

# **THESIS AND DISSERTATION MANUAL**

**The School of Graduate Studies  
and  
The Graduate Council**

**The University of Alabama in Huntsville  
2004**

Available Online at [www.gdeanoff.uah.edu/thman/welcome.html](http://www.gdeanoff.uah.edu/thman/welcome.html)  
(online manual is the most current version)

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Dear Student:

A thesis or dissertation is not only one of the most important elements of your degree program, it is also a document without parallel in scholarly work. Theses and dissertations are usually significantly more detailed than, say, a journal article, yet far more focussed than, say, a textbook. As products of the University, they must adhere to certain standards that reflect the policies and procedures of UAH, as well as those of external entities. They should be reasonably consistent in style and format, should be prepared with full consideration of the various legal and ethical issues in conducting and publishing research, and should adhere to the highest standards of language, grammar and general readability.

Preparation of such a document is clearly no simple task. And, for most individuals, the effort to write one is expended no more often than once or twice in a lifetime. Therefore, this *Manual* is being provided to assist you. I can assure you that a great deal of time, thought, and effort on the part of many individuals has gone into its preparation, and I urge you to read it thoroughly before embarking on your thesis- or dissertation-writing journey. A clear understanding from the outset of the guidelines and requirements set forth within this *Manual* could well save you considerable time and effort as the deadline for submission approaches. Furthermore, the lessons learned will, I trust, serve you well in future scholarly endeavors, both within academe and beyond.

While every attempt has been made to cover or anticipate most issues dealing with the preparation of your thesis or dissertation, there may well be areas where problems or questions arise. Also, colleges, departments, and even individual advisors may have more specific guidelines than those contained in this *Manual*. I therefore encourage you to consult with your advisor early and often in the writing process. However, the Dean of the School of Graduate Studies is the final authority as to the acceptability of a thesis or dissertation, and I will be happy to deal with any issues if and when they arise.

Best wishes,

A. Gordon Emslie  
Dean, School of Graduate Studies

## Acknowledgments

The School of Graduate Studies wishes to acknowledge the efforts of the Thesis and Dissertation Manual Committee and others who have contributed to this complete update and revision of the *UAH Thesis and Dissertation Manual*.

The Committee consisted of Dr. Julie English Early, Committee Chair, College of Liberal Arts; Dr. Gordon Emslie, Dean of the School of Graduate Studies (ex officio); Dr. Marsha Dowell, College of Nursing; Dr. Kenneth Howell, College of Science; Ms. Chantell Marsh, Thesis and Dissertation Reviewer; and Dr. Richard Wyskida, College of Engineering.

University Counsel Robert Rieder and the Council of Deans also reviewed the *Manual*.

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## *The Plan of the Manual*

This manual specifies the requirements for all theses and dissertations submitted to the University of Alabama in Huntsville School of Graduate Studies. It outlines legal and ethical issues and details professional standards for scholarly publication by defining features of style, documentation, and formatting required for a UAH thesis or dissertation.

“Style” refers to English grammar and usage, punctuation, and standard publishing conventions. “Documentation” refers to the system you use for in-text citation or notes and your references, works cited, or bibliography. “Formatting” refers to page layout, document design, and organization.

Before you begin to write, you must become familiar with both legal and formal requirements. As you work, you should consult this manual and the reference sources we recommend. However, please note: should practices in a reference source conflict with those specified in the *Manual*, UAH requirements take precedence. Previous UAH theses and dissertations may be useful as general guides. However, because standards and practices change, we caution you against using them as templates. Your manuscript must conform to the standards specified in this edition of the *Manual*.

Attending to standards in the *Manual* and recommended reference sources will save you the frustration of learning correct forms and practices when you are facing deadlines, and correcting and reprinting a part or all of your manuscript before the School of Graduate Studies will approve it. The School of Graduate Studies employs a thesis and dissertation reviewer to ensure that your document meets the standards specified here.

To guide you in producing an acceptable thesis or dissertation, we have organized the *Manual* as an instructional manual to address first, the issues that you must consider before you begin your project, and then the specifications that you will incorporate during the process of writing a thesis or dissertation.

- Part One defines the elements of professional writing—style, documentation, and formatting. Chapter One directs you to disciplinary reference sources and outlines the thesis or dissertation approval process. Chapter Two alerts you to legal and ethical issues that you must consider before you begin writing;
- Part Two addresses issues that arise according to the sequence of writing. It takes you, in Chapter Three, through organizing and formatting the document as a whole and, in Chapter Four, through specific features that arise as you write a chapter. Chapter Five instructs you in preparing supplementary and reference materials (back matter) and Chapter Six, prefatory materials (front matter) for the document;
- Part Three specifies the final steps in submitting approved copies of the document;
- Appendices provide examples and material for quick reference;
- An index directs you to subject information throughout the *Manual*.

Questions regarding the format and organization of a thesis or dissertation not addressed in the *Manual* may be directed to the School of Graduate Studies.



## **Part One**

### ***What You Should Know before You Begin***

## Chapter One

### *Formal Requirements for an Approved Thesis or Dissertation*

#### **Style**

**Language and writing reference works**

**Publishing conventions**

#### **Documentation**

**General guides**

**Authoritative documentation guidelines**

#### **Formatting**

#### **Overview: the Steps in the Process to an Approved Thesis or Dissertation**

**Advisor responsibilities**

**Student responsibilities**

**The Approval process**

This chapter defines the categories of formal standards—style, documentation, and formatting—applicable to a UAH thesis or dissertation, and outlines the steps in the approval process.

#### **Style**

As a scholarly publication, a thesis or dissertation must cohere in clarity, tone, and English usage with the standards of professional publication in your discipline, outlined in professional guidelines and represented, for example, by its principal journals or presses.

#### **Language and writing reference works**

You may refer to any standard grammar and punctuation handbook and use any standard dictionary.

For grammar and punctuation, we recommend Diana Hacker, *A Writer's Reference*, 5<sup>th</sup> ed. (Boston and NY: Bedford/St. Martin's, 2003).<sup>1</sup>

For achieving an effective professional prose style, we recommend Joseph M. Williams, *Style: Toward Clarity and Grace* (Chicago: U of Chicago P, 1990).

If you need to acquire a dictionary, we recommend *The American Heritage Dictionary*, *Webster's Third New International*, or *The Random House Dictionary*. The most recent non-abridged editions include scientific and technical terms, but should be supplemented by glossaries of specialized terms published by governing bodies in many disciplines. If glossaries have not been developed for your discipline, check spelling of terms against published books or journals in your field.

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<sup>1</sup> As a document about writing, the *Manual* uses the most relevant and appropriate documentation style, MLA, rather than a form used in the sciences. This includes MLA practice for abbreviations for example, on this page, “P” for Press.

### **Publishing conventions**

A thesis or dissertation must comply not only with standard American English usage and professional standards of your discipline, but also with standard publishing conventions. Such conventions include a host of copy-editing matters reflecting a level of correctness and consistency for publishable copy that scholarly writers early in their careers may not have previously encountered.

Among publishers, the most widely used standards are those of *The Chicago Manual of Style*, 14<sup>th</sup> ed. (Chicago: U of Chicago P, 1993). For a shorter version of *The Chicago Manual*, specifically tailored to common problems in theses and dissertations, see Kate L. Turabian, *A Manual for Writers of Term Papers, Theses and Dissertations*, 6<sup>th</sup> ed. Rev. by John Grossman and Alice Bennett (Chicago: U of Chicago P, 1987).

For UAH theses and dissertations, *The Chicago Manual's* guidelines for usage and publishing conventions represent authoritative practice unless there is a demonstrated alternative accepted in your discipline. In all instances, when there are alternative correct forms, you must be consistent in the practice you follow.

### **Documentation**

When citing quotations or ideas in the body of the text and when documenting sources in your references or works cited and/or bibliography, you must use a documentation style that is standard for your discipline or required by your department or program. You may neither combine styles nor invent one.

#### **General guides**

Please note that usage standards, publishing conventions, and documentation styles are not the same thing. In particular, *The Chicago Manual of Style* includes (as does its condensed version, "Turabian") both widely accepted publishing conventions discussed above, and a specific system of documentation (Chicago style). In this instance, the publication and usage conventions in *The Chicago Manual* will apply even though you are using a different documentation system and are following UAH's specific requirements for formatting. Both *The Chicago Manual* and the *MLA Handbook* are excellent guides to usage and publishing standards, even if you are using a different documentation style.

#### **Authoritative documentation guidelines**

You should use the most current edition of the complete reference manual for the documentation style you are using. The complete version will specify the form for less common entries (for example, interviews, private communications, films, videos, etc.) and the most recent edition will include issues such as how properly to cite and document material from the Internet.

Editions current as of this writing of the most common documentation styles by discipline are the following:

##### *Biological Sciences*

Council of Biology Editors. *Scientific Style and Format: The CBE Manual for Authors, Editors, and Publishers*. 6<sup>th</sup> ed. Cambridge: Cambridge UP, 1994.

*Chemistry/Materials Science/Chemical Engineering*  
*The ACS Style Guide: A Manual for Authors and Editors.* 2<sup>nd</sup> ed. Ed. by Janet S. Dodd.  
Washington: Amer. Chemical Soc., 1997.

*Civil & Environmental Engineering*  
American Society of Civil Engineers. *ASCE On-Line Authors' Guide.*

*Electrical and Computer Engineering/Industrial & Systems Engineering/Chemical Engineering/Mechanical Engineering*  
Institute of Electrical and Electronic Engineers. *Information for IEEE Transactions and Journal Authors.* NY: IEEE, 1989.

*English*  
Gibaldi, Joseph. *MLA Handbook for Writers of Research Papers.* 5<sup>th</sup> ed. NY: MLA, 1999.

*History*  
*The Chicago Manual of Style.* 14<sup>th</sup> ed. Chicago: U of Chicago P, 1993.

Turabian, Kate L. *A Manual for Writers of Term Papers, Theses, and Dissertations.* 6<sup>th</sup> ed. Rev. by John Grossman and Alice Bennett. Chicago: U of Chicago P, 1996.

*Mathematical Sciences*  
O'Sean, Arlene, and Antoinette Schleyer. *Mathematics into Type.* Rev. ed. Providence: Amer. Mathematical Soc., 1999.

*Physics/Optical Science and Engineering/Materials Science/Atmospheric Science/ Computer Science*  
American Institute of Physics. *AIP Style Manual.* 4<sup>th</sup> ed. NY: AIP, 1990.

*Political Science*  
Lane, Michael K. *Style Manual for Political Science.* Rev. ed. Washington: Amer. Political Science Assn., 2001.

*Psychology/Nursing*  
American Psychological Association. *Publications Manual of the American Psychological Association.* 5<sup>th</sup> ed. Washington: Amer. Psychological Assn., 2001.

Many professional associations have made their manuals and guidelines available on the Internet as well. You will also find standardized guides online for citing Internet sources if your disciplinary documentation manual does not include this material.

## Formatting

All UAH theses and dissertations must meet standards specified in the *Manual* for physical document design: paper quality, margins, typeface and font, spacing, page layout, pagination, front and back matter, tables, figures, equations, notes, and related issues.

These requirements stem from three practical concerns: first, to meet UAH standards for uniform scholarly presentation; second, to comply with requirements for binding; and third, to comply with requirements for microfilming by University Microfilms International (UMI) and for publishing your abstract in UMI's reference serial, *Dissertations Abstracts International (DAI)*.

All theses and dissertations must be written using word-processing software. You can comply with the formatting specifications in this manual by entering the appropriate settings for your files in any word-processing program. Consult the School of Graduate Studies for advice on procedures in popular software programs that may be troublesome and templates available in common word and/or text processing languages such as Microsoft Word™ and LaTeX.<sup>2</sup>

### Overview: the Steps in the Process to an Approved Thesis or Dissertation

This section specifies the responsibilities of the advisor and the student, describes the approval process, and provides an overview of the parts of the completed document. For a more thorough discussion of the role of the doctoral dissertation, see the Council of Graduate Schools' "Policy Statement on the Role and Nature of the Doctoral Dissertation" (reprinted in Appendix D).

