

BE 6000: Lab Report Guidelines



Lab Report Preparation

Bioengineering 6000 CV Physiology

Organization of All Lab Reports

- Structure;
 - Intro/overview
 - Methods
 - Results and observations
 - Discussion
- Writing
 - Clear, concise, factual, precise
 - Careful wording for accuracy
 - Facts over opinion
 - Use this chance to develop your science writing style
 - Use your own words--do not use text from other sources!



Lab Report Preparation

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Discussion Section

- Purpose:
 - Summarize observations and attempt mechanistic explanations
 - Tie the points of the Introduction to the data in Results
- Approach:
 - Begin with a restatement of the purpose of the lab
 - Make statements, then back them up
 - Base statements on your data first, only secondarily the textbook
 - Speculation is acceptable, as long as the logic is sound and the data support the argument
 - Belief is irrelevant without proof!
 - End with a summary and (optionally) look forward



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Teleology (and Causality)



- Definitions:
 - “A thing, process or action is teleological when it is for the sake of an end, i.e., a telos or final cause.”
 - “The use of ultimate purpose or design as a means of explaining phenomena.”
- The Problem:
 - Suggests causality that is not present or for which there is no evidence
 - Suggests the notion of design, of a system changing to meet some goals



<http://www.answers.com/topic/teleology>

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Teleology Examples

“The function of the left ventricle is to pump the blood to the whole body, accordingly higher pressure is required. **For this reason**, the semilunar cusps of the aortic valve are larger and thicker than those of the pulmonic valve.”

“One initial observation is that the right lung is much larger than the left lung. This makes sense physiologically since the heart is generally located on the left side of the body; **therefore to optimize lung capacity**, the right lung has more room inside of the body to grow.”

“Therefore, the trabeculation would ..., and is perhaps a method of **the body conserving cells for more important tissue**.”

“**The purpose could be to prevent** these branches from collapsing during respiration thus ensuring a more even flow of gasses through the entire organ.”



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Good Report Writing Technique

- Prior to write-up
 - Identify the lab purpose
 - Compile a list of major questions from the lab
 - Develop an outline
- The write-up
 - State the lab purpose
 - Answer all questions asked in the lab
 - Refer to your outline
- Post write-up
 - PROOF READ
 - Review ‘lab comments’

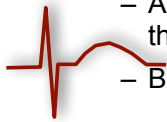


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Report Structure

- Write your report addressing the goal(s) of the lab
- Paragraphs:
 - begin with a summary statement
 - expand with details in the middle
 - end with a summary and transition
- Put the most important words/ideas at the beginning
 - start a section with most important paragraph
 - start a paragraph with the most important sentence
 - start a sentence with the most important words
- Use outlines for structure:
 - to organize your thoughts BEFORE you write
 - and to analyze your flow AFTER you write
- Pay attention to what goes in each section.
 - Methods belongs in methods, not results.
 - Some discussion in results is fine.
 - Any point included in the introduction, should be addressed somewhere again in the report, usually discussion section
 - But avoid explicit and pointless repetition



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General Rules I

- Never use contractions
- Verb tense:
 - In general, use past tense to report methods and results, anything actually performed or measured
 - Use present tense only for statements of general truth
- Avoid excessive use of first person (I, we, us, our)
- Active vs. Passive Voice:
 - “Through dissection, it could be speculated how each aspect of the heart and lung could contribute to their functions such as...” (Passive)
 - “Dissection allows speculation regarding how each aspect of the heart contributes to its respective function.” (Active)



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General Rules II

- Take your report seriously
 - Avoid colloquial or conversational language
 - Humor and jokes do not belong in your report
- Avoid broad generalization, hyperbole
 - Keep statements to what you know. Be careful what you infer to “all”, “every”, etc.
- Use technical words precisely, e.g., significant, efficient
 - Include quantification or modifying words
- Describe objectively rather than subjectively
 - e.g., Explain why it was difficult to find a structure rather than your impression that it was difficult, or why something was surprising rather than the impression of surprise
- Complete comparisons: e.g., “more potent” (than what?)
- Avoid ambiguous “this” references, always complete with a noun

