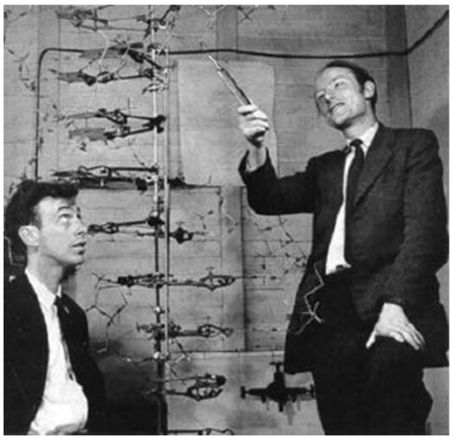
Scientific Writing

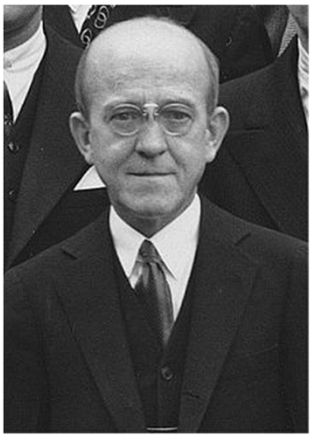
20.109
Fall 2013

Photo credit: Theresa Walunas, http://www.keyboardbiologist.net/knitblog/

The quality of writing can affect the impact of your work.

2





Watson & Crick, 1953: discovered the structure of DNA

Oswald Avery, Colin MacLeod, Maclyn McCarty, 1944: discovered that DNA is responsible for passing on heritable traits

-Long

-Difficult to read

-No claims of importance

-No confidence in work

You can compare the papers yourself:
http://www.nature.com/nature/dna50/archive.html

The goal of scientific writing is to communicate ideas.

"The purpose of a scientific paper is to communicate results and analysis to the wider scientific community. The better a paper is written, the more readers it will attract and the more citations it is likely to receive."

Bredan & van Roy (2006) EMBO 7:846-9.

The IMRaD structure helps you communicate effectively.

- Introduction *(prologue)*
- Methods *(narrative)*
- Results *(proof)*
- Discussion (*epilogue)*

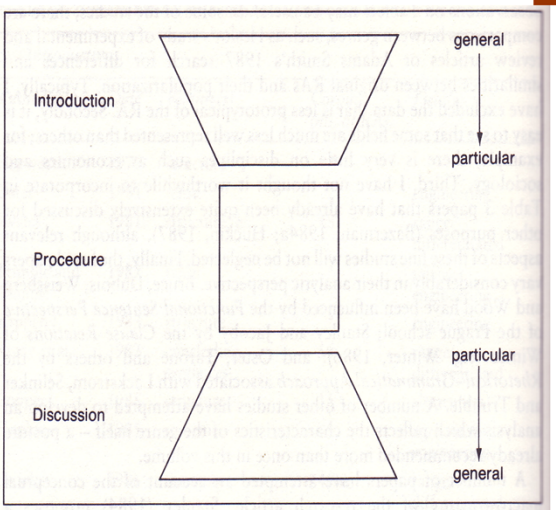
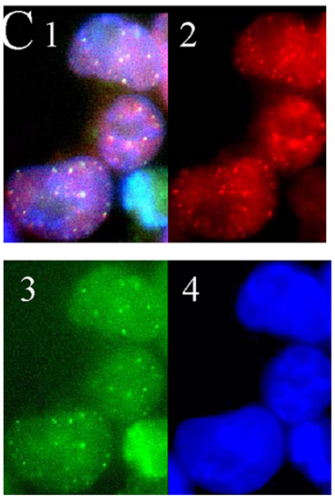


Figure 7 Overall organization of the research paper (Hill et al., 1982).

Article scramble: Identify the section of each passage.