### Advisor responsibilities to a student developing a project and producing a manuscript

The student's advisor is the first-line representative responsible for conveying university policies regarding the student's progress toward a graduate degree at UAH.

The advisor

- provides an intellectually stimulating environment while the student is choosing a research topic, stressing the character of thesis or dissertation research as requiring great depth and limited breadth; the advisor continues this support as the student performs and documents research;
- discusses with the student the legal and ethical issues of scholarly research and publication outlined in Chapter Two: the consequences of plagiarism; the requirements of permissions for specific kinds of research; and the governance by law and policy of issues of intellectual property, whether previously published material, the rights of the University, outside funding agencies, faculty, or student collaborators;
- represents the student's progress to the supervisory committee during the entire research effort. The advisor ensures that the student's research conforms to UAH School of Graduate Studies standards;

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<sup>2</sup> LaTeX template originally formulated by the late Bob Mallozzi, Ph.D. Physics 1996, and dedicated to his memory.

- prepares the student for the thesis or dissertation defense; and before signing the first stage of the approval process, requires that the student’s manuscript conforms to the requirements of the *Manual*.

### **Student responsibilities for presenting research in a thesis or dissertation**

The student

- organizes and presents content accurately, and in accord with legal and ethical issues required for scholarship;
- composes the narrative in clear and correct English to conform with publishable standards of English usage and style;
- documents accurately all scholarly material used;
- formats the text to UAH requirements;
- proofs the manuscript before submitting it for approval;
- submits revised or corrected copy as required for approval;
- submits final copies that meet all requirements and pays attendant fees.

### **The Approval process**

Your completed thesis or dissertation must be approved at several levels in the university before it is accepted as “partial fulfillment of the requirements for the degree of. . . .”

You must prepare an approval page and abstract with an approval section appended (see Chapter Six for discussion and Appendix C for samples) to accompany your manuscript at each stage of approval. Your committee chair, advisor (if different), committee members, the associate dean of your college or the chair of your department or program, the dean of your college, and the dean of the School of Graduate Studies approve your thesis or dissertation.

You should begin the process early in the semester in which you plan to graduate. In the previous semester you should obtain a schedule of deadlines from the School of Graduate Studies. Note that each level of approval takes time, and that you may be asked to revise and submit corrected, reprinted copy at any stage in the process. The thorough review of style, documentation, and formatting by the thesis and dissertation reviewer in the School of Graduate Studies often means corrections and selected reprinting before the Dean of Graduate Studies approves your manuscript. For this reason, you may not wish to print the copy you submit for the approval process on the paper stock required for final copies.

Your committee chair and committee members, having made suggestions or discussed issues with you during draft stages or during your oral defense, are the first to approve your completed manuscript. This approval signifies that your work represents an original, accurate, and worthwhile contribution to scholarship; that it is well written; that it incorporates specified revisions; and that it conforms to UAH guidelines for theses and dissertations.

The associate dean of your college or the chair of your department or program, and next, the dean of your college will read your manuscript. Their approvals certify that your work meets the standards respectively of the department and the college.

You next submit your manuscript to the School of Graduate Studies. At this stage, before the graduate dean approves your manuscript, the thesis and dissertation reviewer for the School of Graduate Studies examines each page for compliance with the standards for style, documentation, and formatting specified in the *Manual*.

The reviewer will inform you if you must make revisions and reprint pages. However, if necessary corrections are so extensive that they represent non-compliance with standards specified in the *Manual*, the dean will notify your committee chair and return your thesis or dissertation for a more thorough review by you, your committee chair, and your committee. The Dean of Graduate Studies will not approve a thesis or dissertation until you have submitted a professional manuscript and the reviewer has received and approved revised, reprinted pages.

The graduate dean's approval signifies that your work meets intellectual standards of the UAH faculty, and that it meets formal standards for a UAH thesis or dissertation—the requirements specified in this manual.

When you have acquired all approvals, you will then reproduce the required number of copies of your manuscript on required paper stock and will submit them to the School of Graduate Studies along with payments and necessary forms (detailed in Chapter Seven). The School of Graduate Studies checks that you have the required number of complete copies; that all meet paper quality and binding requirements; and that you have completed all necessary forms and paid all related fees.

The Copyright Act of 1976 specifically provides, however, as follows:

In no case does copyright protection for an original work of authorship extend to any idea, procedure, process, system, method of operation, concept, principle, or discovery, regardless of the form in which it is described, explained, illustrated, or embodies in such work.

17 U.S.C. § 102(b). This section of the copyright law describes what is known as the idea/expression dichotomy. Under this rule, the particular way in which an author expresses an idea is protected by copyright law, which prohibits others from copying, distributing, etc. that particular expression without the permission of the author. The copyright law does not, however, give the author any rights in the underlying idea. Likewise, copyright law does not confer any rights in particular facts, simply because a "fact" cannot be the original work of an author. Only the particular expression of those facts is protected.

If your thesis or dissertation describes an idea conceived by the faculty advisor or simply data generated by an experiment, copyright law does not mean you are the owner of the intellectual property rights in that idea nor does it place any limitations on the use by others of the data. The only effect of copyright law is that the faculty member, just like any other non-author, cannot copy, distribute, etc., the thesis or dissertation, or significant portions of it, without your consent.

As a rule, if you are reprinting an item complete in itself (a table, graph, photograph, map, complete poem, full text of an article, music or lyrics, computer program, survey instrument, questionnaire, unpublished manuscript, etc.) you are likely to need permission to reproduce it from the copyright holder, whether an individual, an estate, or an archive or library. Any portion of an unpublished manuscript (a letter, for example) may require permission. In addition, much material on the Internet is under copyright. Many copyright holders will charge a fee for permission to reprint, and will specify the form for your in-text permission statement.

You should sign and include the following copyright statement in your thesis or dissertation. The copyright statement is required and is page ii of the front matter. Refer to Appendix C for samples.

**Copyright Paragraph - to be signed by the student and submitted as part of the thesis/dissertation**

In presenting this thesis (dissertation) in partial fulfillment of the requirements for a master's (doctoral) degree from The University of Alabama in Huntsville, I agree that the Library of this University shall make it freely available for inspection. I further agree that permission for extensive copying for scholarly purposes may be granted by my advisor or, in his/her absence, by the Chair of the Department (Director of the Program) or the Dean of the School of Graduate Studies. It is also understood that due recognition shall be given to me and to The University of Alabama in Huntsville in any scholarly use which may be made of any material in this thesis (dissertation).

\_\_\_\_\_  
(student signature)

\_\_\_\_\_  
(date)

## **Patents**

The research that supports your thesis or dissertation may include inventions or discoveries that may be patented.

The patent statute provides that an invention or discovery involving “any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvements thereof” may be patented. The intent of this broad definition is to include a device or material that an individual might be able to produce and the processes used to produce it.

Under University of Alabama Board of Trustees policy (supplemented by UAH policies), the institution owns all inventions conceived or developed by a researcher in the course of his/her employment at the university. In accordance with Board guidelines, the university determines whether ownership of an invention is assigned to the university. If it is, the university determines whether it wishes to pursue patenting. The university and the inventor in accord with the Board’s formula share any income from licensing or sale of an invention patented by the university. The university (or other funding agency) may decide whether it wishes to retain ownership. Thus, even if the institution has first rights, it may choose to release the invention to the inventor to patent it or not as the individual desires. Similar rights to ownership may apply when an outside agency funds work. (See Appendix E for more details regarding patents.)

You must consult the UAH patent administrator as soon as you believe you may have an invention, material, or process suitable for patent. Patent law requires strict record keeping, and is especially stringent about timelines dating discovery or invention of an item or process suitable for patent, disclosing information about it, and applying for patent protection.

## **Protection of Human and Other Animal Subjects**

Research involving either human subjects or other animal subjects must comply with legal requirements and institutional policies. Authorized university bodies must approve your research plan and testing or survey instruments.

### **Human subjects**

If your research requires any testing or surveying of human subjects, you must demonstrate that your research design complies with the guidelines of the UAH Use of Human Subjects Committee (UHSC) and obtain permission from the committee before beginning work.

You must begin by consulting the UHSC chair to confirm and document the level of review your research will require. The UHSC will determine, depending upon the nature of your research, whether your proposal requires a full review, an expedited review, or is exempt from review. A review is based on your research protocol included in a draft informed-consent document with supporting forms, such as survey instruments. The UHSC review evaluates your proposal against federal guidelines for protecting the rights and welfare of a subject group, including issues of equitable selection, risk, safety, privacy, and informed consent.

You may obtain from the UAH Office of Counsel a document describing more fully the issues in using human subjects, essential elements for proposals and research designs, federal guidelines, and the criteria of the UHSC.

You must include, as appendices in your manuscript, a copy of survey or testing instruments as well as the UHSC form granting permission to conduct your research.

**Other Animal subjects**

If your experimental research involves using any animals, you must submit your research plan (or grant proposal) for review and approval to the UAH Institutional Animal Care and Use Committee (IACUC) before you use any animal subjects.

You should begin by consulting the Chair of the IACUC and obtaining an application form. In developing the research plan, you should work closely with your advisor (who may be listed as principal investigator). The IACUC can also provide you with government publications outlining your responsibilities in using animals.

You must conduct research in accord with your approved proposal. If you change methods or procedures during the course of the project, you must submit a revised proposal. Throughout the project you are responsible for the care and well being of the animals in your study.

You must include a copy of the IACUC form granting permission in your manuscript as an appendix.

**Classified Material**

All thesis and dissertation material must be accessible to the general public. Hence, the student is responsible for ensuring that no classified material appears in a thesis or dissertation. For special cases concerning proprietary information consult the School of Graduate Studies.

## **Part Two**

### ***Writing the Thesis or Dissertation***

## Chapter Three

### *Organizing and Formatting the Document as a Whole*

#### **Organizing Information**

**Introduction and conclusion(s)**

**Supporting and reference material**

#### **Formatting Your Text as a Whole**

**Print**

**Margins**

**Spacing**

**Pagination**

**Paper**

**Summary**

#### **Overview: the Parts of the Document**

This chapter discusses the overall plan of a thesis or dissertation, the parts of the document, and the requirements for margins, spacing, paper quality, etc., required for the submitted document.

#### **Organizing Information**

The text of your thesis or dissertation must be divided into chapters that logically and effectively order argument, concepts, information, and evidence. The appropriate structure and divisions may vary considerably among disciplines. Working with your committee, you should devise an organizational plan that best suits your material and reflects disciplinary conventions.

While organization is flexible, all theses and dissertations, no matter the discipline, share certain scholarly elements. You must provide an introductory statement or overview of your project; identify the significance of your investigation; discuss relevant literature to position your work; describe your methodology; state findings or results and their implications; and present conclusions and, if appropriate, recommendations for future work. Your chapters might be organized by kinds of information (for example, a literature review, methodology, and results), or you may organize conceptually with these elements logically interwoven.

#### **Introduction and conclusion(s)**

Regardless of how you organize the central chapters, certain principles govern what you should include or omit in the introduction and the conclusion (if you have a separate chapter as the conclusion).

An introduction situates a reader to your investigation and supplies a context for your research. In some fields, a conclusion summarizes or generalizes the particularities of the research that you presented in the central chapters. However, in most technical fields, a conclusion is expected to place the results in the context of a broader framework and provide recommendations and guidance for future researchers. You should avoid using non-textual material such as tables, figures, and photographs in the introduction and concluding chapter.

### **Supporting and reference material**

Your text chapters should maintain clear focus by including only information relevant to your argument. Information that is not crucial but only enhances or minimally qualifies your argument/evidence or problem/solution belongs in an information or content note (as a footnote on the page or as an endnote at the end of the chapter). If the material is more extensive, it belongs in an appendix. However, if the information is simply “interesting,” it may not belong in your text, notes, or appendices at all.

