



Scientific Writing and Reviewing



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Keys for producing a well-written paper

- Organization: How do you correctly put together a paper?
 - Abstract
 - Introduction
 - Geologic Setting
 - Methods and Materials
 - Results
 - Discussion
 - Conclusions
 - **Acknowledgements**
 - **Data Availability**
 - References

manuscript
~~My thesis~~ is written in



Abstract

- The abstract should briefly outline the most important points made in the paper. Be concise; typically less than 2500 characters.
- Do NOT word for word repeat what is in the Conclusions!
- **Recommendation: write the Abstract last!**
- The abstract should contain:
 - Principal objectives/scope of work
 - Methodology
 - Results
 - Conclusions



Answer these questions with your abstract:

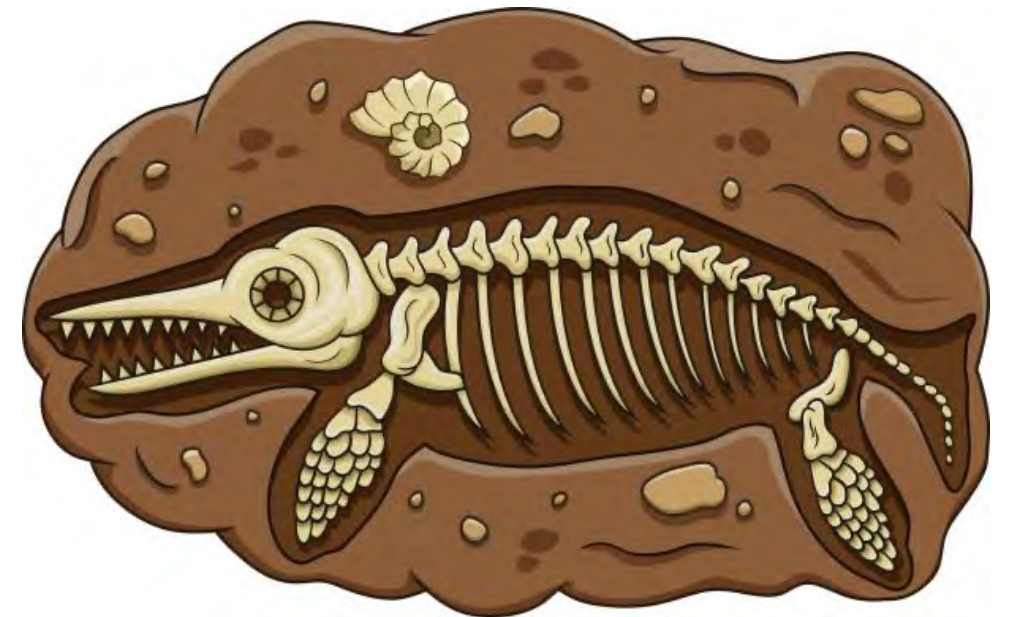
- What did we do?
- How did we do it?
- What did we learn that was not known before?

Introduction

- This section should give background information regarding your study and/or study area
 - Reference papers that help outline the region or (e.g. work that has previously been done on your core/outcrop, geologic mapping, tectonic history, etc.) or field of study. **Provide a latitude and longitude of your core/outcrop/study area!**
 - Briefly discuss age/time (e.g. previous work done on PETM, OAE2, Late Cretaceous in the region, etc.)
 - Make sure you use **both older references (for historical context) and newer references** (to show how the science has moved forward and that you as an author have kept up with recent work in your study area)
 - **As part of the last paragraph, add a sentence or two stating the purpose of the paper**

Geologic Setting

- This is where you should go into some depth regarding the geology of the region
- For example:
 - Discuss lithostratigraphy, sequence stratigraphy, paleoclimate/oceanography
 - How does your section/core relate to other nearby sections?
 - Does tectonics affect your study area?
 - Did paleocurrents play a role in sedimentation?



Methods and Materials

- State very clearly in the first paragraph **how many** samples you looked at and from where. For example: “**We examined** fourteen samples from three separate Cretaceous exposures and 61 samples from 12 separate Paleocene exposures along Cabin Branch for grain size, calcareous nannofossil, and foraminiferal content.”
- Use a different subheading for each method (e.g. Carbonate Petrography, Geochemistry, Calcareous Nannofossils)
- For each method, include the equipment used (e.g. Leica DM2700P), how slides were made (e.g. using the methods of Bown and Young [1998]), what magnification(s) the slides were examined at (e.g. 1000×, what biozonation was used, what timescale was used, etc.
- Indicate where the slides are **deposited** (stored)

Results

- This is where you say **WHAT YOU FOUND**—this is **NOT** where you discuss what it means!
- Examples of results include:
 1. First and last occurrences (gives depths in core/outcrop)
 2. Unconformities and how much time is missing
 3. Grain size, changes in lithology, etc.
 4. Geochemical changes (e.g. carbonate content, stable isotopes)
 5. Differences between sections



Discussion

- This is the meat of the paper where you discuss what it all means!
- Include interpretations of what your data means (paleoenvironment, paleoceanography, temperature, salinity, etc.)
- Compare with other data (geochemical, other fossil groups, lithology) in order to provide a detailed and comprehensive interpretation of your study area
- **DO NOT over interpret your data!** Not every data set will tell you stunning things—sometimes the best you can do is basic biostratigraphy or basic understanding of the section (and that is fine)

