

UNIVERSITY OF COLORADO **DENVER | ANSCHUTZ MEDICAL CAMPUS**

Format Guide for Theses and Dissertations

Guidelines for Students Submitting Theses and Dissertations to the Graduate School in Partial Fulfilment of Graduate Degrees

Effective January 2017
Replaces Style and Policy Manual for Theses and Dissertations Revised September 2016

II. General Information for Filing Theses and Dissertations

Introduction

Though theses and dissertations are no longer published as bound, paper documents, they are still digitally published scholarly works. As such, the Graduate School (GS) sets forth basic guidelines to ensure that all theses and dissertations appear professional and to have been produced by a student at our institution. This Format Guide describes the basic formatting guidelines required of all theses and dissertations submitted for graduate degrees at the University of Colorado Denver | Anschutz Medical Campus, including programs that are not overseen by the Graduate School.

Thesis refers to the research paper required for a master's degree whereas dissertation refers exclusively to the research paper required for a doctoral degree. For convenience, we will use the word "thesis" throughout this document to represent both theses and dissertations.

Graduating involves more than just defending and submitting your thesis. Please consult the Graduate School website for detailed instructions, forms and deadlines. Note that each campus has different deadlines and it is critical that you follow the deadlines for your program's home campus.

Students on the Denver Campus will work with the Denver Graduate School Office:

Phone: 303.315.5879

Location: Lawrence Street Center Suite 1251 Denver Campus Graduation Deadlines

Students on the Anschutz Medical Campus will work with the Anschutz Graduate School Office:

Phone: 303.724.2915

Location: Academic Office 1 Suite 1503

Anschutz Medical Campus Graduation Deadlines

THESIS PREPARATION - "MAKING THESIS FORMATTING EASIER"

We highly recommend that you read and prepare to apply the format guidelines presented here before you start writing your thesis. Review Section III – Examples and Sample Pages (p. 13) carefully as well. It is often easier to start with a properly prepared template than to consistently apply formatting to an existing document. If you use Word to write your thesis, set up Styles to apply your formats. Using Styles allows you to change your format details quickly and easily throughout your thesis. You can also use the Table of Contents tool to automatically create, populate and update an accurate Table of Contents, though you will need to adjust the formatting as Word's automatic formatting does not meet the Graduate School requirements.

We also recommend that you use reference management software to manage your references. Examples include EndNote, Zotero, Mendeley, CiteUlike, Papers, RefWorks, etc.

If you wish to use LaTeX to format your thesis, templates are available from the Math Department at this link. LaTeX is not a word processor, but rather a "document preparation system for high-quality typesetting" (http://latex-project.org/intro.html). Note that this template is in technical format whereas the GS guidelines are more accurately described as traditional format, so you should be prepared to make some modifications to the template as necessary.

We offer seminars at the beginning of each regular semester on the Anschutz Medical Campus to help students identify common formatting mistakes and ways to avoid them. Denver Campus students are welcome to attend this session, if they wish.

FORMAT REVIEW

Students on both campuses must submit their thesis for format review by the deadlines noted in each campus's graduation deadlines. The thesis you submit for format review should be mostly

complete, which will allow us to give you thorough feedback. Pay close attention to the feedback you receive through format review and make all changes we request before submitting your final thesis.

DENVER STUDENTS

Email a PDF of the thesis to Stephanie.puello@ucdenver.edu. Please include your last name and "Format Review" in the subject line of the email. Your thesis will be reviewed electronically and changes will be sent to you via email. Please plan on 2-3 weeks' turnaround time, particularly if you submit close to the deadline.

ANSCHUTZ STUDENTS

Expedited Format Review: email a PDF of the thesis to Shawna.mcmahon@ucdenver.edu. Please include your last name and "Format Review" in the subject line of the email. Your thesis will be reviewed electronically and changes will be sent to you via email. Please plan on 2-3 weeks' turnaround time, particularly if you submit close to the deadline.

Traditional Format Review: call the Graduate School (303-724-2915) to make an appointment with Elizabeth Wethington. This appointment is typically during the week before your defense. You will bring your laptop to the meeting to review your thesis electronically in person.