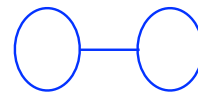


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Discher** Dumbbell of Shame:



- Do not use the same word repetitively when in close proximity:
- Example
 - “To finish up the dissection of the heart, the aortic valve was dissected.”
 - “Detailed examination of the aortic valve concluded the dissection of the heart.”

**In honor of Mr. Kevin Discher, who graded Brian's (former TA) high school American Lit. Honors papers far more belligerently than anything he ever graded our students.



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Superfluous Information:

- Avoid uninformative statements (especially those related to personal experience):
 - “We then took a few moments to identify what each of the vessels were.”
 - “This lab was unique because it was the first the preparer had ever done on heart and lungs.”
 - “This valve has an obvious structure that is not so obvious from the picture.”



Use of Pronouns

- When using pronouns, make sure they are easily identified with their associated noun:
 - “The tricuspid valve is the barrier between the right atrium and ventricle, which was also dissected to observe its role in pumping blood.”
 - From sentence structure ‘which’ and ‘its’ appear to refer to the tricuspid valve, but the reader’s intention was the right atrium.



Text Formatting

- Avoid double column format
- Refer to all figures in text by number
- Include page numbers
- Experiment with header and footers
- Use full justification and hyphenation
- Word processing systems: know your tools
 - Word
 - Pages
 - LaTeX

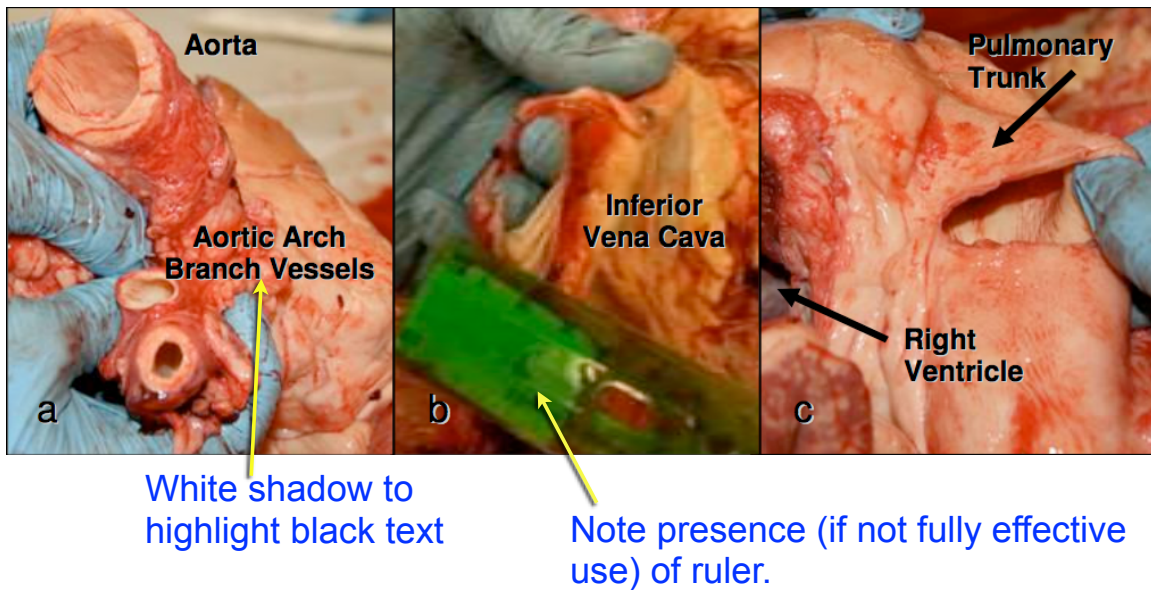


Figure Formatting

- Figures captions:
 - Required
 - Located at bottom of figure
 - Start with title, then include adequate details to understand content of the figure without needing to view text
- Figures often need labels (arrows and text)
- Crop and zoom figures to show only what is relevant
- Incorporate figures and tables in the text
- Figures need scale: rulers or other size markers
- All measurements in SI system