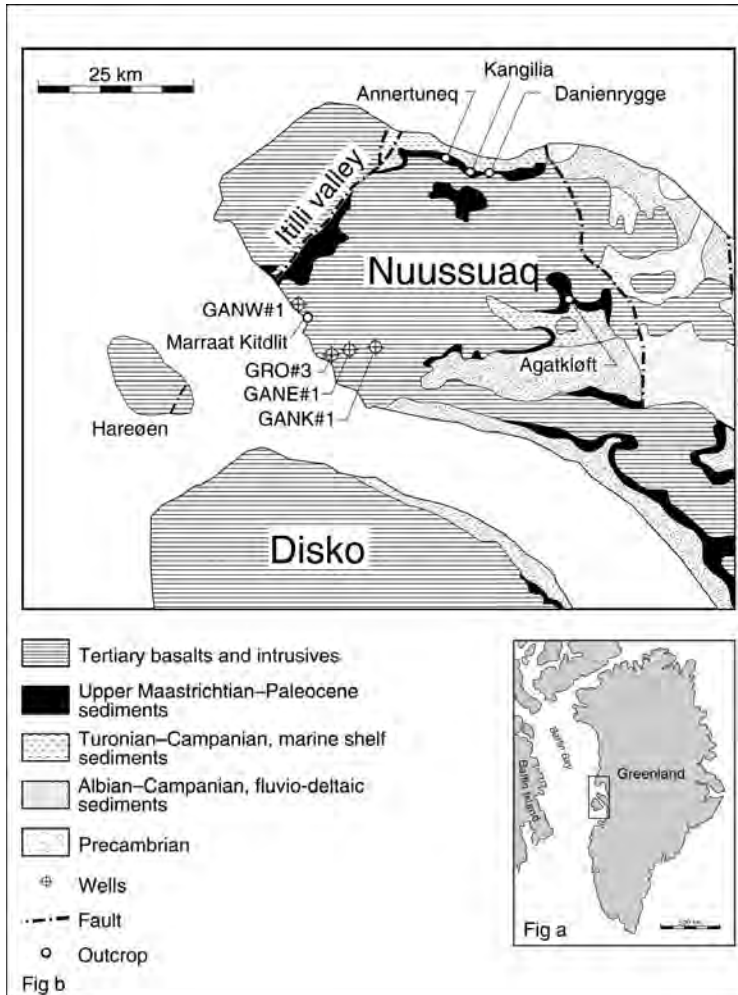


Figures

- Make your figures using one drawing package (e.g. Adobe Illustrator, Corel Draw, etc.)
- *Make sure that all text* in all figures is in the **same FONT**. Check with the journal Suggestions to Authors to see what font to use and suggested sizes
- Make sure that text in columns is neatly aligned and centered
- Do not make your figures in PowerPoint or using freehand—these methods do not produce the best figures
- Make sure that all figures are referred to in the text (callouts) and that you include a Figures/Plates/Tables section with captions for each one

Figures

- Which is best to use? Black and white/grey scale or color?
 - This may depend on cost—some journals charge for color or allow only limited numbers of figures with color

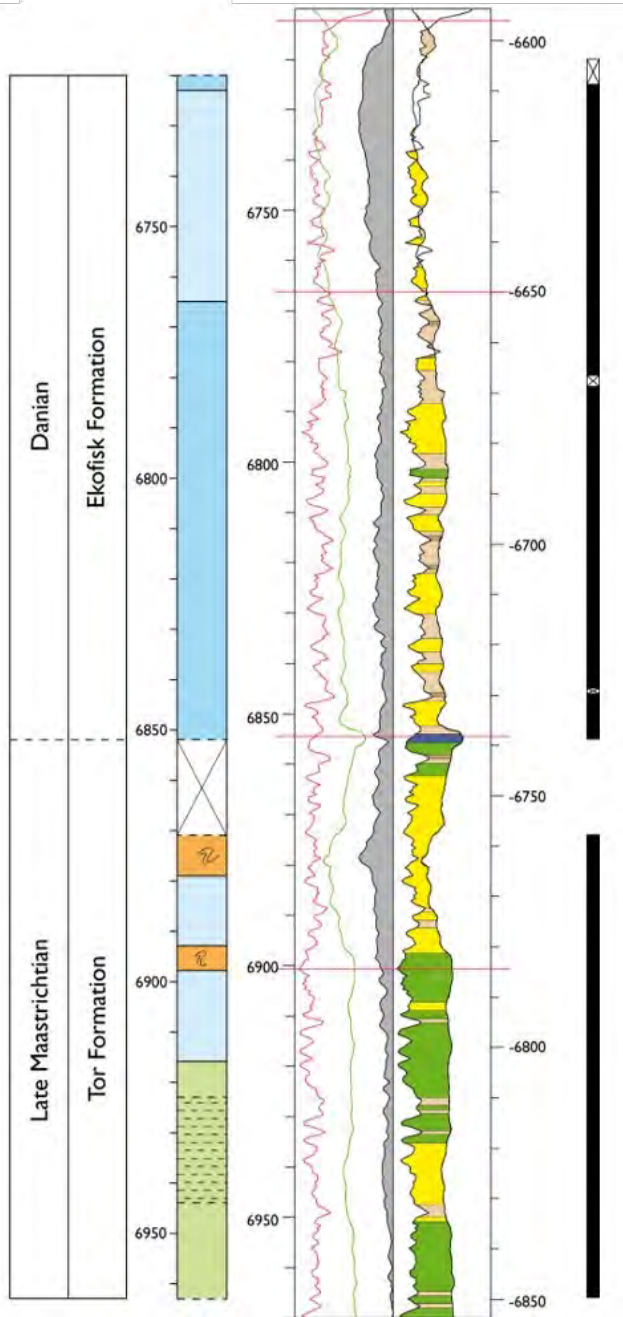


What is done well on this figure?

