

# Local charge to global structure in the face of disorder.

Carlos G. Oliver

Master of Science

Department of Biology

McGill University

Montreal, Quebec

February 3, 2016

A thesis submitted to McGill University in partial fulfillment of the requirements of  
the degree of Master's of Science

©Carlos G. Oliver, 2016

## **DEDICATION**

This document is dedicated to the graduate students of the McGill University.

## ACKNOWLEDGEMENTS

Acknowledgments, if included, must be written in complete sentences. Do not use direct address. For example, instead of Thanks, Mom and Dad!, you should say I thank my parents.

## **ABSTRACT**

Abstract in English and French are required. The text of the abstract in English begins here.

## ABRÉGÉ

The text of the abstract in French begins here.

## TABLE OF CONTENTS

DEDICATION . . . . .	ii
ACKNOWLEDGEMENTS . . . . .	iii
ABSTRACT . . . . .	iv
ABRÉGÉ . . . . .	v
LIST OF TABLES . . . . .	viii
LIST OF FIGURES . . . . .	ix
1 Introduction . . . . .	1
1.1 Introduction . . . . .	1
1.2 General Guidelines . . . . .	2
2 Usage . . . . .	3
3 The document class options . . . . .	4
3.1 Font Size Options: 10pt, 11pt or 12pt . . . . .	4
4 Title Page . . . . .	5
5 The Thesis FrontSection . . . . .	6
5.1 Title page(required) . . . . .	6
5.2 Dedication . . . . .	6
5.3 Acknowledgments . . . . .	6
5.4 Table of Contents, List of Tables and Figures(required) . . . . .	6
5.5 Abstract(required) . . . . .	6
6 The Thesis "Mainmatter" . . . . .	8
6.1 Chapter Titles . . . . .	8

6.2	Section Headings . . . . .	8
6.3	Tables and Figures . . . . .	9
7	The Thesis "Backmatter" . . . . .	10
7.1	List of References . . . . .	10
8	Special Commands . . . . .	12
8.1	Automatically Generated Indices . . . . .	12
8.2	Changing the Code . . . . .	13
8.3	An Example Thesis File . . . . .	13
8.4	Special Cases . . . . .	14
8.5	Testing figures and tables. . . . .	19
9	TESTING FOOTNOTES . . . . .	21
10	Generating an Index . . . . .	22
10.1	Generating an Index . . . . .	22
10.2	Generating a list of abbreviations . . . . .	23
11	Supporting TexShade . . . . .	24
	Appendix A . . . . .	26
	Appendix B . . . . .	27

# LIST OF TABLES

<u>Table</u>		<u>page</u>
8-1	The First Table . . . . .	19



LIST OF FIGURES

<u>Figure</u>		<u>page</u>
8–1	My Little Chick! . . . . .	20
8–2	A Resized Figure . . . . .	20

## CHAPTER 1

### Introduction

#### 1.1 Introduction

The idea of the McGill ETD class (`mcgilletdclass`) is to input the standard  $\text{\LaTeX}$  2 $\epsilon$ report class and make changes as necessary to meet the requirements of the McGill EThesis Project. The following packages, in addition to those included with the base distribution of  $\text{\LaTeX}$  2 $\epsilon$ , must exist on your system; the dates in parentheses give the dates of the oldest version this class was tested with. Since they are all standard packages, they are readily available at any CTAN (Comprehensive TEX Archive Network) site.

- `setspace` (2000/12/01)
- `ulem` (2000/05/26)

You can use `\uline{text}` to underline text. The documentation of the `ulem` package provides more information.

- `sectsty` (1999/04/12)

Since underlining in section headings is rather nontrivial, the `sectsty` package was used to manipulate the formatting of sectional headings.

- `ragged2e` (1999/06/08)

This package adds support to handle ragged right justification appropriately.

- `everysel` (1999/06/08)

Required by the ragged2e package.

## **1.2 General Guidelines**

- Please use commands provided by mcgilletdclass, otherwise your thesis may not be able to pass the validation check.
- If you run into problems using this stylesheet, please contact us as soon as possible.
- Files you must submit: \*.tex, \*.dvi and \*.bib files.

## CHAPTER 2

### Usage

An example of how to use the `mcgilletdclass` document class is provided in `mcgilletdsample.tex`. Details of how to compile the example are provided in a later section. Use this class file the same way as the `report` class, by putting `\documentclass{mcgilletdclass}` at the beginning of the  $\text{\LaTeX} 2_{\epsilon}$  file. There are only a few options available with this document class, which will be described in the following sections. Due to the requirements of the McGill University, this document class does not support **two-sided printing or two-column page layout** .