Information or content notes should be kept to a minimum. Some disciplines do not use them. You should judge whether the reader needs this information or whether you have simply included it because you have it.

Like information notes, an appendix contains supplementary materials, but on a larger scale. An information note may include a further reference, a qualification, or a comment, but an appendix contains relevant reference material too detailed or peripheral to your argument and evidence to include in the text. An appendix may contain material such as technical notes, extensive mathematical developments, computer code, forms used for collecting data, permission forms, copies of supporting documents, highly detailed tables, etc.

Appendices, along with the references or works cited and/or bibliography, constitute back matter (see Chapter Five).

### **Formatting Your Text as a Whole**

Your thesis or dissertation must be word-processed. We strongly advise that you learn the capabilities of your word-processing program so that you can most effectively meet the formatting requirements specified in the *Manual*.

#### **Print**

The text of the entire document must use the same standard serif font (for example, CG Times, Times New Roman, or Courier) in ten- through twelve-point type consistently throughout all of its chapters, its footnotes and endnotes, and front and back matter. There are only two exceptions: you may include a photocopy of an original document in another font and/or size in an appendix; you may use, if you need to meet margin requirements, a slightly smaller font size only within tables and figures. In either case, the type must not be smaller than nine point because it will not microfilm clearly.

#### **Margins**

Note that margin requirements apply not only to pages of text and to pages of front and back matter, but also to pages with figures, tables, and illustrations.

Left: 1½ inches (all pages, no exceptions);  
Right: 1 inch (all pages, no exceptions);  
Top: 1 inch

(exceptions: the first page of a major division such as a chapter, an appendix, references, bibliography, etc., will have a two-inch top margin. These special requirements are specified in chapters on formatting a chapter, back matter, and front matter, and are indicated on sample pages);

Bottom: 1 inch

(exceptions: you may have a slightly larger bottom margin if you need to move a line of text or a heading or subheading to the next page to avoid a widow or orphan condition. Similarly, you may add one line of type only to complete a footnote on the page. Chapter Four details both widow and orphan conditions and footnotes.)

Within these margins, you may use a ragged or justified right edge; however, we recommend the ragged right edge for practical reasons. Justified right edges may adjust text so that punctuation and spacing, particularly in reference or bibliographic entries, will appear incorrect when printed.

### **Spacing**

Double-space all text in your chapters, acknowledgments, and abstract. Single-space within entries that appear as supplementary units, such as footnotes or endnotes, table or figure captions, or units such as material in front or back matter (entries in the table of contents, references, and/or bibliography), but double-space between units. See Chapter Four for discussion of block quotations, footnotes, and captions. See Chapters Five and Six for discussion of single-spaced units in front or back matter.

### **Pagination**

The pages of a thesis or dissertation are numbered in accord with standard publishing conventions.

Paginate front matter with small Roman numerals at the bottom center of the page. Not all pages in the front matter are counted (for example, a dedication page); some pages that are counted do not bear a number on the page (for example, the title page). See Chapter Six for the rules for each element.

Paginate the body of the text and its back matter with consecutive Arabic numerals. Insertions (for example, page 12a) are not acceptable. If you add a page you must repaginate the document.

Place page numbers at the bottom center only when the page bears a title (for example, the first page of the chapter or the first page of an appendix, reference or works cited list and/or, bibliography). Place subsequent page numbers in such divisions in the upper right corner. Do not use any punctuation with page numbers. Do not insert additional information as a header or footer.

### **Paper**

Final copies must be made from a printed laser-quality original. All copies must be printed on one side only of white eight and one-half by eleven inch twenty-pound 100 percent rag- or cotton-fiber paper.

Paper of this standard will be watermarked. All copies should be printed on the page with the watermark rightside and topside up.

## **Summary**

While there are specific exceptions (discussed in Chapters Five and Six on back matter and front matter), the document as a whole must

- ?? have 1½-inch margins at the left edge;
- ?? have 1-inch margins at top, bottom, and right edges;
- ?? be double-spaced;
- ?? use a standard serif font in 10- through 12-point type;
- ?? avoid bold, italics, underlining, and capitalization except when specified;
- ?? be paginated with small Roman numerals for front matter placed at bottom center;
- ?? be paginated with Arabic numerals for the body of the text and subsequent back matter with numbers at bottom center of the first page of a section, and the upper right corner for subsequent pages;
- ?? must be reproduced on bond paper of required weight, size, and quality.

## **Overview: the Parts of the Document**

### **Front matter:**

The pages preceding your text include optional and required items discussed in Chapter Six.

The full list, in the order in which they would appear in your text, is title page, copyright page, approval page, abstract (with approval section), acknowledgments, table of contents, list of figures, list of tables, list of abbreviations and/or acronyms, list of symbols, glossary, dedication, epigraph[s].

Paginate front matter with lower-case Roman numerals placed at the bottom center of the page. For exceptions to counting or showing numbers on pages in the front matter, see Chapter Six.

### **Text:**

Your chapters, including the introduction and conclusion, constitute the body of the text.

You begin the Arabic numbering of the pages of your text with the first page of your introduction and continue through the last page of the back matter.

### **Back matter:**

The pages of supplementary and reference material following your text constitute its back matter. See Chapter Five for a discussion of the optional and required items.

The full list, in the order in which they would appear in your text, is appendices heading sheet (if you have more than one appendix), appendix (one or more), references or works cited, and bibliography. Theses and dissertations do not include an index.

The back matter continues the Arabic numbering of the body of the text.

## Chapter Four

### *Style and Format within a Chapter*

#### **Formatting the First and Subsequent Pages**

#### **Headings and Subheadings**

#### **Paragraphs**

#### **Prose Conventions**

##### **Typography**

##### **Punctuation and mechanics**

##### **Spelling and grammar checkers**

##### **Acronyms and numbers**

#### **Quotations**

##### **Block quotations**

##### **In-text quotations**

#### **Citation**

##### **Numeric systems**

##### **Author systems**

##### **Footnote or endnote systems**

##### **Common problems with in-text citations**

#### **Mathematics**

##### **Displaying and numbering equations**

##### **Constructing a list of symbols**

#### **Tables, Figures, and Photographs**

##### **Placing tables and figures**

##### **The Caption line**

##### **Referring to tables and figures in the text**

This chapter discusses elements of prose style (including publishing conventions), documentation, and formatting as they arise in a chapter. It specifies conventions for quotation, in-text citation, mathematical expressions, and tables and figures.

#### **Formatting the First and Subsequent Pages**

The first page of the chapter has a two-inch top margin rather than the one-inch margin specified for regular text pages.

- ?? Center the chapter heading, for example, CHAPTER ONE or CHAPTER I (all in caps) two inches from the top edge. Use the same font as your text in the same size or no more than three points larger than your text;
- ?? Center the chapter title two double-spaced lines below it. If the title runs more than one line, center and double-space the balance of it to a second line;
- ?? Begin your text two double-spaced lines below the title;
- ?? Number the first page of the chapter at the bottom center;
- ?? Number subsequent pages in the upper right corner;

?? Number the first page of the first chapter as page 1. Your consecutive Arabic numbering will continue through the text and back matter.

### **Headings and Subheadings**

A hierarchy of headings and subheadings may divide chapters.

- ?? An alphanumeric system (outline form: A.1, A.2, A.2.a) uses indention to reinforce descending groupings;
- ?? A decimal system (1, 1.1, 1.2, 1.2.1) is arranged flush left;
- ?? A heading system uses the placement and typography (font size, type, emphasis) of headline text (as the *Manual* does) to show hierarchy and subordination.

Subdivisions should make your organizational scheme readily apparent; however, a too-exhaustive system is confusing rather than helpful. Do not break chapters up into too many small parts (three levels of subdivision are generally adequate). The number of levels you use in different chapters may vary, but the large scheme must be absolutely systematic and consistent throughout the thesis or dissertation.

If you subdivide chapters using any of these systems, you must be exact and consistent about indenting, numbering, placement and typography within the chapter, and you must use only one system for all chapters.

In all systems, you must always have text before a subheading; that is, you must not begin a subheading directly beneath a heading. You also may not go to a subordinate level of heading unless you have two subheadings at that level.

You must be sure that no heading appears alone at the bottom of the page with its text beginning on the next page. This type of “orphan” condition, described below in formatting paragraphs, is one that word-processing programs may not detect.

Consult Turabian for the conventions of heading systems and refer to sample pages with headings in Appendix C.

### **Paragraphs**

Paragraph layout must follow a consistent pattern throughout the text:

- ?? Indent paragraphs one-half inch rather than setting them in a flush left block;
- ?? Use two spaces rather than one between sentences;
- ?? Do not leave the first line of a paragraph alone as the last line on the page (termed an “orphan”);
- ?? Do not leave a single word or line ending a paragraph alone at the top of a page (a “widow”).

Moving the last line of text from one page to the next will correct either an orphan or widow condition, leaving a slightly larger bottom margin on the first page. The orphan rule applies as well to headings and subheadings.

## Prose Conventions

You must maintain consistency in matters of style, usage, and conventions in your own prose.

### Typography

Exercise restraint using bold, italic, underlining, double quotation marks, or capitalization to add emphasis to your own prose. Avoid single quotation marks to suggest tone; for example, that a word is meant ironically. Reserve single quotation marks for specific disciplinary conventions (names of cultivars in plant science, philosophic terms, etc.). Consult a style manual for acceptable uses of typography in your field.

### Punctuation and mechanics

Observe correct and consistent spacing for punctuation.

Use two spaces following a period. Use one space following a colon or semi-colon. Do not space before a comma, colon, semi-colon, or period. Use one space before an open parenthesis or bracket, but no space within.

?? Incorrect:

Do not space colons, parentheses, and semi-colons (or periods) like this :( 17 ) ;

?? Correct:

Do space these elements (including periods) like this: (17).

Avoid hyphens in two instances:

?? Do not hyphenate the last word on the last line of a page;

?? Do not hyphenate the last words of two consecutive lines of text.

If your word-processing program hyphenates automatically, it may not do it accurately. Check a dictionary or style manual for correct syllabication.

Be aware that there are specific rules for most of the mechanics of writing. For example, rules govern the formation of compound words, capitalization, abbreviations, punctuation with abbreviations, ellipses, brackets, foreign words and phrases, and a host of other matters. Consult a grammar or style manual for the correct form. See Appendix A for a list of common grammatical and mechanical errors in theses and dissertations.

### Spelling and grammar checkers

If you use spelling and grammar checkers in your word-processing program, be aware that they are unreliable for some types of errors.

Spelling checkers cannot detect misused words. For example, if you spell “latter” as “later” throughout your text, a spelling checker will not catch it. Similarly, grammar checkers sometimes mistake the subject of a complex sentence and either miss agreement problems or mark correct agreement as an error. If you rely only on spelling and grammar checkers without careful proofing, your manuscript may contain extensive (and egregious) language errors.

### **Acronyms and numbers**

Any organization, process, etc., that may be referred to by its acronym must first appear in fully written form.

The acronym should appear in parentheses following the written form. In subsequent references use the acronym only. Regardless of the previous pattern of reference, a sentence must never begin with an acronym. Either write out the full form, or revise the sentence so that the name does not begin it. The same is true for numbers and dates: either write out the number or revise the sentence.

In non-scientific writing, numbers one through ninety-nine are customarily written out; those over 100 appear in numerals. Scientific writing generally uses all numerals. However, just as with acronyms, no sentence can begin with numerals.

## **Quotations**

### **Block quotations**

If a quotation extends to four lines or more of type in your double-spaced text, it should then instead be offset as a block quotation, indented by twice the amount of your paragraph indent (both right and left margins), and single-spaced. Double-space above and below the quote.

Note that you do not use quotation marks for a block quotation, and you punctuate the end of the quote and citation differently from an in-text quote. Unlike the examples below that show the punctuation after the parenthetical or bracketed citation, a block quote ends with a period followed by a space and then a parenthetical or bracketed reference without any final punctuation.