SUBMISSION PROCESS

All theses are submitted electronically by uploading a PDF to ProQuest. Your thesis must be submitted by the published deadline in order to graduate in a given semester. Before we can approve your thesis, we need your completed Statement of Approval AND Exam Report Form. Note that students cannot handle the Exam Report Form themselves. Once you submit your final thesis, we will review it for format correctness before we approve it for publication. Some revisions are usually required so please watch for emails from ProQuest. All final format review will be handled through ProQuest; please do not email theses after the initial format review.

STATEMENT OF APPROVAL

Download and complete the Statement of Approval of the Thesis/Dissertation <u>before</u> your exam and take it with you to facilitate signing. If you have revisions, we suggest that all but your chair or advisor sign at the exam so that you only have to get one more signature. All members of your committee must sign in ink. In rare circumstances, a remote committee member may print and sign a separate copy, which should be appended (physically or digitally) to the main document. Submit the fully executed Statement to the GS before you submit to ProQuest. We prefer to receive the original inked document, but can accept a high quality scan if necessary. Do not include the Statement in your thesis.

Note: this is not the same as the Exam Report Form! Your committee will receive and handle the Exam Report Form, but you are responsible for the Statement of Approval.

EXIT SURVEYS

Doctoral students will receive invitations to complete three surveys as part of graduation: BEST Program Survey (Anschutz Students Only), Graduate School Exit Survey and the <u>Survey of Earned Doctorates</u>.

Masters students will receive an invitation to complete the Graduate School Exit Survey.

THESIS SUBMITTED TO PROQUEST

1. Submit your thesis electronically to ProQuest through the University of Colorado Denver | Anschutz submission website:

- a. Anschutz Medical Campus student's submission website
- b. Denver Campus student's submission website
- 2. ProQuest will automatically send you and the Graduate School an email confirmation of your submission.
- 3. The Graduate School will review the thesis to confirm it meets format guidelines. Should corrections be needed, the you will receive an email directly from ProQuest.
- 4. If no corrections are needed or once corrections are made, you will receive an email directly from ProQuest that your submission has been accepted.

FINAL APPROVAL BY THE GRADUATE SCHOOL

The Graduate School will review all components of submission outlined above, including the statement of approval, exit surveys (if applicable) and acceptance of the thesis. Once all components are complete, the GS will approve the thesis for publishing.

COSTS

There are no fees associated with standard electronic publication. Additional publishing options with fees associated are optional and payment will be made via credit card directly to ProQuest during the submission process. Additional publishing options are as follows:

Open Access Publishing: \$95.00

Copyright: \$55.00

HARD BOUND COPIES

You or your program/department may request or require bound copies of your thesis. You can order these documents directly from ProQuest or work with the Denver Bookbinding Company. Be sure to tell the Denver Bookbinding Company that you are binding a university document to receive a discount on services. Note that the Graduate School does not require bound copies and you may order them at any time after we accept your thesis for publication.

EMBARGO

You <u>may</u> choose to place an embargo on your thesis, which will prevent the full document from being accessible through the library until six months, one year or two years after submission. Only your title and abstract will be available until the embargo is lifted.

COPYRIGHT

You <u>may</u> apply to have the copyright on your thesis registered through ProQuest for an additional fee. Additional information about copyrighting can be found on the ProQuest website. If you have already published portions of your thesis, you must get permission of the publishers or copyright owners. If you will publish your thesis in the future, personal copyright is probably unnecessary.

You may include previous publication and copyrighted materials in your thesis following these guidelines:

- The work must represent research conducted while enrolled in the master's or doctoral program and must not have been previously used to fulfill the requirements of another degree.
- 2. You must be the sole or primary author of the published work; when multi-authored works are included, your contribution and how it relates to the thesis must be clearly explained in the introduction or body of the text.
- 3. Previously published work must be reformatted to meet requirements in this document.

