TITLE OF YOUR THESIS ON SEVERAL LINES IF NEEDED

A DISSERTATION
PRESENTED TO
THE ACADEMIC FACULTY

BY

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IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE
DOCTOR OF PHILOSOPHY IN THE
SCHOOL OF MECHANICAL ENGINEERING

Georgia Institute of Technology

January 2020

**TITLE OF YOUR THESIS
ON SEVERAL LINES IF NEEDED**

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Date Approved: January 1, 2020

It is my belief that nearly any invented quotation, played with confidence, stands a good chance to deceive.

<div align="right">

—Mark Twain

</div>

To Ted Striker,
whose valour and bravery
shall not be forgotten

Acknowledgements

"There are so many people trying to take credit for this I wouldn't know where to begin."

—Bill Murray

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SUMMARY

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Chapter 1
Introduction and Background

1.1 About this Template

This template is an adaptation `gatechthesis_latex` template (17 January 2017 update) and `ut-diss-2`. I've made some (mostly) aesthetic changes, but I believe it should conform to the requirements liseted in the Georgia Tech "Graduate Thesis/Dissertation Guidelines & Procedures" (April 2015 Update). It is by no means an official template, though. So as stated in the license file, you can use, change, distribute, sell it however you'd like, provided

1. You include the copyright notice in the license file; and

2. You hold none of the authors liable for any results of such use.

1.2 Basic Elements

This section talks about common components (figures, tables, and equations), and how they're included in LaTeX documents. Much better and more complete resources are available elsewhere, but hopefully this enough to get started.

1.2.1 Figures

Figures are included with the `figure` environment. They are floats, which means that they will appear wherever LaTeX thinks is best based on the surrounding text. You can tinker with this positioning, but the details are out of scope. A quick example will give most of the salient details. The following code will give the results in Fig. 2.1.
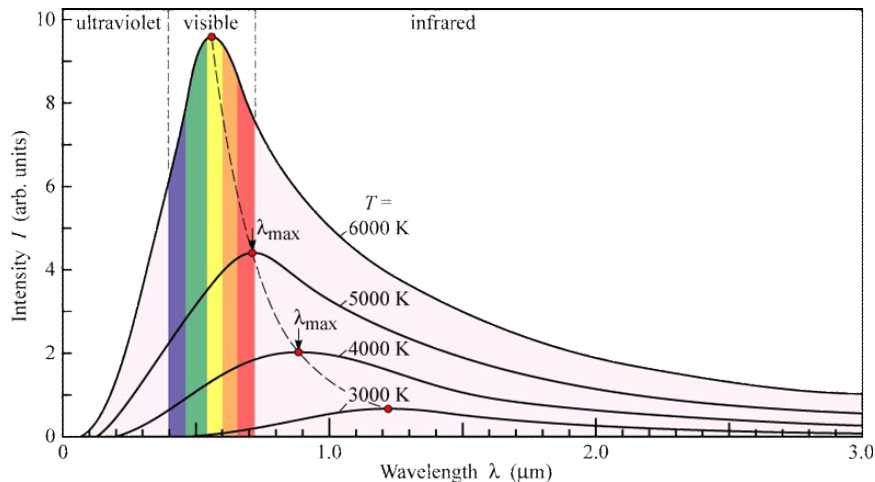
FIGURE 1.1: This is a long caption. It's too long for the table of contents, so we specify a short caption in the brackets.

```
\begin{figure}
  \centering
  \includegraphics[width=0.75\linewidth]{figures/exampleFigure.png}
  \caption[Short Caption]{This is a long caption. It's too long
        for the table of contents, so we specify a short caption
        in the brackets.}
  \label{fig:IntensityVsWavelength}
\end{figure}
```

Note the use of a short caption in brackets in the `\caption` command. This lets us have a long explanatory caption, without keeping our List of Tables compact (compare the caption of Fig. 2.1) with how it's listed on page viii.