### **In-text quotations**

Incorporate quotations of less than four lines in your text. Indicate them by double quotation marks, and follow them with an in-text citation or a superscript number keyed to a footnote or endnote.

The rules for punctuating end quotations and subsequent citations are precise, but vary by specific circumstance.

?? If an in-text citation does not immediately follow, place commas and periods within the end quotation mark. Place colons and semi-colons that are part of your sentence structure (rather than the quote's) outside the end quotation mark. Question marks and exclamation points go within if they are a part of the quote, or outside if they refer to your sentence that includes the quoted material;

?? If an in-text citation immediately follows the quote, the end punctuation appears after the citation. With a footnoted quote, the punctuation appears before the end quote and the superscript footnote number;

?? Note the punctuation differences in the following examples:

“The controversy over the newer methodologies is one of epistemology.”

“The controversy over the newer methodologies is one of epistemology.”<sup>2</sup>

“The controversy over the newer methodologies is one of epistemology” [3].

“The controversy over the newer methodologies is one of epistemology” (Tichi 227).

Consult a handbook for more detailed discussion of punctuation for quoted material, including editing quotes, using brackets and ellipses, using *sic*, and using quotations as epigraphs.

## Citation

Citation serves two purposes: it properly credits intellectual property and language, and it shows the reader how to find the material you are citing.

You identify the source of quotations and information in your text—including tables, figures, and photographs—with in-text citations keyed to your reference list or works cited list, or you use footnotes or endnotes with full bibliographic data in the note. The form for in-text citations is determined by the documentation style that you have chosen. Whatever system you use, you must comply with its specifications exactly and consistently.

There are three basic citation systems: numeric, author, and footnote or endnote systems. While there are variations among documentation styles for these types, all of them require the basic punctuation pattern illustrated in examples in the preceding section on quotations.

### Numeric systems

A numeric system uses Arabic numerals (the same size as your text) enclosed by brackets or parentheses. Do not use superscript numbers for in-text numeric citations. There are two types of numeric systems. They differ according to how your documentation style specifies the order of entries on your reference list.

The first type of system keys the in-text number to an alphabetized and numbered reference list. On the reference list entries are numbered consecutively 1, 2, 3, 4, 5, alphabetized by author in accordance with the form for bibliographic main entry in the documentation style you are using. In the chapter, the sequence of in-text citations might, for example, be 14, 2, 27, 1, 7 (see Appendix C for samples).

?? The procedure discovered in 1971[3] details the steps involved. . . .

?? The procedure discovered by Smith [3] in 1971 details the steps involved. . . .

The second type of system keys the number to a reference list, ordered and numbered according to the sequence of the first appearance of a citation in the text. The reference list is not alphabetized. In a numeric/sequence system, in-text numbers begin with 1 and proceed with consecutive numbers for each new source referenced. Entries appear on your reference list only once, in order of your first citation to them in the text. Your sequence of initial citations in the chapter would be 1, 2, 3, 4, 5. However, more commonly, you will refer again to a source after the first citation, so that your sequence in the text may look like this: 1, 1, 2, 1, 2, 3, 4, 2, 5. Your reference list will be ordered 1, 2, 3, 4, 5 (see Appendix C for samples).

### Author systems

Rather than using numbers keyed to a numbered reference list, an author system uses the name (or main entry) keyed to an unnumbered, alphabetized reference or works cited list.

Documentation styles for author reference systems vary in the information required: some specify author/date or author/date/pages; some specify author/pages. Please note the points on which systems differ: the information required, the order of information, punctuation within

the citation, rules for multiple authors, whether p. before page numbers is included or omitted, or whether citations are enclosed in parentheses or brackets. Placement of the citation may vary as well. Some styles prefer citations only at the end of a sentence or clause, some at the immediate point of reference.

?? The formula was discovered by Smith (1971).

?? The formula was discovered in the early 1970s [Smith, 1971].

### **Footnote or endnote systems**

A note system uses superscript numbers keyed to footnotes at the bottom of the page or endnotes at the end of the chapter or the document as a whole.

A note system includes all bibliographic data in the note rather than referring the reader to a reference list. The document as a whole, however, must include a bibliography in the back matter. The specifications for a note system are extensive. If you are using this type of documentation, refer to *The Chicago Manual* or Turabian.

Notes may include discussion as well as bibliographic reference. You may use footnotes or endnotes as information or as content notes, even if you are using a numeric or author system of in-text citation. If you use notes as content notes in addition to an in-text system, and you need a citation for information in the note, you use within the note the same form of in-text citation rather than providing full bibliographic data. Keep footnotes and endnotes as brief as possible.

Single-space within all footnotes and endnotes; double-space between them. Footnotes and endnotes must use the same font in the same size as your text.

### **Common problems with in-text citations**

Frequent errors in theses and dissertations include citations to the wrong reference source and inconsistent in-text formatting.

?? If, as you are working, you add entries to a numbered reference list, you must renumber the in-text citations;

?? If you are using a number system, and have used author name as a 'place-holder' while you work, you must substitute numbers for all in-text citations once the reference list is complete;

?? If you are using an author system, you must use the name for the in-text citation that matches the main entry on the references, works cited, or bibliography;

?? You must use exactly the same form, including punctuation, for all citations.

## **Mathematics**

“Math is prose.” In many academic fields, mathematical expressions (equations, formulae, etc.) are part of the language and should be incorporated into the text as such.

A simple mathematical expression such as  $\sin(2x)$  may be included in the text, that is, in line. However, no sentence may begin with an in-line expression. More complicated

expressions should be displayed, that is, presented on a line separate from the main text body. Whether displayed or in line, equations are part of the text and must be punctuated accordingly, as illustrated by the following sample text:

Let  $m$  be a positive integer, and assume  $f$  is any twice-differentiable function on the interval  $(0, \infty)$  such that, for some pair of positive values  $M$  and  $\epsilon$ ,

$$x^2 \frac{d^2 f}{dx^2} + x \frac{df}{dx} + m^2 f > 0, \quad (3.1)$$

$$f(0) > 1, \quad (3.2)$$

and

$$|f(x)| < M e^{\epsilon x}. \quad (3.3)$$

The theorem of Merkle then . . .

Use the same font size for the mathematics as you use for your text. And be consistent in your use of fonts and symbols for mathematics. Do not, for example, refer to an entity as “ $f$ ” in one line and as “ $f$ ” in another.

If you use a general purpose word-processing program, then use an equation editor for all mathematical expressions and entities, both in line and displayed. However, be aware that commonly available equation editors often do a poor job of typesetting mathematics. For example, the equation editor used to set Equation (3.1) did not automatically place the correct spacing about the “+” and “=” symbols: that spacing had to be inserted manually within the equation editor. If your work requires a substantial amount of mathematics, you should consider using a technical word-processing or typesetting software such as EXP, TeX, or LaTeX.

### Displaying and numbering equations

Either center all displayed mathematical expressions between the margins or indent them one inch from the left margin. Be consistent in the layout you choose. Add vertical spacing from one half- to two-line spaces greater than your text-line spacing both before and after the expression to offset it. Be consistent in the amount you choose.

You may either number all of your displayed expressions or number only those necessary for later reference. To number equations, use Arabic numerals in the form (a.b): “a” indicates the chapter number and “b” indicates the sequential number of the expression within the chapter. Label displayed mathematical expressions with the number in parentheses on the line of the expression, aligning the close parenthesis with the right margin. See Equation (3.1) above.

There are several acceptable conventions for referencing mathematical expressions by their number, as illustrated by the following examples:

?? Using Equation (3.1), Initial Condition (3.2), and Inequality (3.3) . . .

?? Using equation (3.1), initial condition (3.2), and inequality (3.3) . . .

?? Using (3.1), (3.2), and (3.3) . . .

Choose one and be consistent.

### **Constructing a list of symbols**

If a thesis or dissertation involves a significant amount of mathematics, we recommend that you construct a list of symbols as you work. The list will then appear in the front matter.

At a minimum, the list should alphabetize the symbols used. Greek and other fonts may either be inserted at logical places (e.g.,  $\alpha$  after a,  $\beta$  after b, etc.) or may comprise a separate alphabetized list. Constructing such a list of symbols can alert you to duplicate notation problems at an early stage before most of the equations are written, thus avoiding considerable rewriting. A list of symbols also helps the reader to identify the meaning of symbols readily. You may also choose to include page numbers or expression numbers indicating where the symbol first appears.

### **Tables, Figures, and Photographs**

Only tables and figures that you discuss or directly refer to in the text may be included in your chapters. Tables or figures that you do not discuss may appear in an appendix if they constitute supporting material.

A table is information (most often numbers) arranged in columns to show relationships efficiently and to present data economically. Consult a style manual specific to your discipline, or *The Chicago Manual* or Turabian for valuable advice on constructing tables.

A figure is a graphic illustration or representation such as a chart, graph, diagram, map, photograph, or plate. If you are creating your own illustrations, you may want to consult Frances W. Zweifel's *A Handbook of Biological Illustration*, 2<sup>nd</sup> ed. (Chicago: U of Chicago P, 1988), which provides excellent advice not limited to the discipline of biology.

All tables and figures, including photographs must

- ?? fit within margins specified for the document as a whole, and must be printed on the same bond paper as the rest of the document;
- ?? have page numbers placed as specified for the document as a whole regardless of whether the item is placed horizontally or vertically on the page;
- ?? be numbered, captioned, and cited (if you are reprinting an item) in the same system as your in-text citations, and in the same font and size as your text. If you are using copyrighted material, you must also indicate that you are reprinting by permission;
- ?? be in perfect focus;
- ?? in the case of photographs, be scanned into the document;
- ?? be keyed to a list of tables and/or a list of figures that will appear in the front matter.

### **Placing tables and figures**

A table or figure should appear close to your first reference to it in the text. Smaller tables and figures may appear on a page with text; larger ones may require an entire page, or may be divided to extend over two regular, numbered, single-sided pages. They may not be placed on facing pages, or on fold-out pages.

- Tables or figures placed on a text page must
- ?? be no larger than a half page;
  - ?? fit within standard margins;
  - ?? have required spacing above and below the table or figure;
  - ?? have number, caption, citation, and if needed, permission lines.

Separate a table or figure (including caption) from the text above and/or below it by two double spaces. Separate the caption from the bottom of the figure or from the top of a table by one double space. You may reduce a table or figure, but only to the degree that all essential characters are equivalent to nine point or larger type. The caption line, however, may not be reduced. If tables or figures are small, you may put more than one on a page with text. Either use software to embed the table or figure in your document, or reduce the table or figure, then copy it onto the page on which text, table or figure caption, and page number have previously been printed.

- Tables or figures placed on a non-text page must
- ?? follow the text page on which you first referred to them (or it);
  - ?? fit within standard margins;
  - ?? meet requirements for spacing, margins, and type size for text pages.

You may divide oversized tables or figures over consecutive pages. The caption line appears only on the first page. However, if you are continuing a table or figure onto a second page, include only necessary labeling information; for example, Table 2.3 (continued). Place the heading—left or center—consistent with the placement used for the caption line throughout the thesis or dissertation. On subsequent pages of a multi-paged table or figure you must repeat any information essential to reading a table or figure (for example, headings over the columns of a table).

### **The Caption line**

#### *Placement*

- ?? Caption lines for tables always appear above the tables.
- ?? Caption lines for figures always appear below the figures.
- ?? Separate captions from tables or figures by a double space, either above a table or below a figure. If the caption exceeds one line, single-space between lines within the unit.

Caption lines may be centered or placed flush left. Whichever layout you choose, you must be consistent throughout the document. If you place a table or figure lengthwise on the page, the top of the table or figure should be at the left side (the binding side), and the caption line above the top of a table or below the bottom of a figure.

### *Content*

The caption line contains at least two, but if needed, three or four pieces of information.

