How to Read and Write a Paper - How to do Research

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讀論文 寫論文 做研究

- 要做甚麼?
- 怎麼做?
- 做對了沒?

-目的:要解決的問題

-方法:產生正確的結果

-成果與結論:是否文不對題;是否達成目的?

The Framework of a Paper

- *Title* (題目)
  - authors and affiliation
- *Abstract* (摘要)
- *Introduction* (引言)
- *Method* (方法)
- *Result and Discussion* (結果與討論)
- *Conclusion and Suggestion* (if any) (結論與建議)
- *References* (參考文獻)

- *Figures* (圖) and *Tables* (表)

Title

- "Grammar" is less of a concern; it's an expression made of concise words to faithfully reflect the meaning of your work.
- *Title* and *Abstract* are closely related! *Title* is almost a condensation of *Abstract*, while *Abstract* is the condensation of the whole work.
- Reading *Title* should be helpful for understanding *Abstract*, reading *Abstract* should be helpful for understanding the rest of the paper.

Abstract

- a number of sentences indicate the “essence” of your work.
- must include the purpose (the problem solved) and the conclusions and suggestions (if any) with most significant results.
- if space allows, some background information and method employed may be added.
- written after the other parts of the paper are done, so no misrepresentation involved!
- no equations, no symbols, no citations; capable of standing alone, self-contained.

Introduction

- to establish, to manifest, to validate the worth of the research.
- leads to what you are expecting in the followings and why they are important.
- normally consists of *Background*, *Literature Review* and *Purpose*; they may or may not be distinguished as separated sections.
- ultimately brings forth the ***Purpose***.

- What should be discussed in the three parts?

Literature Review(文獻回顧)

- to cite references (currently available papers) to prove the problem of interest (the purpose) to be "new" (has not been solved or dealt with before)

- 原創性(originality and creativity): 新問題新方法,新問題老方法,老問題新方法

- "Background": cite references to indicate what had been done in the related area in order to reveal the scientific or practical importance of the problem of interest.
- A good literature review and background information naturally bring forth the purpose(s) of your work!

Purpose: The Problem of Interest

- statement(s) of the problem of interest (the problem to be solved).
- be specific, clear, and right on the target.
- can be followed by how the problem solved; that is, the method employed in the research.
- begins with a “transit verb”, e.g.,

- to investigate, to evaluate, to test, to understand…

Examples of Purpose Statements

- The purpose of this study is to conduct a pumping test to investigate the influence of anisotropy on drawdown variation in an unconfined aquifer.
- ⋯to investigate and understand the issues of breakthrough curve tailing effects using sand column tracer tests.
- ⋯to characterize the fracture connectivity in a Cenozoic sand stone formation. To achieve this goal, multilevel slug tests, ⋯ and ⋯ are employed.

Purpose and Conclusion

- The purpose(s) stated must be related to the “Conclusions”, and the conclusions made must answer the questions associated with the Purpose.
- Work is not done until the goal is achieved, the purpose accomplished.

Results vs. Conclusions

- Results (結果): the outcome of the practice of the methods proposed to solve the problem(s) of interest- presented in figures, tables, words
- Discussion (討論): to analyze, to compare, to evaluate, to test, to verify… of the results in order to obtain “conclusions”.
- Conclusion (結論): to “Conclude” the work by achieving the goals- the problem of interest is solved!

Methods

- The approach, the technique (lab experiment, field test, numerical modelling, analytical solutions, comparison and analysis of available data…)
- Assumptions = Limitations
- The assumptions are made to simplify certain conditions or problems beyond the scope of the research, to prevent the over-generalization of the problem, or to focus on some specific issues among many.
- Assumptions must be reasonable and pertinent to the problem of interest.

Oral Presentation vs. Reading Reports

Reading Reports: As a reader, you have the book or paper in front of you as long as you need, no pressure of missing the object. You have time to understand sentences, tables, or figures involved no matter how long or how complicated they are. You are free to check different pages or even other references to clear up your confusion.

Oral Presentation: As an audience, you only have limited time in grasping what the speaker want's to share with his words and PPTs (visual aids). You quickly lose interest and confidence, if the PPTs are too complicated, too many words, mathematic equations, symbols. Figures are colorful but lack of focuses. Tables are long and have many rows, columns, numbers, symbols…

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- PPTs contain too many words, mathematic equations, symbols...

- figures lack of focuses or have too many details,

- tables are long and have many rows, columns, numbers, symbols…

Figures, Sentences

- Animated figures? Secondary aids. Don’t over do it.
- Colors? Use colors to highlight the differences and attract attention.
- Long, detailed sentences? No! short and correct grammar.
- Mathematics, equations and symbols can easily turning off attention and interest.
- Number of PPTs? Depends on how many minutes you are allowed to speak.