- Introduction
- Methods
- Results
- Discussion
- Figure legend



RAD51 [K133] mutants impart a dominant-negative phenotype…However, we do not know the consequences of the long-term expression of the K133 mutants and their impact on replication fork maintenance and chromosomal stability. To bridge this gap, we knocked in Homo sapiens RAD51…adjacent to the endogenous *Mus musculus* promoter…in two lines of mouse embryonic stem (ES) cells.

6

What features of this excerpt identify it as belonging to the Introduction?

The introduction provides a framework for the story you are about to tell, and thus serves two main purposes. For one, you must provide sufficient background information for a reader to understand the forthcoming results. Just as importantly, you must motivate the audience to keep reading! How? Reveal the significance of the work through connections to both prior scientific accomplishments and interesting future applications. (20.109 guidelines for scientific writing)

TR responses:

-Has background information.

-States the question experimenters want to answer.

-“To bridge this gap”: explains what the scientists plan to do to address the lack of information.

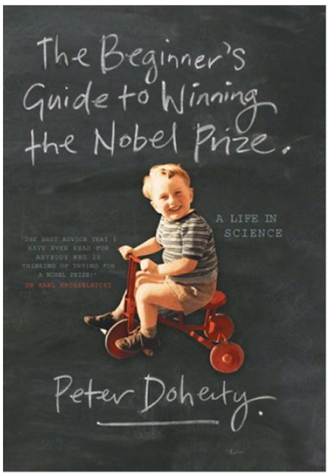
WF responses:

-Highlights something they don’t know: sets up experimental question

-First sentence tells what’s known, not what they did

-Experimental question is stated; strategy is explained.

Introduction gives the context, focus, and justification.



- Start broadly; end with your goal
- Identify what is (un)known
- Explain how you will address the unknown

Following permeabilization, the cells were washed three times in PBS and then blocked with blocking buffer (4% nonfat milk in PBS) for 1 to 2 h at room temperature. After being washed, anti-HsRAD51 antibody (H92, 1:200 dilution; Santa Cruz Biotechnology) in 4% nonfat milk in PBS was applied to cells, and the slides were incubated overnight at 4°C.

8

What features of this excerpt identify it as belonging to the Materials & Methods?

The methods section should allow an independent investigator to repeat any of your experiments. Use sub-section headings to allow readers to quickly identify experiments of interest to them…The key to a good methods section is developing your judgement for what information is essential and what is extraneous. Note that the methods section should be written in the past tense,…in complete sentences and paragraphs, not in bullet point form. (20.109 guidelines for scientific writing)

TR responses:

-Gives directions of what scientists did.

-Gives sources of materials.

-No explanation about why they performed that experiment.

-No data

-Information given so that an experiment can be replicated.

WF responses:

-Very specific (numbers, amounts); allows reader to replicate experiment

-No interpretation

-Passive voice

The M&M allows replication or interpretation of your work.

- Provide the right level of detail
- List the methods in logical order
- Use proper grammar

Next, we measured the combination of MmRAD51 and eGFPHsRAD51 foci after exposure to CPT by immunofluorescence using anti-RAD51 antibody that cross-reacts with both mouse and human proteins… Cells expressing eGFP-HsRAD51WT exhibited spontaneous and CPT-induced red foci in similar numbers to green foci (Fig. 9C).

10

What features of this excerpt identify it as belonging to the Results?

The purpose of the results section is to present your data in a relatively unbiased way, but with some guiding framework. Begin with a short description of the goal and strategy of your overall experiment, and then delve into specific sub-sections that describe each piece of the work…Ultimately, each sub-section should begin with an overview sentence that motivates and introduces the present experiment and end with a sentence stating the primary conclusion reached from that experiment. Note that verbs in the results section are usually in the past tense. (20.109 guidelines for scientific writing)

TR responses:

-Does not have analysis, e.g. what the data mean in a larger context.

-Cites a figure.

-Describes the method and the observations from an experiment.

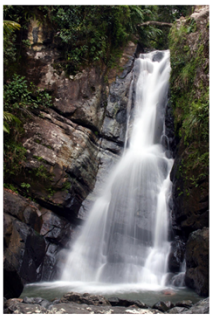
WF responses:

-Last sentence describes the data.