First, you must number each table or figure in a consecutive sequence with other tables or figures in a chapter. Label tables and figures by decimal notation with the chapter number first and the consecutive numbers within the chapter after the decimal: Table 3.1, Table 3.2, Figure 2.3, Figure 3.1, etc. Tables or figures in an appendix use letters rather than numbers: Table A.1, Table B.2, Figure B.1, etc. When you number the table or figure on the caption line, do not separate the number from the title with any punctuation. Instead, allow adequate and consistent space between table/figure number and caption. See samples in Appendix C.

Second, you must caption all tables and figures. The caption should clearly and concisely define the substance of the table or figure. The caption becomes the entry on the list of tables or the list of figures in the front matter. The title on the list of figures or list of tables must exactly match the caption on the page. Throughout the text, you must follow a consistent practice either of capitalizing or using lower-case for initial letters of words in the caption. Like the tables and figures in a chapter, all tables or figures that appear in an appendix or appendices must appear on the list of tables or list of figures prefacing the document.

Third, if you have taken a table or figure or the data for it from another source, you must cite the source just as you cite information or quotation in your text and use exactly the same citation form as you have used in the text. If you are using a numeric citation scheme, you already will have numbered a reference when you first mentioned the table or figure. You will use the same number for your reference at the end of the caption line. In an author scheme, you will use the same form that you have used in the text. If you have generated the data and created the table or figure, you do not need a citation.

Fourth, if you are reprinting a table or figure from a copyrighted source, you must include a statement that you have obtained permission to use it. On the line beneath the reference or citation add the words, *reprinted by permission*. If the copyright holder specifies a different phrase for the credit line, use that form instead. See Chapter Two on legal and ethical issues for discussion of materials requiring permissions.

### *Form*

A sample caption line, chapter numbering, no citation:

Table 2.4 Structure design and analysis data

or

Table 2.4 Structure Design and Analysis Data

A sample caption line, chapter numbering, numeric citation, permission:

Figure 4.6 Clothing trades employment, 1906-07 [41]

Reprinted by permission.

A sample caption line, appendix lettering, author citation, permission:

Table A.8 The first column shows the distribution of values. The second column shows the uncertainties associated with these values (Smith & Jones 1992) reprinted with permission.

**Referring to tables and figures in the text**

In the text, you do not refer to a table or figure by its caption, but by its numeric label, for example, Table 1.2 or Figure 3.4.

Table and figure are always capitalized when followed by a number and are not abbreviated. Be sure that you are consistent with this form throughout the document.

## Chapter Five

### *Back Matter: Supporting and Reference Material*

#### **Appendices**

##### **Format**

##### **Pagination and headings**

#### **Reference or Works Cited List**

##### **Format**

##### **Documentation style**

#### **Bibliography**

Material that supplements your text appears after the body of the text in appendices, a references or works cited list, and possibly, a bibliography. This supporting material continues the Arabic numeral pagination of the body of the text.

### **Appendices**

Appendices contain supporting material relevant to the work presented in the body of the text but which cannot reasonably be incorporated into that discussion.

Appendices are not required. You may have no appendices, one appendix, or several appendices depending on whether you have supporting material appropriate or necessary for inclusion. You do not need a separate appendix for each item. An appendix may contain a grouping of related items. You will have multiple appendices when you have more than one logical category of supporting material.

Material appropriate for appendices may include, but is not limited to, technical notes on equipment and/or methods, computer code, computer-generated data, extensive or highly detailed tables and figures, consent, release, or permission forms, survey instruments, and case studies.

Appendices may appropriately contain details of obtaining or generating raw data for your research and documentation of that data—provided these details are not otherwise available to the reader. Such data must be complete, unaltered, and presented in a clear and comprehensible form. Computer code and computer-generated data must be appropriately documented. Do not include irrelevant material such as documenting attempts to develop code or learn software syntax.

List each appendix but not each item within the appendix on the table of contents.

#### **Format**

Appendix material may appear as reprints of documents created in forms different from UAH thesis and dissertation specifications.

Fonts, font sizes, and line spacing in appendices do not have to cohere with standards specified for your text as long as the font size does not fall below nine point, and the material fits within the margin requirements for the document as a whole.

If you use tables or figures in an appendix, you must number, caption, and cite them just as you do in the body of the text. However, you will label tables and figures in an appendix using letters rather than the numbers you have used for tables or figures in chapters; thus, the label Figure B.1 identifies the first figure in the second appendix.

### **Pagination and headings**

Pages in appendices continue the Arabic numeral pagination of your text. Center the page number of the first page of the appendix at the bottom of the page. On subsequent pages of an appendix place the page number in the upper right corner.

#### *One appendix*

When you have only one appendix, you may title the appendix, but are not required to do so. The heading, APPENDIX (in caps) appears on the first page centered three double spaces down from the top margin. If you wish to title the appendix, place the title two double spaces below the heading (centered and in caps). The text then begins two double spaces below the title (or below the heading if there is no title).

#### *More than one appendix*

When you have multiple appendices, you must preface them with a section sheet labeled APPENDICES (uppercase and centered on the page) placed between the last page of the text and the first appendix. Center the page number at the bottom of the page.

With multiple appendices you must title and label each of them alphabetically. The formatting for the first page follows the pattern specified above for a single appendix, but with the heading modified to include the appendix letter. For example, the first appendix of multiple appendices would bear the heading APPENDIX A with the title below it.

### **Reference or Works Cited List**

The reference or works cited list is constructed as you write chapters, but must be carefully examined, revised, and formatted once you have completed the text.

#### **Format**

Format the first page of the list of references just as you format other heading-bearing pages such as the first page of a chapter or appendix.

The heading, either REFERENCES or WORKS CITED appears in uppercase, centered, and three double spaces below the top margin. The first entry begins two double spaces below the heading. Single-space within the entry. Double-space between entries.

The pagination continues the single Arabic number sequence used in the text and appendices. On the first page of the list of references, center the page number at the bottom. On subsequent pages, place it in the upper right corner.

### **Documentation style**

The entries on the list must conform exactly to the specifications of the documentation style that you are using. You may not invent a style, approximate a style, or combine styles.

- ?? Note the layout the style requires: some, for example, use a paragraph indent; some use a hanging indent; some are flush left;
- ?? Adhere exactly to the format for determining main entry, name order for second authors, the practice for first names or initials, information order, punctuation, spacing, capitalization, underlining and italics, and abbreviation that the documentation style specifies;
- ?? Note carefully the information required for an entry; that is, volume, number, issue, year, pages for chapters, editors, translators, compilers, etc.

### **Bibliography**

Any work not cited in the text but sufficiently relevant to bear mentioning may be listed in a bibliography following references or works cited. A bibliography is optional. The bibliography and reference list may not be combined. If a bibliography for most documentation styles is appropriate, then its style and formatting must be consistent with the documentation style used throughout.

## Chapter Six

### *Front Matter: Preliminaries to the Text*

**Title Page**  
**Copyright Page**  
**Approval Page**  
**Abstract**  
**Acknowledgments**  
**Table of Contents**  
    **Front matter**  
    **Text**  
    **Back matter**  
    **Form**  
**List of Figures, List of Tables, List of Symbols**  
**Dedication Page**  
**Other Pages**

The pages preliminary to the body of your text and its reference material are the last pages that you will assemble. Some are required and some are optional. The entire group appears in the following order:

Title page	Required
Copyright page	Required
Approval page	Required
Abstract	Required
Acknowledgments	Required
Table of contents	Required
List of figures	Required if you have figures
List of tables	Required if you have tables
List of abbreviations/acronyms	Optional
List of symbols	Recommended with mathematical expressions
Glossary	Optional
Dedication	Optional
Epigraph[s]	Optional

All pages constituting the front matter are numbered using lower-case Roman numerals at the bottom center of the page. The most important exception is the title page: the title page counts as the first page, but the page number does not appear on it. The second exception is the optional dedication page, which is neither counted nor numbered. Samples of all required pages of front matter appear in Appendix C.

## **Title Page**

Observe spacing, centering, and capitalization of information as indicated on samples in Appendix C. A title extending to two lines or more is double-spaced. Although the page is page i, the number does not appear on the page.

Be sure that you list your department or program name exactly. Consult the list in Appendix B to verify titles.

You will need two extra copies of the title page apart from those bound into each thesis or dissertation copy. They are submitted to the School of Graduate Studies at the stage of final procedures: one is forwarded to the UAH Registrar; the other to University Microfilms International (UMI).

## **Copyright Page**

See the discussion on copyright in Chapter Two. The copyright page is page ii. The number appears at the bottom center of the page.

## **Approval Page**

A copy of the approval page with all signatures is bound into all copies of your thesis or dissertation.

Your thesis or dissertation manuscript, when you submit it to the School of Graduate Studies for review and approval, must include an approval page with all necessary and original signatures preparatory to the signature of the Dean of the School of Graduate Studies.

Use the format indicated on the sample page. Select the title describing your degree, option, etc., from the list in Appendix B. Number at bottom center with lower-case Roman numeral.

All copies of your thesis or dissertation will include a photocopy on required paper stock of the signed approval page. The original is turned into the School of Graduate Studies separately and is then kept on file in the Office of the Registrar.

## **Abstract**

An abstract briefly summarizes the content of the work.

It should state the problem investigated, the method and materials used, your argument, and conclusions. It should be clear and specific to serve reference purposes when it appears in *Dissertation Abstracts International (DAI)*. The publisher, UMI, specifies word limits: abstracts for theses must not exceed 150 words; abstracts for dissertations, 350.

Your manuscript submitted to the School of Graduate Studies for review and approval must include an abstract page with all necessary and original signatures preparatory to the signature of the Dean of the School of Graduate Studies.

Use the format indicated on the sample page. Number at bottom center with lower-case Roman numeral.

Like the approval page, photocopies of the signed abstract on required paper stock will be bound into all copies of the thesis or dissertation. The abstract with necessary and original signatures is submitted separately to the School of Graduate Studies when you turn in final copies. You will also need an additional copy, which is sent to UMI.

### **Acknowledgments**

You must pay your scholarly debts by thanking those who have provided intellectual guidance, facilities, or financial support for your project; thus, you thank those who have been significantly involved in your work.

You must acknowledge any agency providing funding or other resources, and any individual or institution who has granted you permission to reprint material.

If you wish, you may also thank family or friends. You may conclude your acknowledgments with a dedication rather than using a separate dedication page. Your acknowledgments should be brief and consistent in tone with a formal publication.

Number at bottom center with lower-case Roman numeral.

### **Table of Contents**

All entries on the table of contents must correspond exactly to the wording you have used in the text: front matter headings, chapter titles, first-level headings, and back matter headings and titles.

#### **Front matter**

Some, but not all, of the items constituting front matter appear in the table of contents:

- ?? You do not list the title page, copyright page, approval page, table of contents, dedication, or epigraphs page;
- ?? You do list the list of figures, list of tables, list of abbreviations, acronyms, list of symbols, and glossary.

#### **Text**

The table of contents must accurately represent the organization and divisions of your text. You must include chapter titles and first-level headings exactly as they appear in your text. You may include or omit further levels of subdivision; however, you must be consistent in the level represented for all chapters. If you have used an outline form, labeling headings or subheadings in the text A, A.1, A.2, B, etc., or a decimal form, 1.1, 1.2, etc., you must also use these labels in the table of contents. Double-space between entries. If a chapter title requires two or more lines, single-space between the lines of the entry.

### **Back matter**

You must include all divisions of your back matter, using the same headings that appear on the respective pages. For example, if you have used “works cited” as the heading, you must also use “works cited” (rather than “references”) on the table of contents. In listing appendices, you must also identify the contents of an appendix with its title following the heading Appendix B, but if you only have one Appendix, you don’t have to title it.

### **Form**

Duplicate the pattern of capitalization, indentation, and spacing shown on the sample table of contents. Note that chapter titles and back matter divisions use full capitalization. Front matter, chapter heading levels, and titles of appendices are lower case with only initial letters capitalized.

