

Master of Science in Biology: Guidelines for writing a Master Thesis Manuscript

Below are the instructions for writing your master thesis, which should consist of two main parts:

- (1) Scientific paper
- (2) Supplementary Information

(1) Scientific paper

Except for citations, we largely follow the style of *Scientific Reports*, please refer to publications in that journal for examples of published papers (<http://www.nature.com/srep/>). The master thesis should be presented as the work of a single author (the student).

The main text (not including Abstract, Methods, References and figure legends) should be no more than 4,500 words. The maximum Article title length is 20 words. The Abstract — which must be no more than 200 words long and contain no references — should serve both as a general introduction to the topic and as a brief, non-technical summary of the main results and their implications.

For the main body of the text, there are no explicit requirements for section organization. According to the students' preference, the text may be organized as best suits the research. As a guideline and in the majority of cases, however, we recommend that you structure your manuscript as follows:

- Introduction (without subheadings)
- Results (with subheadings)
- Discussion (with or without subheadings)
- Methods (with or without subheadings)

A specific order for the main body of the text is not compulsory and, in some cases, it may be appropriate to combine sections (Results and Discussion, for example). Figure legends are limited to 350 words. Footnotes should not be used. Articles should contain no more than 6 display items (figures and/or tables).

Figures

The students are responsible for obtaining permission to publish any figures or illustrations that are protected by copyright, including figures published elsewhere and pictures taken by professional photographers. Figures should be numbered separately with Arabic numerals in the order of occurrence in the text of the manuscript. When appropriate, figures should include error bars. A description of the statistical treatment of error analysis (preferably standard deviation or standard error) should be included in the figure legend. If statistical tests involve hypotheses about means, means should be plotted in figures, not medians.

Figure lettering should be in a clear typeface (for example, Helvetica); the same typeface in the same font size should be used for all figures in a paper. Use 'symbols' font for Greek letters. All display items should be on a white background, and should avoid excessive

boxing, unnecessary color, spurious decorative effects (such as three-dimensional 'skyscraper' histograms) and highly pixelated computer drawings. The vertical axis of histograms should not be truncated to exaggerate small differences. Labelling must be of sufficient size and contrast to be readable. The thinnest lines in the final figure should be no smaller than one point wide.

Figures divided into parts should be labelled with a lower-case bold a, b, and so on, in the same type size as used elsewhere in the figure. Lettering in figures should be in lower-case type, with only the first letter of each label capitalized. Units should have a single space between the number and the unit, and follow SI nomenclature (for example, ms rather than msec) or the nomenclature common to a particular field. Thousands should be separated by commas (1,000). Unusual units or abbreviations should be spelled out in full or defined in the legend. Scale bars should be used rather than magnification factors, with the length of the bar defined on the bar itself rather than in the legend. In legends, please use visual cues rather than verbal explanations such as "open red triangles". Unnecessary figures should be avoided: data presented in small tables or histograms, for instance, can generally be stated briefly in the text instead.

Figure and Table legends

Legends begin with a brief title sentence for the whole figure and continue with a short description of what is shown in each panel in sequence and the symbols used; methodological details should be minimized as much as possible. Each legend must total no more than 350 words.

Methods

Where appropriate, we recommend that you limit the Methods section to 2,500 words. When more technical details are necessary, please use the Supplementary information section for that. You must ensure that the Methods section includes adequate experimental and characterization data necessary for others in the field to reproduce your work. Descriptions of standard protocols and experimental procedures should be given. Commercial suppliers of reagents or instrumentation should be identified only when the source is critical to the outcome of the experiments. Sources for kits should be identified. Students should describe the experimental protocol in detail, referring to amounts of reagents in parentheses, when possible (eg 1.03 g, 0.100 mmol). Standard abbreviations for reagents and solvents are encouraged. We advise to add an ethical statement and safety hazards posed by reagents (and measurements taken) whenever appropriate.

Statistical guidelines

The number of independent statistical units (n) should be clearly provided for each test. In case of a hierarchical nested design, the different levels should be clearly specified. Every article that contains statistical testing should state the name of the statistical test, the n value for each statistical analysis, the comparisons of interest, a justification for the use of that test, the alpha level for all tests, whether the tests were one-tailed or two-tailed, and the actual P value for each test (not merely "significant" or " $P < 0.05$ "). Assumptions of statistical tests should be discussed briefly. All P values should be accompanied by the value of the test statistic used to calculate the P-value. It should be clear what statistical test was

used to generate every P value. Use of the word "significant" should always be accompanied by a P value; otherwise, use "substantial," "considerable," etc. P values do not provide information about how strong an effect is. A measure of effect size should therefore be provided when possible (e.g. standardized regression coefficients, a correlation coefficient, the coefficient of determination).