## CHAPTER 3

### The document class options

#### 3.1 Font Size Options: 10pt, 11pt or 12pt

These are the font sizes that are available in the standard  $\text{\LaTeX} 2_{\epsilon}$  report document class. The 12pt font size is the preferred option for the final typeset version of the document. Obviously, only one of these options should be used in the `\documentclass` command. The 12pt option is selected by default if none of these options are specified in the `\documentclass` command.

## CHAPTER 4

### Title Page

The document preamble is the part that occurs before the `\begin{document}` statement. Throughout the document, information about the author, the title, etc., is **required**. The following commands are used in the document preamble to define all of the required text strings that are used to personalize the document.

- `\SetTitle{text}` :This is the title as it appears on the title page. The title must be entered using all upper-case letters. Line-breaks can be entered in the title by using the `\\` command.
- `\SetAuthor{text}` :The author's name, using capital letters where appropriate.
- `\SetDegreeType{text}` :Something like "Master of Science" or "Doctor of Philosophy".
- `\SetDepartment{text}` :The department or faculty
- `\SetUniversity{text}` :McGill University
- `\SetUniversityAddr{text}` :Montreal, Quebec
- `\SetThesisDate{text}` :Date of your thesis
- `\SetRequirements{text}` :Text of requirements statements
- `\SetCopyright{text}` :Copyright Statements

## CHAPTER 5

### The Thesis FrontSection

In this section, we present the commands used to add all pages prior to the first chapter of the thesis. Some of these commands are required while some of them are optional.

#### 5.1 Title page(required)

The command `\maketitle` formats the title page.

#### 5.2 Dedication

The optional dedication can be inserted by using the command `\SetDedicationName{text}`, `\SetDedication{text}` and `\Dedication`, where `text` is the contents of the dedication.

#### 5.3 Acknowledgments

In order to format the optional acknowledgments, use the command `\SetAcknowledgeName{text}`, `\SetAcknowledge{text}` and `\Acknowledge{text}`. The title "ACKNOWLEDGMENTS" is automatically added to the table of contents.

#### 5.4 Table of Contents, List of Tables and Figures(required)

These lists are generated with the commands `\tableofcontents`, `\listoftables` and `\listoffigures`. The titles of these lists may be changed by renewing the `\TOCHeading{text}`, `\LOTHeading{text}`, and the `\LOFHeadling{text}` macros, respectively.

#### 5.5 Abstract(required)

This command, which actually is an environment, sets up the required text for the abstract. The proper use is : `\SetAbstractEnName{text}` for the heading of the

abstract and `\SetAbstractEnText{text}` for the text of the abstract. The command `\AbstractEn` is used to incorporate the heading of the abstract and the abstract text into your document. `\SetAbstractFrName{text}`, `\SetAbstracFrText{text}` and `\AbstractFr` are the equivalent commands for the French abstract, and `\SetAbstractOtName{text}`, `\SetAbstracOtText{text}` and `\AbstractOt` are for an abstract in another language. And abstract in English and French are required by the University.



## CHAPTER 6

### The Thesis "Mainmatter"

In this section, we describe the commands used to format the main chapters of the thesis. Please refer to the sample thesis file `mcgilletdsample.tex` for examples of how these commands are used.

#### 6.1 Chapter Titles

Use the `\chapter` command to start a new chapter in the document. If the boolean `SetDSpace` is true, then the chapter will be typeset using double-spacing. In general, the class file sets the `SetDSpace` boolean appropriately so that the selection of singlespacing or double-spacing is transparent to the user. Note that the chapter title may extend over more than one line by using the following form: `\chapter[Title Line 1 \protect\newline Title Line 2]Title Line 1 \\\ Title Line 2`

#### 6.2 Section Headings

Use the `\section` command for first-level subheadings. Use the `\subsection` command for second-level subheadings. Since it may be difficult to distinguish third-level subheadings from second-level subheadings, it is suggested that the `\paragraph` command be used for all third-level subheadings. Note that the text of the heading may extend over more than one line. In this case, use the same command as shown for the `\chapter` command above.

### 6.3 Tables and Figures

Use the `\begin{table}` and `\end{table}` to contain a new table.