Avoid common errors:

- ?? Be sure to align numbers at both the left and right margins according to the final digit;
- ?? Be sure to align all leaders (series of periods) between entries and page numbers;
- ?? Use the heading ‘Chapter’ only once to preface the titles for all your chapters;
- ?? Do not underline in the table of contents.

### **List of Figures, List of Tables, List of Symbols**

On lists of figures and tables, entries must appear in the same order as they appear in your text, and must be titled exactly as they are in the text.

The full number assigned a figure or table in the text precedes each entry; thus indicating the chapter in which it appears. Note that any table or figure in an appendix must appear on the list. Consult the sample for proper spacing, alignment, and heading (“figure,” “table,” “page”). Omit underlining for these headings. Double-space between entries, but if titles are long, single-space within the entry.

For advice on constructing a list of symbols, see the section ‘Mathematics’ in Chapter Four. The list should either be an integrated alphabet (combining Greek and other characters), or may be separate alphabetized lists. Refer to the sample page for format.

### **Dedication Page**

A dedication may be added as the last line of the acknowledgments, or you may include a dedication centered on a separate page.

Omit the word dedication, “To” is sufficient; for example, To Mary. A dedication page is neither paginated nor counted.

### **Other Pages**

Consult a style manual, such as Turabian, for formats for optional items constituting front matter not discussed here.

## **Part Three**

### ***Final Procedures***

## Chapter Seven

### *Submitting Final Approved Copies*

#### **Copies** **Additional Pages** **Forms** **Fees**

In order to graduate in the current semester, you must submit final copies of your approved thesis or dissertation, required forms, and payments by the deadlines specified by the School of Graduate Studies.

Once your thesis or dissertation has been approved at all stages, you are authorized to print or photocopy the required six copies on specified paper stock. For a discussion of the approval process, see Chapter One.

#### **Copies**

When you submit final copies to the School of Graduate Studies, all six copies will again be checked for required margins for binding. Examine each copy to be sure all pages are in order. Submit copies in eight and one-half- by eleven-inch boxes to avoid damage to document pages. Separate copies with colored sheets.

Of the six bound copies, two are for the library, one for your major department, one for your advisor or committee chair, one for you, and one for microfilming by UMI. You must pick up your copy at the UAH library. The library can provide dates for deliveries from the bindery.

#### **Additional Pages**

In addition to the copies of pages bound into each of the six thesis or dissertation copies, you will also need—separately—the original signed approval page, the original signed abstract page, a copy of the signed abstract page, and two copies of your title page.

If you have permissions for using copyrighted material, you must also include copies of the permission forms or letters, which the School of Graduate Studies will send to UMI.

#### **Forms**

All forms that you will need are available in the School of Graduate Studies. You can complete them at the time you submit final copies.

All students must submit a UAH thesis/dissertation binding form and a UMI thesis or dissertation agreement form. Doctoral candidates must also submit the Survey of Earned Doctorates form. If you wish UMI to register copyright for you, you must include that form as well.

## **Fees**

You must present receipts for payment and payments to the School of Graduate Studies when you submit final copies for binding.

- ?? You must pay the fee for binding (at this writing, \$55 for the required six copies for either theses or dissertations) in the Bursar's office, and present the receipt to the School of Graduate Studies;
- ?? You must pay UMI fees for microfilming to UMI (at this writing, \$45 for theses, and \$55 for dissertations) in the School of Graduate Studies;
- ?? If you wish UMI to register copyright for you, you must also pay their fee (at this writing, \$45) in the School of Graduate Studies;
- ?? If you wish extra bound copies, you must submit extra manuscript copies to the library and pay the additional bindery fee (at this writing, \$10 per copy) there.

## Appendix A

### *Frequent Errors*

1. An Abstract that exceeds specified word counts (thesis/150; dissertation/350)
2. Abstract headings  
College/Dept: This heading requires both college and department names with the exception of Interdisciplinary Programs for which only the program name should be given, e.g., Program Optical Science & Engineering. No abbreviations or shortened versions are permitted. The full names of college and department, e.g., Engineering/Industrial & Systems Engineering and Engineering Management, are required.  
Degree: UAH offers specific degrees with exact titles. You can find a complete listing (as of 1/2001) of degrees and departmental/college/program titles in Appendix B.
3. Placement of captions on tables and figures  
Captions rather than titles: Examples are provided in Appendix C.  
Exact reproduction on list of figures/tables: Captions must be reproduced exactly on the list of figures and the list of tables. Abbreviated versions of captions are not permitted.
4. Page number placement  
All pages must have a number, with the exception of the title page, which is counted but not numbered. Lower-case Roman numerals placed in the bottom center are used in the front matter. Arabic numerals are used throughout the remainder of the document. On the first page of a chapter or appendix, the page number is placed bottom center. For the remaining pages of a chapter or appendix, the page number is placed in the upper right hand corner.
5. Margins  
Margin guidelines must be followed throughout the entire document. Tables and figures must fit completely within margin guidelines.
6. et al.  
Period placement: The al. of et al. is an abbreviation for alia; therefore, a period is required in all instances.  
Consistency in comma placement: When using et al. in parenthetical references, you must be consistent in your usage of commas. For example, either use Moore, et al. 1999 or Moore et al. 1999 throughout the entire document. Comma usage before dates in parenthetical references must also be consistent, e.g., Moore, et al., 1999 or Moore, et al. 1999.
7. Spelling errors  
When British variants exist, the American spelling must be used.
8. Orphans/Widows  
Do not leave single or partial lines of text isolated at the bottom or top of a page.
9. Textual material does not correspond with table of contents  
Titles of chapters, headings, subheadings, etc., must match the table of contents exactly. This applies not only to wording, but also to numeric systems and format.

## 10. Symbols and mathematical expressions

The use of Greek and Roman symbols must be exact. If you use Roman symbols in equations or text, you must continue to use Roman symbols to represent those expressions throughout the text.

Variations in the font used for symbols: Do not use both  $x$  and  $x$  for the same variable. In addition,  $\text{?}$  (inserted via an equation editor) and  $\text{?}$  (inserted via a different “insert symbol” menu) should also not be used as the same variable. Use your equation editor to enter all mathematical expressions.

Not using the equation editor to enter all equations/symbols/variables: No matter how difficult it may be, entering all equations/symbols/variables with the equation editor will help in avoiding these problems.

Font size of the mathematics not matching the font size of the text: Make sure the font size setting in your equation editor agrees with the size of the font being used for the main text.

Using small parentheses and brackets to enclose large expressions: It should be

$$F\left(\frac{x^2 + 4}{x^2}\right) \quad \text{and not} \quad F\left(\frac{x^2 + 4}{x^2}\right).$$

## 11. Errors in grammar and punctuation

Lack of subject-verb agreement: Subjects and verbs must agree, especially in sentences in which the subject is singular, but the object of a prepositional phrase is plural (e.g., *A group of students was surveyed*). (Note, *data* when being used as a noun is plural.)

Misuse of comma and semicolon: Examples of correct and incorrect usage of commas and semicolons should be provided in any grammar handbook. Please do not rely on computer grammar checkers for correct usage.

Incorrect spacing of the hyphen and dash: No spaces should be used before or after these punctuation marks (e.g., *single-spaced* (hyphen); *Carefully explaining the procedure—a procedure that would revolutionize science as we know it—John hoped to...* (dash)).

Misuse of commonly confused words: Be careful to use the correct version of commonly confused words, e.g., *affect and effect, principal and principle, later and latter*, etc.

Misuse of the colon: Within a sentence use a colon only following complete independent clauses (for example, *Smith (1999) explains it clearly*: not *Smith (1999) states*: ).

Specifically, verbs and prepositions cannot be separated from their objects.

Misplacement of periods and commas in quoted material: Colons and semicolons are placed outside quotation marks; periods and commas are placed inside quotation marks.

## 12. Consistency in spacing between section breaks

Spacing between paragraphs and section breaks must remain consistent throughout the document.

## 13. Usage of *i.e.*, *etc.*, *e.g.*, and *such as*

The use of *i.e.* and *e.g.* should be mandated by their translated equivalents (*i.e.* means “that is,” and *e.g.* means “for example”). Both *i.e.* and *e.g.* require a comma (*i.e.*, and *e.g.*) when being used in a sentence. *Such as* does not require a comma nor should one be used. When *etc.* is being used to end a series within a sentence, a comma should be placed after it as well unless it ends the sentence completely.

14. Single vs. Double spacing

The text of your document should be double-spaced throughout. Table/figure captions and endnote/footnotes should be single-spaced.

15. Non-breaking spaces

Certain elements of your text should never be broken between lines. For example, “Figure 2.1” should be completed on the line of text started. To accomplish this, you should use the appropriate non-breaking space command (e.g., control/shift/space in Microsoft Word? ; the tie (~) in TeX) as you are typing your document. This prevents breaking such expressions. Other examples of entities that should not be broken between lines include units from quantity (25 ml); initials from surnames (F. Lee Bailey); mathematical expressions; and ampersand-connected text (Smith, Brown, & Lee).

## Appendix B

### *Degree and Department/Program Titles*

The University of Alabama in Huntsville offers a number of different advanced degrees. The degree titles are very specific and must be adhered to exactly on the approval page (see samples). In addition, Department and Program titles are also very specific and must be reproduced precisely as the official title on the title page (see samples). If in doubt, please check with the School of Graduate Studies for specifics.

UAH offers the following Graduate degrees:

#### **Master's Programs**

- Master of Accountancy
- Master of Science in Management
- Master of Science in Management Information Systems
- Master of Science in Engineering
  - with an option in Aerospace Engineering
  - Chemical Engineering
  - Civil Engineering
  - Computer Engineering
  - Electrical Engineering
  - Industrial & Systems Engineering
  - Mechanical Engineering
  - Operations Research
- Master of Science in Operations Research
- Master of Arts in
  - English
  - History
  - Psychology
  - Public Affairs
  - Mathematics
- Master of Science in Nursing
  - with a track in Acute Care Nurse Practitioner
  - Adult Health Nursing Specialist
  - Family Nurse Practitioner
  - Nursing Administration
- Master of Science in
  - Atmospheric Science
  - Biological Sciences
  - Chemistry
  - Computer Science
  - Mathematics
  - Materials Science
  - Physics

**Doctoral Programs**

Doctor of Philosophy in  
Computer Engineering  
Electrical Engineering  
Industrial & Systems Engineering  
Mechanical Engineering  
with a specialization in Civil Engineering  
Chemical Engineering  
  
Applied Mathematics  
Atmospheric Science  
Computer Science  
Physics

**Interdisciplinary Programs**

Doctor of Philosophy in Materials Science  
Doctor of Philosophy in Biotechnology Science and Engineering  
Doctor of Philosophy in Optical Science and Engineering

Degrees are offered in the following colleges/departments/programs:

College of Administrative Science

College of Engineering

Department of Chemical & Materials Engineering  
Department of Civil & Environmental Engineering  
Department of Electrical & Computer Engineering  
Department of Industrial & Systems Engineering and Engineering Management  
Department of Mechanical & Aerospace Engineering

College of Liberal Arts

Department of English  
Department of History  
Department of Political Science  
Department of Psychology

College of Nursing

College of Science

Department of Atmospheric Science  
Department of Biological Sciences  
Department of Chemistry  
Department of Computer Science  
Department of Mathematical Sciences  
Department of Physics

Biotechnology Science and Engineering Program

Materials Science Program (tri-campus for Ph. D.)

Optical Science and Engineering Program

## Appendix C

### *Sample Pages*

The following pages show examples of title, approval, and abstract pages for theses and dissertations in a variety of fields. Pay particular attention to the difference between department name and degree name, etc. This appendix also contains other relevant sample pages to provide guidance in formatting your thesis/dissertation. If you have any questions, contact the School of Graduate Studies.

