國立交通大學
National Chiao Tung University

科技論文寫作經驗談

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Profile

- 1978.9~1989.6 交通大學機械系
  - 1982 (BS)、1984 (MS)、1989 (PhD)
- 1989.10~2010.1 工業技術研究院
  - 研究員 (1989)、正研究員(1998)、資深正研究員(2005)
- 2010.2~ 交通大學機械系教授
- 2005.7 ASHRAE Fellow
- 2008.12 ASME Fellow
- Associate Editors of 2 SCI Journals
- Approx. 200 SCI/EI papers (up to 2010)

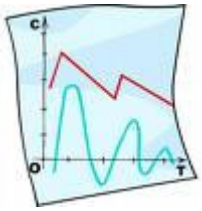
Outline

- 背景
  - 前言
  - 為什麼需要撰寫 SCI/EI期刊？
  - 研究論文的重要性
- 論文撰寫步驟
  - 資料收集與整理
  - 蹲馬步工法
  - 論文整理技巧
  - 投稿與答辯
- 簡短總結

Russell Ackoff - the contents of the human mind classifications

- Data(數據): symbols
- Information(資訊): data that are processed to be useful; provides answers to "who", "what", "where", and "when" questions
- Knowledge(知識): application of data and information; answers "how" questions
- Understanding(理解): appreciation of “why”
- Wisdom(智慧): evaluated understanding.

每一個門檻僅有1/10的人能夠跨過!

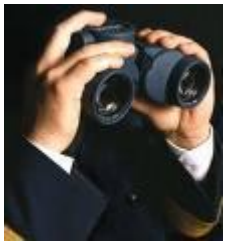





Data → Information → Knowledge → Understanding → Wisdom

Trivial Question: 那一個範疇的人比較容易被淘汰？

- 多看多讀多想多整理，是跨過門檻的必要手段



- Yet, Less Talk

為什麼要撰寫 SCI/EI論文？

- 嚴格來講 – 不需要 (for master students)
- For PHD, it is a must.
- For some researchers, it is also needed.
- Maybe the pressure is from your adviser/boss.

研究論文的重要性

- 整理、整理、整理
- Thinking, Thinking, and Thinking
- 從嘴巴到文字間的距離 $\rightarrow \infty$
- 技術深耕與傳承的最重要依據
- 自我成長的最佳工具

為什麼要將研究成果發表稿在國際期刊上？

- 提升能力 (功夫)
- 心血結晶，心得共享
- 真金不怕試煉
- 讓更多的研究機構/研究人員認識你與你所屬的機構
- 留下你的研究紀錄
- **肯定自己也接受別人的肯定**

Step 1 .. 資料收集

- 資料收集與整理
  - 紙本、電子資源定期與不定期的收集
    - 收集包含現階段研究相關與你個人專長有關或與計畫技術有關與特殊有興趣的主題
  - 工具的使用
  - Quick overview if the topics you collected are currently relevant – even a quick view of the abstract/conclusions will help
  - 組織收集資源 (命名、Folder管理..)
  - 資料收集觀點
    - 寧爛勿缺
    - 廣泛的收集

收集與研讀是整理的前置工作

- 廣泛收集
  - 資料通常很多，但絕大部分是不太相關
- 仔細研讀該項技術的**重要回顧文章**
- 快速瀏覽「可能是次要」的資料
  - 留下印象
- 仔細瀏覽「極度相關」的資料

Quiz: 能否在5~10分鐘內把這項技術的重點與問題說明清楚(甚至說明與別種相關技術的比較)？

Then..

