Journal of Materials Processing Technology – Guide to writing a good paper

This guide proposes a model for writing a good paper, and gives some advice on writing style. It should be used in conjunction with the separate JMPT "Guide for authors" which describes the format and structure requirements for submitting a paper to the journal.

A good paper in the JMPT makes a contribution to knowledge by providing insights into the influence of a process on material in a way that will be useful to others in future. The knowledge may be coded as an equation, or formulated in some concise statements, but must always be supported by experimental or theoretical evidence that allows the reader to judge its value. The authors opinions are of very little value in a journal paper: claiming that a new theory or model is 'good' or 'successful' is unconvincing, but providing evidence that allows a sceptical reader to evaluate the theory, is valuable. Accordingly, we propose here a model of a good paper as a defence case in a court trial in which the authors are accused that their work has no value. In writing the paper, the authors must anticipate all of the arguments that the prosecution (the reviewers) may put to them, and respond to them with evidence. The sections listed below are not intended to define the section headings of the paper – but we believe that a good paper will cover all parts of the argument set out here. Our intention in this document is to define the 'prosecution' arguments that the authors should attempt to address in their writing.

Need . What is the context for the research work? What would we like to be able to do in practice that we don't know how to do at present?

Prosecution case:

- This research is not important
- The problem is too specific and clearly does not lead to transferable knowledge

Analysis of existing work. There are two purposes to examining previous work: to summarise previous work in the area (what knowledge exists in the area and is relevant to the need defined above), and to demonstrate that a knowledge gap exists (precisely what is the gap between the defined need and existing literature that this paper will attempt to fill?)

Prosecution case:

- The claimed knowledge gap does not exist– it has already been filled.
- You have failed to connect the stated need to previous work
- You haven't understood the existing work that you have quoted
- The paper only presents established textbook knowledge
- The evaluation of the previous work is not fair

Proposal. A postulated model, theory, technological innovation, experiment, operating method or framework of analysis that will in some way contribute to filling the gap. The paper then tests the hypothesis that the proposal fills the gap identified in the analysis of existing work. The importance of treating the paper as a test of this hypothesis is that provided the proposal is novel and credible, the paper is valuable regardless of whether the hypothesis turns out to be true or false – both results are useful, and there is no need for authors to claim 'success.'

Prosecution case:

- The proposal is arbitrary
- You have made assumptions which you haven't stated, or which are untested or which are un-testable
- You have over-simplified
- The proposal is too restrictive and makes too many assumptions
- The proposal clearly won't work

- The proposal is wrong – the derivation contains an error
- The proposal is incomplete – it cannot reasonably be tested.

Design of test and implementation. Given the above hypothesis, what is the most fair and objective way to test whether the proposal fills the knowledge gap? How can the hypothesis be proved or disproved? Typically this is achieved by comparison with experimental data, or with existing models, but it is important that the chosen test would be seen as valid even by someone initially sceptical about the proposal.

Prosecution case:
- The test does not prove anything
- The test is wrong
- The test is over simplified
- The test is false – the outcome will not prove anything because it assumes the proposal is true

Results and evaluation. The results should be presented as clearly and objectively as possible supported by a careful evaluation. The evaluation should be written in such a way that an informed reader seeing the same results would draw the same conclusions – and should not claim 'good agreement' unless this has been explicitly shown and the limits of the test are carefully defined.

Prosecution case:
- The results are too specific and apply only to one situation
- Your interpretation of the results is wrong
- You claim more than you have proved

Discussion and conclusions. To what extent does the proposal close the gap identified in the review of previous work? Based on the experience of evaluating the proposal described in this paper, what extensions or related approaches would be worth investigating? What are the wider implications of the work: does this investigation suggest the use of other solutions to this problem? Are there other problems for which this solution might also be useful? Based on the work described in this paper, are there other proposals that might usefully be tested in future work?

Prosecution case:
- The work is incomplete – you haven't gone far enough
- You haven't understood the context of your proposal
- You have missed the implications of your evaluation

Abstract. Although the abstract appears first to the reader, it should be written after the paper is finished and is a concise summary of the entire paper. A good way to construct an abstract is with a one or two sentence summary of each of the above six themes.