Include a footnote on the chapter title that states: "Portions of this chapter were previously published in provide reference info like journal, year, issue> and are included with the permission of the copyright holder." For more information on copyright, please visit:

US Copyright Office: www.copyright.gov

Fair Use Information: http://copyright.gov/fair-use

ProQuest/UMI: http://media2.proquest.com/documents/UMI CopyrightGuide.pdf

RESPONSIBLE CONDUCT OF RESEARCH

Every thesis must uphold the utmost level of research and academic integrity. Plagiarism, fabrication, falsification, and other forms of research misconduct will be investigated by the Office of Regulatory Compliance Research Integrity Officer and/or the Research Ethics Committee.

RESEARCH ON HUMAN SUBJECTS OR ANIMALS

All research involving human subjects or animals requires review and approval by the Colorado Multiple Institutional Review Board (COMIRB) or the Institutional Animal Care and Use Committee (IACUC) before the research is initiated. Failure to abide by this policy can have serious consequences including but not limited to your degree not being granted.

If you have performed research involving human subjects, include your COMIRB/IRB protocol number in your Acknowledgements. If you have used live animals, animal tissue or observational animal work, include your IACUC protocol number in your Acknowledgements.

INVOLVEMENT OF STUDENTS IN RESTRICTED, PROPRIETARY OR CLASSIFIED RESEARCH

Two important policy documents provide guidance on restricted research: (1) Board of Regents Policy 4F: Classified Research and (2) Administrative Policy Statement 1023: Restricted, Proprietary and Classified Research. It is important to note that only the Chancellor can approve research that is sponsored by an entity that imposes research restrictions and that in general, students cannot work on projects where publication is restricted; see Section IX of APS 1023 for more details.

II. THESIS AND DISSERTATION FORMAT

Before you read this section, we recommend that you review Section III. Examples and Sample Pages (p. 13). Also, consult with your advisor and/or committee about their expectations, as you do have some choices. The key to formatting your thesis is consistency: use the same font, font size, header style, margins, page number location, etc. throughout your thesis. We only provide guidelines on structural format; please consult a content style guide appropriate to your field for additional guidance on the following:

- Abbreviations and symbols
- Formulas and equations
- Table, figure & graph appearance
- Units & measures
- Hyphens, colons, semicolons, dashes

Examples of such style guides include:

- Publication Manual of the American Psychological Association (APA)
- A Manual for Writers of Term Papers, Theses and Dissertations by Turabian

OVERALL STRUCTURE

The Graduate School does not prescribe thesis structure beyond requiring that the document is <u>organized into chapters</u>. As such, so long as a program, committee and/or advisor approve, a student may choose to present content in different ways. Two common approaches for a traditional written document can generally be classified as "<u>chapters as sections</u>" and "<u>chapters as papers</u>." In the "chapters as sections" structure, chapter headings may seem familiar as sections in a single scholarly paper. In the "chapters as papers" format, you would start with a global introduction/literature review and end with a global conclusion/summary/future directions. Each paper would be a separate chapter in between. Previously published manuscripts must be formatted per this formatting guide. If your discipline dictates a format other than a written document, please consult with your program for guidance on appropriate structure.

THESIS ORGANIZATION

Organize your thesis as follows. The items marked with an asterisk (*) are required in every thesis; other items are optional. Examples of these items can be found in the sample page section of this document. Items 1-10 are collectively known as the "preamble" pages of your thesis.

- 1. Title Page*
- 2. Copyright Page
- 3. Approval Page*
- 4. Abstract*
- 5. Dedication
- 6. Acknowledgements
- 7. Table of Contents* (ToC)
- 8. List of Tables
- 9. List of Figures
- 10. List of Abbreviations ↑ Number these pages with lowercase Roman numerals (e.g. i, ii, iv)

 \checkmark Number these pages with Arabic numbers (e.g. 1, 2, 10)

- 11. Text (Chapters)*
- 12. Endnotes13. Bibliography, Selected Bibliography or References*
- 14. Appendix or Appendices

TYPEFACE

Theses must be typed in a font between 10 and 12 point. Use a standard font such as Courier, Times New Roman, Cambria, Arial, Helvetica or Calibri. Think carefully about your choice of a serif vs. sans serif font. Many people consider serif fonts to be easier to read in long documents and large blocks of text (think about the font in a novel, for example).

