BIOL 5380
Topics in Biomechanics
LaTeX and Writing Advice Following First MP

1 Writing a scientific paper

Most folks do pretty well with the "writing" writing (i.e., style, grammar, clarity), however, most folks missed some of the big ticket items that **should** be in a scientific report. Most often, folks missed the mark by not presenting any analysis of results. A results section always reports data, not just a written representation of what happened during the experiments. One should describe the figures that demonstrate the results, however, data need to be reported in the results.

For instance, the results section of the MP1 report required—if one were to answer the questions asked—to analyze stiffness according to a number of parameters for two material. Not many folks even reported stiffness values. Presenting the result values and representing them graphically is the basis of a results section. This is the opportunity for you to use those new R skills to analyze and put results into figures. I've gone ahead and produced something in R that would produce data frames and figures for beam analysis that go a long way in accomplishing analysis and graphical representation. Please use this as inspiration for the next MPs and final project.

Other more minor issue will likely be cleared up if folks read this very good guide from Nature that describes how to write a scientific paper. tf can be found here.

2 Margins

The margins of many documents were unreasonably large.

Use the geometry package as was done here for this document.

```
\usepackage[left=2 cm,top=2 cm,right=2 cm,bottom=3 cm,nohead]{
    geometry}
```

3 Figures

3.1 Figures vs. graphics

Some folks are inserting graphics, however, not as figures. With figures you can label the graphics and make references in the text. For instance, should you want to insert a figure (that

is [Figure 1]) demonstrating the behavior of stranded biomaterials under significant wind shear, one needs to insert the figure:

Figure 1: Behavior of a keratin- vs. cellulose-based biomaterial in significant wind shear

```
 \begin{figure}[h!]
\centering
  \includegraphics[width=.5\linewidth]{trump.jpeg}
  \captionof{figure}{Behavior of a keratin- vs. cellulose-based
    biomaterial in significant wind shear}
  \label{fig:trump}
```

Notice the "label" tag. Once that's in place, one only needs to insert the "autoref" tag like so:

```
\autoref{fig:trump}
```

to have the figure reference in the text and with an automatic figure number. Notice also the "caption" tag using the "caption" package. See this in preamble:

```
\usepackage{caption}
```

Some folks may want to wrap their figures by the text to save space. This works well with the "wrapfig" package. For example, here's a familiar graphic ([Figure 2]) with a lot of dummy text.

```
\begin{wrapfigure}{r}{0.4\textwidth} %this figure will be at the
   right
    \centering
    \includegraphics[width=0.4\textwidth]{ihateexcel}
    \captionof{figure}{Excel is scary}
      \label{fig:excel}
\end{wrapfigure}
```

One needs merely to use the "wrapfig" environment like so:

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero, nonummy eget, consectetuer id, vulputate a, magna. Donec vehicula augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Mauris ut leo. Cras viverra metus rhoncus sem. Nulla et lectus vestibulum urna fringilla ultrices. Phasellus eu tellus sit amet tortor gravida placerat. Integer sapien est, iaculis in, pretium quis, viverra ac, nunc. Praesent eget sem vel leo ultrices bibendum. Aenean faucibus. Morbi dolor nulla, malesuada eu, pulvinar at, mollis ac, nulla. Curabitur auctor semper nulla. Donec varius orci eget risus. Duis nibh mi, congue eu, accumsan eleifend, sagittis quis, diam. Duis eget orci sit amet orci dignissim rutrum.

Figure 2: Excel is scary

3.2 Vector versus raster images

Always, always, always, always use vector graphics in documents. That means stay away from JPG, GIF, TIFF, PNG and other raster images if you can. With R or other programming platforms, you almost always can export or save figures as some sort of vector format (e.g., PDF, EPS, etc.). The difference between the two is that vector graphics scale with any zoom (i.e., resolution doesn't matter), however, rasters images don't (i.e., resolution does matter). For more on this, check out this link.