Not all papers have six sections, as some of the sections would be very short if the above scheme were followed identically. However, most papers could be organised to cover all aspects of this argument, and we commend it as a working template.

Review papers are written in quite a different way, and will be structured by the subject being discussed. A good review is not just a catalogue, but adds value to the readers by demonstrating a structure for knowledge in the area being described – that allows clear evaluation of where work has been largely completed, where opportunities for new work clearly exist, and where different approaches have been developed, a review should contrast them clearly and with fairness.

Style.

- It is important to write the paper so that the reader finds it complete and compelling. You must assemble the information presented in it into a coherent narrative, and don't leave the

reader to assemble related ideas or evidence from different sections. To help achieve this: the introduction should motivate the reader to read the rest of the paper and demonstrate why the ensuing structure is logical; the first paragraph of each section should motivate the reader to read the section, and should present a clear structure for the information contained in it; the first sentence of each paragraph should motivate and structure the rest of the paragraph. First paragraphs and first sentences generally do not include references as their purpose is to give structure for the reader, not to present new information. Each paragraph should have a single purpose.

- Paragraphs beginning “another”, “furthermore” etc. are worrying to the reader – they suggest that you haven’t anticipated the structure of the section. If you find yourself beginning paragraphs in this way, go back to the first paragraph of the section and re-define the structure. As an example, the following opening sentence clearly shows the reader what to expect: “There are four possible means to increase safety in manufacture of light bulbs: product changes; process changes; changes in personnel policy; changes in infrastructure. Each of these is examined in turn, considering the cost of implementation, the range of skills required, and their likely benefits.”
- The correct way to cite previous work includes some description of what the authors did, and what the conclusion was – so the reader knows how seriously to take the information you claim from them. References in papers work best when the reference is used as the subject of a verb. For example “Smith (2004) analysed 14 companies manufacturing light bulbs in Norwich and found that 12 of them failed basic Health and Safety requirements at least once per year” as opposed to “Safety is a concern in light bulb manufacture (Smith, 2004).” It is of almost no value to quote references in a list – precisely because this fails to give any indication of what each of the authors did, and how their conclusions differ.
- People reading papers have read a lot of them before – don’t philosophise (don’t attempt to show that your work has great significance outside of the context in which you pursued it) or claim that is more significant than it is. What readers like is clarity about the purpose of the work, clarity about how it fits into previous work, clarity about what was done and clear evaluation of the outcomes without any hint of “salesmanship.” Inexperienced writers often make statements of the type “the model and experiments showed perfect agreement” where actually the statement “the model matched the experiments well within normal operating conditions, but was never less than 20% inaccurate outside of this range” is both more honest and more useful.
- Long sentences are harder to understand than short ones.
- The clearest sentences are often the simplest. English is built around sentences that have the structure: subject-verb-object. Lack of clarity often occurs when this order is ignored. It is surprisingly easy to write a sentence with a long sub-clause between the subject and verb of the main clause, and sometimes the object of the main clause is missing altogether. If you realise that your writing is becoming unclear, it sometimes helps to see if that sentence or paragraph would be clearer if written in reverse order.
- Aim to be concise.
- Academic writing is formal. Avoid colloquialisms or ‘chatty’ phrases.
- The reader will examine your writing to see if you have provided evidence to support your claims. Your own opinion about the value of your claims is rarely significant. Therefore, writing in the 3rd person is generally more effective than writing in the 1st person. The statement “we found that forces grew with displacement” is an opinion. The statement “The plot of measured forces against displacement shown in figure 1 shows a strong positive correlation” is evidence – so is more convincing.
- The most common failing in academic writing is claiming that the paper is more significant than it is. Be precise in describing the conclusions that may safely be drawn from the evidence you have provided – even if they appear to you to be small or insignificant. Leave it to the reader to assess the quality of your contribution – you don’t need to “sell” it.