

6. Scientific writing

Types of scientific contributions

- **original contribution (the article)** - universal communication tool, it exists in several forms, the style of writing should be standardized
- **review** - summary of already published results with new interpretations, critical approach is highly needed here
- **monographs, books** - collections of already published, discussed results in a way that resulting book will have long-term validity
- **popularization article or a book** - must be accessible to broad reader's community (public), it is not a true scientific report
- **bachelor, master, dissertation and habilitation theses** - their purpose is to get the an academic or scientific degree, they could be presented as "stand alone" or just as the collection of already published papers

6.1 Writing bachelor thesis

- **bibliographic search** - thesis itself may contain experimental results, but bibliographic part is the most rated part of the work
- **instructions for writing bachelor thesis** - they are unified for whole section of biology (http://www.natur.cuni.cz/biologie-en?set_language=en), detailed instructions (in Czech) could be found at the web of biological section ([biologická sekce](#)).

Basic conception and overall extent of the work:

- **the responsibility is up to the student** - the supervisor helps by useful advices and may help with interpretations
- **it is a bibliographic search** - this is the most evaluated part of the work, experimental results might be included, but they are not so important
- **the work should demonstrate the ability of student to compile relevant scientific literature** - the most important is the complexity of the view, the ability of making conclusions, strong statements and generalizations.
- **scientific style of writing** - in Czech, Slovak and English. The best and very concise introduction to scientific writing is from William Strunk Jr.
- **The Elements of Style**, it is freely available at [Google books](#) or here in [pdf](#). Wikipedia also gives great introduction to the correct scientific writing at http://en.wikipedia.org/wiki/Scientific_writing

6.1 Writing bachelor thesis

Basic conception and overall extent of the work:

- **information from text books are not enough**
- **secondary references should be minimized** - there are even papers describing the [potential risk](#) of trusting secondary references
- **more focused topic is better than general** - it gives student the chance to deeply understand certain topic and discuss it in detail

6.1 Writing bachelor thesis

Structure of bachelor thesis:

- **Optimal length 15-20 pages** - should not be longer than 40 pages, spacing 1.5, page borders around 2.5 cm, 70 characters/line
- **abstract** - both in Czech and English, maximum 2000 characters
 - it should unequivocally define the aim of this bibliographic search
- **key words** - 5-10 words, they should be both in Czech and English, they should reflect the topic clearly
- **introduction** - setting out the rationale for the thesis as a whole including short overview on the historical context of the research in the field of selected topic. It is worth to state why would one want to read it now, rather than at any other time. It should mention how individual topics are going to be organized into a clearly structured article.
- **main text** - it could be divided with subheadings reflecting individual topics

6.1 Writing bachelor thesis

Structure of bachelor thesis:

- **results of experiments** - they could be implemented, but only as the complement to the main bibliographic search. The best is to include the paragraph describing how the selected topic will be experimentally approached during master studies.
- **references** - the style is not pre-defined. It could be selected from certain scientific journal, or as suggested by official standards (could be found in Czech at citace.com pages <http://www.citace.com/index.php>
 - reference manager software for collecting and organizing references is the best solution for formatting citations as well as bibliography
- **supplements, images** - it is always better to include them into the text, only in case of larger amount of data they could be at the end

Whole bachelor thesis is submitted both in printed (2 copies) and electronic pdf form.

6.1 Writing bachelor thesis

Review procedure:

- **reviews of opponent and supervisor** - opponent is selected by respective department from experts in the field, PhD. students in the last year of their studies might be opponents as well.
- **instructions for writing opponent's review** - the aim is to prevent the heterogeneity in the evaluation of the work.
- **bachelor work as well as opponent's and supervisors's reviews are announced at the departmental web pages 2-3 days before defense procedure**

Defense procedure:

- **parts of the defense procedure** - student's presentation, reading of opponent's reviews by the opponents, answers of opponent's questions by student, and general discussion, altogether not more than 30 minutes
- **decision** - it is up to the committee that is composed from at least 3 members from 3 faculty departments

6.1 Writing bachelor thesis

Some common mistakes:

- **not enough or too much of references used for assembling of the thesis**
- **language mistakes** - both in English and Czech, both in syntax and grammar
- **citation inaccuracy** - both ignorance and misunderstanding of the cited paper might be a reason, the effort to understand the text is crucial here.
- bachelor thesis as a bibliographic search might be in optimal situation used for master thesis theoretical introduction.

6.1 Writing master thesis

The main objective:

- **to integrate experimental results with the actual knowledge in the field** - master thesis is not only bibliographic search, correct discussion with student's experimental results is crucial, not properly working experiments are not so big obstacle in case of their correct discussion i.e. why it did not work, etc.