Use the same font for all text throughout the thesis, including but not limited to headings, paragraph body, quotes, figure captions, table titles, footnotes and page numbers. Text within a table or figure as well as superscript numbers for footnotes/endnotes can be smaller than your main font (as small as 9 pt.). Text within a figure should be legible when the figure is embedded in the thesis.

Equations, formulas and words within figures must also be typed. Handwriting is only permissible within a figure if it is a necessary aspect of the figure (e.g. the figure depicts a handwriting sample).

Computer code can be in any typeface and format.

MARGINS, ALIGNMENT AND PAGINATION

Thesis margins must be 1.25" from the left and 1" from top, right and bottom sides.

Align your text to the left (ragged edges).

Preamble pages (items 1-10 in the Thesis Organization section) are numbered with lowercase Roman numerals (e.g. i, ii, iii, ...). The title page is counted as page i but does not have a page number printed on it. The main body of the thesis (items 11-13) are numbers with Arabic numbers starting with 1 on the first page of the first chapter. Page numbers are printed on all pages of the thesis except the title page.

You can put the page number in the upper right corner, the lower right corner or the bottom center of the page. Page numbers should be $\frac{1}{2}$ " from the top or bottom of the page and 1" from the right side of the page. These distances are set by setting the margin of the document to 1" and the header/footer margin to be $\frac{1}{2}$ ".

Remember that page numbers are the same size and font as the rest of your thesis.

SPACING AND INDENTS

The entire thesis is double-spaced except for the items listed below, which are single-spaced:

- Footnotes/endnotes
- Long, indented quotes (more than 40 characters; entirely indented from margin)
- Figure legends/captions
- Text inside a table or figure
- Footnotes under a table
- References/bibliography (single-space within entries, double-space between entries)

Do not put extra space between paragraphs.

You should have at least 8" of content per page including the top margin unless you are at the end of a chapter. Insert a page break to move a heading of any level to the next page if it is not followed by at least two lines of text. See the Examples section for samples.

Indent the first line of each paragraph throughout the thesis. For consistency, use the tab key or format your body text style to have an indent built in. Long quotations are indented entirely from the left. See Section III: Examples and Samples section for examples of different types of indentation and images of the ruler in Word for each.

HEADINGS

Choose a hierarchical style for headings and subheadings; each level of heading should be progressively less eye-catching. The spacing above and below headings must be consistent. Apply your heading styles consistently throughout the document, i.e. all Level 1 headings must be the same in every chapter.

Chapter headings are required but all other heading levels are optional. You should follow proper outlining protocol: there must be two or more subheadings below any higher level heading.

If your program/department does not dictate specific heading styles, we offer the following recommendations. Remember that all text is double spaced unless otherwise noted under Spacing and Indents so all headings naturally have a double space before and after them.

Chapter Name: bold, centered, all caps, no additional space

- Level 1: bold, centered, upper & lower case (title case)
- Level 2: bold, aligned left, upper & lower case (title case)
- Level 3: underlined, aligned left, upper & lower case (title case)
- Level 4: bold, paragraph indent, first letter cap only (sentence case) followed by period then paragraph text
- Level 5: italic, paragraph indent, first letter cap only (sentence case) followed by period then paragraph text

See Section III for examples of how you could apply headings.

For title case, capitalize main words; articles, conjunctions and prepositions are not capitalized unless they are the first word. Visit <u>grammar-monster.com</u> for more detailed instructions.

For sentence case, capitalize only the first word and proper nouns (or other special words like acronyms), just like in a sentence.

TITLE PAGE

Format your title page following the example page.

Key features:

- Thesis title and your name are all caps.
- All text is centered on the page and double-spaced.
- Your name must be identical on the Title Page, Approval Page and Abstract.
- List all prior academic degrees including location if the institution had multiple campuses. Do not include your major.
- In the block of text at the bottom of the page, use the full name for your degree, the College or Program from which it was granted and the year in which your degree will be granted (not necessarily the same as the year you defended).