**CRYSTAL GROWTH EXPERIMENTATION IN BONE GRAFT  
REPLACEMENT**

**by**

**BETHANY MARSHALL**

**A DISSERTATION**

**Submitted in partial fulfillment of the requirements for the  
Degree of Doctor of Philosophy**

**in**

**The Joint Tricampus Materials Science Program of  
The University of Alabama**

**The University of Alabama at Birmingham  
The University of Alabama in Huntsville**

**to**

**The School of Graduate Studies**

**of**

**The University of Alabama in Huntsville**

**HUNTSVILLE, ALABAMA**

**2003**

In presenting this dissertation in partial fulfillment of the requirements for a doctoral degree from The University of Alabama in Huntsville, I agree that the Library of this University shall make it freely available for inspection. I further agree that permission for extensive copying for scholarly purposes may be granted by my advisor or, in his/her absence, by the Director of the Program or the Dean of the School of Graduate Studies. It is also understood that due recognition shall be given to me and to The University of Alabama in Huntsville in any scholarly use which may be made of any material in this dissertation.

---

(student signature)

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(date)

## DISSERTATION APPROVAL FORM

Submitted by Bethany Marshall in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Materials Science and accepted on behalf of the Faculty of the School of Graduate Studies by the dissertation committee.

We, the undersigned members of the Graduate Faculty of The University of Alabama in Huntsville, certify that we have advised and/or supervised the candidate on the work described in this dissertation. We further certify that we have reviewed the dissertation manuscript and approve it in partial fulfillment of the requirements of the degree of Doctor of Philosophy in Materials Science.

\_\_\_\_\_ Committee Chair  
(Date)

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ Program Director

\_\_\_\_\_ College Dean

\_\_\_\_\_ Graduate Dean

**ABSTRACT**

The School of Graduate Studies  
The University of Alabama in Huntsville

Degree Doctor of Philosophy Program Materials Science.

Name of Candidate Bethany Marshall.

Title Crystal Growth Experimentation in Bone Graft Replacement.

Abstract Approval: Committee Chair \_\_\_\_\_

Program Director \_\_\_\_\_

Graduate Dean \_\_\_\_\_

**LANDMINE DETECTION TECHNIQUES USING  
ELECTRONIC SCANNING DEVICES**

**by**

**ROBERT DAWES**

**A DISSERTATION**

**Submitted in partial fulfillment of the requirements  
for the degree of Doctor of Philosophy  
in  
The Department of Electrical and Computer Engineering  
to  
The School of Graduate Studies  
of  
The University of Alabama in Huntsville**

**HUNTSVILLE, ALABAMA**

**2003**

In presenting this dissertation in partial fulfillment of the requirements for a doctoral degree from The University of Alabama in Huntsville, I agree that the Library of this University shall make it freely available for inspection. I further agree that permission for extensive copying for scholarly purposes may be granted by my advisor or, in his/her absence, by the Chair of the Department or the Dean of the School of Graduate Studies. It is also understood that due recognition shall be given to me and to The University of Alabama in Huntsville in any scholarly use which may be made of any material in this dissertation.

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(student signature)

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(date)

## DISSERTATION APPROVAL FORM

Submitted by Robert Dawes in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Electrical Engineering and accepted on behalf of the Faculty of the School of Graduate Studies by the dissertation committee.

We, the undersigned members of the Graduate Faculty of The University of Alabama in Huntsville, certify that we have advised and/or supervised the candidate on the work described in this dissertation. We further certify that we have reviewed the dissertation manuscript and approve it in partial fulfillment of the requirements of the degree of Doctor of Philosophy in Electrical Engineering.

\_\_\_\_\_ Committee Chair  
(Date)

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ Department Chair

\_\_\_\_\_ College Dean

\_\_\_\_\_ Graduate Dean

**ABSTRACT**

The School of Graduate Studies  
The University of Alabama in Huntsville

Degree Doctor of Philosophy College/Dept. Engineering/Electrical and Computer  
Engineering

Name of Candidate Robert Dawes

Title Landmine Detection Techniques Using Electronic Scanning Devices

Abstract Approval: Committee Chair \_\_\_\_\_

Department Chair \_\_\_\_\_

Graduate Dean \_\_\_\_\_

**OPTICAL TESTING TECHNIQUES FOR LENS  
SPECIFIC APPLICATIONS**

**by**

**JOSEPH MILLER**

**A DISSERTATION**

**Submitted in partial fulfillment of the requirements  
for the degree of Doctor of Philosophy  
in  
The Optical Science & Engineering Program  
to  
The School of Graduate Studies  
of  
The University of Alabama in Huntsville**

**HUNTSVILLE, ALABAMA**

**2003**

(This format is also applicable to the Biotechnology Science & Engineering Program.)

In presenting this dissertation in partial fulfillment of the requirements for a doctoral degree from The University of Alabama in Huntsville, I agree that the Library of this University shall make it freely available for inspection. I further agree that permission for extensive copying for scholarly purposes may be granted by my advisor or, in his/her absence, by the Director of the Program or the Dean of the School of Graduate Studies. It is also understood that due recognition shall be given to me and to The University of Alabama in Huntsville in any scholarly use which may be made of any material in this dissertation.

---

(student signature)

---

(date)

## DISSERTATION APPROVAL FORM

Submitted by Joseph Miller in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Optical Science & Engineering and accepted on behalf of the Faculty of the School of Graduate Studies by the dissertation committee.

We, the undersigned members of the Graduate Faculty of The University of Alabama in Huntsville, certify that we have advised and/or supervised the candidate on the work described in this dissertation. We further certify that we have reviewed the dissertation manuscript and approve it in partial fulfillment of the requirements of the degree of Doctor of Philosophy in Optical Science & Engineering.

\_\_\_\_\_ Committee Chair  
(Date)

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ Program Director

\_\_\_\_\_ College Dean

\_\_\_\_\_ Graduate Dean

**ABSTRACT**

The School of Graduate Studies  
The University of Alabama in Huntsville

Degree Doctor of Philosophy Program Optical Science & Engineering.

Name of Candidate Joseph Miller.

Title Optical Testing Techniques for Lens Specific Applications.

Abstract Approval: Committee Chair \_\_\_\_\_

Program Director \_\_\_\_\_

Graduate Dean \_\_\_\_\_

**THREE-DIMENSIONAL TESTING METHODS FOR  
LASER MODULES**

by

**MELANIE THOMAS**

**A THESIS**

**Submitted in partial fulfillment of the requirements  
for the degree of Master of Science  
in  
The Department of Physics  
to  
The School of Graduate Studies  
of  
The University of Alabama in Huntsville**

**HUNTSVILLE, ALABAMA**

**2003**

In presenting this thesis in partial fulfillment of the requirements for a master's degree from The University of Alabama in Huntsville, I agree that the Library of this University shall make it freely available for inspection. I further agree that permission for extensive copying for scholarly purposes may be granted by my advisor or, in his/her absence, by the Chair of the Department or the Dean of the School of Graduate Studies. It is also understood that due recognition shall be given to me and to The University of Alabama in Huntsville in any scholarly use which may be made of any material in this thesis.

---

(student signature)

---

(date)

## THESIS APPROVAL FORM

Submitted by Melanie Thomas in partial fulfillment of the requirements for the degree of Master of Science in Physics and accepted on behalf of the Faculty of the School of Graduate Studies by the thesis committee.

We, the undersigned members of the Graduate Faculty of The University of Alabama in Huntsville, certify that we have advised and/or supervised the candidate on the work described in this thesis. We further certify that we have reviewed the thesis manuscript and approve it in partial fulfillment of the requirements of the degree of Master of Science in Physics.

\_\_\_\_\_ Committee Chair  
(Date)

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ Department Chair

\_\_\_\_\_ College Dean

\_\_\_\_\_ Graduate Dean

**ABSTRACT**

The School of Graduate Studies  
The University of Alabama in Huntsville

Degree Master of Science College/Dept. Science/Physics.

Name of Candidate Melanie Thomas.

Title Three-Dimensional Testing Methods for Laser Modules.

Abstract Approval: Committee Chair \_\_\_\_\_

Department Chair \_\_\_\_\_

Graduate Dean \_\_\_\_\_

**STRUCTURAL DESIGN TECHNIQUES FOR IMPROVED  
LONGEVITY**

**by**

**KELLY WHITWORTH**

**A THESIS**

**Submitted in partial fulfillment of the requirements  
for the degree of Master of Science in Engineering  
in  
The Department of Civil and Environmental Engineering  
to  
The School of Graduate Studies  
of  
The University of Alabama in Huntsville**

**HUNTSVILLE, ALABAMA**

**2003**

In presenting this thesis in partial fulfillment of the requirements for a master's degree from The University of Alabama in Huntsville, I agree that the Library of this University shall make it freely available for inspection. I further agree that permission for extensive copying for scholarly purposes may be granted by my advisor or, in his/her absence, by the Chair of the Department or the Dean of the School of Graduate Studies. It is also understood that due recognition shall be given to me and to The University of Alabama in Huntsville in any scholarly use which may be made of any material in this thesis.

---

(student signature)

---

(date)

**THESIS APPROVAL FORM**

Submitted by Kelly Whitworth in partial fulfillment of the requirements for the degree of Master of Science in Engineering in Civil Engineering and accepted on behalf of the Faculty of the School of Graduate Studies by the thesis committee.

We, the undersigned members of the Graduate Faculty of The University of Alabama in Huntsville, certify that we have advised and/or supervised the candidate on the work described in this thesis. We further certify that we have reviewed the thesis manuscript and approve it in partial fulfillment of the requirements of the degree of Master of Science in Engineering in Civil Engineering.

\_\_\_\_\_ Committee Chair  
(Date)

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ Department Chair

\_\_\_\_\_ College Dean

\_\_\_\_\_ Graduate Dean

**ABSTRACT**

The School of Graduate Studies  
The University of Alabama in Huntsville

Degree Master of Science in Engineering College/Dept. Engineering/Civil and  
Environmental Engineering.

Name of Candidate Kelly Whitworth.

Title Structural Design Techniques for Improved Longevity.

Abstract Approval: Committee Chair \_\_\_\_\_

Department Chair \_\_\_\_\_

Graduate Dean \_\_\_\_\_

**CRYSTAL GROWTH EXPERIMENTATION IN BONE GRAFT  
REPLACEMENT**

by

**JOHN ALLEN**

**A DISSERTATION**

**Submitted in partial fulfillment of the requirements for the  
Degree of Doctor of Philosophy  
in  
The Joint Civil Engineering Program of  
The University of Alabama at Birmingham  
The University of Alabama in Huntsville  
to  
The School of Graduate Studies  
of  
The University of Alabama in Huntsville**

**HUNTSVILLE, ALABAMA**

**2003**

**LANDMINE DETECTION TECHNIQUES USING  
ELECTRONIC SCANNING DEVICES**

**by**

**ROBERT DALTON**

**A DISSERTATION**

**Submitted in partial fulfillment of the requirements  
for the degree of Doctor of Philosophy  
in  
The Shared Computer Engineering Program of  
The University of Alabama in Huntsville  
The University of Alabama at Birmingham  
to  
The School of Graduate Studies  
of  
The University of Alabama in Huntsville**

**HUNTSVILLE, ALABAMA**

**2003**

**STRUCTURAL DESIGN TECHNIQUES FOR IMPROVED  
LONGEVITY**

**by**

**KIM STICE**

**A THESIS**

**Submitted in partial fulfillment of the requirements  
for the degree of Master of Science  
in  
The Materials Science Program  
to  
The School of Graduate Studies  
of  
The University of Alabama in Huntsville**

**HUNTSVILLE, ALABAMA**

**2003**

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## CHAPTER I

### INTRODUCTION

In the past 25 years, coronary artery bypass grafting (CABG) has risen from its infancy to become the most frequent cardiac operation worldwide. Approximately 200,000 CABG surgeries are performed in the United States annually, according to Richards [27]. Despite the emergence of other treatments of coronary atherosclerosis such as pharmacologic agents and percutaneous transluminal coronary angioplasty, CABG remains the treatment of choice when other measures are inadequate in restoring coronary circulation.