- 語言閱讀是否是障礙?
- 若是，我應該如何改善我的語言與閱讀能力?
  - 沒有捷徑
  - 如何訓練提升你的語言與英文能力?
  - 與自己交談
  - 持續、有恆、提醒
    - the most difficult part

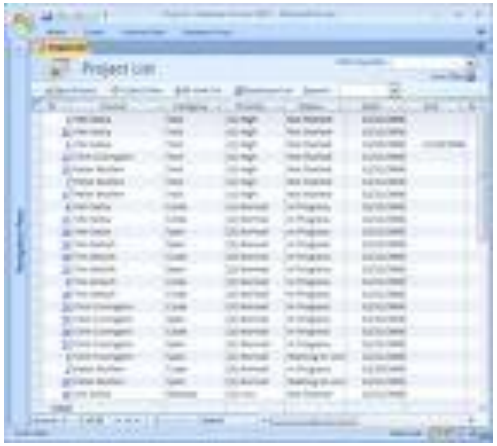
Then…

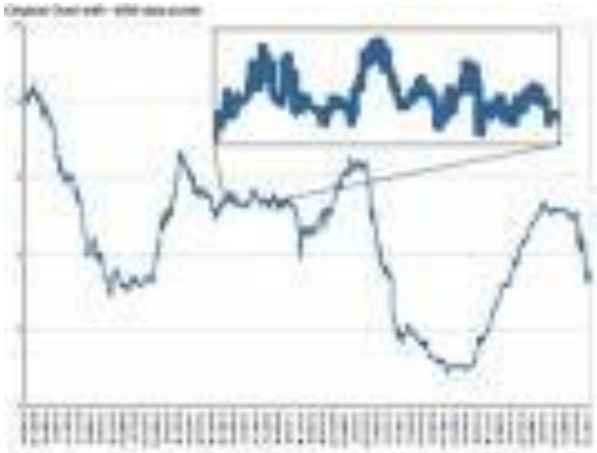
– 如何訓練自己與管理破碎時間

- 隨時提醒自己…
  - I want to be …. (10 or 5 years from now)
  - 如果只有15~30分鐘，我能做些什麼?
    - Listing what you can do, and remind yourself all the time when you have the time.
  - 開無聊會議時，我能做些什麼?
  - 上網閒逛或看八卦時，是否有其他“摸蛤蜊兼洗褲”的作法?
  - 等車坐車時，我能做些什麼?
  - 看電視或空閒時間時，我能做些什麼?

Step 2, 資料的初步整理流程

0. 從製程、實驗中擷取數據
1. 從數據到圖表





2. 定性判定趨勢、參數的影響與特別現象
3. 趨勢是否符合習知之原理
   (正確的數據才具有分析判斷的價值)
4. 造成某一趨勢或結果的可能的原因
5. 設計實驗去驗證這個可能的原因

Step 3, 思考

- 他們講什麼?
- 他們講得對嗎?闡述是否合理?
  - 合理是否只是定性?定量是否也OK?
- 這些說明的適用範圍?
- 這些研究是否一致?
- 將這些研究圖表化，更清晰的Highlight出一致與不一致的地方
- 釐出差異的可能原因

Step 4
撰寫論文前的蹲馬步工法

- 定出時間表
  - 何時讀完相關論文
  - 何時做完實驗或分析
  - 何時整理完成
  - 何時 ...

→ 設定Deadline, 按時完成 (至少完成六七成)

→ Meet the deadline all the time. No excuse.

蹲馬步工法 (Conti..)

- Some techniques…
  - 選擇Review article作為踏入研究的第一步
    - 詳細與仔細的研讀
  - 掌握研究內容的基本物理與化學原理
    - 方程式不是重點，但應確切清楚相關重要參數的定性影響
      - What are the most important parameters?
      - What do not have any influences?
      - What may be important but are unclear at this stage?
    - 抓住問題背後的Physics/Mechanisms
      - This is the most crucial part for you to become professional.

蹲馬步工法 (Conti..)

- 好的研究題目
  - 加上研究資源與研究能力比較容易獲得好的研究成果
  - 好的成果搭配適當的表達能力就能順利發表
- Sometimes it is not possible to find the appropriate research topic.
  - Is this right?
  - Yes & No

蹲馬步工法 (Conti..)

- Keep in mind
  - 給作爛的題目不見得不是個好題目
  - 即使是老掉牙的題目，永遠都是有空間的
    - 大題小作，小題大作 (陳省身)
    - 簡化、修飾、抽離、 集中 (divide & conquer)
  - 不是別人做過的題目就不值得投入做
  - 重點在是否有新的見解與看法(或不同的整理比較)
- 改正 9 to 5 心態
  - 研究工作不是按表操課

蹲馬步工法 (Conti..)

