How to Read & Write a scientific paper

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Organization of a paper

Title
Authors and their addresses
Abstract
Introduction
Background information
Methods
Results
Discussion
Conclusions
Acknowledgements
Appendix
References

Title

The title should describe the content of the paper and catch the attention of the reader

Determination of initial $^{87}Sr/^{86}Sr$ and $^{143}Nd/\ ^{144}Nd$ in primary minerals from mafic and ultramafic rocks: experimental procedure and implications for the isotopic characteristics of the Archean mantle under the Abitibi greenstone belt, Ontario, Canada

Title

The title should describe the content of the paper and catch the attention of the reader

Extraordinary heterogeneous mantle under Hawaii

or

Raising Tibet

Authors

- **Who should be included?**

  All the people who contributed significantly to the study

- **In which order?**

  Normally according to the amount of work done (rarely alphabetical)

- **Addresses**

  Main address - where the work was done

  Current address - present address of first author (corresponding author)

Abstract

A complete but brief summary of the content of the paper, which should be entirely understandable without the rest of the paper.

Many journals will have a size limit for abstracts

Abstract

An abstract should explain:

- ***what*** was done,
- ***why*** it was done (the scientific problem)
- ***how*** it was done (which methods were used),
- ***what*** results were obtained (summarize the most important measurements or data)
- ***what*** was discovered (the scientific conclusions)

Introduction

A statement of the intent of the paper

Give the reasons why the research was undertaken

- explain the nature of the scientific problem
- discuss earlier attempts to solve the problem (and why they were not successful)
- recount briefly your approach to the problem and why it promised to be more successful

Encourage the reader to go on with the paper

Background information

- Previous work on the problem
- Earlier interpretations

Methods

- Techniques used to study the samples or to approach the problem
- Experimental procedures
- Types of equipment
- Laboratory(ies) where the research was done
- Problems encountered during the research
- Methods of treating raw data
- Estimated reliability of results

Explain how each person contributed to the research; if data or information from other sources were used, clearly identify these sources (data files, published papers; communication with other scientists)

Results

In this section you should **PRESENT** and **DESCRIBE**, but not **INTERPRET**, your results

You should present your results in tables and figures, then give a brief summary of the principal aspects in the text

*e.g. in Fig. 1a, it is seen that as parameter **X** increases, parameter **Y** first increases then decreases; under the conditions illustrated in Fig. 1b, the maximum is absent and parameter **Y** constantly decreases*

Discussion = interpretation

- How can the results be explained?
- How do they help to solve the problems posed in the introduction?
- Presentation of alternative theories that may explain the results
- Discussion of positive and negative aspects or each theory

Conclusions

- A summary of the most important results
- Recapitulation of the successful hypothesis(es) that best explain the data

Acknowledgements

In this section you thank all the people and organizations that helped to support the research and to produce the paper

- People who helped with field work, sample or data collection, analyses, experimental support, computing
- Agencies that provided financial or logistic support
- People who read early drafts of the paper, reviewers, editors
- **ICTP…**

Appendix

Aspects or data that are too detailed for most readers but useful for specialists

- Detailed descriptions of analytical or experimental procedures
- Detailed sample descriptions
- Derivation of equations
- Tables of supplementary data

Such information is usually not printed with the paper but is placed as electronic data files on the publisher's web site

References

All sources of information must be given in the text by citing the source. There are various different schemes, defined by the journal.

e.g. (1) Journal of Petrology:

For one or two authors:

"McKenzie & Bickle (1988) showed that the plasma heating …"

"It is known that the plasma heating… (McKenzie & Bickle, 1988)"

References

For three or more authors:

"Deer et al. (1963) showed that the plasma heating …"

"It is known that the plasma heating… (Yoder, 1962; Deer et al., 1963)"

(2) Nature

"It is known that the plasma heating[1,2]"

References

All references cited in the text or in captions for figure and tables, must be given in the list of references at the end of the paper.

There are many different formats; e.g. from Physical Review

References cited must be given in full and listed in alphabetical order in the last section of the manuscript. The following examples are given:

References

A normal paper

McKenzie, D. & Bickle, M. J. (1988). The volume and composition of dense plasmas. *Physical Review A 129* , 342-532.