Figure Layout

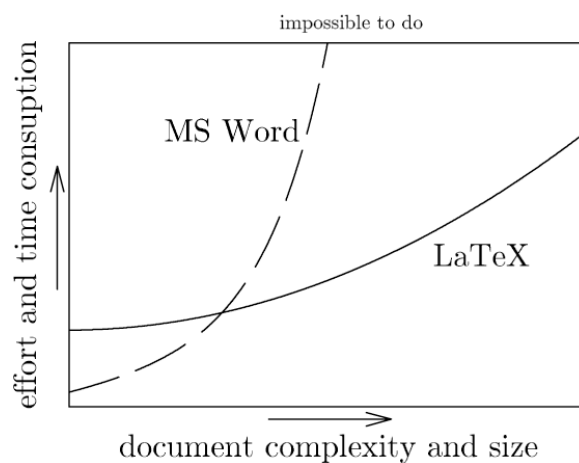


Lab Report Preparation

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Text Tools

L^AT_EX
VS



The LaTeX Philosophy

Separate the writing from the document creation

Let the computer keep track of things

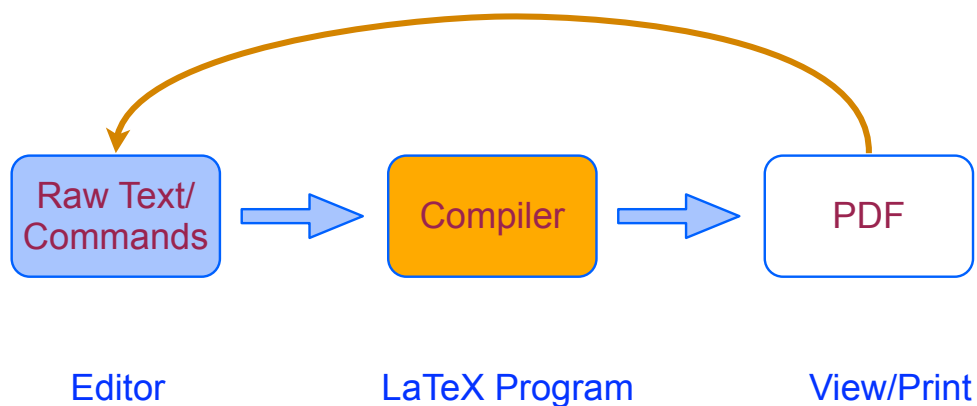
Support clean structure

Make shareable document and shareable templates

Extend the language through packages

Visible markup is more powerful than hidden “smart”
commands

The LaTeX Process



The LaTeX Process

```
\begin{document}

\title{Notes for Lab \#1: Dissection}
\author{2012: Rob, Brian, Brett, and the legacy of great TA's}
\maketitle

\tableofchildlinks

\section{Introduction}

This Lab allows you to identify and compare the size, shape and tissue type
of the major anatomic landmarks of the heart and lungs. The goal of the
lab is not, however, just to observe anatomy but to associate structure
with function. The heart is a pump for blood that comes into the right
atrium, goes out through the right ventricle, returns through the left
atrium, and leaves again through the left ventricle. Imagine this is all
the information you had and imagine you are the first person to be permitted
to dissect one. Try and figure out what the various components are, how
each works, especially how the shape, composition, and even texture of
each part contributes to its function.

\section{Reference material}

\begin{itemize}

\item \htmladdnormallink{www.hometrainingtools.com}
      {http://www.hometrainingtools.com/article.asp?ai=1318&bhcd2=1263563424}
      from the \htmladdnormallink{Home Science Tools}
      {http://www.hometrainingtools.com} web site.
\item
\htmladdnormallink{www.gwc.maricopa.edu/class/bio202/heart/anthrt.htm}
{http://www.gwc.maricopa.edu/class/bio202/heart/anthrt.htm} from the
\htmladdnormallink{Biological Sciences Home Page}
{http://www.gwc.maricopa.edu/class/bio202/index.htm}
```