Use the `\begin{figure}` and `\end{figure}` to include a new figure. Captions must be placed above tables and below figures. `\TableCaption{text}` is for tables and `\FigureCaption{text}` is for figures. Please note that captions are required for both figures and tables, and must be supplied on a strictly one-to-one basis.

`\TableCaptionOpt{text1}{text2}` is another command for the similar use. Here, `text1` will appear in the list of tables; `text2` is the actual caption of a table. Similarly, `\FigureCaptionOpt{text1}{text2}` is for figures.

## CHAPTER 7

### The Thesis "Backmatter"

The following commands are used to control the appearance and content of appendices and other thesis end-matter. You might have to tailor some of these commands to suit your requirements. Use the `\ETDAppendix{Appendix}{text}` and `\ETDAppendix{Appendix}{text}` commands to add an appendix; you may have more than one appendix if necessary.

#### 7.1 List of References

We only support the BibTex tool. Use the `\bibHeading{text}` command to set the heading of your references. Use the `\bibliography{bibtexdatabase}` to incorporate your BibTex list. Use the `\bibliographystyle{text}` to set the citation style of your bibliography.

Here is a simple example to demonstrate the use of BibTex.

The following text and latex commands (in conjunction with the `mgilletd.bib` file included in the `mcgilletd` package):

These rather startling results were explained by subsequent research `~\cite{Ammons:001}` and were later separately confirmed `~\cite{Fishman:001}`.

produce:

These rather startling results were explained by subsequent research [?] and were later separately confirmed [?].

The references themselves are inserted in the document at the point of the `\bibliography{mcgilletd}` command (see the end of this document).

## CHAPTER 8

### Special Commands

The commands described in this section are used to aid in the commenting of the source file, and also describe support for special formatting. These commands are optional, in that they are not required in order to format the document.

#### 8.1 Automatically Generated Indices

Several commands have been included in this document class file to facilitate the creation of automatically generated lists with the MakeIndex program. Use this command in the document preamble to enable the creation of an index file. If only one index is to be created, then just use the `\makeindex` command. However, if there is to be more than one index, or it is desirable to name the index file something besides the default, use the following command `\makeindex[filename]`. A unique filename for each index must be assigned, so a `\makeindex[]` command should exist for each index, in the document preamble. Issue this command at the point in the document where the index is to be typeset. Typically, this will be after the lists of figures and tables (if included). The command creates a new chapter and sets up the initial page formatting for the list to be generated. The form of the `\printindex` command directly corresponds to the form of the `\makeindex` command used in the document. This is the command that is used to actually define what is going to be added to the index list. As with the other indexing commands

there are two forms that can be used, depending on how the `\makeindex` command was issued. For generating only one index file, use the command shown below `\indextext` to add to index. If there are more than one index files, or if a custom filename was used for the index, then the following form of the command must be used: `\index[filename]{text to add to index}`. Of course, for each index file that is created, a run of the MakeIndex program will be required.

## 8.2 Changing the Code . . .

It might be necessary to modify some of the commands defined in the documentclass. However, you do NOT have to (and SHOULD NOT!) edit the `mcgilletdclass.cls` file directly. Instead, place any commands you wish to create or modify in a file called `mcgilletdclass.cfg` and put it in the same directory as your main thesis file. The `mcgilletdclass` documentclass will automatically load this file. Please note that required commands must not be changed if your thesis is to be correctly converted to XML for the McGill EThesis Project.

## 8.3 An Example Thesis File

In order to typeset the example file, the following files should exist: `mcgilletdclass.cls`, `mcgilletdsample.tex`, `mcgilletd.bib`, `chick.eps`, and the additional packages described at the beginning of this document. (See the documentation for your local installation of L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> for information on how to install local customizations.)

Use the following commands to typeset the `mcgilletdsample` file:

```
latex mcgilletdsample
bibtex mcgilletdsample
latex mcgilletdsample
```

latex mcgilletdsample

## 8.4 Special Cases

An objective of the McGill Electronic Thesis Project is to create a means to ensure the long-term preservation and long-term accessibility of theses created at McGill University. The submitted theses will be archived as XML, which is a subset of SGML, a markup language for the interchange of structured data. The basis for SGML/XML is the description of the contents, not the layout. Therefore, the mcgilletdclass documentclass adds semantic support to text layout commands. Some of them are described as below:

- Emphasis ProperName

- i `\BProperName` is to set text to boldface; the text will be treated as a proper name.
- ii `\BIProperName` is to set text to boldface and italic; the text will be treated as a proper name.
- iii `\BIUProperName` is to set text to boldface, italic and underline; the text will be treated as a proper name.
- iv `\BUProperName` is to set text to boldface and underline; the text will be treated as a proper name.
- v `\IUProperName` is to set text to italic and underline; the text will be treated as a proper name.
- vi `\UProperName` is to set text to underline; the text will be treated as a proper name.

vii `\IProperName` is to set text to italic; the text will be treated as a proper name.