- Has a scale bar
- Provides a smaller map of Greenland to put the sampling location in perspective
- Has a legend

What could be improved?

- Missing a North arrow
- Missing latitude and longitude
- Missing name of body of water (note that bodies of water are always *italicized* in figures)



©GEUS, 2004

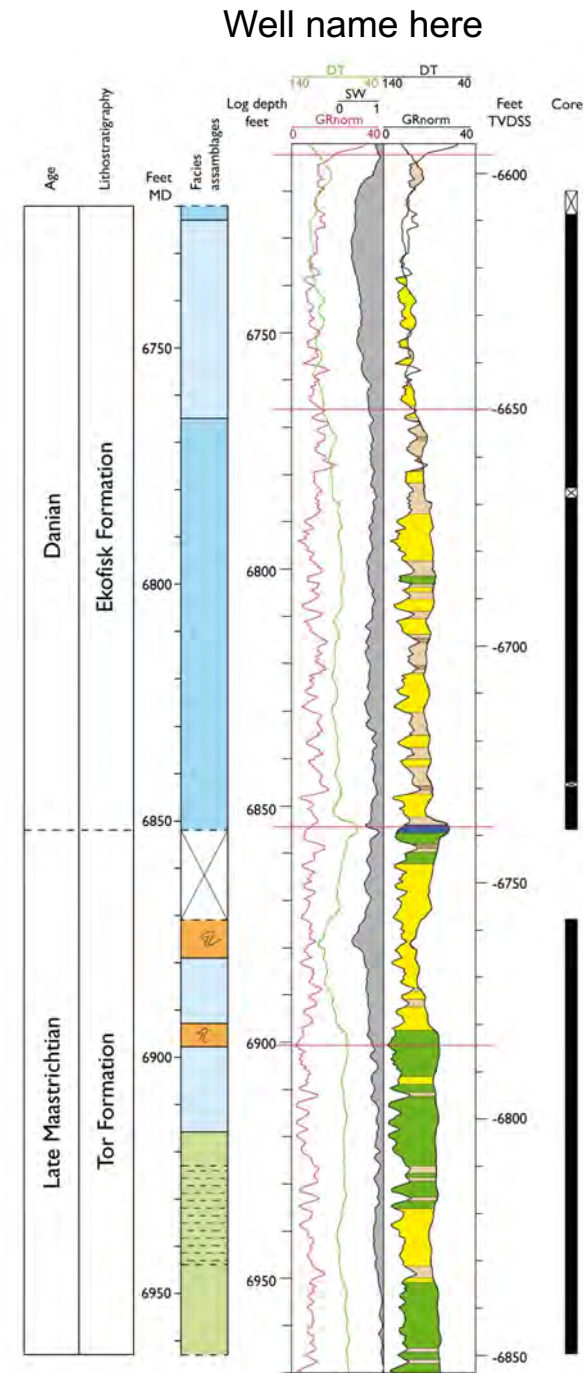
What is wrong with this figure?

This figure is missing headers such as:

- The well name
- Age
- Lithostratigraphy
- Depth with units (m, feet, etc.)
- Log Depth
- TVDSS
- Log Trace Titles
- Core

It also needs a key/legend to explain facies assemblages and lithostratigraphy (what do the colors mean?)