APPROVAL PAGE

Format your approval page following the example page.

- All text is centered on the page and double-spaced.
- Like the Title Page, use the full name of your degree and the College or Program from which it was granted.

- If your advisor was on your committee, list second (after Chair); if not, list at end.
- Do not include degrees or titles for committee members.
- Use the last day of the semester in which the degree will confer, regardless of when you defend/submit.

ABSTRACT

Format the text at the top of the page as in the example:

- <Last name>, <first name> (<degree abbreviation>, <discipline>)
- Thesis title should be in title case.
- Thesis directed by <advisor's title> <advisor's name> (e.g. Assistant Professor Doe)

Center and bold "ABSTRACT" followed by abstract text.

End with (<u>right-justified</u>):

The form and content of this abstract are approved. I recommend its publication.

Approved: <advisor name, no title or degree>

DEDICATION

Dedications are optional and personal. If it is long, center the title "DEDICATION" at the top of the page. If it is short, center the dedication on the page and don't use a title.

ACKNOWLEDGEMENTS

If you are the sole author, Acknowledgements are optional unless you have a COMIRB or IACUC protocol. Acknowledgements also include funding sources and people who contributed to the research and preparation of the thesis.

If you have co-author(s), i.e. other persons made substantive contributions to the research and/or writing of individual chapters, these should be specified on the Acknowledgements page or within the appropriate chapter(s).

If you choose to include Acknowledgements in the preamble of your thesis, center the title "ACKNOWLEDGEMENTS" at the top of the page.

If you choose to include Acknowledgements in your individual chapters, either format your acknowledgements as a footnote on the title of the chapter or include a separate Acknowledgments section at the end of the chapter. If a chapter has been published, this is also a useful place to cite that publication along with assurance that the publisher has waived copyright. (See p. 5 for more information.)

TABLE OF CONTENTS

You must have a Table of Contents in your thesis. Follow the sample page formatting.

- Title: CONTENTS or TABLE OF CONTENTS centered and bold
- Number the pages of the ToC itself in lowercase Roman numerals
- Minimum: include Chapter titles (numbered with uppercase Roman numerals, all caps)
- Standard: include Level 1 headings (case matching your thesis)
- Advanced: include Level 2+ headings (case matching your thesis)
- "CHAPTER" aligned left with I. <first chapter name> on the subsequent line
- Page numbers aligned right with or without leaders
- Double space all text

- Indent each heading level consistently
- Recommended: Properly format hanging indents to align first letter of multi-line titles

If you properly use the Styles tool in Word to apply your chapter heading style and your level 1 and level 2 heading styles, you can use the Table of Contents tool to automatically generate and easily update the Table of Contents. We highly recommend you do this to ensure accurate page numbers and easy updates as you edit your thesis.

Note that REFERENCES and APPENDIX are not chapters, so are not numbered and are aligned left. If you have more than one appendix, "number" them with A, B, etc.

LIST OF TABLES, LIST OF FIGURES, LIST OF MAPS, ABBREVIATIONS

All of these pages are optional and are part of the preamble pages that are numbered in lowercase Roman numerals.

Key features:

- Title: TABLES or LIST OF TABLES, FIGURES or LIST OF FIGURES, etc., ABBREVIATIONS centered and bold
- Number pages in lowercase Roman numerals
- "TABLE," "FIGURE," "MAP" aligned left with entries numbered as in thesis (e.g. 1.2, 3, 4a)
- Page numbers aligned right with or without leaders
- Double space between entries; single space within multi-line titles
- Recommended: Properly format hanging indents to align first letter of multi-line titles

Arrange abbreviations in neat columns and single-space entries if desired.

CHAPTERS

Key features:

- Written theses must be arranged in chapters.
- "CHAPTER X" followed by chapter title also in all caps; double spaced; bold, center.
- Chapters numbers in capital Roman numerals
- Apply guidelines presented in earlier sections throughout chapters (e.g. margins, headings, body text, etc.)

TABLES, FIGURES, MAPS, ETC.

