



# The typical anatomy of a paper:

- Title and authors
- Abstract/summary
- Introduction
- Materials and Methods
- Results
- Discussion
- Acknowledgements
- References
- Figures/Tables

# Title and authors

- Title is very descriptive (often states the main finding) and is not about being creative and “catchy”!
- Order of authors is important. What can you tell from it?
- Many PIs simply refer to work from other PIs’ labs...so as you keep a catalogue in your mind —DO associate work with lab.

Example:

VEGF, a prosurvival factor, acts in concert with TGF-beta1 to induce endothelial cell apoptosis.

[Ferrari G](#), [Pintucci G](#), [Seghezzi G](#), [Hyman K](#), [Galloway AC](#), [Mignatti P](#).

# Abstract/Summary

- Purpose for the study
- Major findings of the study
- Relationship between these findings and the field

# Introduction

- Presents the background information for a fellow scientist (possibly in another field) to understand why the findings of this paper are significant.
- Structure is usually:
  - Accepted state of knowledge in the field
  - Focus on a particular aspect of the field, often the set (s) of data that led directly to the work of this paper
  - Hypothesis being tested
  - Conclusions (scientists don't really like surprise endings!)

# How to approach the introduction


- **Grab a blank piece of paper:**

- Take notes
- Draw mini figures
- Define vocabulary  
(wikipedia is a quick reference)



- **Answer these questions:**

- What data led directly to the work of this paper?
- What is the hypothesis being tested?
- What are the basic conclusions? (Scientists don't really like surprise endings and this is usually stated in the last paragraph.)

A red paperclip is attached to the top edge of a piece of white lined paper. The paper has blue horizontal lines and is slightly crumpled at the corners. The text is written in a black, sans-serif font.

Notes allow you to take  
a break (hours to days)  
and come back to your  
thoughts...you won't  
have to re-read the  
parts you completed.

# Materials and Methods

- Should be detailed enough for another scientist to replicate the work (volumes, times, company material was purchased from etc.)
- In reality, often compressed and you may need to look up another paper that is referenced for more detail.



# Should you read the materials and methods?



- Often you can skim over them before the results.
- However, when you get to the results, you will need to flip back to them often to clarify how experiment was done.
  - Sample number? (*Did they do this more than once?*)
  - Conditions? (*Am I looking at a reduced or non-reduced protein gel?*)

# Results

- While the introduction poses the questions being asked, the results describes the outcome of the experiments that were done to answer the questions.
- Results are often simply stated with *interpretation* of them coming later in the discussion.
- Figures and tables allow the reader to see the outcomes of the experiments for themselves!

# How to read the results:

- Read the text straight through, but as a figure is referred to, examine the figure.
- Take notes, giving yourself a place to refer to about each figure.
- With each experiment/figure you should be able to explain :

- 1) the basic procedure
- 2) the question it sought to answer
- 3) the results
- 4) the conclusion
- 5) criticisms



**\*Look up methods you are not familiar with (wikipedia is a quick reference)**

# Discussion

- Data is analyzed to show what the authors believe the data show. (You don't have to agree with their interpretations!)
- Findings are related to other findings in the field (contribute to knowledge, correct errors, etc.)– How is this work significant?

# How to read a discussion

Take notes and answer these questions:

- What conclusions do the authors draw? Be sure to separate fact from their opinion/interpretation?
- Describe for yourself why these data significant. (Does it contribute to knowledge or correct errors?)





**By now, you may  
be tired of this  
paper...  
but don't relax  
yet.**

**Save energy for  
the overall  
reflection and  
criticism**

# Reflections and Criticisms

(Cite specific example for yourself)

- Do you agree with the authors' rationale for setting up the experiments as they did?
- Did they perform the experiments appropriately? (Repeated a number of times, used correct control groups, used appropriate measurements etc)
- Were there enough experiments to support the one major finding they are claiming?
- Do you see patterns/trends in their data that are problems that were not mentioned?
- Do you agree with the authors' conclusions from these data? Are they over-generalized or too grand? Or are there other factors that they neglect that could have accounted for their data?
- What further questions do you have? What might you suggest they do next?

# Tips for success:

- Spend a lot of time on each paper NOW look up every detail that you are unsure of. (Time you invest now will payoff in the long run). Discovering the answers for yourself is one of the best ways to learn and have the information be retained.
- Imagine yourself teaching the paper or figures to classmates—teaching something to others is also another great way to learn.



# Tips for success:

- Start a database of procedures that you take the time to look up and teach to yourself. What are some of the common procedures that are used in various papers? (e.g. western, immunoblots, RT-PCR, apoptosis assays, yeast two hybrids, etc.)
- Watch others in your lab experiences and find out what they are doing...you may never get the opportunity to do RT-PCR, but the more you understand the procedure, the more critical you can be of data you need to interpret.

# Tips for success:

- Read papers when you are awake and interested in reading. If you are going to break up a paper and read it over several days be sure to summarize before continuing each day.
- If you are already in the field you plan to stay in, consider starting a database on papers that relate to your lab/project. You will want to be able to impress your P.I. with your quick analysis and summary of a monumental paper from another lab!