Point source → Sink source

Point source Governing Equation：

$$S_s \frac{\partial h}{\partial t} = K_x \frac{\partial^2 h}{\partial x^2} + K_y \frac{\partial^2 h}{\partial y^2} + K_z \frac{\partial^2 h}{\partial z^2} - Q\delta(x - x_0)\delta(y - y_0)\delta(z - z_0)$$

Initial condition：

$$h(x, y, z, t = 0) = h_0$$

Boundary condition：

(1) The base of the aquifer：

$$\frac{\partial h(x, y, 0, t)}{\partial z} = 0$$

(2) The water table ： (instantaneous drainage)

$$K_z \frac{\partial h(x, y, d, t)}{\partial z} + S_y \frac{\partial h(x, y, d, t)}{\partial t} = 0$$

(3) Lateral boundaries：

$$h(\pm\infty, y, z, t) = h(x, \pm\infty, z, t) = 0$$

Implications to carbonate crystal chemistry at lower mantle condition?

$$\mathrm{Fe}^{2+}_{\mathrm{Pv}} + \mathrm{Mg}^{2+}_{\mathrm{Carb}} \rightleftharpoons \mathrm{Fe}^{2+}_{\mathrm{Carb}} + \mathrm{Mg}^{2+}_{\mathrm{Pv}}$$

$$K = \frac{\left[\mathrm{Fe}^{2+}_{\mathrm{Pv}}\right]\left[\mathrm{Mg}^{2+}_{\mathrm{Carb}}\right]}{\left[\mathrm{Fe}^{2+}_{\mathrm{Carb}}\right]\left[\mathrm{Mg}^{2+}_{\mathrm{Pv}}\right]} \Longrightarrow lnK = ln\left[\frac{\mathrm{Fe}}{\mathrm{Mg}}\right]_{\mathrm{Pv}} - ln\left[\frac{\mathrm{Fe}}{\mathrm{Mg}}\right]_{\mathrm{Carb}} = -\frac{\Delta G(P,T)}{RT}$$

$$lnK_{LS} - lnK_{HS} = \frac{P\Delta V + \Delta CFSE - 5B - 8C}{RT} = -31.2$$

B, C are Racah parameters

$$lnK_{LS} = \frac{P\Delta V + \Delta CFSE - 5B - 8C}{RT} + lnK_{HS} = -31.2 + lnK_{HS}$$

lnK_{HS}=2.2 (Stagno et al. 2011)

$$lnK_{LS} = \left[ln\left[\frac{\mathrm{Fe}}{\mathrm{Mg}}\right]_{\mathrm{Pv}} - ln\left[\frac{\mathrm{Fe}}{\mathrm{Mg}}\right]_{\mathrm{Carb}}\right]_{LS} = -29, \text{ implises } \left[\frac{\mathrm{Fe}}{\mathrm{Mg}}\right]_{\mathrm{Carb}} > \left[\frac{\mathrm{Fe}}{\mathrm{Mg}}\right]_{\mathrm{Pv}}$$