A book

Yardley, B. W .D. (1989). *An Introduction to High Temperature Plasma*. Harlow: Longman Group UK.

References

A chapter in a book

Thompson, J. B. Jr. (1959). Local equilibrium in cold plasmas. In: Abelson, P. H. (ed.) *Researches in Tokamaks*. New York: John Wiley, 427-457.

A normal paper that has been accepted by a journal but not yet published

Wilson, M., Rosenbaum, J. M. & Dunworth, E. A. (1998). Does temperature induce high frequency wall fluctuations in tokamaks, Zeit. für Physik D, **in press.**

Commercial software such as ENDNOTE is available for editing references

Advantage: easy formatting for different journal styles

Disadvantage: all references must first be entered into a database

Figures

OXFORD JOURNALS

Journal of Petrology
INSTRUCTIONS TO AUTHORS

http://www3.oup.co.uk/jnls/list/petroj/instauth/

FIGURES

Think carefully about how the figures will look after reproduction and study some recent issues of the *Journal* to see the page lay-out.

Faint or fine-grained stippling/shading or continuous-tone shading will be lost, reproduce patchily or may appear black on reproduction. Use coarse stippling or an appropriately patterned fill. Grey shading and grey lines should be avoided because they do not reproduce well. Use black lines, preferably no finer than 1 pt or 2 pt.

Each figure must be submitted on a separate page, be clearly identified with figure number and author's name(s), be no larger than A4 size and of a line weight and lettering size suitable for reduction to the type area of the Journal. The maximum width of a double column figure is 164 mm and the maximum depth is 214 mm. After reduction, the smallest lettering should not be less than 2 mm high. Where figures are comprised of several parts, they must be squared accurately and separated by at least 5 mm. Each part must be labelled with a lower case letter, e.g. (a), (b) etc.

Attach a legend in which all symbols and abbreviations used in the figure are defined. Common abbreviations or those that have been defined in the text need not be redefined in the figure legend.

A list of all figure captions should be printed on a separate sheet(s). Text references to figures should appear as Fig. 1 or (Fig. 1) as appropriate.

Figures

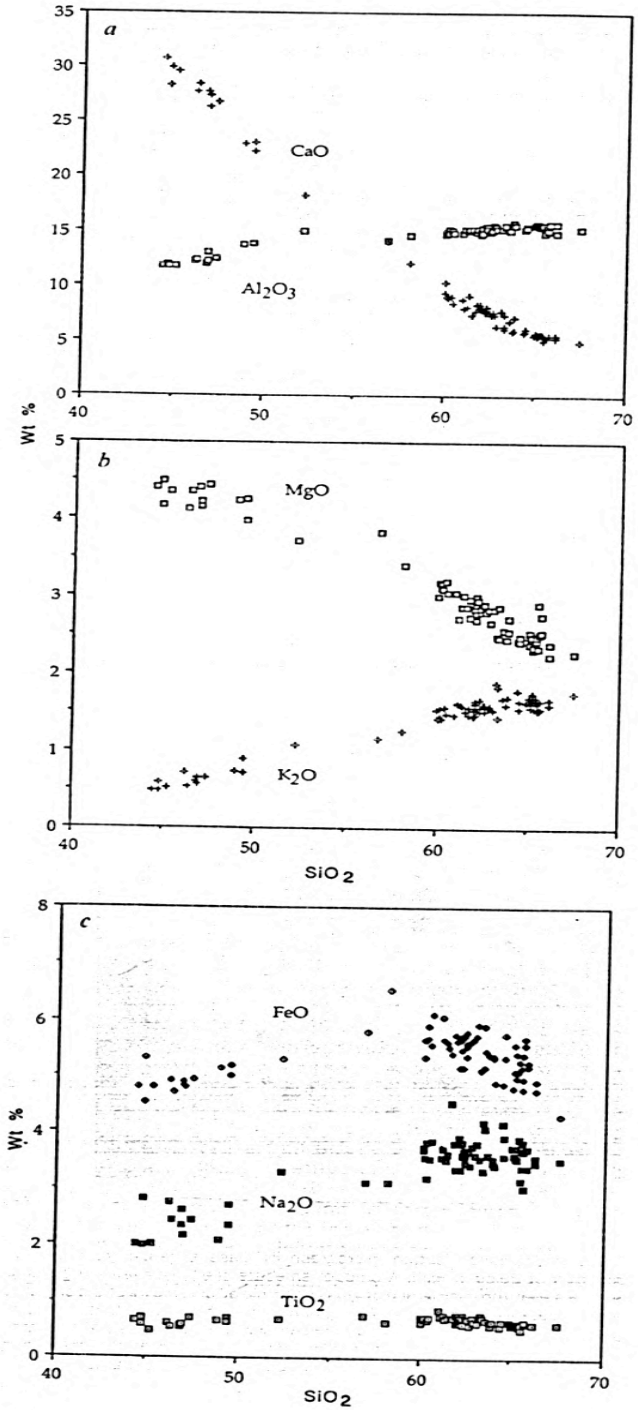
- Use diagrams to illustrate graphically your data
- It is not necessary to plot all your data. Select the data so that the diagram demonstrates specific points - try to pass a message with each diagram
- Take care to make the diagrams clear and legible. Avoid text and symbols that are too small. Write on the diagram to highlight important aspects