- Emphasis Technical Term

i `\BTechnicalTerm` is to set text to boldface; the text will be treated as a technical term.

ii `\BITechnicalTerm` is to set text to boldface and italic; the text will be treated as a technical term.

iii `\BIUTechnicalTerm` is to set text to boldface, italic and underline; the text will be a treated as technical term.

iv `\BUTechnicalTerm` is to set text to boldface and underline; the text will be treated as a technical term.

v `\IUTechnicalTerm` is to set text to italic and underline; the text will be treated as a technical term.

vi `\UTechnicalTerm` is to set text to underline; the text will be treated as a technical term.

vii `\ITechnicalTerm` is to set text to italic; the text will be treated as a technical term.

- Emphasis Title

i `\BTitle` is to set text to boldface; the text will be treated as a title.

ii `\BITitle` is to set text to boldface and italic; the text will be treated as a title.

iii `\BIUTitle` is to set text to boldface, italic and underline; the text will be a treated as title.



- iv `\BUTitle` is to set text to boldface and underline; the text will be treated as a title.
- v `\IUTitle` is to set text to italic and underline; the text will be treated as a title.
- vi `\UTitle` is to set text to underline; the text will be treated as a title.
- vii `\ITitle` is to set text to italic; the text will be treated as a title.
- **Emphasis ForeignWord**
  - i `\BForeignWord` is to set text to boldface; the text will be treated as a Foreign Word.
  - ii `\BIForeignWord` is to set text to boldface and italic; the text will be treated as a Foreign Word.
  - iii `\BIUForeignWord` is to set text to boldface, italic and underline; the text will be a treated as Foreign Word.
  - iv `\BUForeignWord` is to set text to boldface and underline; the text will be treated as a Foreign Word.
  - v `\IUForeignWord` is to set text to italic and underline; the text will be treated as a Foreign Word.
  - vi `\UForeignWord` is to set text to underline; the text will be treated as a Foreign Word.
  - vii `\IForeignWord` is to set text to italic; the text will be treated as a Foreign Word.
- **Visual Emphasis**

- i `\BVisualEmphasis` is to set text to boldface; the text will be treated as Visual Emphasis.
  - ii `\BIVisualEmphasis` is to set text to boldface and italic; the text will be treated as Visual Emphasis.
  - iii `\BIUVisualEmphasis` is to set text to boldface, italic and underline; the text will be treated as Visual Emphasis.
  - iv `\BUVisualEmphasis` is to set text to boldface and underline; the text will be treated as Visual Emphasis.
  - v `\IUVisualEmphasis` is to set text to italic and underline; the text will be treated as Visual Emphasis.
  - vi `\UVisualEmphasis` is to set text to underline; the text will be treated as Visual Emphasis.
  - vii `\IVisualEmphasis` is to set text to italic; the text will be treated as Visual Emphasis.
- Quotation
  - i Use `\SingleInlineQuote` command to do ‘inline quote’.
  - ii Use `\DoubleInlineQuote` command to do “inline quote”.
  - iii Use `\begin{quote}` and `\end{quote}` for block quote
- Verse
  - i Use `\verse` command for verse.
- Lists
  - i Use `\begin{BulletList}` and `\end{BulletList}` commands to create bulleted lists.

- ii Use `\begin{RomanList}` and `\end{RomanList}` commands to create upper case Roman numbered lists.
  - iii Use `\begin{romanList}` and `\end{romanList}` commands to create lower case roman numbered lists.
  - iv Use `\begin{AlphList}` and `\end{AlphList}` commands to create upper case Alphabetical lists.
  - v Use `\begin{alphList}` and `\end{alphList}` commands to create lower case alphabetical lists.
  - vi Use `\begin{arabicList}` and `\end{arabicList}` commands to create arabic numbered lists.
- Formula
    - i Use `\begin{MathFormula}` and `\end{MathFormula}` commands to embed normal math formula as per the following example:

`\begin{MathFormula}`

`\begin{math}`

...