- 成長需要參與
  - 時間投入是不二法門 (即使是破碎的時間)
  - 養成長期閱讀研究論文的習慣
    - 至少要定期收集與看完論文抬頭
    - 可能的話，收集的論文至少要看完摘要或結論
  - 功力的培養需要長期經營與耕耘
  - Do it for yourself, because you need it
- Scale analysis & Order of Magnitude
  - 不須細部分析即可取得大概趨勢

論文撰寫1-2-3

-  & Coca-Cola

- Impact factor is important but it should not be the major issue.
  - Disregard the Impact Factor, just think about what you can learn through this writing.
  - The paper should be placed at the Journal where relevant technical people often access.

Step 5, 論文撰寫 1-2-3

- 論文不是抒情文
- 論文研究過程與討論通常需要Team Work, 但論文的撰寫通常僅有一個主筆

- 三段論法
  - Why your efforts deserve to be published? (the most important issue in the introductory part)
  - Why your approaches/equipments are superior and reliable?
  - Why your points make a contribution?

- Get to the point, 說清楚、講明白、多比較；重複(以不同的文字)強調你的貢獻。

論文撰寫1-2-3

- 論文必須過Reviewer這一關
  - 多數的Reviewers 為相關領域的競爭者
- Reviewer 與 Judge 你的Performance/Project的老闆沒有兩樣
  - Rule of engagements
    - Reviewers (like your boss) are busy people
    - If they can not understand what you are the main objective of your work in ***three minutes***, your paper is not acceptable.
    - If they can not comprehend your work in 15 minutes, there is little chance of your work.

一般技巧

- 動手撰寫 (Just do it)
- 不要先寫中文再將之翻譯成英文
- 先製作圖表再撰寫
- 結構應保持簡單 (simple, short, concise)
- 撰寫順序
  - 製作圖表→完成討論與比較→結論→摘要→選擇合適期刊→理論架構/實驗設備→介紹
  - **通常討論與比較部需要非常久的時間 (iterations needed)**

一般技巧 (Introduction)

- 推銷 (@ Introduction)
  - The subject is important
    - Because it ….
  - Current research status of this subject
    - What has been done (thoroughly)?
      - Table listing for quicker and easier comprehension
    - What is missing and what must be clarified?
    - Or what is confusing (controversy exists)?
  - Any conflict?

一般技巧 (Introduction)

- There must be something that deserves to go further - State it, substantiate it, and convince the reviewer (readers) that it is worthwhile to do this.
- Avoid tedious and long sentence to get them lost.
- State what you propose to resolve the current situation and your approach to tackle the problem via your efforts.

一般技巧 (Theory/Experiment)

- Convince reviewers that your approach (theoretical/experimental) are feasible
  - Report uncertainty (numerical & experimental).
  - The tools you used are up to date, well calibrated, or precise enough.
  - The equations are applicable and the boundary conditions are appropriate.
  - Schematic/Figure/Cartoon should be used to help reviewer/reader.

一般技巧 (Results & Discussion)

- Tell the story
- 選用合適的圖表 (僅置入必要的圖表，論文不是研究報告)，圖表數越少越好。
- 圖表說明討論
  - 不是流水帳
  - 先說明趨勢與大小變化
  - 趨勢變化的原因 (物理、化學、數學等機制與可能原因)
  - 圖表資料與他人的比較 (差異性與一致性說明)，說明別人的看法與你個人的見解

一般技巧 (Results & Discussion)

- 理出可能的機制與數據間的關聯
  - 證明 (at least use scale analysis) 你的說法應該無誤
- 整理出可能的方程式或關係式說明數據的分布 (經驗式、半經驗、或者是適用的理論方程式)
  - 儘量使用與機制有關的參數來整理回歸數據
- 比較你提出的方程式與別人的比較，指出可能的範圍與限制，如果能從物理面說明此一限制更好。

一般技巧 (Results & Discussion)

- 重複說明 (use different phrases) 你的發現、看法；加深讀者的印象
- 避免獨斷性的說詞，儘量利用你的研究結果作客觀的說明佐證，並同時引用一致的文獻來說明你的結果
- 釐清重要參數的影響，說明差異的來源與適用範圍

一般技巧 (Conclusions & Abstract)

- Conclusion
  - 簡短說明問題與本研究的作法
  - 扼要說明研究結果與適用範圍與相關機制，(可適度說明這幾個結果的重要性讓Reviewers appreciate your efforts)
- Abstract
  - 清楚的說明最重要的幾個發現與結果

Title

A *good title should contain the* ***fewest*** possible words that **adequately describe** the contents of a paper.