Discussion

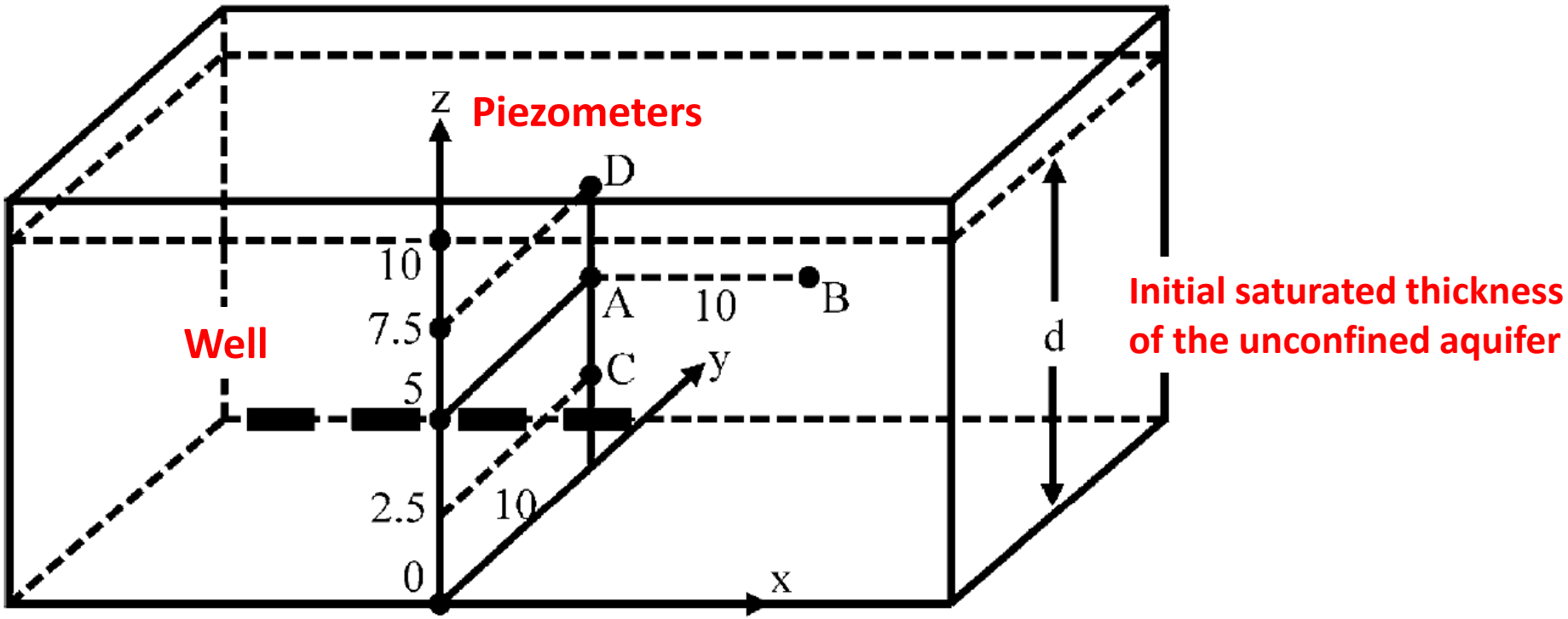
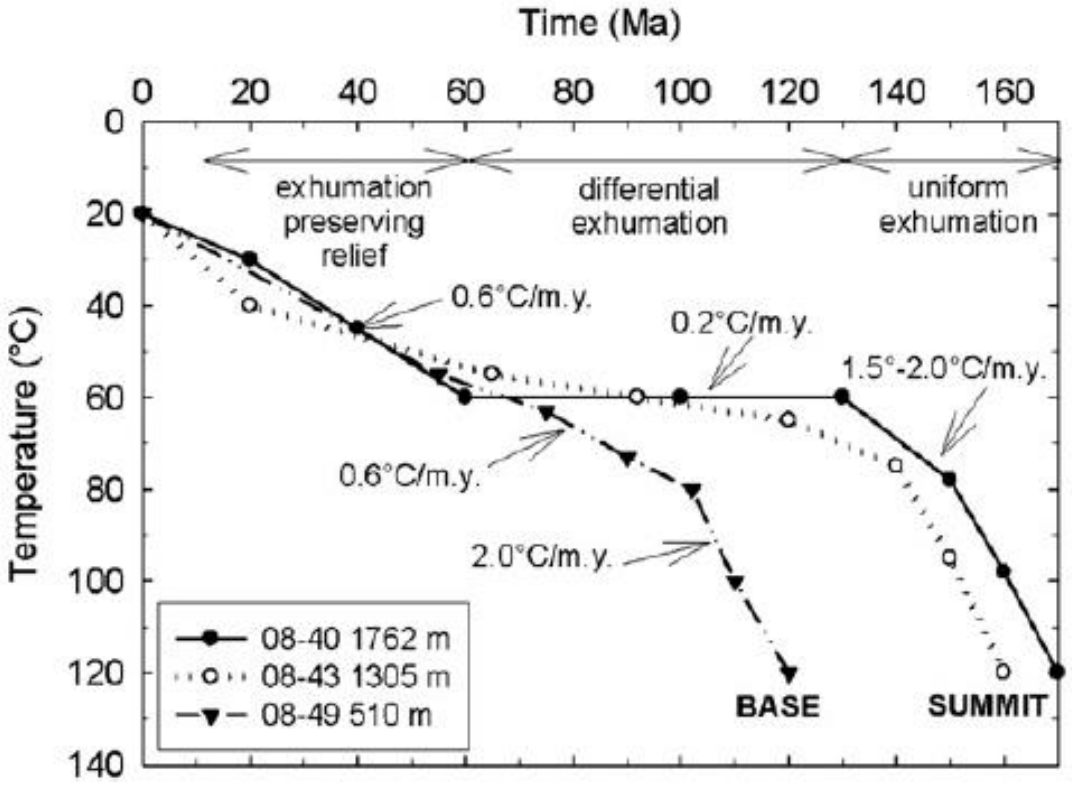


Fig 4. Locations of piezometers at point A(0, 10 m, 5 m), B(10 m, 10 m, 5 m), C(0, 10 m, 2.5 m) and D(0, 10 m, 7.5m).

Apatite fission track time and temperature models



(Forward time–temperature models for Mt. Washington samples 08–40 near the summit (1762 m), 08–43 halfway down the mountain (1305 m), and 08–49 at the base of the auto road (510m) calculated from measured apatite fission-track length distributions using the Ketcham et al. (2007) annealing model and the HeFTy program version 1.6.7 (Ketcham, 2009))

Some Suggestions

- Each PPT stays no more than 2-3 minutes, contains no more than ~8 sentences- as a rule of thumb!
- The Title of each PPT must serve to direct audience to grasp the points in the PPT as quick as possible.
- Avoid complicated mathematical equations, long tables, and figures of many colors and images.
- Avoid generic, generalized, suggestive words in *Purpose* and *Conclusion*.
- Use “plain and professional” English, if short of vocabulary check an English-English dictionary.
- Control your presentation time - *if you can’t do your presentation in 10 minutes, you don’t know your work.*

梓匠輪輿能與人規矩，不能使人巧

感　謝