Results and Discussion

- This is where you present your data, make your conclusions and propose future work.
- Your conclusions should closely resemble the objectives presented in your introduction.
- Your results should clearly support your conclusions.
Results and Discussion

- Two major styles
  - Separate Sections
  - Combined: Results and Discussion

- It is likely your major advisor will have an opinion on which style to use....
Results: Organization

- Make your results easy to read.
- Organize results using a style identical to your materials and methods.
  - Use identical headings and labels
  e.g. “Experiment 1” should always be called “Experiment 1”
- Present results in the same order as in your M and M.
Results and Discussion Tense Usage

- Use past tense for the results of your research (in this paper)
- Use present tense for previous results (assuming “universal truth”)
  - Rose chafers feed on numerous hosts (Brown et al. 1985)
  - Unless results are unique to a time and place and/or your results disagree with previous results
  - e.g. Smith et al. (1992) showed … but our results indicate ….
Results: Content

- “Just the Facts”
  - Avoid interpretation and/or flowery language

Do not say: Hemipteran species richness increased with habitat complexity completely nullifying Dr. Frankenstein’s postulate that “homogeneity breeds diversity”.

Do not say: It is clearly evident from Fig. 1 that hemipteran species richness increased with habitat complexity.

Instead: Hemipteran species richness increased with habitat complexity (Fig. 1).
Whenever possible provide the reader with a number.

- **Do not say:** Treatment A had a higher mean value than treatment B.
- **OK:** The mean value for treatment A was two fold greater than treatment B.
- **Better:** Mean values of 2 and 4 were observed for treatment A and B, respectively.
When presenting differences among treatments clearly state whether they are “numerical” or “significant” and list test statistic, degrees of freedom and P values whenever a statistical analysis was performed. These can be listed in the text, in a table, or both.

- **Numerical** e.g. “Although no significant difference was detected, the mean for treatment A was numerically higher than treatment B by a factor of 2 \((F = 2.2, df = 2,10, p = 0.10)\) (Table 1).”

- **Significant** e.g. “Treatment A was significantly higher than treatment B \((F = 223.2, df = 2,10, p < 0.001)\) (Table 1) with a two-fold higher mean value.”
Results: Content

- Use (Cite) your tables and figures!
  - e.g. Treatment A was significantly higher than treatment B with mean responses of 4 and 2, respectively ($F = 223.2, df = 2,10, p < 0.001$) (Fig. 1).

Tables and Figures should be Labeled in the order they occur in the text.

**Figure 1.** Mean widgets per w ngdoodle in experiment 1. Bars with different letters are significantly different at $p = 0.05$ (Tukey HSD).
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Use present tense for previous results (assuming “universal truth”)
  » Rose chafers feed on numerous hosts (Brown et al. 1985)
    – Unless results are unique to a time and place and/or your results disagree with previous results
      » e.g. Smith et al. (1992) showed … but our results indicate ….
Discussion

- The discussion should be the most fun section of your paper to read!
- This is where you interpret and discuss the broader meaning of your results, describe how your results relate to previous knowledge and suggest work that should be done in the future.
Discussion: Organization

- The Discussion should begin with the specifics of your research and move towards generalities.
- Talk about each conclusion in turn and then explain the significance of your conclusions to the:
  - Establishment or reinforcement of scientific principles
  - Generalizations that can be made
  - How your results compare to those of others
  - Theoretical and practical implications
Discussion: Questions to Address

- What is the meaning of your observations?

- What are the logical conclusions that can be drawn from your results?

- What is the broader context of your results?
Discussion: Questions to Address

- What is the meaning of your observations?

**Summarize:** important findings at the beginning
Discussion: Questions to Address

- What are the logical conclusions that can be drawn from your results? **For Each Result:**
  - **Describe:** Patterns, principles, and relationships
  - **Explain:** Relationships with expectations in the introduction (Agreement? Contradiction? Exception to the Rule?) and their plausibility
  - **Ask:** New questions based on your results
  - **Describe:** Additional research to resolve contradictions and answer new questions
Discussion: Questions to Address

What is the broader context of your results?

**Suggest:** Theoretical implications and practical applications of results

**Extend:** Findings to other circumstances, situations, and organisms

**Give:** “The big picture” how do your findings help us understand a broader topic?
Discussion: Questions to Address

What is the broader context of your results?

DISCLAIMER: DO NOT STRETCH THINGS TO FAR!
Be sure that your broader contexts are at least somewhat supported by your results and the findings of others!

Make sure each conclusion and is supported by evidence you have presented!

Discuss “pitfalls” in your results and/or reasons for unexpected findings!
Discussion: Concluding Statements

- Finish with concluding section(s) or paragraph(s)
  - SO WHAT!
  - Refer back to introduction and objectives to see what you thought was important
  - Broaden back out, opposite to how the introduction began broad and narrowed

- For example… “Given the information we have on …., we are now better able to design management systems for Colorado potato beetle. However…”
Results and Discussion (Combined)

- Use largely the same approach as in separate sections
- However, break each individual result into two sections:
  - A paragraph or two on results
  - A paragraph discussing results
  - One or more paragraphs at the end that provide the “SO WHAT?”
Assignments

- Day and Gastel, Chapters 12 and 13
- Revise Figures and Tables
- Write Results and Discussion
- Due April 2 (including Intro, Materials and Methods, References)