

# Writing a Scientific Manuscript: Thoughts Gleaned Over 40+ Years in Science

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Special thanks to Françoise Chanut, Editor, Gladstone Institutes for sharing her perspectives on scientific writing that contributed to this presentation

# General Thoughts

- Scientific papers form the permanent record of science: preparing such a paper deserves your best effort
- Writing should not be drudgery, change your mindset, make it engaging even exciting
- Find the right environment for you to write
- Consider an outline
- Write in simple clear sentences that convey a single idea. Short is almost without exception better than long
- Papers are not written in the sequence they appear. Start with the Figures and write clear legends, then write the Methods followed by the Results and then write the Introduction and Discussion, finally write the abstract

# General Thoughts

- Barf and buff: one writing style. For me, it is important to get a first, albeit imperfect, draft down on paper that I can then begin transforming into a mature paper
- Become expert in the use of a reference management system (EndNote)
- Work hard on your Title—multiple drafts; shorter is often better, be sure to include a present tense verb
- Try to use active voice (present tense) in all sections except in the Methods and Results (there is an exception here in the Results-wrapup sentence of each experiment is usually conveyed in present tense)
- Don't allow acronyms and abbreviations to kill the readability of your paper

# Figures and Legends

- Try to prepare Figures that essentially stand on their own and can be understood without referring to the legends
- the Figures form the story board of your paper
- Use color in figures to improve clarity; be consistent in your color assignments
- Figures should be called out in sequence in paper (never Fig. 4 before Fig. 3)
- Title of the legend should summarize the key conclusion of the Figure
- Legend provides essential details of the experiment and information on reproducibility of results (statistics)
- Legends are becoming more and more minimalistic

# Methods

- Key part of the manuscript- provide sufficient detail that your experiments can be repeated; that is how your work is validated-is it repeatable
- STAR methods becoming popular with increased emphasis on Rigor and Reproducibility—these Methods are comprehensive including identification of every reagent including supplier and catalogue number
- Methods commonly broken into subsections—titles of subsections often written without verbs
- Methods usually written in past tense (passive voice)

# Results

- Construct the description of your experiments and observations in a manner that conveys a logical story (**satisfy reader anticipation**)
- Each section starts with a sentence framing the experiment followed by the results and a wrap up sentence that summarizes the experimental result....this type of approach will be welcomed by readers
- Results are described in past tense but summarizing statements should be in present tense.
- Do not allow Discussion material to enter into your Results. You have great liberty in the Discussion area to share your personal thoughts or perspectives, you have no liberties in the Results section—“just the facts” but presented in a clear and logical manner
- Use Headers (written in present tense ) to organize and create logical flow through the Results section

# Discussion

- Here you have some poetic license-you can offer an opinion or speculate
- Use this section to place your study in context with prior results, highlight surprises, explain inconsistencies. How has this set of studies changed our understanding? What is new and why is it important?
- Often helpful to start discussion by stating the original hypothesis for your study and then describe whether or not that hypothesis was supported
- Results can be briefly summarized to support the discussion but they should not dominate this section...they are merely the springboard
- This section should bring the entire story to a logical and hopefully compelling conclusion.
- Write this section in the present tense

# Introduction

- Sets the table for the body of work you are presenting-needs to convince the reader you are studying an important problem/question
- Not the place to summarize the results of your study
- Often starts broad highlighting what is know and not known, then hones in on the key question that will be addressed; often generates an hypothesis that forms the basis of the paper. The hypothesis and/or goals of the study are clearly stated in the final paragraph of the Introduction
- Be generous in your referencing
- Don't get trapped into spending too much time describing what is known instead of moving into what is not known

# Abstract

- Consider this your baited hook in the water.....will your abstract form a compelling synopsis that catches the attention of readers and persuades them to continue
- The abstract serves as a mini—version of the paper and should be organized as such. State the problem, the hypothesis, give results at the 30,000 foot level and summarize importance of the findings
- The abstract is not the place for an intensive review of the literature or a detailed description of all of the experimental results

# Title

- Aims to attract interest of potential readers
- Effectively summarizes in a few words the main conclusion of the study—creating great titles is an artform.....
- Aim for shorter titles—will increase number of times your paper is cited
- The best titles include an active verb
- Titles should emphasize the result over the technique or methodology employed