Bioengineering 606: Preparations

Mechanics: Writing

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The LaTeX Process

Notes for Lab #1: Dissection

2012: Rob, Brian, Brett, and the legacy of great TA's

January 11, 2012

1 Introduction

This Lab allows you to identify and compare the size, shape and tissue type of the major anatomic landmarks of the heart and lungs. The goal of the lab is not, however, just to observe anatomy but to associate structure with function. The heart is a pump for blood that comes into the right atrium, goes out through the right ventricle, returns through the left atrium, and leaves again through the left ventricle. Imagine this is all the information you had and imagine you are the first person to be permitted to dissect one. Try and figure out what the various components are, how each works, especially how the shape, composition, and even texture of each part contributes to its function.

2 Reference material

- www.hometrainingtools.com from the Home Science Tools web site.
- www.gwc.maricopa.edu/class/bio202/heart/anthrt.htm from the Biological Sciences Home-Page
- Both lung photos faculty.washington.edu/kepeter/119/images/lung.sections.htm and heart photos faculty.washington.edu/kepeter/119/images/heart.sections.htm from Karen Petersen at the University of Washington.
- Even a YouTube video

Figure 1 shows a diagram for the cow heart geometry that will be useful during the dissection.

Bioengineering 606:

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The LaTeX Process

```
\begin{document}
```

```
\title{Notes for Lab \#1: Dissection}
\author{2012: Rob, Brian, Brett, and the legacy of great TA's}
\maketitle
```

```
\tableofcontents
```

```
\section{Introduction}
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```

```
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      {http://www.hometrainingtools.com/article.asp?ai=131&bhcd2=1263563424}
      from the \htmladdnormallink{Home Science Tools}
      {http://www.hometrainingtools.com} web site.
```

```
\item \htmladdnormallink{www.gwc.maricopa.edu/class/bio202/heart/anthrt.htm}
      {http://www.gwc.maricopa.edu/class/bio202/heart/anthrt.htm} from the
      \htmladdnormallink{Biological Sciences HomePage}
      {http://www.gwc.maricopa.edu/class/bio202/index.htm}
```

```
\item Both lung photos
      \htmladdnormallink{faculty.washington.edu/kepeter/119/images/lung
      \sections.htm}
      {http://faculty.washington.edu/kepeter/119/images/lung_sections.htm} and
      heart photos
      \htmladdnormallink{faculty.washington.edu/kepeter/119/images/heart
      \sections.htm}
      {http://faculty.washington.edu/kepeter/119/images/heart_sections.htm}
      from Karen Petersen at the University of Washington.
```

```
\item Even a \htmladdnormallink{YouTube video}
      {http://www.youtube.com/watch?v=z3UHpVJ3Mns}
```

```
\end{itemize}
Bioengineering 6061: Presentations
```

Notes for Lab #1: Dissection

2012: Rob, Brian, Brett, and the legacy of great TA's

January 11, 2012

1 Introduction

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- Even a YouTube video

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Mechanics of Writing

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What LaTeX Keeps Track Of

```
\section{Methods}
\label{sec:meth}
```

In the methods in
Section~\ref{sec:meth}

4. Methods

In the Introduction in
Section 4,

What LaTeX Keeps Track Of

Sections (6 levels)

Page numbers

Figures

Tables

Lists and list items

Equation numbers

Figures