Correct

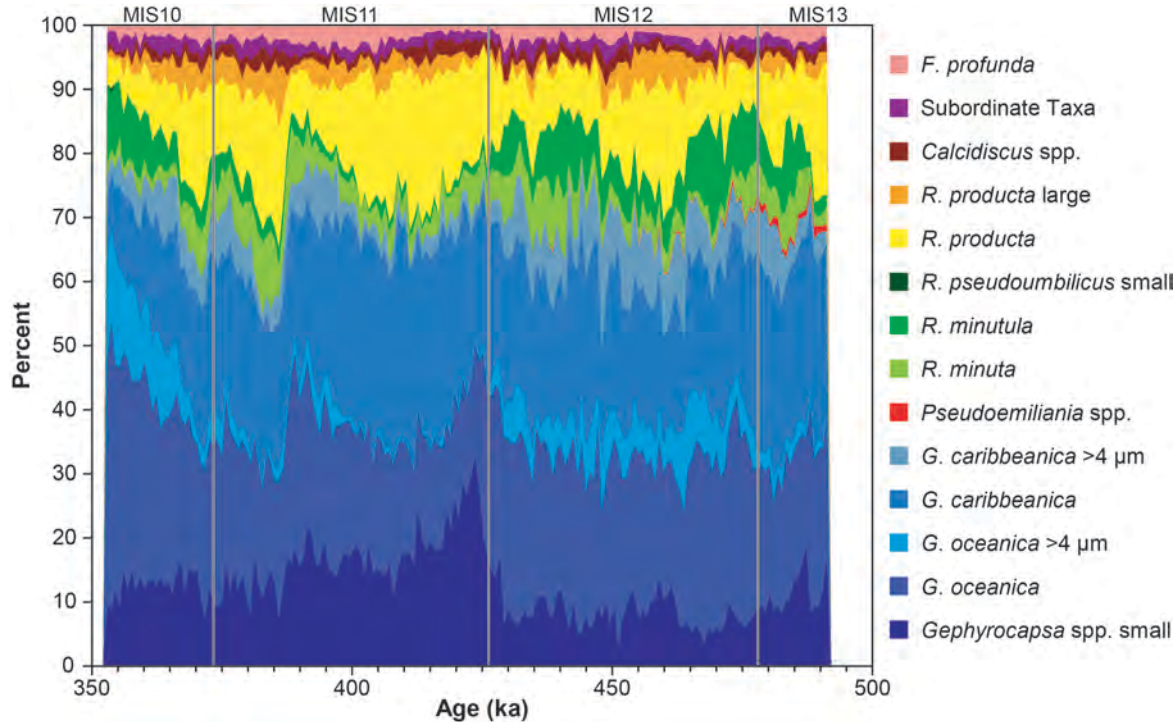


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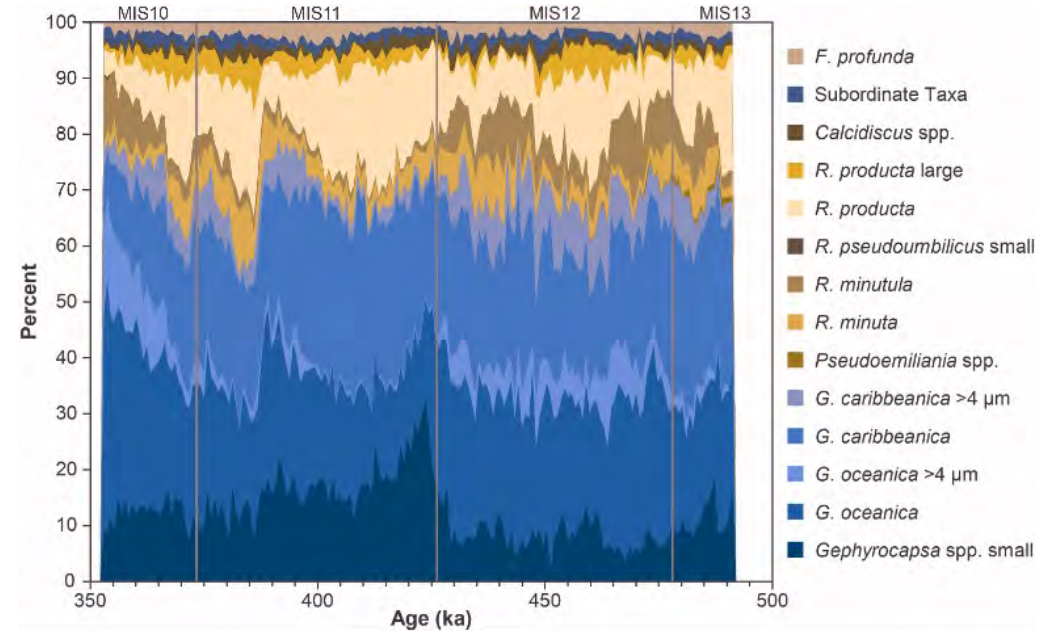
Figures

Consider what your figure will look like for the visually impaired

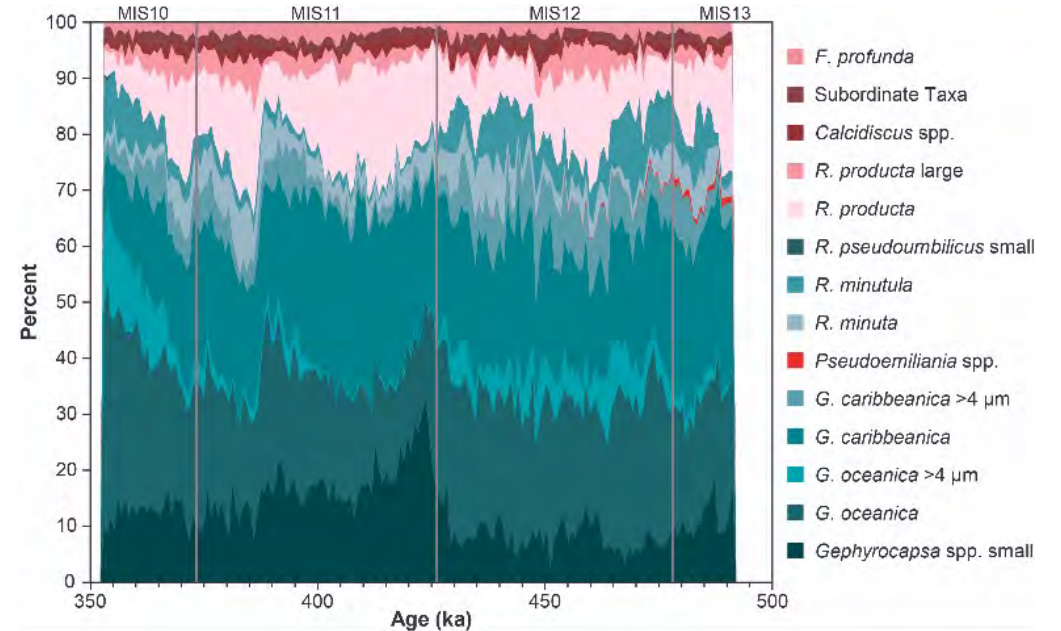
Original



Deuteranopia (absence of green retinal photoreceptors)