1.2.2 Tables

1.2.3 Equations

I recommend using the `align` environment exclusively for equations. It's virtually identical to `equation`, but allows you to have multiple lines and specify where you want them to—well—*align* with each other. Compare the following

```
\begin{equation}
  a^{2} + b^{2} = c^{2}
\end{equation}
```

```
\begin{align}
  a^{2} + b^{2} = c^{2}
\end{align}
```

$$a^2 + b^2 = c^2 \tag{1.1}$$

$$a^2 + b^2 = c^2 \tag{1.2}$$

1.3 Cross-Referencing

One of the chief advantages of LaTeX is how easy it makes cross-references. Sure, this can be done in Word, but if you've tried messing with field codes, you probably sensed that there was probably an easier way. In this template items are referenced using `cleveref` and `hyperref` packages. For example, suppose we type for an equation

```
\begin{align}
  i\hbar\frac{\partial}{\partial t}\psi
  &=
  \left[ \frac{-\hbar^{2}}{2m}\nabla^{2} + V\right]\psi\,.
  \label{eqn:SchrodingerEquation}
\end{align}
```

which prints as

$$i\hbar\frac{\partial}{\partial t}\Psi = \left[\frac{-\hbar^2}{2m}\nabla^2 + V\right]\Psi\,. \tag{1.3}$$

To refer to this equationlater on, we type `\cref{eqn:SchrodingerEquation}`, which prints as Eq. (2.1).

The `cleveref` package allows you to define how the refereces print out, e.g., Eq. 1 vs. eq. (1); or Figure 1 vs. fig. 1, etc. The `hyperref` package makes it so that all your references are clickable. So if you reference, for example, Fig. 2.1 a few pages later, clicking it will jump back to the figure (try it). Unfortunately there's no "back" button, so if you jump back, you have to manually scroll forward.

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TABLE 1.1: This is an example Table.

x	$f(x)$	$g(x)$
1	6	4
2	6	3
3	6	2
4	6	2

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Chapter 2
Some Formatting Items

This chapter serves as a brief explanation of basic document elements, as well as a demonstration of their inclusion in the document. Note that many of these items are stylistic choices that either

- I have found is the best option for my use; or

- I think looks the best.

As with any aesthetic opion, mine may be uninformed, mistake, wrong, etc. But that's just, like, your opinion man.

2.1 Basic Elements

This section talks about common components (figures, tables, and equations), and how they're included in LaTeX documents. Much better and more complete resources are available elsewhere, but hopefully these will provide some amount of introduction.[†]

2.1.1 Figures

Figures are included with the `figure` environment. They are floats, which means that they will appear wherever LaTeX thinks is best based on the surrounding text. You can tinker with this positioning, but the details are out of scope. A quick example will give most of the salient details. The following code will give the results in Fig. 2.1.

[†]For instance, if you know the distinction between TeX and LaTeX, there's probably not too much of value for you here. But please send me an email so I can ask you to explain why `\hspace` never works like I want it to.
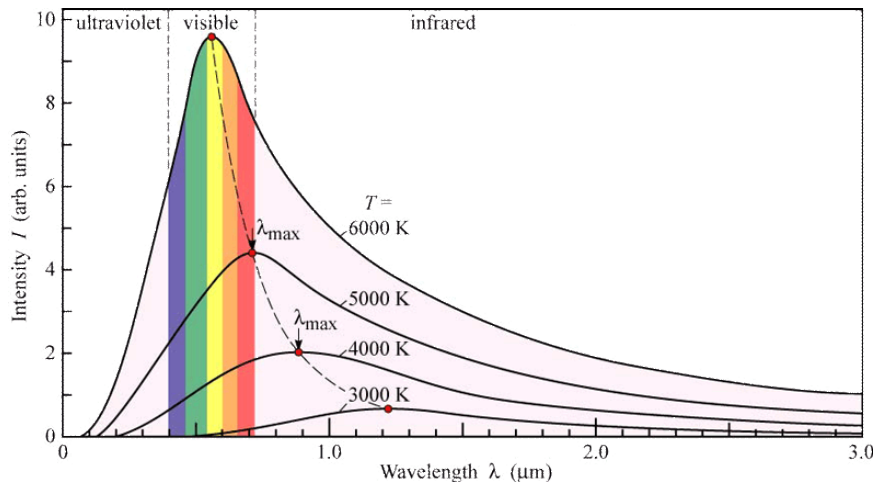
FIGURE 2.1: This is a long caption. It's too long for the table of contents, so we specify a short caption in the brackets.

```
\begin{figure}
  \centering
  \includegraphics[width=0.75\linewidth]{figures/exampleFigure.png}
  \caption[Short Caption]{This is a long caption. It's too long
          for the table of contents, so we specify a short caption
          in the brackets.}
  \label{fig:IntensityVsWavelength}
\end{figure}
```

Note the use of a short caption in brackets in the `\caption` command. This lets us have a long explanatory caption, without keeping our List of Tables compact (compare the caption of Fig. 2.1) with how it's listed on page viii.

