

Paper Writing in Practice

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Finishing the graphics and writing the methods section

1. More about figures

- Each should stand on its own
- Layout/titles should tell the story of the paper for you
- Should avoid unnecessary repetition
- Since they will most likely be reduced to fit a standard column of the journal in which they are published, make sure resolution is sufficient and that the point you want to make is clearly illustrated (do you need a panel that zooms in?).
- Make sure that labels will be readable, and that labels within a figure are formatted consistently.
- Make sure that the legend identifies a specific reagent used to obtain the data in that panel if multiple possibilities exist (e.g. you tested 3 antibodies, but used one in particular for this IP).
- See **Sample guidelines for data presentation** handout (from *JCB*) to read about a variety of topics including: image resolution, the line between acceptable and unacceptable figure adjustments, what to keep in mind when acquiring images, and what kind of information must be included with different kinds of figures.

Using graphics effectively (adapted from Judith Swan, and based on references listed below):

- Use graphics when they will tell your story better than writing would (e.g. table of time vs temp)
- Expectations for graphics:
 - enough information (not too little *or* too much)
 - the right kind of information (not too detailed *or* too abstract)
 - information is relevant to subject under discussion
 - presentation is appropriate to setting
- Principles of good graphic design:
 - let content drive the design (e.g. bar graph vs pie chart)
 - define the relationship examined in the visual
 - let the reader in by labeling relevant content
 - design each visual to make a point
 - make the point of the visual visible to audience
 - reduce “chart junk”
 - make changes visible
 - use differences in appearance to indicate significance
 - use differences to show change
 - use differences *only* when trying to show change
- Strategies for designing persuasive graphics:
 - use boundaries of the visual field to provide structure
 - use depth of visual field; take advantage of eye’s full range of resolution
 - use the viewer’s natural patterns of motion—left to right, top to bottom
 - don’t bore the reader with description—allow her/him to analyze
 - provide context and emphasis: the static and predictable plus change and novelty
 - limit visual *differences* to moments of change and novelty
 - make sure the reader finds the context before the emphasis (e.g. constant variable in left-hand column of table)
- Keep in mind that:
 - every picture tells a story—choose the one that tells yours
 - the default settings of most software aren’t helpful in telling *your* story (design your own template, use more appropriate colors, use open space purposefully).
 - the first representation is rarely the most informative—plan to revise, question the context, and try alternatives as learning experiences
 - ask for feedback and take it seriously—your viewers’ descriptions of problems in interpretation are always right
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- References:
 - Tufte, Edward R. 1983. *The Visual Display of Quantitative Information*. Cheshire, CT: Graphics Press.
 - Tufte, Edward R. 1990. *Envisioning Information*. Cheshire, CT: Graphics Press.
 - Tufte, Edward R. 1997. *Visual Explanations: Images and Quantities, Evidence and Narrative*. Cheshire, CT: Graphics Press.
 - Grice, H. Paul. 1975. "Logic and conversation". In Cole, P. and Morgan, J. (eds.) *Syntax and semantics*, vol 3, pp 41-58. New York: Academic Press.

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2. Summary of what you want in Materials & Methods / Methods / Experimental Procedures sections

- Will be read most (and most critically) by experts in the field
- They should:
 - explain each experiment in sufficient detail to allow others to repeat it (will be crucial to an important subset of readers)
 - editor will be interested in this section *mainly* if this is a methods paper
- Materials:
 - provide exact technical specifications, e.g. quantities and source/method of purification (many journals require company name, city and state or country)
 - list all animals or plants used by genus, species and strain designation
 - in case human subjects are used, describe selection criteria and provide informed consent statement
- Methods:
 - be precise, e.g. give an actual temperature (some journals will not accept “RT”)
 - group related methods together
 - present methods in a logical order, e.g. chronology where appropriate
 - cite other sources for methods if they are easily and permanently accessible (no lab websites, which aren’t permanently archived)
 - clearly describe any deviation (don’t just mention; also give details of what you did) from those sources
 - explain the reason for taking any non-standard approaches
- NOTE: This is a section where a list-like quality is acceptable/can be helpful (a bit like figure legends)

3. References

- build bibliography up as you write the paper
- provide citations *any* time you mention another published work (including your own)
- be sure to include (this is especially applicable to the introduction and discussion too):
 - papers by competitors
 - papers that come to conclusions different from yours
 - papers that are published while your work is in progress
- be sure to follow journal formatting requirements (especially if rewriting for a new journal after rejection!) & to check accuracy

4. Supplementary information

- follow journal guidelines (this may not be meant as a place for the entire methods section)
- recognize that this may not be copy edited
- recognize that this is not limited to the types of information that can be provided in print, e.g. can now include:
 - videos
 - large primary data sets for other researchers to mine