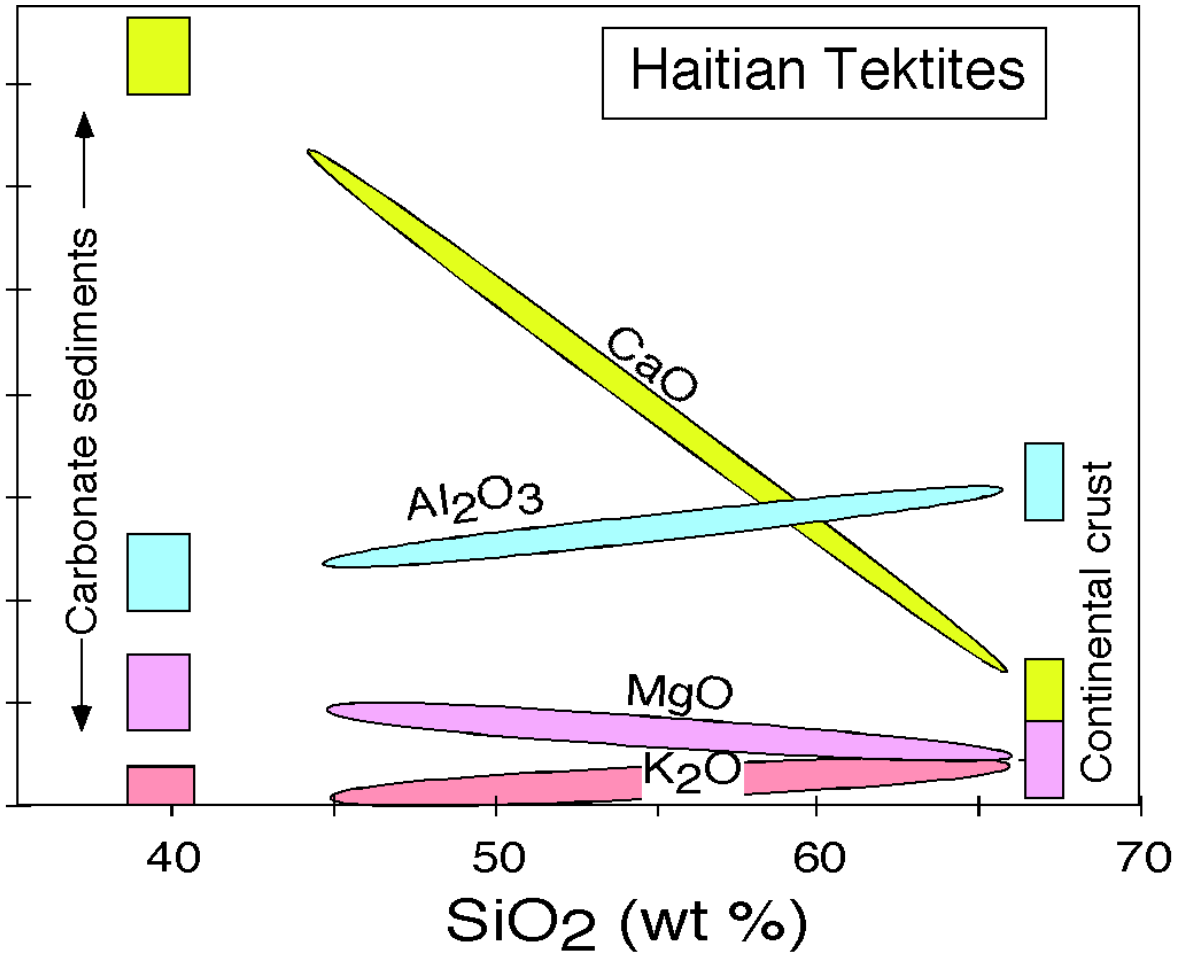
Figures

- Use fonts and patterns that will reproduce well
- Always include a legend and write on the legend to explain the meaning of each symbol or pattern. Don't use *bloody numbers*!
- Always include a figure caption that explains the diagram. Identify the sources of all data, particularly those from other scientists.