Tables and figures can EITHER be inserted in-line with the text immediately after their first mention, OR on separate pages. If you use separate pages for your tables/figures, you can EITHER insert the separate page as the next page after mention, OR gather all tables and figures at the end of the chapter. See Figure 1 for a graphical example. You may put multiple small tables or figures on one page. Consult with your committee/program for their preference and consider readability.

- Refer to a style guide for the formatting of tables, figures, graphs, etc.
- Must fall within margins (including left border of tables, which Word misaligns).
- Table titles and figure captions are the same size as body text.
- Text can be smaller than body text, but should still be readable (esp. in scaled figures).
- Format table titles and figure captions consistently throughout.
- Large tables/figures can be formatted in landscape with top to the left when in portrait, but page number of such items must appear in same position as all other pages.

- Tables/figures can be numbered sequentially through the entire thesis or within each chapter.
- Unless your discipline dictates otherwise:
 - o Table titles appear at the top of the table.
 - o Figure captions appear at the bottom of the figure.
 - o Table footnotes appear at bottom of table.
 - o Figure footnotes appear at bottom of figure, above the caption.
 - o Caption should be the full width of your page.
- For large figures or those with very long captions, put the caption on the next page, but include the figure number (minimum) or the figure title (recommended) under the figure itself. Figure caption stands alone on next page. Don't break figure captions across pages. See Figure 2 for a graphical example.
- For tables longer than one page, repeat the header row and indicate "Table X cont'd" at the top of each subsequent page.

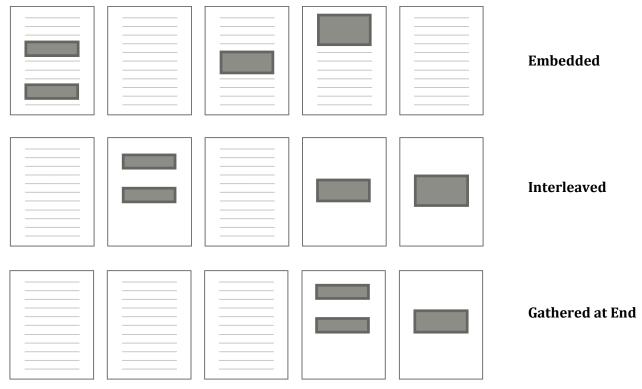


Figure 1. Three options for figure/table placement. This figure depicts the three acceptable options for placing tables and figures in your thesis. Choose one option and use it consistently throughout.

FOOTNOTES/ENDNOTES

Consult a relevant style manual for the structure of footnotes/endnotes. Use is optional.

- Indicated with a superscript number.
- Numbered consecutively through thesis.
- Bibliography should include all references cited in footnotes/endnotes.
- Superscripts may be in a smaller font size; single space within multi-line notes; double space between notes.

BIBLIOGRAPHY/REFERENCES

You must include a bibliography or reference section even if you use footnotes/endnotes. Choose the appropriate format for documenting your sources. A bibliography is a list of documents used or consulted in preparing the thesis. References are a list of documents that are cited in the thesis.

Consult your committee, a relevant journal or professional style guide for citation format and reference list format. Apply your citation format consistently throughout your thesis.

We highly recommend using reference management software such as EndNote, Zotero, etc. This will make reformatting references easy if you publish your papers in multiple journals with different formats.

Key features:

- Title: "REFERENCES" or "BIBLIOGRPAHY" or "LIST OF REFERENCES" centered, bold
- Single space within multi-line entries; double space between entries.
- Keep a single entry together (don't split it across a page break).
- Make sure each page starts with an entry, not a blank line.

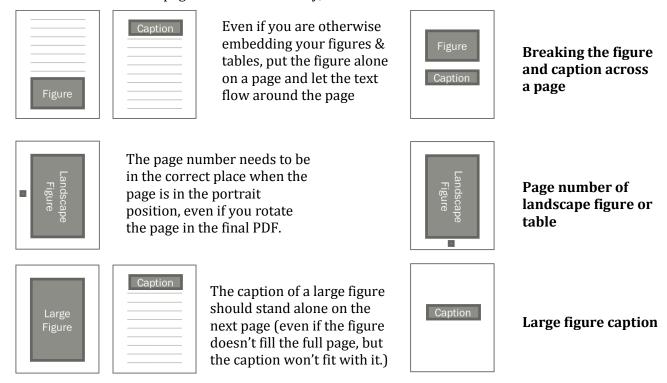


Figure 2. Common mistakes in figure and caption placement. The right column depicts the correct way to format the aspect of figure placement addressed in that row.