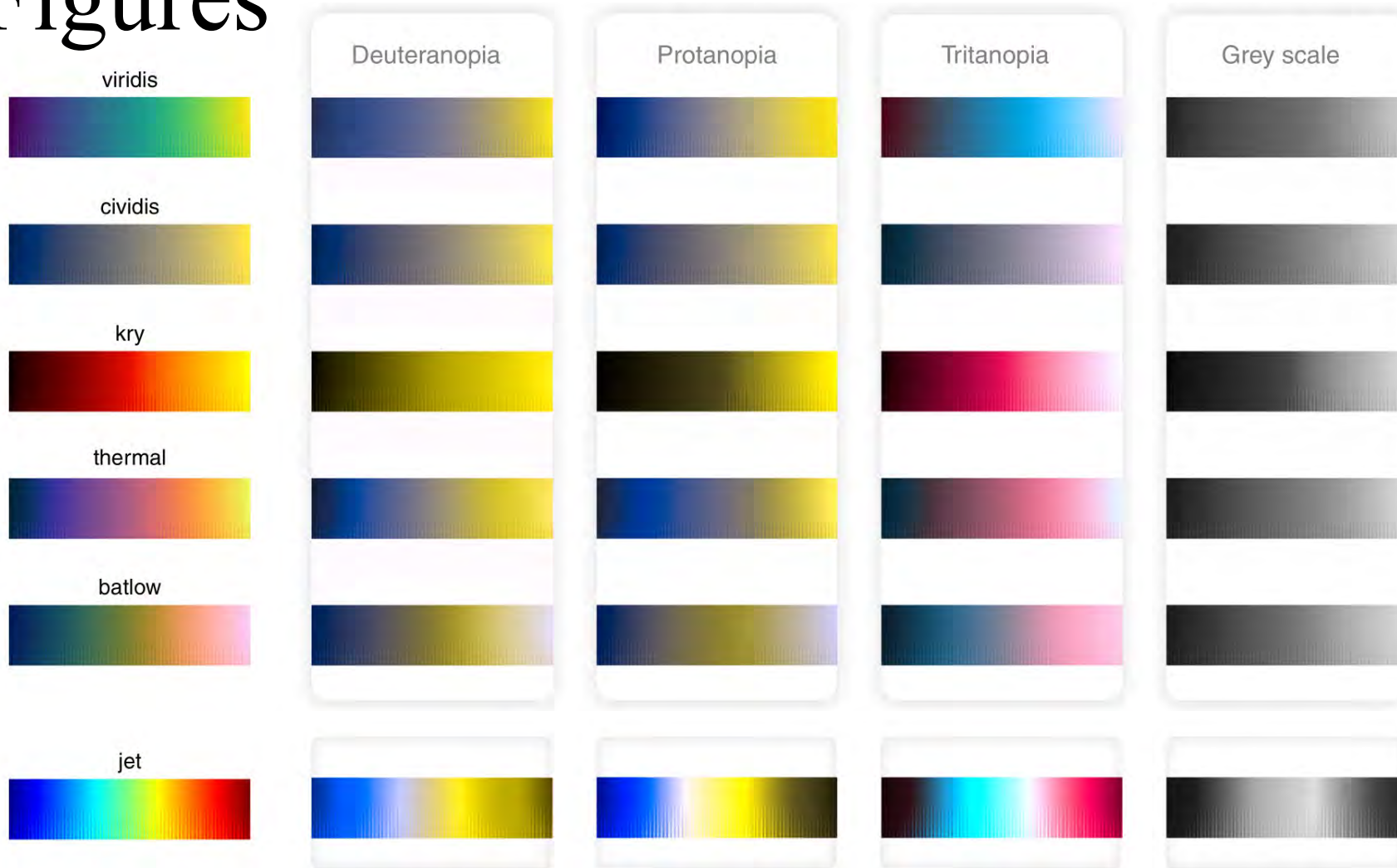


Tritanopia (absence of blue retinal photoreceptors)



Rainbow color schemes are not good for those with visual impairments!

Figures



These *non-Rainbow/jet* colorscales are **universally readable**.