Figures

Simplify graphs





A horrible, old Russian map

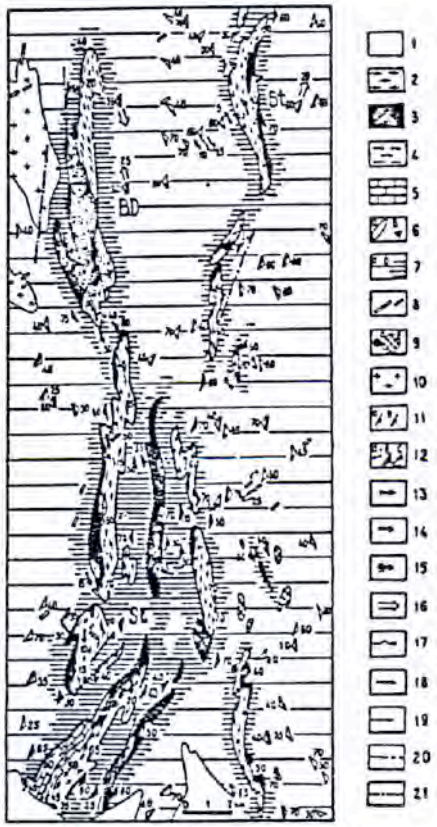
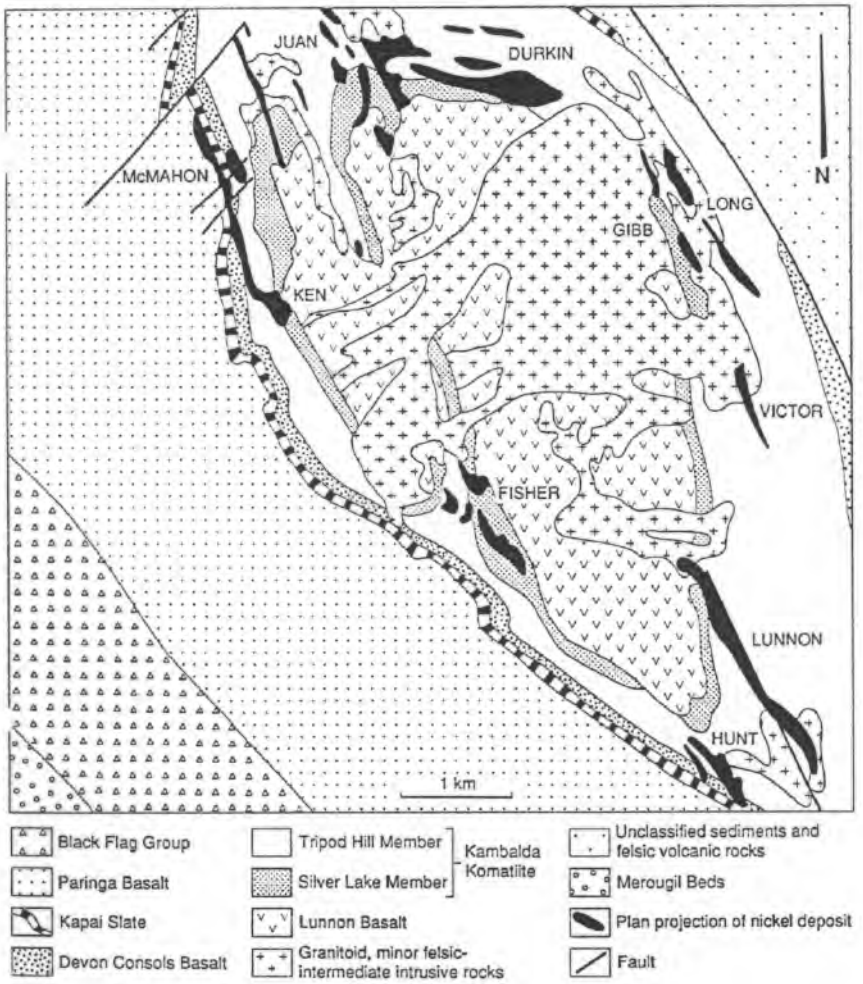
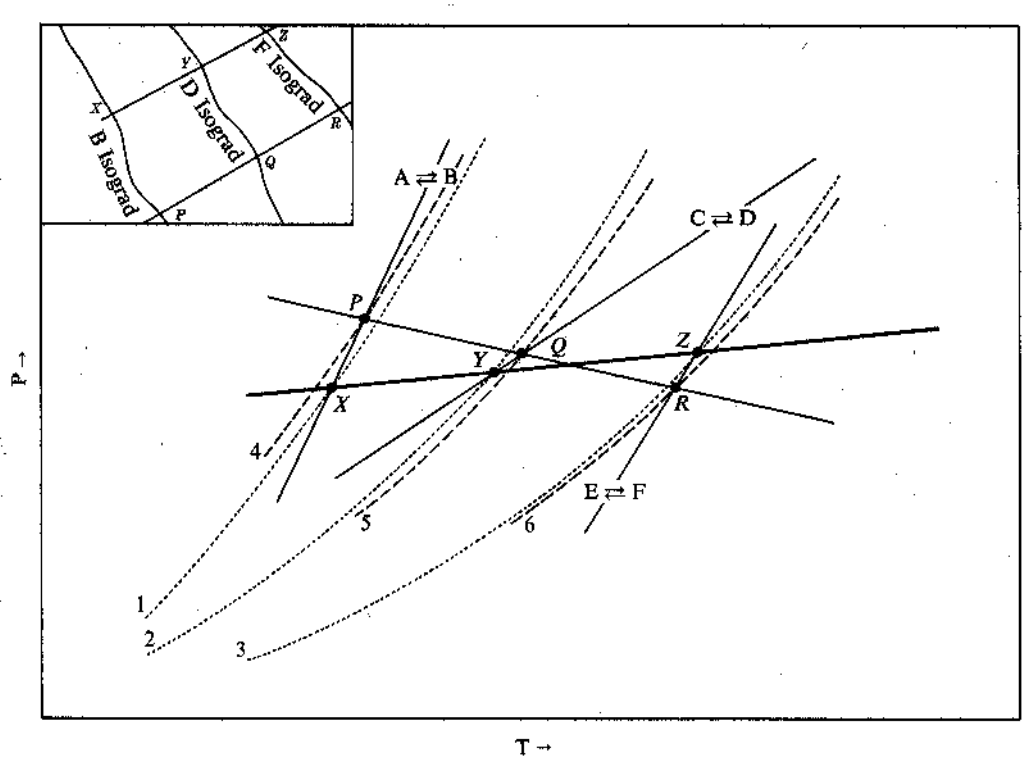