APPENDIX

- Optional
- Multiple appendices are delineated with alpha characters (A, B, C, etc.)
- Title: "APPENDIX X" centered, bold
- Page numbers continue from rest of thesis
- Content must fit within margins

III. EXAMPLES AND SAMPLE PAGES

This section contains examples of various formatting guidelines from Section II, as well as samples of the various pages that are required or may be included in a thesis.

HEADINGS EXAMPLES

These are examples of how you could apply different collections of the headings described in Section II of this document.

CHAPTER III (Chapter Name)

WINTER – VERSUS SUMMER-ACTIVE BACTERIAL COMMUNITIES IN ARCTIC SOIL

Introduction and Review of the Literature (Level 1)

As the Artic climate changes, resulting in longer summers and milder winters (Maxwell, 1002), the microbial communities in soil will likely change, in turn altering the biological process microbes perform, particularly when soil is frozen.

Materials and Methods (Level 1)

Sample collection and field site. Soil was collected from the North Slope of Alaska at Toolik Field Station (68° 38' N, 139° 39' W) in May, June, August and November 20015. (Level 4)

CHAPTER III (Chapter Name)

WINTER – VERSUS SUMMER-ACTIVE BACTERIAL COMMUNITIES IN ARCTIC SOIL Introduction and Review of the Literature (Level 2)

As the Artic climate changes, resulting in longer summers and milder winters (Maxwell, 1002), the microbial communities in soil will likely change, in turn altering the biological process microbes perform, particularly when soil is frozen.

Materials and Methods (Level 2)

Sample collection and field site. Soil was collected from the North Slope of Alaska at Toolik Field Station (68° 38' N, 139° 39' W) in May, June, August and November 2015. (Level 5)

CHAPTER III (Chapter Name)

WINTER - VERSUS SUMMER-ACTIVE BACTERIAL COMMUNITIES IN ARCTIC SOIL

Introduction and Review of the Literature (Level 1)

As the Artic climate changes, resulting in longer summers and milder winters (Maxwell, 1002), the microbial communities in soil will likely change, in turn altering the biological process microbes perform, particularly when soil is frozen.

Materials and Methods (Level 1)

Sample Collection and Field Site (Level 3)

Soil was collected from the North Slope of Alaska at Toolik Field Station (68° 38' N, 139° 39' W) in May, June, August and November 2015.

WINTER MICROBIAL CARBON METABOLISM AND COMMUNITY COMPOSITION IN ALASKAN TUNDRA SOIL

by

JANE KATHERINE DOE

B.S., University of Manitoba, 2001

M.S., Oregon State University, 2004

A thesis submitted to the

Faculty of the Graduate School of the

University of Colorado in partial fulfillment

of the requirements for the degree of

Doctor of Philosophy (full degree name)

Structural Biology and Biochemistry Program (program or college if College of Nursing)

2015

© 2015

JANE DOE

ALL RIGHTS RESERVED

Masters Approval Page

This thesis for the Master of Science <full degree name> degree by

Jane Katherine Doe

bas been approved for the

by

David D. Myrold, Chair

Peter J. Bottomley

Elizabeth Sulzman

Date: < last day of the semester>

Note that typically, the chair of a Master's committee is also the advisor. If the advisor is someone other than the chair, indicate with ", Advisor" after their name. If the advisor is not part of the committee, list their name last.

Example degrees: Master of Science, Master of Science Clinical Science, Master of Arts, Master of Humanities, etc.

Example Programs: Genetic Counseling Program, Epidemiology Program, History Program, Civil Engineering Program, etc.