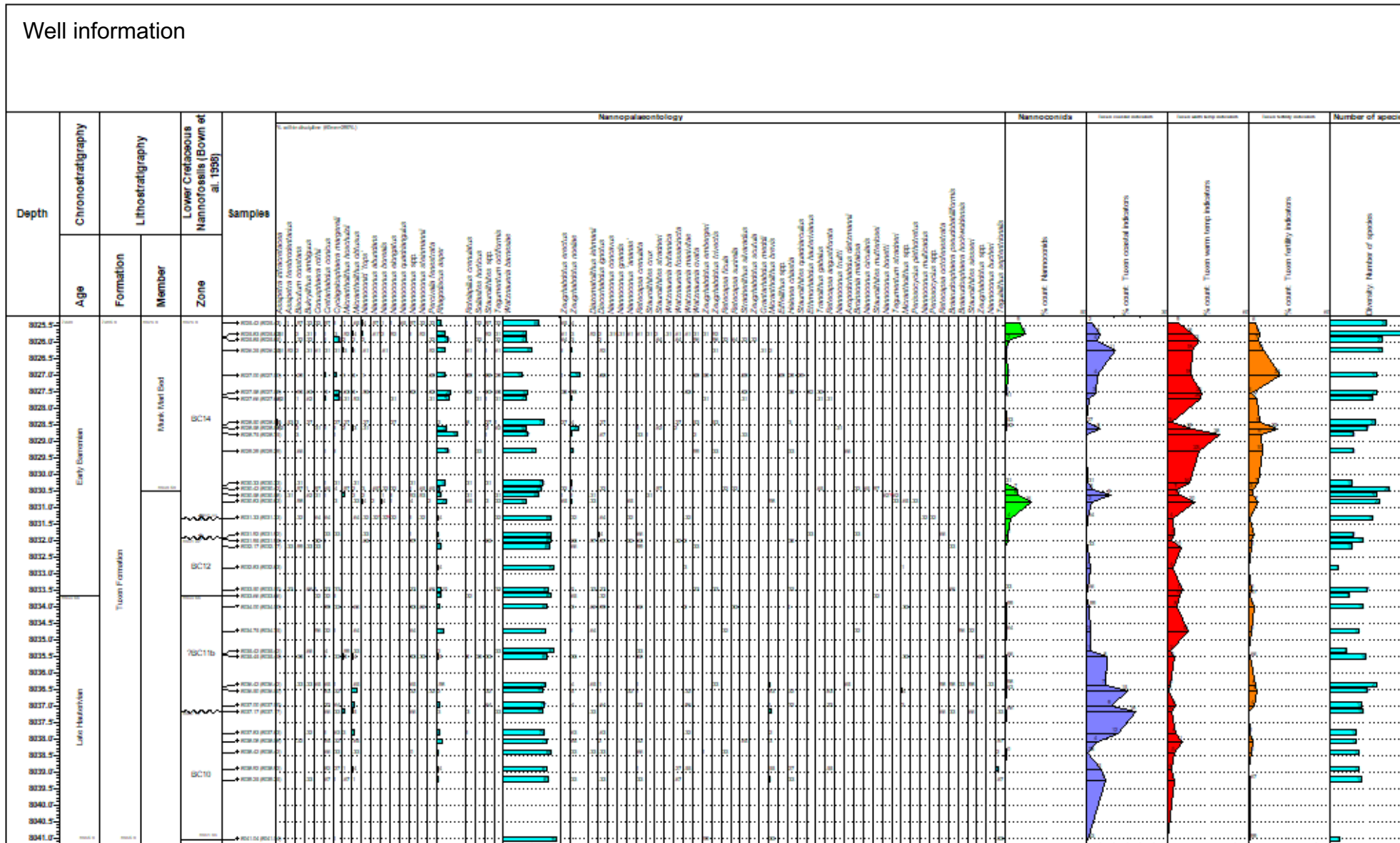
Rainbow/jet **fails** to reproduce a meaningful smooth gradient and unambiguous color transitions.

There are online resources to help you check your figures for meaningful visualizations!

- <https://www.color-blindness.com>
- <http://hclwizard.org>
- <https://colororacle.org/>

Occurrence/distribution charts

This chart is better (but the font size is still a little small)!



Don't forget to make sure that all species names are *italicized* and that all text is centered and aligned

Journals can change the orientation to landscape so that the figure is larger (and you can zoom in a PDF)