DO	DON'T
Convey main findings of research	Use unnecessary jargon
Be specific	Use uncommon abbreviations
Be concise	Use ambiguous terms
Be complete	Use unnecessary detail
Attract readers	Focus on part of the content only

How to write a world-class Paper
Stephen G. Lisberger
Professor, University of California San Francisco

How to write a world-class Paper
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Title

Motor learning in smooth pursuit eye movements is in the cerebellar cortex and the deep cerebellar nuclei

Effect of cerebellar lesions on motor learning in smooth pursuit eye movements

How to write a world-class Paper
Stephen G. Lisberger
Professor, University of California San Francisco

Abstract

Abstract format varies widely among journals.

A good abstract is an art form.

I usually write the abstract of my paper last.

Read some abstracts from the journal you've chosen to get the right idea.

Abstracts are important!

Editors use them to screen papers for review and to choose handling editors.

Prospective reviewers use them to decide whether or not to agree to review a paper.

How to write a world-class Paper
Stephen G. Lisberger
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A good abstract:

- Is precise and honest
- Stands alone
- Uses no technical jargon
- Is brief and specific
- Cites no references

Manuscript preparation

- Main text
  - Introduction
  - Methods
  - Results
  - Discussion
  - Supplementary material and Appendices

- Each section has a clearly defined purpose
- Different journals have different length requirements -- follow them!
- I usually start by making good versions of all figures.

Graphics

Figures and tables are **the most effective way to present data.**

BUT:

- Neatness counts -- graphics should look pretty.
- You need to design your figures carefully.
- As a general rule, a figure should be deleted if it can be replaced with one or two sentences in the text and a few numbers.

How to write a world-class Paper
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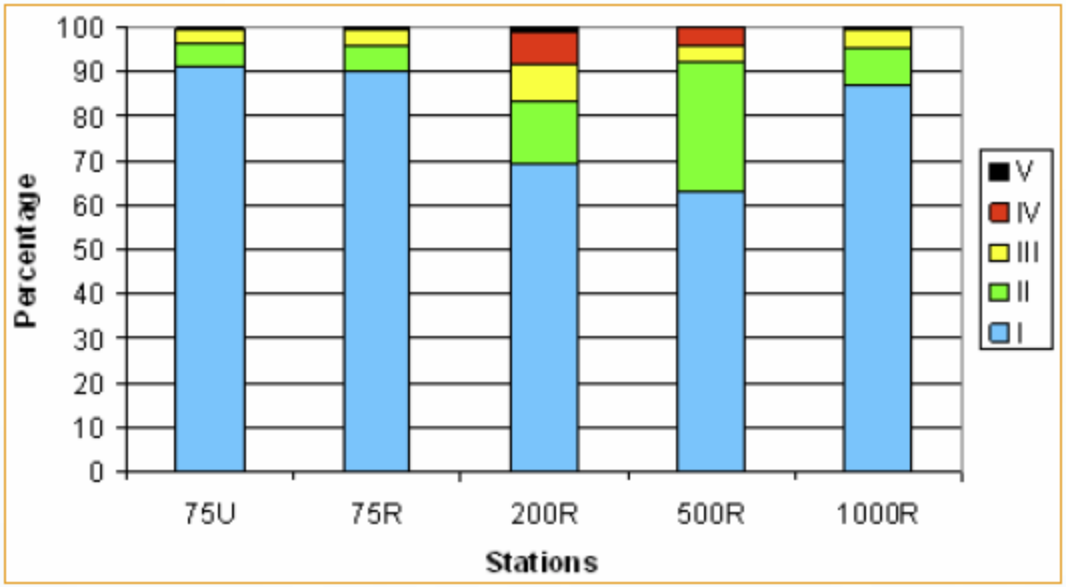
Graphics

Five rules for making figures

- Design your figures carefully and make them in the final size you desire in the published paper.
- Make all your figures uniform -- same line style, same font and font sizes, etc.
- No unnecessary text in the figures.
- Use color only when it is essential.
- If a colleague cannot immediately tell what is shown in a figure, you probably need to redesign it.