`\end{math}`

`\end{MathFormula}`

Example:

$$\bar{u} = \int_I^E g(x)dx \tag{8.1}$$

- ii Use `\begin{ChemFormula}` and `\end{ChemFormula}` commands for chemical formulae, similar to the above example.

```
\begin{ChemFormula}  
...  
\end{ChemFormula}
```

## 8.5 Testing figures and tables.

Table 8–1: The First Table

First	Second	Third	Fourth
12	26	12	33
17	93	88	3
12	26	12	33
12	26	12	33
12	26	12	33
17	93	88	3
12	26	12	33
12	26	12	33
12	26	12	33
17	93	88	3
12	26	12	33
12	26	12	33

Figure 8–1: My Little Chick

Figure 8–2: A Resized Figure

## CHAPTER 9

### TESTING FOOTNOTES

We will now work on testing footnotes.<sup>1</sup> And now let's add some spurious text so that we can have a second<sup>2</sup> footnote.

---

<sup>1</sup> This is the first footnote.

<sup>2</sup> This is the second footnote. To test if the footnote is typeset single-spaced, we add meaningless text until we can see a second line.

## CHAPTER 10

### Generating an Index

#### 10.1 Genereating an Index

If you want to generate an index, you will need the command `\makeindex[index]` in the preamble. Here, index can be any word named by users.

The command `\index[index]{entry}` is used to index entry at that point in the document. For example, the following code:

```
\makeindex[myindex1] ...
```

```
... Eigenvectors\index[myindex1]{eigenvector} ...
```

will produce output and place the entry ‘eigenvector’ in the myindex1.idx file with the associated page number.

The mcgill etd class redefines the command `\printindex` which should be placed at the point in the document where you want your index to appear. And `\printindex` command can be used as following:

```
\printindex[myindex1]{Index - appears in the table of contents}
```

```
{Index - will be the title of your index.}
```

```
{Some textual information you want to add the head of your index.}
```

Two index formats are defined. One is with leading dots, another is without dots. If you are also using BIBTEX and index without leading dots, you will need to do:

```
latex filename.tex
bibtex filename
makeindex -s mcgillpage.ist myindex1
latex filename.tex
latex filename.tex
```

## 10.2 Generating a list of abbreviations

Generating a list of abbreviations is similar to generating an index. Usually, items of an index follow by a page number. However, lists of abbreviations do not include page number at all. In this case, you have to use the following commands to generate a list of abbreviation:

```
\makeindex[ListOfAbbr]
\index[ListOfAbbr]{WWW@World Wide Web}
...
\printindex[ListOfAbbr]{List of Abbreviation}{List of Abbreviation}{}
```

You need to use makeindex to generate the list as below:

```
makeindex -s mcgillnopage.ist ListOfAbbr
```




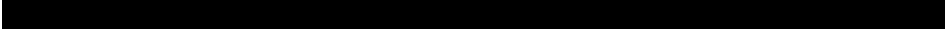

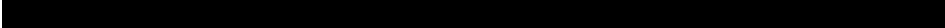

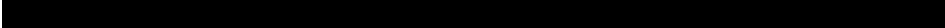

## CHAPTER 11

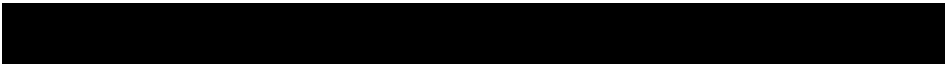




### Supporting TexShade

If you want to use TexShade, you will need to add an option "TexShade" to the `\documentclass[optionlist]{mcgilletdclass}`. And it looks like the following: `\documentclass[TexShade, 12pt, letterpaper]{mcgilletdclass}`. Then you should add the TexShade package into your thesis: `\usepackage{TexShade}`. Here is an example:

```
\begin{texshade}{alng.fasta}
\noblockskip
\hideconsensus
\end{texshade}
```

And you will get the following result:

seq1		50
seq2		49
seq1		100
seq2		99
seq1		150
seq2		149
seq1		200
seq2		199
seq1		250
seq2		249

seq1			300
seq2			299
seq1			350
seq2			349
seq1			400
seq2			398
seq1			450
seq2			436
seq1		482	
seq2		455	

## Appendix A

Here is the text of an Appendix.

## Appendix B

Here is the text of a second, additional Appendix