Occurrence/distribution charts

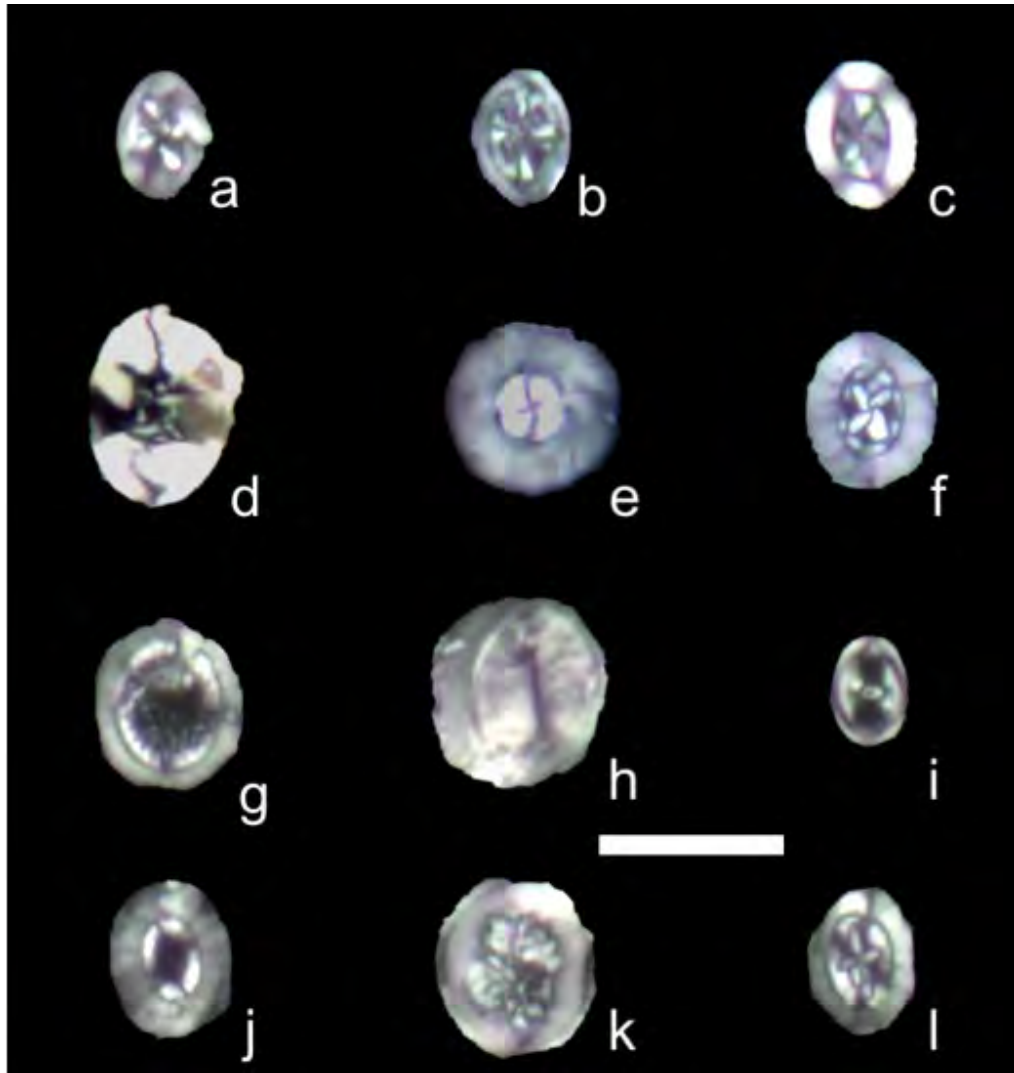
			Well 1	Well 2	Well 3	Well 4	Well 5
Horda Fm	H2 Member					Lutetian - Bartonian	
Horda Fm	undifferentiated		Ypresian - Bartonian	Ypresian - Bartonian	Ypresian - Bartonian		
Horda Fm	H1 Member						Ypresian - Lutetian
Balder Fm			early Ypresian	early Ypresian	early Ypresian	early Ypresian	early Ypresian
Sele Fm			Thanetian - Sparnacian	Thanetian - Sparnacian	Thanetian - Sparnacian	Thanetian - Sparnacian	Thanetian - Sparnacian
Lista Fm			Selandian - Thanetian	Selandian - Thanetian	Selandian - Thanetian	Selandian - Thanetian	Selandian - Thanetian
Våle Fm			Selandian	Selandian	Selandian	Selandian	Selandian
Ekofisk Fm			Danian	Danian	Danian	Danian	Danian
Tor Fm	upper member		Late Maastrichtian		Late Maastrichtian	Late Maastrichtian	Late Maastrichtian
	undifferentiated			Late Campanian - Maastrichtian			
Tor Fm	lower member				Late Campanian - Maastrichtian	mid Campanian - Late Maastrichtian	Maastrichtian
Hod Fm	D			?C-D members: Early Santonian - mid Campanian	Late Campanian	combined C-D members: Campanian	Campanian - Early Maastrichtian
Hod Fm	C		combined B & C members: mid Coniacian - mid Campanian	?C-D members: Early Santonian - mid Campanian		combined C-D members: Campanian	Campanian - Late Santonian
Hod Fm	B		combined B & C members: mid Coniacian - mid Campanian	Early Coniacian - mid Santonian		Coniacian - mid Campanian	Coniacian - Late Santonian
Hod Fm	A		Coniacian	Late Turonian - Early Santonian	mid - Late Turonian	Turonian - Santonian	Coniacian - mid Santonian

What is wrong with this table?

- Too much wasted white space
- Make font bigger so it can be seen
- Add headers
- Delete column with nothing in it
- Adjust column widths
- Think carefully about how best to use outlines and color or shading in your tables