In 1951, Vineburg et al. [48] implanted an internal mammary artery into the myocardium to increase blood flow to the muscle; this procedure had limited success. The biggest breakthrough came in the 1960s when Sones, at the Cleveland Clinic, developed a procedure to directly visualize the coronary arteries called cine coronary arteriography. In 1967, Falvaro [12], also at the Cleveland Clinic, began performing reversed saphenous vein bypass grafting.

(Reference list alphabetized and numbered.)

## CHAPTER I

### INTRODUCTION

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(Reference list ordered and numbered according to the sequence of first appearance in the text.)

## Appendix D

### *A Policy Statement on the Role and Nature of the Doctoral Dissertation*

#### **Role of the Dissertation and Dissertation Research**

The doctoral dissertation should (1) reveal the student's ability to analyze, interpret, and synthesize information; (2) demonstrate the student's knowledge of the literature relating to the project or at least acknowledge prior scholarship on which the dissertation is built; (3) describe the methods and procedures used; (4) present results in a sequential and logical manner; (5) display the student's ability to discuss fully and coherently the meaning of the results. In the sciences the work must be described in sufficient detail to permit an independent investigator to replicate the results.

The dissertation is the beginning of one's scholarly work, not its culmination. Dissertation research should provide students with hands-on, directed experience in the primary research methods of the discipline, and should prepare students for the type of research/scholarship that will be expected of them after they receive the Ph.D. degree.

#### **Relationship of Course Work**

Scholarly activity and research should be encouraged from the onset of a student's graduate program, not introduced at an advanced point in the student's career. Involvement at early stages in a research program facilitates intensive participation and rapid progress and is characteristic of the physical and biological sciences, engineering, and to some extent, the behavioral sciences.

#### **The Dissertation as a Report of Scholarship or Research**

Differences among the disciplines - Disciplinary diversity affects the dissertation process and product. Any set of university-wide standards and requirements must acknowledge and accommodate the differences in how scholars in different disciplines conduct their work and how the diversity is reflected in expectations for the Ph.D. dissertation.

The question of originality - In its most general sense, "original" describes research that has not been done previously or that creates new knowledge. Although a dissertation should not duplicate another researcher's or scholar's work, the topic, project, or approach taken need not be solely that of the graduate student. An advisor or other faculty member should encourage a student to explore a particular topic or project with the idea that the student himself or herself will independently develop the "thesis" of the dissertation. The student should be able to demonstrate what portion of the research of scholarship represents his or her own thinking.

The question of collaboration - In those disciplines where doctoral research efforts are typically part of a larger collaboration project, it is crucial that an individual student's contribution be precisely delineated. Whether the collaboration is between faculty and student or among students, Ph.D. candidates are expected to be able to demonstrate the uniqueness of their own ideas and individual efforts.

#### **Form of the Dissertation**

Although the "traditional" dissertation as a unified work with an introduction that states an objective, a literature review, a presentation of the methodology or procedures to be used, and a concluding discussion of results should be respected, flexibility with respect to form also should be permitted. Some disciplines, mainly in the sciences, already permit inclusion in the dissertation of research papers or scholarly articles published by the student. This practice should

be adopted more frequently by the humanities and social sciences. Whatever the discipline, the published work must be logically connected and integrated into the dissertation in a coherent manner. Binding reprints or collections of publications together is not acceptable as a dissertation in either format or concept.

### **Adviser-Advisee Relationship**

One of the most important contributions an adviser can make, both to reducing the time spent in the process and to facilitating completion of the dissertation, is to help students select manageable topics and to discourage them from undertaking that which is too broad in scope to complete in a reasonable and timely fashion.

In those cases where graduate students' research is enmeshed in their advisers' projects, clear, written understandings should be formulated at the outset about respective rights to the data generated and other intellectual products.

Dissertation advisers should themselves be actively involved in advanced research and scholarship and in the graduate programs of their institutions.

New doctoral students should be advised to meet all prospective dissertation advisers and talk with other students in the program about the attributes of various advisers. To facilitate this practice, departments should provide students with (1) an annually updated list of graduate students with their dissertation topics and names of their advisers, and (2) a similar list of departmental members of the graduate faculty with information about their areas of research, selected references to their publications, and indication of their availability to supervise dissertations.

### **Administrative and Faculty Support**

Faculties are strongly encouraged to prepare handbooks for dissertation directors and students which codify what the discipline expects of graduate education, in general, and the dissertation, in particular. Guidelines should focus on the mutual responsibilities of advisers and the students and should include targets for the periods of time needed to complete each major stage in doctoral studies: i.e., course work, master's thesis (where applicable), qualifying examinations, dissertation prospectus, and completed and defended dissertation.

Departments and programs should review periodically the expectations of their disciplines with respect to Ph.D. education, and they should relate the role of the dissertation to those expectations.

Graduate schools should require every department to do at least an annual review of each student's progress in the dissertation and to share that appraisal with the student.

Graduate schools should collect and make available data on how long students take to complete their dissertations and degrees in each department.

## Appendix E

### *Patent Laws*

The research that supports your thesis or dissertation may include inventions or discoveries that are patentable. The patent statute provides that a patent may be obtained for an invention or discovery involving “any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvements thereof.” The intent of this broad definition is to include within its scope anything in the way of a device or material that an individual might be able to produce and the processes used to produce it.

The function of a patent is to grant to the patentee the right to exclude others from making, using, or selling the patented invention throughout the United States. This “monopoly” right extends generally for 20 years from the date of the filing of a patent application. A patent does not, however, grant the patentee the right to make, use, or sell the patented invention. These acts might be prohibited by law, infringe on other patents, violate antitrust laws, etc. Therefore, a patent is a type of “negative right,” in the sense that it only serves to exclude others from making certain uses of patented inventions.

Patent rights are property and may therefore be sold, assigned, pledged, mortgaged, licensed, bequeathed, or donated. Such transfers may convey the entire interest in the patent or only a portion of the whole interest. Patent rights may be jointly owned by two or more persons or entities. Any joint owner, no matter how small the share, may transfer or license his/her interest to another without the approval of the other joint owner(s). Therefore, it is prudent for joint owners to have an agreement as to their respective rights and obligations to each other.

The United States government does not, simply by virtue of granting the patent, acquire any interest in the patent. Government rights in a patent are controlled by the Patent and Trademark Amendments Act of 1980 and by the contractual provisions. If your research is funded by an external source, the terms of the funding agreement will be important in determining ownership or patent rights.

Public disclosure of an invention is an important concept in patent law, because the time for filing a United States patent application begins to run with the date of such disclosure. It is even more important with respect to the filing of foreign patent applications, because public disclosure precludes the right to file an application in almost every other country. Particular attention must therefore be paid to the date of any public disclosure, since that date can dramatically impact an inventor’s substantive rights.

Public disclosure is any communication to another person who is not duty-bound to keep the information confidential. It can be accomplished in many different ways. It may occur through a written publication available to the public, including a grant proposal, or a published thesis or dissertation. An oral presentation, such as a thesis or dissertation defense, may amount to a public disclosure, as may a discussion of the invention at a meeting with one or more third parties; communications with persons employed by the same organization as the inventor are not, however, considered a publication. The providing of prototypes or samples may, depending upon the circumstances, amount to a publication. Finally, the sale or public use of the device or material, or even offering it for sale or use, is considered public disclosure.

As a limitation on the public disclosure rule, it applies only with regard to what is known as an “enabling publication.” The published information must contain sufficient detail to enable duplication of the invention by another party with ordinary skill in the art, failing which it will not affect the substantive rights of the inventor.

Often, an inventor desires to publish the results of research efforts in a scholarly journal or desires to participate in a conference to disclose the invention before a group of his or her peers. As mentioned above, if such disclosures are enabling, these publications could affect the patentability of the invention. How can an inventor participate in scholarly pursuits, which may often be necessary to obtain favorable reappointment/promotion/tenure review or to obtain funding for continued research, without forfeiting patent rights?

First, an inventor could file a patent application before publication. Recent changes in the patent law allow for the filing of what is known as a “provisions application.” This is a procedure that is much less formal and considerably less expensive than is involved in the regular patent application process. Often a provisional application can be filed on only a few days notice. The benefit of this procedure is that it allows publication of the research results. A regular application must be filed, however, within a year of the filing of the provisional application.

A second approach is to use a non-disclosure agreement entered into with the recipients of the information as a means of maintaining the confidentiality of the research. Information disclosed under such an agreement is not considered “public” and therefore has no effect on patent rights. Although it may not be feasible to use a non-disclosure agreement with a large audience at an oral presentation or with a written publication, a non-disclosure agreement works well for small meetings or proposals and should be used as possible.

A third approach is also available. The inventor may make public disclosure without providing enabling information if the invention is described only in general or vague terms. This approach carries some risk, however, since an issue about whether the information was or was not enabling may be raised at a later date. The first two options discussed above are preferable if they are available.

If public disclosure has been made without taking any of these protective measures, all is not lost. United States patent protection is still available if a patent application is filed within one year from the date of disclosure, although the possibility of foreign patent protection is lost.

Good recordkeeping is essential to effective patenting. The date of invention is critical in the patenting process. A researcher should remember that he or she may be creating evidence for a court to consider at a later date if there are competing claims to the same invention.

There are several important recordkeeping principles that may help insure that a researcher will have sufficient documentation for a patentable discovery. Invention notes should be kept in a bound notebook with numbered pages. All entries should be in ink and should be dated and signed. Contemporaneous entries should be made, noting any gaps in research activity. Entries should be legible and coherently written. Additional materials (photographs, graphs, charts, etc.) should be glued into the notebook, signed, and dated; these materials should never be removed. Notes should be periodically witnessed, making sure, however, that nothing is done that would constitute publication. Witnesses’ dated signatures should be obtained immediately if something important in the invention development process happens. It is important that any entry never be erased. Instead, errors should either be crossed-out with a single line so that the item(s) corrected can be read or a superseding entry made, reference the corrected entry by page number.

The Board of Trustees of the University of Alabama has an established patent policy, set forth in Board Rule 509, for its three campuses, and each campus also has adopted policies and procedures to implement the general directives of the Board. Under the Board policy, the institutional entity owns all inventions conceived or developed by a researcher in the course of his/her employment at the University.

Procedurally, an employee at this campus begins the patent process by reporting any new invention or discovery to the Patent Administrator, a requirement that may overlap with the obligations of the federal contract. The University next will decide if, under guidelines established in its patent policies, the invention is one that must be assigned to the University. If not, it is released to the inventor, who may choose to do nothing further with it or who may proceed to seek patent protection and market or license the invention. The cost of these activities must be borne by the employee, and the employee will be entitled to any revenue generated from the invention.

If the invention is one that must be assigned to the University, the University will determine whether or not it wants the invention, focusing on questions of patentability and marketability. If the University decides not to pursue patenting or marketing the invention, all rights in the invention will again be released to the inventor. However, if the University elects to seek patent protection, outside counsel will be engaged to prepare, file, and process the application, and licensing or other marketing efforts may be undertaken at the expense of the University.

Distribution of royalty income or other income received by the University from the licensing or sale of the invention is initially made based on a formula set forth in the Board of Trustee policy. Generally, all income is first reduced by 15% for the University's administrative costs in managing the patent process. Next, actual out-of-pocket costs and expenses incurred in obtaining the patent, such as patent counsel fees and government filing fees, are reimbursed to the University. After payment of these amounts pursuant to the Board rule, the remaining income is then divided among the University, its divisions, and the inventor or inventors based on the current policy of the campus.

The above summary of patent law indicates that the protection of intellectual property rights requires no small measure of diligence and cooperation by research personnel. Given the high level of research activities at UAH and the potential for significant financial reward for both the University and the individual inventor, compliance with these principles and requirements is in the best interest of all parties.

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