Fig. 6. Geologic map of the Syrylyr-Bolshaya Dagda River systems (compiled by L. Bogomolova and V. Timofeyev, using data of V. Berezkin, A. Breido, V. Dook, L. Malkov, S. Rozhin and A. Smelov).
1. Mesozoic and Quaternary cover; 2-6. Greenstone complex, Tungurcha group: 2. High alumina (with garnet, staurolite, sillimanite, kyanite) schists, 3. Alternation of mica-quartz schists, mafic schists, monomineralic and BIF, 4. Mica-quartz schists and microgneisses, 5. Marbles and calciphyres, 6. Ferruginous quartzites (BIF): Lenses (a), sign of presense (b); 7. Biotite, amphibole-biotite orthogneisses of tonalite-trondhjemitic composition and migmatites: Infracomplex (a) in shear zones of epidote-amphibolite facies (b); 8. Kongo-diabases (quartz diabases) metamorphosed at greenschist facies; 9. Meta-ultramafic rocks (a), metagabbro and metagabbro-diorites (b) of Amnunankit complex metamorphosed at amphibolite-epidote facies; 10. Fine-porphyroid biotite and two-mica granites; 11. Schistosity S_{1-3} (a) coinciding with S_0 (b) in Tungurcha group; 12. Attitude of schistosity and foliation (gneissification) in ortho-gneisses of infracomplex (a), in zones of shearing of epidote-amphibolite facies (b), banding and schistosity coinciding with it in migmatites (c); 13-16. Minor folds: With hinges along dip of axial surface (13), NW-trending with gentle hinges (flexures) (14), with subhorizontal axial surface (15), NW-trending in orthogneisses and migmatites of infracomplex (16); 17. Orientation of crenulation; 18. Lineation of quartz in schistose gneisses from infracomplex; 19. Geological boundaries; 20. Faults accompanied by shearing under conditions of epidote-amphibolite facies; 21. Zones of retrograde greenschist facies. BD-Bolshaya Dagda, Bt-Botolkoi, Sl-Syrylyr.

A modern Australian map



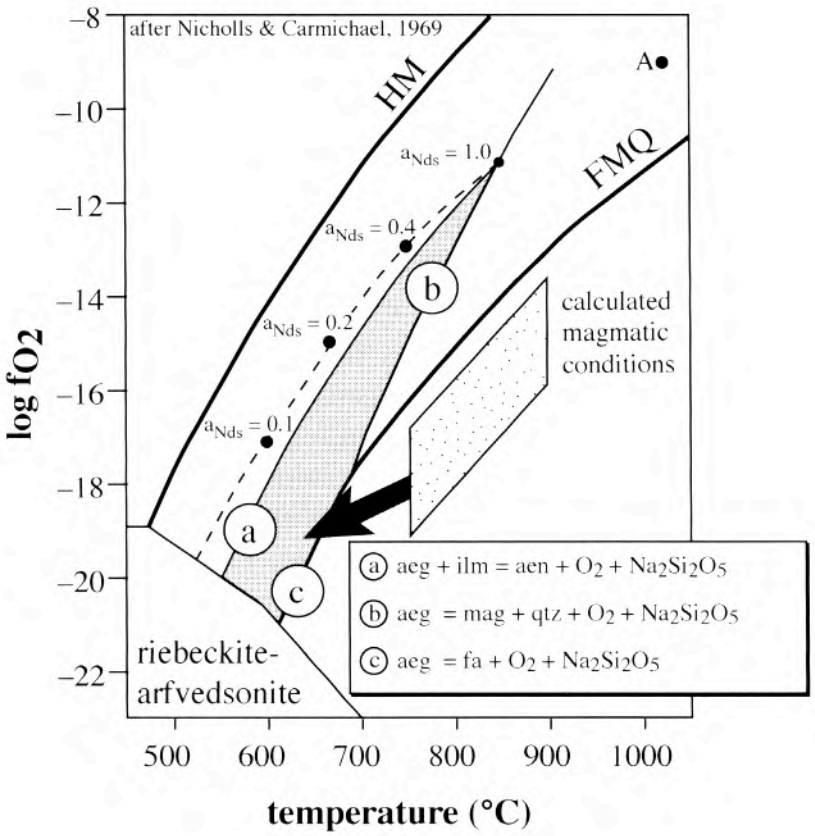
- simplified so that only essential information is shown
- legend with explanation (no bloody numbers!)
- text almost large enough