Graphics

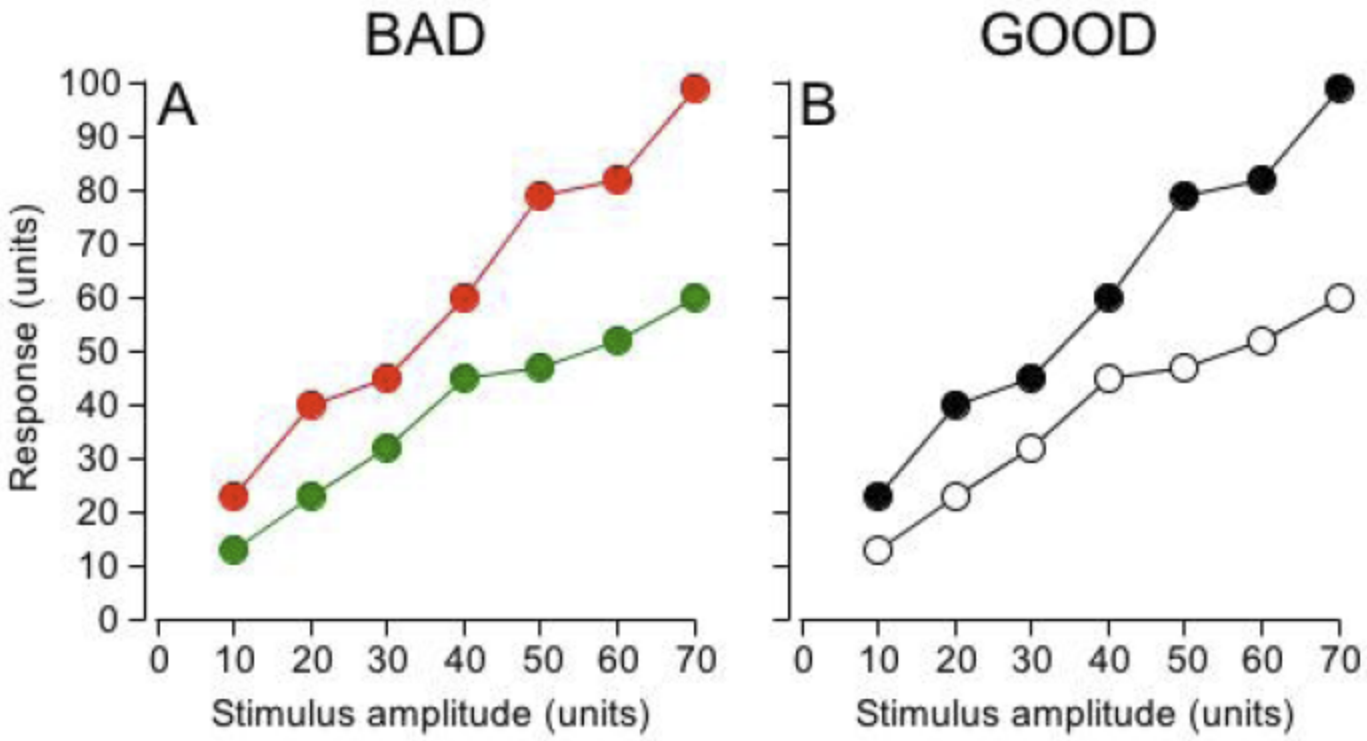


The figure and table show the same information, but the table is more direct and clear and uses less space.