4 Tables

Tables should be inserted as text and referenced as a table, not a graphic. For instance, say you wanted to refer to a table of data (say Table 1), you could insert:

```
\\begin{table}[ht]
\centering
\caption{Model results requency versus speed}
\label{tab:bass}
\begin{tabular}{rllrrr}
  \hline
 & Initial value & Est. value & AICc & $\Delta$AIC & AIC weight \\
  \hline
1.1 & 0.25 & 0.541 & -205.28 & 18.97 & 0.00 \\
  1.2 & 0.6 & 0.543 & -205.29 & 18.96 & 0.00 \\
  1.3 & 0.8 & 0.543 & -205.29 & 18.96 & 0.00 \\
  2.1 & 0.25, 0.6 & 0.594, 0.643 & -224.25 & 0.00 & 0.29 \\
```

```
  2.2 & 0.25, 0.8 & 0.591, 0.636 & −223.44 & 0.81 & 0.19 \\
  2.3 & 0.6, 0.8 & 0.592, 0.645 & −224.20 & 0.05 & 0.28 \\
  3.1 & 0.25, 0.6, 0.8 & 0.479, 0.615, 0.635 & −223.79 & 0.46 & 0.23
     \\
   NA & NA & NA & −200.02 & 24.22 & 0.00 \\
    \hline
\end{tabular}
\end{table}
```

to produce . . .

Table 1: Model results requency versus speed

	Initial value	Est. value	AICc	ΔAIC	AIC weight
1.1	0.25	0.541	-205.28	18.97	0.00
1.2	0.6	0.543	-205.29	18.96	0.00
1.3	0.8	0.543	-205.29	18.96	0.00
2.1	0.25, 0.6	0.594, 0.643	-224.25	0.00	0.29
2.2	0.25, 0.8	0.591, 0.636	-223.44	0.81	0.19
2.3	0.6, 0.8	0.592, 0.645	-224.20	0.05	0.28
3.1	0.25, 0.6, 0.8	0.479, 0.615, 0.635	-223.79	0.46	0.23
NA	NA	NA	-200.02	24.22	0.00

Notice the "label" tag that permits a reference to be made in the text. Also not that each "cell" is separated by "&".

5 References

A link to a website is not a reference. Please, as was indicatted in the MP description, cite peer-review papers from the primary literature. This is easily done in LaTeX in a number of ways. This is adapted from the ShareLaTeX page on this topic:

```
\begin{thebibliography}{9}

\bibitem{latexcompanion}
Borri, A., Corradi, M. and Grazini, A., 2005. A method for flexural
   reinforcement of old wood beams with CFRP materials. Composites
   Part B: Engineering, 36(2), pp.143−153.

\bibitem{einstein}
Shang, J.K., Combes, S.A., Finio, B.M. and Wood, R.J., 2009.
   Artificial insect wings of diverse morphology for flapping−wing
   micro air vehicles. Bioinspiration & biomimetics, 4(3), p.036002.
```

```
\bibitem{knuthwebsite}
Alhayek, H. and Svecova, D., 2012. Flexural stiffness and strength of
    GFRP-reinforced timber beams. Journal of Composites for
    Construction, 16(3), pp.245-252.
\end{thebibliography}
```

To produce . . .

References

[1] Borri, A., Corradi, M. and Grazini, A., 2005. A method for flexural reinforcement of old wood beams with CFRP materials. Composites Part B: Engineering, 36(2), pp.143-153.

[2] Shang, J.K., Combes, S.A., Finio, B.M. and Wood, R.J., 2009. Artificial insect wings of diverse morphology for flapping-wing micro air vehicles. Bioinspiration & biomimetics, 4(3), p.036002.

[3] Alhayek, H. and Svecova, D., 2012. Flexural stiffness and strength of GFRP-reinforced timber beams. Journal of Composites for Construction, 16(3), pp.245-252.