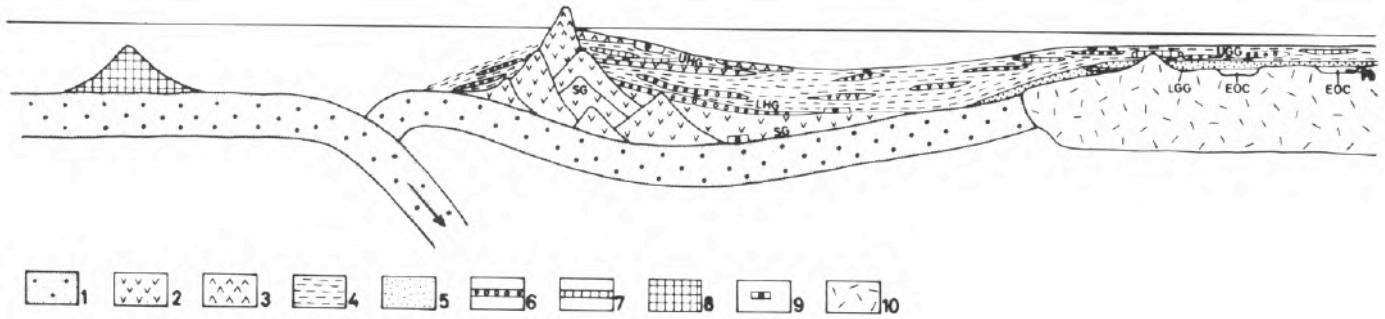
A horrible old American PT diagram

- text too small
- too complicated
- no explanation

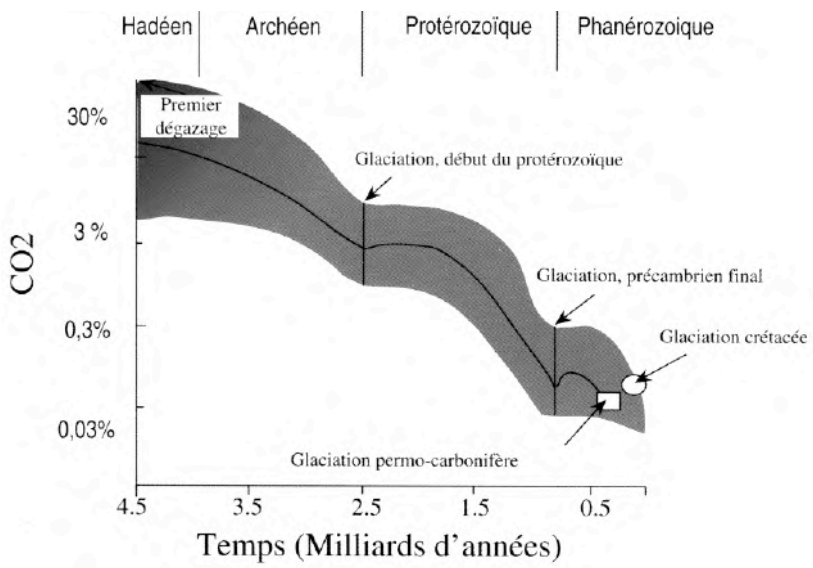
A modern English diagram

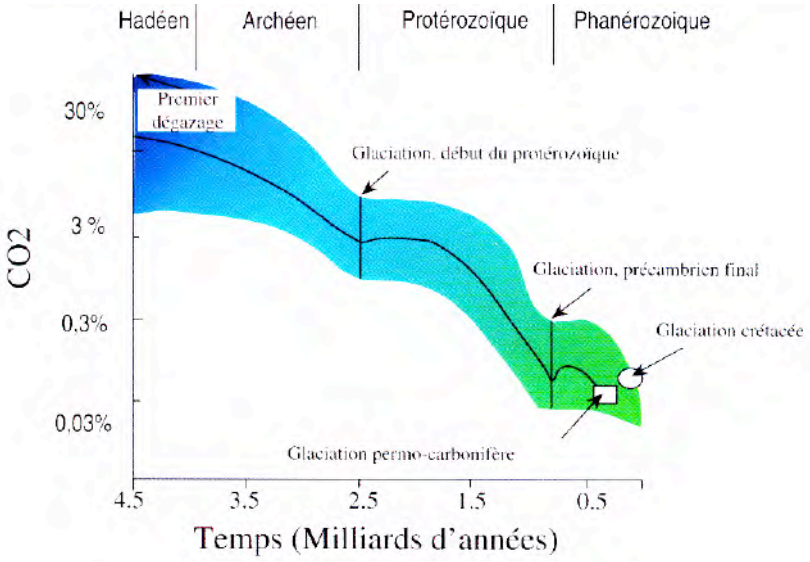


A horrible old Canadian section



Modern French diagrams





Tables

Table 1a: Detrital zircon fission-track data from western foreland basin sediments