```
\begin{figure}[!ht]
\centering
\includegraphics[width=100mm]
{./Figures/NonConformal}
\caption{\label{fig:Conformal}}
\textbf{A comparison of the replicated
boundary between two material types
using conformal, or a boundary fitting
meshing algorithm, and without conformal
meshing techniques. } The solid red line
in this figure represents the original
boundary between the two materials.
Figure A shows a meshing algorithm ... }
\end{figure}
```

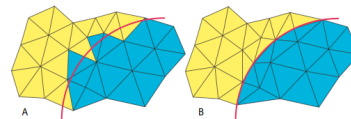
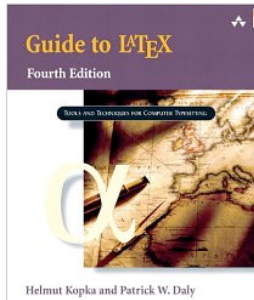


Figure 1: A comparison of the replicated boundary between two material types using conformal, or a boundary fitting meshing algorithm, and without conformal meshing techniques. The solid red line in this figure represents the original boundary between the two materials. Figure A shows a meshing algorithm that does not attempt to preserve the interface during the tessellation of the volume, but reconstructs the boundary post-tessellation. Figure B shows a conformal mesh that attempts to preserve the boundary by placing nodes directly on the interface.

How to Learn LaTeX



The Not So Short Introduction to $\text{\LaTeX}$ 2 ϵ

Or $\text{\LaTeX}$ 2 ϵ in 157 minutes

Rob's LaTeX Page

Rob's favorite links to all things LaTeX.

<http://www.sci.utah.edu/~macleod/latex/>

Basic Documentation

- Guide To LaTeX by Kopka and Daly. 4th edition is current. This is my personal favorite.
- LaTeX: A Document Preparation System by Leslie Lamport (2nd edition) is a classic; the original from the author of LaTeX.
- pdfLaTeX: the main source of information from TUG.
- pdfTeX manual (in pdf) and the pdfTeX FAQ collection (in pdf)
- How I like to use figures in LaTeX
- My own sample.tex file
- CVRTI LaTeX Local Guide, also in single sided and double sided postscript files.
- Mac Users Guide to LaTeX links to everything about using LaTeX on the mac.
- The LaTeX Navigator
- A LaTeX manual from Emory University

Getting the Software

There are many sources for LaTeX, almost all of them free. Here are some I, or people I respect, have used:

- MacOSX: MacPorts, the first choice for all free OSX software
- TeXLive package documentation in MacPorts. Check this as there are too many different TeXLive bundles and one has to choose carefully.
- MacOSX: TeXShop: a TeX previewer for Mac OS X.
- Windows: MikTeX, this is the dominant freeware version of LaTeX for Windows. Use WinEdt as the editor.
- Windows: WinEdt is the editor of choice to go with MikTeX
- CTAN the comprehensive TeX archive (UNC mirror)
- LaTeX home page TeX is also available via MacPorts It is no longer the package of choice—try TeXLive instead, available through Macport
- TeX Users Group (TUG)

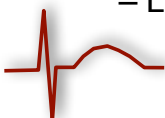
Bioengineering 6061: Presentations

Mechanics of Writing

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Lab Reports for LaTeX Users

- Try to manage figure placement
 - use [htb] option
 - adjust figure width based on \columnwidth parameter
- Watch out for spacing oddities
 - Figure~\ref{fig:figure1}
 - 14~mm
- Use labels and references
 - \label{fig:figure1} -- Figure~\ref{fig:figure1}
 - \label{sec:introduction} -- Section~\ref{sec:introduction}
- To learn more:
 - <http://www.sci.utah.edu/~macleod/latex/>
 - Lab template (linked to class web site)



Plagiarism

- Unacceptable
- We anticipate similar figures/tables within groups
- Each individual is responsible for producing their own report (all sections)
- Consider this the **one and only** warning