	ECOLOGICAL GROUP				
Station	**I**	**II**	**III**	**IV**	**V**
75U	91.3	5.3	3.2	0.2	0.0
75R	89.8	6.1	3.6	0.5	0.0
200R	69.3	14.2	8.6	6.8	1.1
500R	63.0	29.5	3.4	4.2	0.0
1000R	86.7	8.5	4.5	0.2	0.0

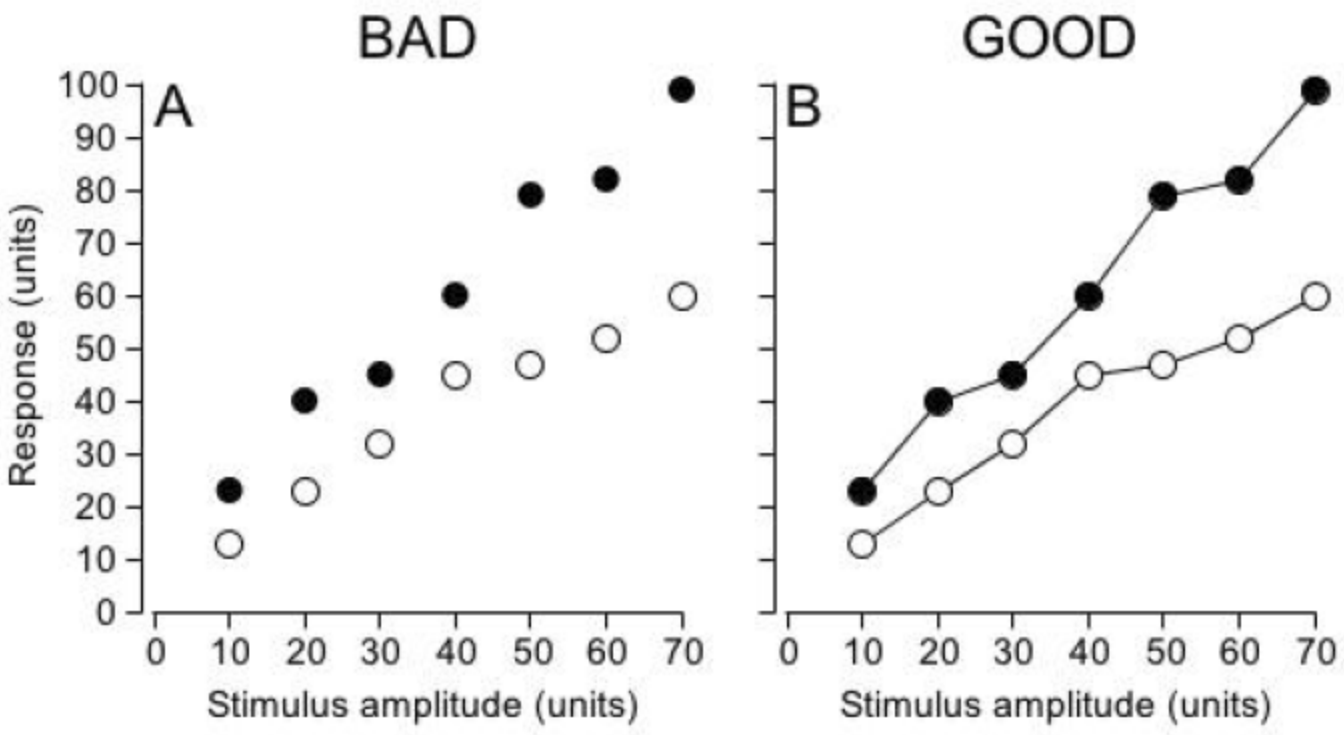
Graphics

Use color only when it adds to the presentation.