- **writing rules** - similar for all departments of experimental biology, but there are no common obligatory rules (as it is for bachelor thesis)

- the most important is to keep uniform style of writing and organization of the text, main text blocks are abstract, introduction, bibliographic search, material and methods, results, discussion, summary and references

6.1 Writing master thesis

Defense procedure:

- **requirement for the successful termination of MSc. studies** - Mgr (Magister) or MSc (Master of Science)
- introduction of students by the chair of the defence procedure
- student's oral presentation, max. 20 min
 - the most important is to introduce the main objectives of the work, why there was necessary to perform particular experiments. One should choose only the most important results for the presentation, optimal presentation should be in a form of exciting story with exciting conclusions
 - conclusions should put results into the context of general knowledge, do not forget to acknowledge colleagues, publication strategy may be mentioned as well
- reading of opponent's reviews - opponent should be from other institution
- answering the questions
- general discussion - try to avoid too extensive argumentation
- committee decision

6.2 Writing Ph.D. thesis

- **it is required for the successful finish of Ph.D. studies** - title Ph.D. (<http://www.natur.cuni.cz/biologie/studium/doktorske-studium>)
- **„PhD study board“** - it guarantees the existence of the particular research specialization at the faculty, it continuously evaluates the work of Ph.D. students including defense procedures
- **Forms of PhD work** - either separate thesis or collection of published papers with the introduction
- **electronic theses** - available at the web, [here](#) or [here](#).

6.2 Writing scientific report/paper

- **the main outcome of scientific activities** - next to patents, they can not be combined together at one time
- **the matter of intellectual property** - repeated publication of one fact prohibited
 - correct reference to the original contributions
- **what to consider before the submission of the original article?**
 - **choose a suitable journal** - overall scope and impact factor
 - editorial board composition
 - **assess the scope (length) of the work proposed for the submission to the Journal**
 - is it going to be competitive?
 - **publication expenses** - page charges, mainly because of color images, but also when publishing in the purely online „open access free“ journals
 - **compare results with „minimal requirements“** - minimal requirements are defined some disciplines of experimental biology in the form of [MIBBI](#) i.e. [Minimum Information for Biological and Biomedical Investigations](#)

6.2 Writing scientific report/paper

- **Required format and appearance** - it is always specific for the journal, [instruction for authors](#) should be studied carefully as well as recent articles from the journal
- **Practical assessment, Research and Evaluation online (PARE)** - [PARE](#)
- **EASE - European Association of Science Editors** - very good „universal“ guidelines for [scientific writing](#)
- **very good tutorial on scientific writing and publishing of original articles** - [San Francisco Edit](#)

6.2 Writing scientific report/paper

The structure of standard manuscript of the original contribution:

- **Title** - always attract attention by original and informative titles, title page contains names and addresses of all authors, key words, running title, etc.
- **Abstract (summary)** - condensed form of the article
- **Introduction** - summarization of recent knowledge in the field, only relevant information should be here, always ends with the paragraph highlighting our results and conclusions
- **Results** - arranged in the individual parts
- **Discussion** - it could form one coherent part with results
- **Material and Methods** - one should be able to repeat all experiments based on the information provided in this part
- **References** - in the specific style of the journal
- **Figures, Tables** - separate numbering
- **Captions** - figure legends, should be self-explanatory

6.2 Writing scientific report/paper

Manuscript submission procedure:

- **revision of language** - it should be done by native speaker, who is familiar with the particular scientific field, there are also professional editors. Artificial intelligence-based software could help here as well.
- **electronic submission** - uploading of individual files to the server of the journal
- **cover letter** - the letter to the editor-in-chief or associate editors, where the reasoning why this particular paper should be published is clearly stated
- **review process** - it is the editor's decision to send the manuscript to 1-3 experts in the field to peer-review the manuscript
 - the principle of solidarity, authors may suggest potential reviewers
 - reviewers are anonymous, their comments should be satisfied fully by authors
 - manuscript is accepted when the general consensus is achieved
- **proofreading** - the article should conform all standards of the journal

6.3 Writing scientific projects and grant proposals

Consider the type of the project that is most suitable at the moment and choose the grant agency accordingly

Constitute a functional team - project feasibility is guaranteed by the research institution

Strictly keep formal requisites - project proposals are often eliminated before scientific evaluation, just because of formal defects

- proposal text is similar to scientific paper, it contains expected results, the judgment of possible practical applications and financial demands

Example of the scientific proposal [here](#)

Evaluation of the proposal - members of expert panels select several external reviewers according to the topic of the proposal. These reviewers are always anonymous.

- it takes roughly half to one year to evaluate the project proposal

6.3 Writing scientific projects and grant proposals

Successful proposals are granted, financially supported, applicants turn to be „**principal investigators**“ and their research institutions are typically „**beneficiaries**“.

Reporting periods are pretty variable, from one month to several years

The outcomes of the particular project are **scientific papers or patents**

- grant agencies control **the publication** of results of the principal investigator
- in case of **bad outcome** (no papers, no patents), the principal investigator has problems in any future calls
- In Czechia, scientific projects are **all listed** at the pages of Research and Development Council (<https://www.vyzkum.cz/FrontClanek.aspx?idsekce=633>)