For large figures, it might be necessary to display it sideways (i.e., in landscape). If only the figure is to be done this way, the `\sidewaysfigure` environment may be used:

```
\begin{sidewaysfigure}
  \centering
  \includegraphics[width=0.5\textwidth]{figures/exampleFigure.png}
  \caption[Sideways Example Figure]{This is another example Figure,
  rotated to landscape orientation.}
  \label{LandscapeFigure}
\end{sidewaysfigure}
```

The result of this code is shown in Fig. 2.2. Note that this figure will occupy the

entire page. If you'd like to have landscape text as well, consider using the `lscape` or `pdflscape` packages.

2.1.2 Math

Math in LaTeX is typeset in two ways:

1. **Display Mode** This is for equations that will appear on their own line, usually centered. Equations in display mode are typeset larger and have numbers by default.

2. **Inline Mode** For symbols and short expressions that are to be displayed in running text.

2.1.2.1 Display Mode

There are several environments for specifying display equations. The original TeX used $$ · $$, while LaTeX uses \[· \]. These still work, but TeX primatives should be avoided (unless you know what you're doing) to avoid compatibility problems with newer packages. If you're using LaTeX, the `equation`, `eqnarray`, and `align` environments are your friends. I recommend using the `align` environment exclusively for equations. It's virtually identical to `equation`, but allows you to have multiple lines and specify where you want them to—well—*align* with each other using the & character. For example:

```
\begin{align*}
  c &= \sqrt{ a^{2} + b^{2} } \\
    &= a\sqrt{1 + (a/b)^{2}}\,.
\end{align*}
```

$$c = \sqrt{a^2 + b^2}$$
$$= a\sqrt{1 + (a/b)^2}\,.$$

2.1.2.2 Inline Mode

For text that is to diplay inline, use $ · $. For instance

```
Here, $m$ is the mass, and
$\ddot{x}$ is the acceleration.
```

Here, m is the mass, and $\ddot{x}$ is the acceleration.

While it is possible to typeset equations inline, this is sometimes a poor aesthetic choice, as it will cause the math to look a bit cramped and often alter the linespacing.

```
The fundamental theorem says that
$\int_{a}^{b}{f(x)\,\mathrm{d}x}
= F(b) - F(a)$, though this is
really a special case of Stokes'
theorem, named for Irish physicist
George Stokes.
```

The fundamental theorem says that $\int_a^b f(x)\,\mathrm{d}x = F(b) - F(a)$, though this is really a special case of Stokes' theorem, named for Irish physicist George Stokes.
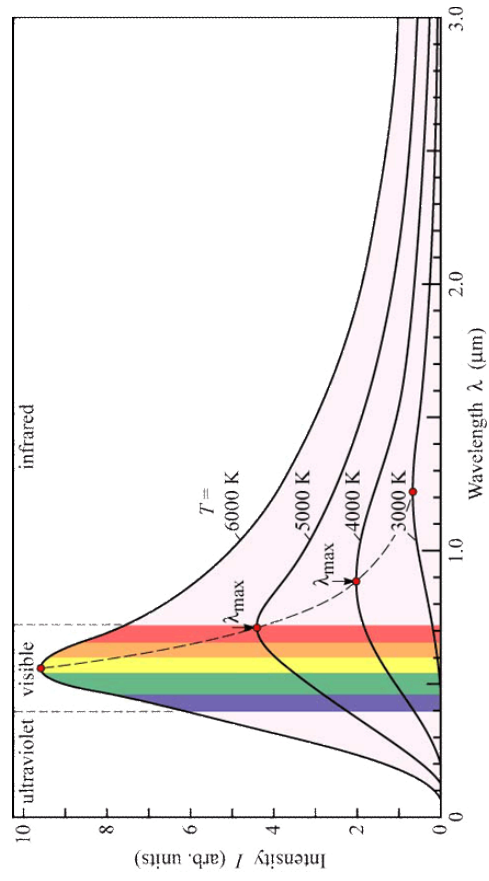
FIGURE 2.2: This is another example Figure, rotated to landscape orientation.