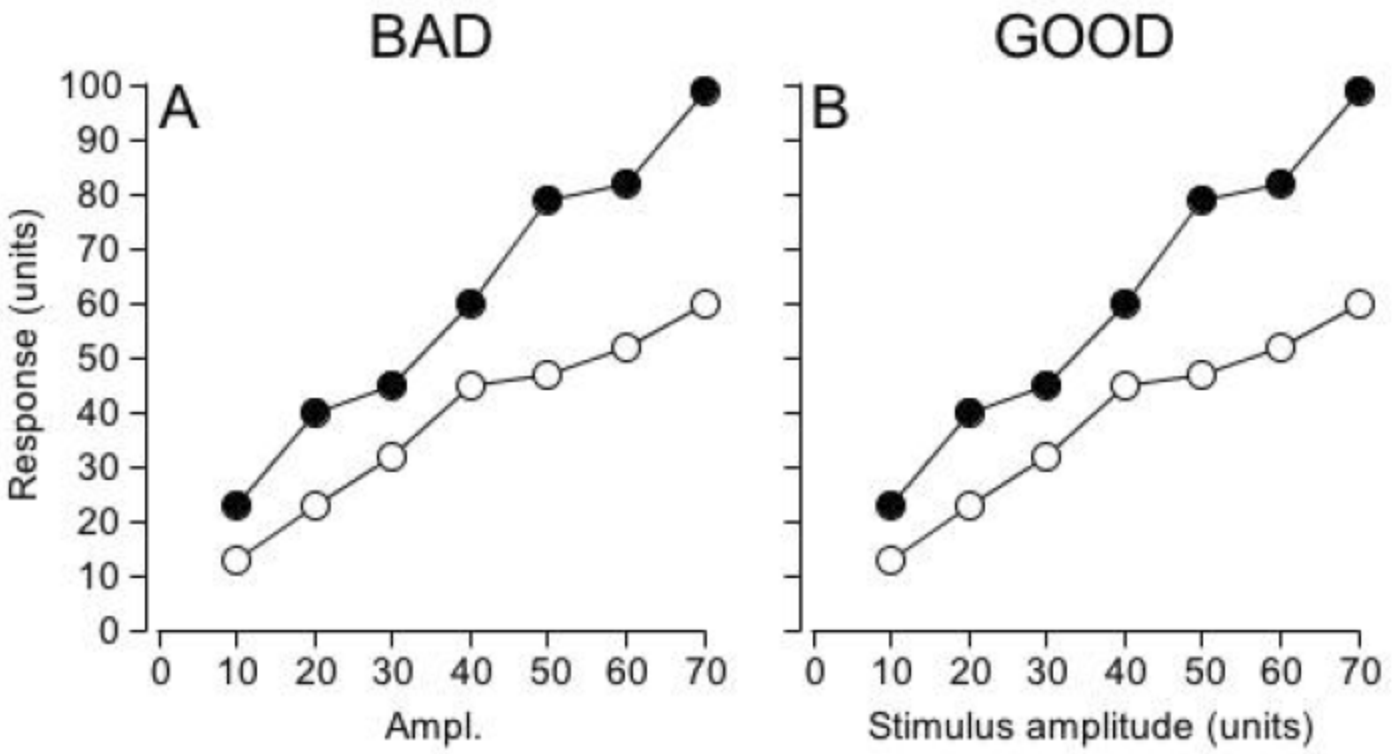
Graphics

Connecting the dots makes the graph easier to read



Graphics

Use axis labels and legends that are as descriptive as space allows



Wrong way to outline a paper

1 intro

2 related work

3 my method

3.1 module 1 – lots of details

3.2 module 2 – lots of details

3.3 module 3 – lots of details

4 results

5 conclusion

Right way to outline a paper

- Motivation
  - write a sentence explaining the high level motivation
- Challenge
  - write a sentence explaining the challenge
- Contribution
  - write a sentence explaining the contribution
- Related work
  - write down all the related work you can think of and for each write a sentence about why it does not sufficiently address the challenge you specified
- *Your actual work – not important – really, its not*

Step 6, SCI論文投稿

Just do it!

Enjoy!

Recap – 論文內容

- 過去的研究整理(Review)
- 研究的著力點(Idea)
- 實驗與研究規劃(Planning)
- 數據 (Data)
- 資料整理 (Information)
- 分析 (Analysis)
- 判斷 (Judgment)
- 簡潔說明 (Elaborate)

Step 6, SCI 論文投稿

- Submit you paper, and wait..
- Outcome of Review
  - Accept as it is
  - Accept with major revision (***)
  - Accept with minor revision
  - Reject
- Why my paper is rejected?

  (James Davis, UC Santa Cruz)

Rejection: not the end of the world

- Everyone has papers rejected
  - do not take it personally.
- Try to understand why the paper was rejected.
- Note that you have received the benefit of the editors and reviewers' time; take their advice seriously!
- Re-evaluate your work and decide whether it is appropriate to submit the paper elsewhere.
- If so, begin as if you are going to write a new article. Read the Guide for Authors of the new journal, again and again.