Data sets should be summarized with descriptive statistics, which should include the n value for each data set, a clearly labelled measure of center (such as the mean or the median), and a clearly labelled measure of variability (such as standard deviation or range). Ranges are more appropriate than standard deviations or standard errors for small data sets. Graphs should include clearly labelled error bars. You should state whether a number that follows the \pm sign is a standard error (SE) or a standard deviation (SD).

You should justify the use of a particular test and explain whether the data conform to the assumptions of the tests. Three errors are particularly common:

- Multiple comparisons: When making multiple statistical comparisons on a single data set, you should explain how you adjusted the alpha level to avoid an inflated Type I error rate, or you should select statistical tests appropriate for multiple groups (such as ANOVA rather than a series of t-tests).
- Normal distribution: Many statistical tests require that the residuals are approximately normally distributed; when using these tests, you should explain how you tested the data for normality. If the data do not meet these assumptions, another error distribution may be appropriate (e.g. Poisson, Binomial) or a non-parametric alternative should be considered.
- Small sample size: When the sample size is small (less than about 10), you should use tests appropriate to small samples or justify their use of large-sample tests.

References

References should be limited to 60. In contrast to the format of Scientific Reports, references should be mentioned as the authors + year of publication. When there are more than two authors, the reference becomes 'Author et al., year of publication'. Only papers that have been published or accepted by a named publication or recognized preprint server should be in the references.

All authors should be included in reference lists unless there are six or more, in which case only the first author should be given, followed by 'et al.'. Authors should be listed last name first, followed by a comma and initials (followed by full stops) of given names. Article titles should be in Roman text, only the first word of the title should have an initial capital and the title should be written exactly as it appears in the work cited, ending with a full stop. Book titles should be given in italics and all words in the title should have initial capitals. Journal names are italicized and abbreviated (with full stops) according to common usage. Volume numbers and the subsequent comma appear in bold. The full page range should be given, where appropriate.

Published papers:

Schott, D. H., Collins, R. N. & Bretscher, A. Secretory vesicle transport velocity in living cells depends on the myosin V lever arm length. *J. Cell Biol.* **156**, 35-39 (2002).

Books:

- Smith, J. Syntax of referencing in *How to reference books* (ed. Smith, S.) 180-181 (Macmillan, 2013).
- Jones, H. in *How to reference books 2nd edn*, Vol. 4 (eds Brown, R. *et al.*) Ch. 8, 222-223 (Macmillan, 2014).

Website:

Buckley, M. and Reid, A., *Global food safety - keeping food safe from farm to table. Technical report.* (2010) Available at: insert website here. (Accessed: 4th November 2012)

Acknowledgements

Acknowledgements should be brief. Grant or contribution numbers may be acknowledged. Only people, institutions or organizations should be thanked, not animals or supernatural beings.

(2) Supplementary Information

This section, which accompanies the manuscript, can be used to clarify anything you want. This can contain an extra introduction, extra figures, extra tables, ... Supplementary Information (text, tables and images) should be combined and supplied as a single file of maximum 20 pages, preferably in PDF format. Supplementary videos, spreadsheets or data files are not encouraged. Designate each item as Supplementary Introduction, Table, Figure, Methods, Discussion, as appropriate. Number Supplementary Tables and Figures as, for example, "Supplementary Table S1". This numbering should be separate from that used in tables and figures appearing in the main article. Supplementary Introduction, Methods or Discussion should not be numbered. **Refer to each piece of supplementary material at the appropriate point(s) in the main article.** Be sure to include the word "Supplementary" each time one is mentioned. Please do not refer to individual panels of supplementary figures.

Use the following examples as a guide (note: abbreviate "Figure" as "Fig." when in the middle of a sentence): "Table 1 provides a selected subset of the most active compounds. The entire list of 96 compounds can be found as Supplementary Table S1 online." "The biosynthetic pathway of L-ascorbic acid in animals involves intermediates of the D-glucuronic acid pathway (see Supplementary Fig. S2). Figure 2 shows..."

Important note

The fact that you have written your master thesis as a manuscript, does not automatically allow you to also submit this manuscript to a journal for publication. The promoter of your thesis has the final word on when, how, and where data and results from your master thesis will be published (or not). You are also not allowed to post your master thesis (or part of it, or research results) anywhere on internet.

After the thesis, all samples and biological material will remain at the VUB. Deposition in another location is possible when approved by the promoter. Before leaving the VUB, it is the student's duty to hand over all data to the promoter.

