize the paper's main argument in one paragraph. If you fail, you are probably not ready to write a cogent paper. If you succeed, you are not only ready to write the paper, but you've finished a first draft of your abstract.
- (2) Because papers that contain an "omnibus" of ideas are more complex to write, they should be attempted only with caution. If done poorly, the reader will lose the main thread of the argument. Too many points or asides knock the reader off the track of the essential purpose of your paper. Thus, if your theory has many implications and potential applications, write several papers.
- (3) All introductions and conclusions should be self-contained. Like a several page abstract, these should cogently present your problem, argument, and insights to the reader.
- (4) Every student should own and memorize Strunk and White's *The Elements of Style*. This is the single best "short course" in writing. From the standpoint of a busy graduate student, one of its principal strengths is that it does not attempt a comprehensive approach to writing. Instead, it presents a relatively small number of principles of style and a philosophy of writing that greatly facilitates learning to write.

Learn what rules you violate most frequently; and then learn how to look for these mistakes in your drafts.

(5) Two useful rules of thumb about writing.

(A) Jim Alt has always said to write with “clarity and conviction.” If you fail to be clear, you will confuse the reader. If you fail to write with conviction — e.g., using “woulds,” “coulds,” “mights,” and “maybes” — you will sound like you’re not sure of your argument. And most readers will not waste their time reading such an argument.

(B) Dierdre McCloskey, in her *Writing of Economics* 2<sup>nd</sup> ed. MacMillan (1999), provides a useful aphorism you should remember “Do not write to be understood, but that you cannot be misunderstood.” Incidentally, this is an excellent book about social science writing, though as the title suggests, all the examples come from economics.

(6) Last but not least! Write and rewrite. And then rewrite again. First drafts are NEVER good enough. Too many students and faculty stay up late the night of a deadline to finish a draft of their paper or grant proposal. Such drafts are markedly inferior to ones produced in advanced and then rewritten under more leisurely conditions.

**Exercise:** Suppose your purpose was to develop a new theoretical argument, and then apply it for illustrative purposes. Unlike the emphasis in the paper described above, the purpose here is to display a new theory and convince the reader of its importance and or usefulness. How would you adjust the rules of thumb above to handle this?