Accepting rejection

Don't take it personally! Everyone gets papers rejected, even Nobel laureates.

- Try to understand why the paper has been rejected.
- Evaluate honestly – will your paper meet the journal's requirements with the addition of more data or is another journal more appropriate?
- Don't resubmit elsewhere without significant revisions addressing the reasons for rejection and checking the new Guide for Authors.

Accepting rejection

A possible strategy for submitting elsewhere

- In your cover letter, declare that the paper was rejected and name the journal.
- Include the referees' reports and show how each comment has been addressed.
- Explain why you are submitting the paper to this journal; is it a more appropriate journal?

Reasons for rejection

(The most common reasons I reject papers that I am asked to review); James Davis; UC Santa Cruz; 2005

01 No statement of contribution
02 No relation to previous work
03 Not sufficiently novel
04 Unconvincing results
05 Incomprehensible writing
06 Bad grammar / English usage
07 Infatuated with math
08 No statement of motivation
09 Inscrutable figures
10 Poor figure captions

Why is revision important and necessary?

- Which procedure do you prefer?
  - (Option 1) Send out a sloppily prepared manuscript get rejected after 4-6 months send out again only a few days later get rejected again…. Sink into despair.
  - (Option 2) Take 3-4 months to prepare the manuscript get the first decision after 4 months revise carefully within time limitation….accepted.
  - (Option 3) Just Leave it.

Please cherish your own achievements!

Step 7, Responses to **Major Revision**

- 首先，感謝Referees & editor (即使很不樂意)
- Referees 所有的問題都須回覆 (做到的要說明，做不到的更要說明)
- 可以使用推託的說法(但不要常用)，例如某項工作無法執行，因為不在本研究的Scope內，或是本項工作已在進行中，未來會持續發表這些研究資訊

Responses to **Major Revision**

- 姿態未必要低(尤其是Referee 有誤解時)，但應該盡量客氣，某些時候甚至可加強說明Referee 的誤解部分以及你如何在本文中的修改讓讀者更容易Follow
- 回覆問題時，盡量引用其他文獻的支持說法，而非全是自己研究的觀點
- Editor 的要求必須想盡辦法滿足(Editor 除了注重Technical Problems 的回答外，作者投稿是否滿足期刊格式的要求也非常得重視)

Responses to **Major Revision**

- 可在回覆中加入圖表說明，這些圖表未必要放入修改的本文，這些圖表可能有某些針對性，例如針對Referee 的看法提出一些定量的說明，告訴Referee (不可行或是無明顯差異等)
- 絕大部分的Rebuttal 是要說服 Editor 而非Referees
- 與Referee & Editor 的實質互動是持續成長的動力源頭

Step 8, Some advices .. Be open minded

- 競爭才有進步
- 研究工作中，失敗是常態，保持開放的心靈有助於後續問題的改善
- 不需畫地自限
  - Open your eyes at all time
  - Life will find the way
- 深度的討論溝通有助於成熟構想的形成
- 適度的開放才有合作的空間

Some advices.. Remember

- Acknowledgements
  - Boss, colleagues who assist you (even it is not so straightforward). At least they did not get in the way.
  - Sponsors
  - Friends, family and the like.
- Keep the low profiles
- **Train Yourself, not just sit there waiting someone else to train you.**

簡短總結

- 最佳的研究環境，需要自己長期的經營，目的在讓自己不斷成長，Be highly Professional.
- 研究工作是長期投入的心力，必須秉持長期投資的心態
- 如果興趣在此，不要中斷；再怎麼忙都不是藉口
- 養成一心多用平行處理的能力 (It is hard and takes time)
- 擠壓整合你有限的時間 (Squeeze and combine your limited time)
- Ask yourself before asking someone else
- Share your credits to your sponsor, colleagues, and boss
  - It is really hard but necessary.

Last Reminder

- Family
- Health
- Enjoyment

→ Be aware of the sequence.

Thanks for your attentions

Questions?