TABLE 2.1: This is an example Table.

x	$f(x)$	$g(x)$
1	6	4
2	6	3
3	6	2
4	6	2

2.1.3 Tables

Tables are kind of a pain in LaTeX. There are some utilities that allow you to create a table and export the code, but I don't have much experience with these. Table 2.1 shows a simple table; note that the caption must appear *above* the table. I do not like this convention, but there it is.

2.2 Cross-Referencing

One of the chief advantages of LaTeX is how easy it makes cross-references. Sure, this can be done in Word, but if you've tried messing with field codes, you probably sensed that there was probably an easier way. In this template items are referenced using `cleveref` and `hyperref` packages. For example, suppose we type for an equation

```
\begin{align}
  i\hbar\frac{\partial}{\partial t}\psi
  &=
  \left[ \frac{-\hbar^{2}}{2m}\nabla^{2} + V\right]\psi\,.
  \label{eqn:SchrodingerEquation}
\end{align}
```

which prints as

$$ i\hbar\frac{\partial}{\partial t}\Psi = \left[\frac{-\hbar^2}{2m}\nabla^2 + V\right]\Psi\,. \tag{2.1}$$

To refer to this equationlater on, we type `\cref{eqn:SchrodingerEquation}`, which prints as Eq. (2.1).

The `cleveref` package allows you to define how the refereces print out, e.g., Eq. 1 vs. eq. (1); or Figure 1 vs. fig. 1, etc. The `hyperref` package makes it so that all your references are clickable. So if you reference, for example, Fig. 2.1 a few pages later,

clicking it will jump back to the figure (try it). Unfortunately there's no "back" button, so if you jump back, you have to manually scroll forward.

2.3 Section

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

This is the second paragraph. Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

And after the second paragraph follows the third paragraph. Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

After this fourth paragraph, we start a new paragraph sequence. Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original

language. There is no need for special content, but the length of words should match the language.

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

2.3.1 Example Subsection

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

2.3.1.1 Example Subsubsection

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

2.4 God, *Another* Section???

Chapter 3
Results

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Chapter 4
Discussion

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Chapter 5
Conclusion

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Appendices

Appendix A
Experimental Equipment

Per the handbook, numbering of figures and tables (and presumably equations) may be sequential throughout the document or prefixed with the chapter number. The second option is used in this template, and so for appendices, a letter is used. For instance

$$a^2 + b^2 = c^2,$$ (A.1)

and for figures, see Fig. A.1.[†]

A.1 Section of Appendix
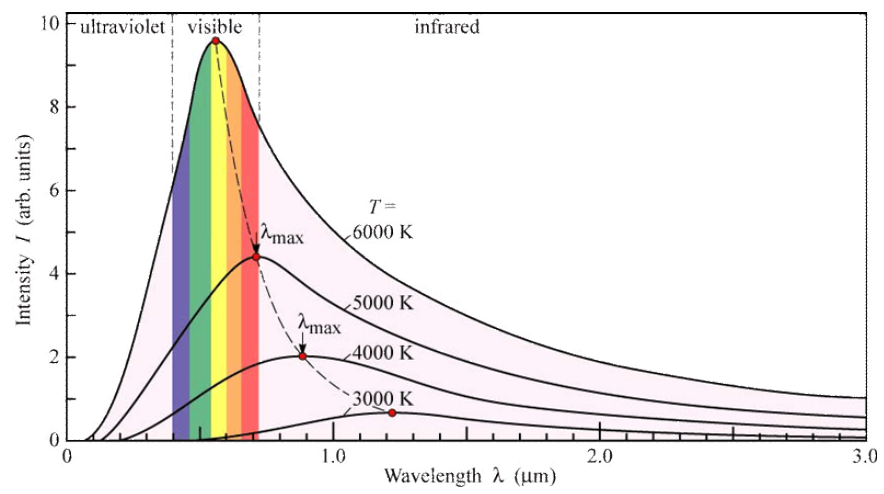

[†]Does it look familiar? See also Fig. 2.1

Figure A.1: Using this same graph to show how appendix figures are handled.

Appendix B
Data Processing

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Bibliography

[1] B. W. Kernighan and D. M. Ritchie, *The C Programming Language Second Edition* (Prentice-Hall, Inc.) (1988).

[2] G. P. Burdell, *Myths and Their Origins Plus Some Extra Words to Make the Title Really Long and Extend to the Next Line* (Real Books, Inc.) (2017).

Vita

Vita may be provided by doctoral students only. The length of the vita is preferably one page. It may include the place of birth and should be written in third person. This vita is similar to the author biography found on book jackets.