-Refers to the experiment performed.

-Cites figure

The Results tells a story about your data.



- Select data carefully
- Provide context
- Describe illustrations

Spontaneous and CPT-induced foci in AB2.2 cells. (C) Cells expressing eGFP-HsRAD51WT after 3 h of exposure to 1 μM CPT. Panel 1, merge; panel 2, anti-HsRAD51 antibody; panel 3, green fluorescence; panel 4, DAPI.

12

What features of this excerpt identify it as a Figure Legend?

Legends to the figures and tables explain the elements that appear in the illustration. Conclusions about the data are usually NOT included in the legends... As you write your first draft, you might state in a short simple sentence what the point of the figure or table is. In later drafts, make sure each element of the figure or table is explained. Your figure legends should be written in the present tense since you are explaining elements that still exist at the time that you are writing the paper. (20.109 guidelines for scientific writing)

TR responses:

-Not full sentences.

-Starts with a title.

-The letter C refers to one component of a figure.

-Describes the different parts of a figure.

WF responses:

-Contains labels of samples.

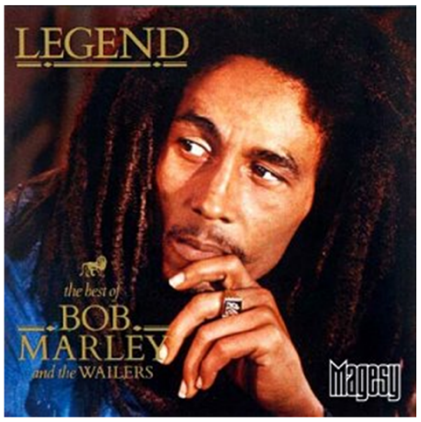
-First phrase is the title.

-Refers to different parts of the figure.

Legends allow illustrations to stand on their own.

13

- Describe experiment
- Explain abbrev, symbols
- Do not interpret or describe data



Analysis of cells that stably express the eGFP-HsRAD51 proteins (WT, K133A, and K133R) along with endogenous MmRAD51 allowed us to make three important observations about protein dynamics…Second, eGFP-HsRAD51WT efficiently colocalized with MmRAD51 at or adjacent to newly replicated DNA… Thus, MmRAD51 and eGFPHsRAD51WT likely formed functional mixed filaments, as seen in biochemical assays (19).

14

What features of this excerpt identify it as belonging to the Discussion?

The purpose of the discussion section is to interpret and contextualize your data…[C]onnect your findings to other research (published or that of your peers); describe any ambiguities and sources of error in the data, and suggest future experiments to resolve uncertainties; explain where you expect your work may lead, and suggest specific experiments for extending your findings; describe any conceptual or technical limitations of the research. (20.109 guidelines for scientific writing)

TR responses:

-Starts with “Analysis…”

-Infers things from the data.

-Points out important results.

-Cites previous papers.

WF responses:

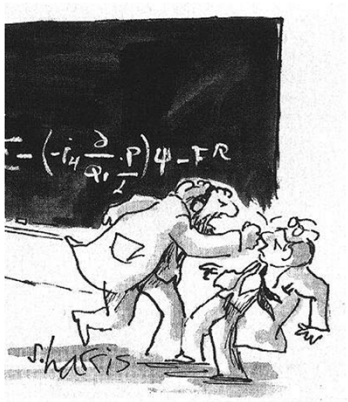
-Three observations made from experiment

-”Thus”, “likely formed” suggest conclusion

-Attributes importance to certain observations.

The Discussion is an argument about your data.

- Interpret data
- Explain contribution to field
- Admit limitations and flaws



"YOU WANT PROOF? I'LL GIVE YOU PROOF!"

In sum, understand IMRD to improve scientific writing.

16

- Introduction: What did you know?
- M&M: What did you do?
- Results: What did you see?
- Discussion: What does it mean?

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