Doctoral Approval Page

This thesis for the Doctor of Philosophy degree by

Jane Katherine Doe

has been approved for the

by

Oliver Chadwick, Chair

Josh P. Schimel, Advisor

Sally MacIntyre

Craig Carlson

Matthew Wallenstein

Date: < last day of the semester>

If the advisor is not part of the committee, list their name last.

Examples of Colleges or Programs: College of Nursing, Human Medical Genetics Program, Cancer Biology Program, Applied Mathematics Program, Clinical Health Psychology Program

Doe, Sarah Katherine (<degree abbreviation>, college if CON>)

Linking Soluble C to Microbial Community Composition and Dynamics During Decomposition of

¹³C-Labeled Ryegrass

Thesis directed by Associate Professor David D. Myrold

ABSTRACT

This line indicates how the body of the abstract is to begin. The body should not exceed 350

words. The following approval statement must be typed exactly as it appears at the end of the

abstract. Just type the advisor's name for approval; signature actually appears on the Statement of

Approval page. Do not list any titles or degrees. Right justify.

The form and content of this abstract are approved. I recommend its publication.

Approved: David D. Myrold

TABLE OF CONTENTS

CHAPTER

I.	INTRODUCTION (Chapter Heading)	1
	Role of Substrate Quality in Residue Decomposition (Level 1 Heading)	2
	Microbes in Cold Environments (Level 1 Heading)	5
	Challenges to Life in Frozen Soil (Level 2 Heading)	8
	Nitrogen Cycling in the Arctic (Level 3 Heading)	13
	Types of Carbon in Arctic Soil (Level 3 Heading)	17
	Microbial Community Diversity and Function	20
	Phospholipid Fatty Acids (PLFAs)	26
	Stable Carbon Isotope: 13C	29
	Specific Aims	32
II.	ACTIVE MICROBIAL COMMUNITIES IN ARCTIC SOIL MEASURED BY BRDU	
	INCORPORATION	34
	Introduction	34
	Materials & Methods	37
	Results	41
	Discussion	46
REFER	RENCES	123
APPEN	NDIX	
A.	Permits Required to Collect and Transport Soil from the High Arctic Sites in Thule,	
	Greenland	132
В.	Raw Data	226

LIST OF TABLES

TABLE

1.	PLFAs correlated with the first principal component in PCA of all treatments		
	(soil and detritosphere) at each sampling time	12	
2.	Common phospholipid biomarkers and their interpretation	96	

LIST OF FIGURES

FI	GU	RE

2.1. NMS ordination of shrub and tussock active and bulk soil community T-RFLP				
profiles from Toolik Lake, Alaska	54			
6.5. Amount of added substrate respired during incubations from all four seasons	88			

APPENDIX A

You can put any content in any format in an appendix so long as it fits in the margins. Have fun!

SPACING AND INDENTS EXAMPLES

EXAMPLE 1: INSERT A PAGE BREAK... (LEVEL 1 HEADING) ...Because there is only one line of text following the heading. This paragraph text would continue. EXAMPLE 2: DON'T INSERT A PAGE BREAK... (LEVEL 1 HEADING) ...BECAUSE THERE IS A SUBHEADING... (LEVEL 2 HEADING) ...And a line of paragraph body text. EXAMPLE 3: DON'T INSERT A PAGE BREAK... (LEVEL 2 HEADING) ...Because there is at least two lines of text following the subheading. This paragraph text would continue on the next page because you wouldn't have a subheading with only two sentences after it. This is an example of a quote text that is more than 40 characters long and has been entirely indented from the left using the margin adjuster tool on the Word ruler to move the entire paragraph in. Bulleted or number lists should have properly formatted hanging indents. This is a properly formatted bulleted list item generated using the bulleted list tool in Word. It ensures that all lines of text in the bullet align with each other. You can manually move the margin tool to create any size hanging indent you need. This is an example of a bullet that does not have the hanging indent properly formatted, so multiple lines of text align with the left margin and the bullet, not the previous line of text. 1, 1, 1, 1, 2, 1, 1, 3, 1, 1, 1, 4, 1, 1, 5, 1, 1, 6, 1, 6