Samples	Biozones	deposition (Ma)	*N*	Age range (Ma)	P1	P2	P3
99MB13 Sable de Montvendre	NN11	8.0	60	11.5 – 184	17.2 ± 1.8 52%	28.3 ± 5.1 25%	99.8 ± 11.9 23%
99MB16 Sable de Valeras	NN7	13.0	60	14.2 – 195	22.0 ± 1.8 66%	63.9 ± 9.8 19%	121.8 ± 26.7 15%
99MB22 Etang du Lavalduc	NN4	16.0	60	18.3 – 142	24.0 ± 2.0 59%	66.0 ± 10.7 19%	116.4 ± 18.5 22%
00MB53 Grés verts	NP24	26.0	11	31.9 – 221	47.8 ± 8.6 70%	167.2 ± 50.3 30%	-
00MB54 Molasse Rouge	NP23	28.0	60	23.5 – 267	34.4 ± 3.3 45%	59.7 ± 7.7 26%	152.9 ± 17.5 29%
00MB55 La Poste Fm	NP23	30.5	50	22.7 – 160	32.4 ± 2.8 50%	60.4 ± 10.1 16%	111.1 ± 14.4 34%
00MB52 Grés d'Annot	NP20	36.0	50	35.3 – 341	60.9 ± 9.0 51%	122.3 ± 19.5 49%	-

Note: *N* = total number of grains counted; binomial peak-fit ages are given ±2 SE. Also given is the percentage of grains in a specific peak. All samples were counted at 1250x dry (100x objective, 1.25 tube factor, 10 oculars) by M. Bernet using a zeta (CN-5) of 334.22±3.40 (±1 SE). Depositional ages after Pomerol (1980) and Evans and Mange-Rajetzk (1991). Biozones after Hartland et al. (1989) and Berggren et al. (1992).

Additional points

- Writing a paper
  - Is a long process
  - Be prepared to make many revisions
  - Have friends and colleagues criticize your work
  - Write a paper for a specific journal
  - Take official reviews seriously
  - Don’t get frustrated with criticism

Additional points

Avoid acronyms! (ANMD = a nasty modern disease)

Irvine and Rumble (1992) "A Writing Guide for Petrological (and Other Geological) Manuscripts" J. Petrol, supplement, 1992, 46 pp

"32. **Acronyms and contractions**

A few acronyms and contractions have been widely used in petrology and geochemistry with great success -e.g., MORB for mid-ocean ridge basalt, REE for rare earth elements, and PGE and PGM for platinum-group elements and minerals. Some have also been valuable in particular studies and have been usefully imitated-eg. LZa,b,c; MZ; and UZa,b,c for the Lower, Middle, and Upper zones and their subdivisions in the Skaergaard intrusion.

Not surprisingly, however, such successes have also led to excesses and abuses. Some authors have successfully used numerous acronyms by virtue of being accomplished writers, but in following example, others who are not so accomplished have produced results verging on babble. Over the years, as both reviewers and editors, we have seen several manuscripts in which authors defined an acronym such as "FHI" for the "Flat Hill intrusion" and then *proceeded to use it in almost every other sentence, even though an occasional reference to "the intrusion" would have sufficed and any confusion with other intrusions could easily have been avoided. The authors thought they were saving words and space but in fact, they were just trying to compensate for poor writing, and in the end, they actually added to their problems.*

In our view, *best use for most acronyms and contractions is to flag the pertinent terms during the writing process to be sure that they are not used too frequently. Then, after their presence has been minimized by restructuring sentences, convert the residue back to word.*"

Additional points

- Use of acronyms
  - Common acronyms:
    - XRF– X-Ray fluorescence
    - AFM– Atomic Force Microscope
    - FTIR– Fourrier Transform InfraRed spectroscopy
  - Avoid using or inventing too many acronyms
  - Some journals will not allow the use of acronyms

Additional points

- Reading a paper
  - You won't have the time to read all papers in detail
  - If time is short focus on
    - Abstract, introduction, conclusions
    - Figures and tables
  - Be prepared to read papers that are important for your research several times

Conclusions

- Organization of the manuscript
- Prepare your figures and tables carefully
- Acknowledge other peoples' work in your references
- Read what is important for your work