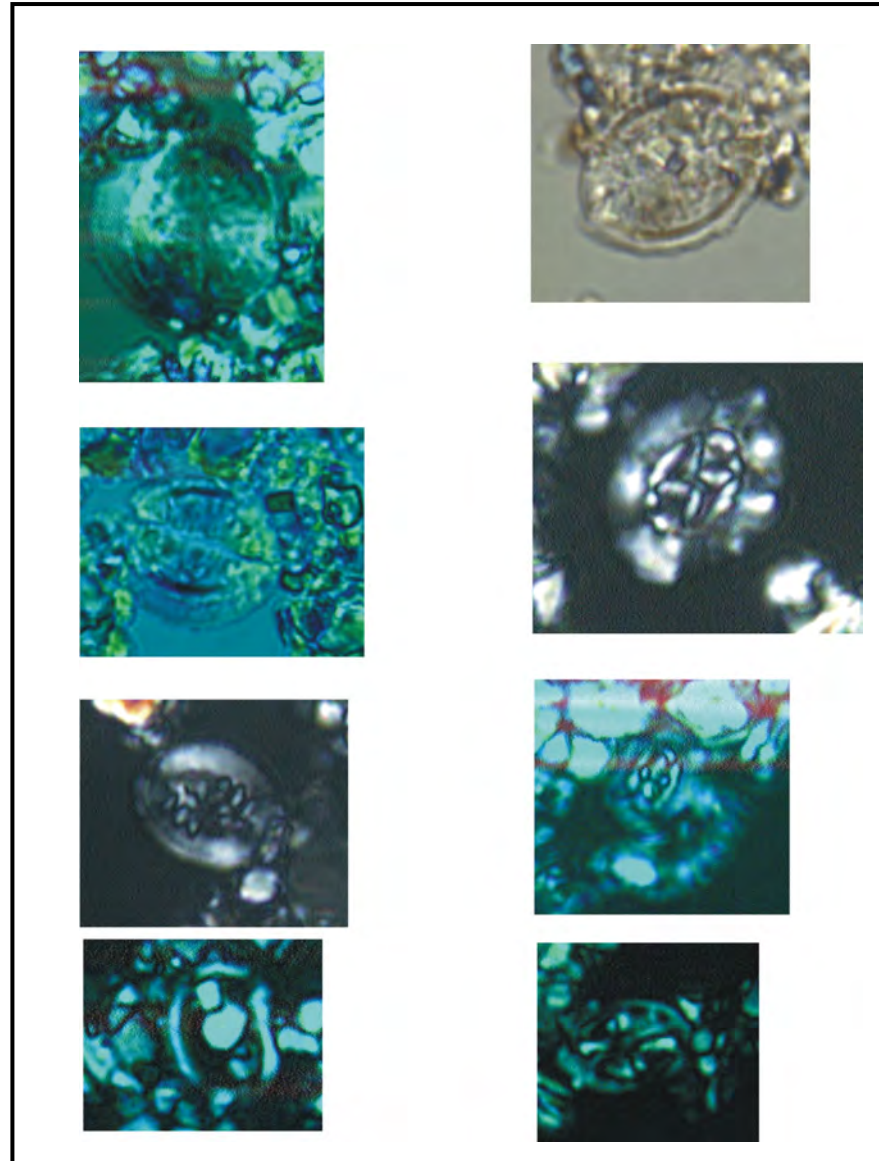
Tables should be neat and concise!

Plates



Do not cut out light microscope images like this!
Cutting out SEM images is OK

What is wrong with these plates?

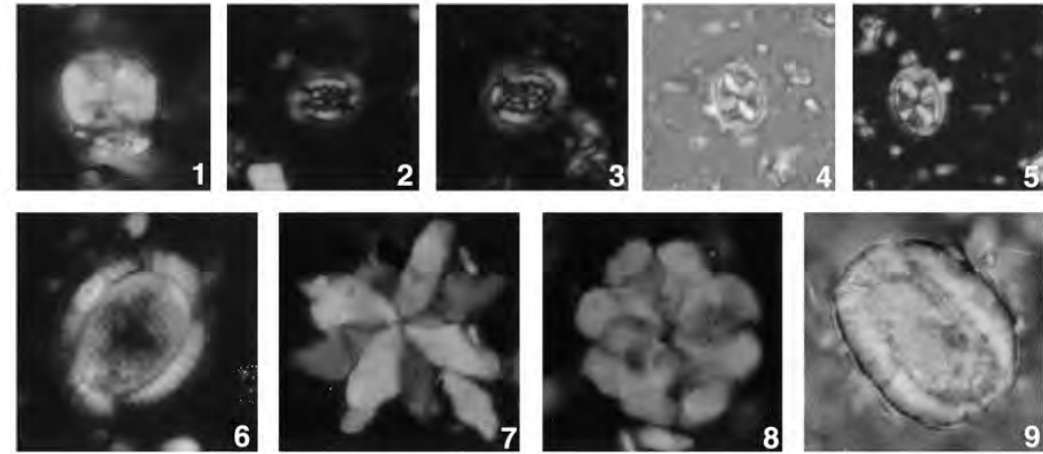


- Different orientations
- Different colors using the same light technique
- Material and debris covering the fossils

Plates

Plate 1

Selected light-micrographs of marker-taxa



Explanation of Plate 2

Fig. 1. *Nannoconus pseudoseptentrionalis* (side view), crossed-nicols, SMH-19-12, 1580 m (core), Norway 31/3-3 (LK15). **Figs 2–3.** *Seribiscutum dentatum*: 2, crossed-nicols, SMH-19-14, 9481 ft (sws), UK 21/13b-4 (LK12A); 3 (holotype) crossed-nicols, SMH-19-16, 9481 ft (sws), UK 21/13b-4 (LK12A). **Figs 4–5.** *Staurolithites palmula*: 4, bright field, SMH-21-21, 1584 m (core), Norway 31/3-3 (LK15); 5 (holotype) crossed-nicols, SMH-21-22, 1584 m (core), Norway 31/3-3 (LK15). **Fig. 6.** *Ethmorhabdus haueriviana* (wide rim variety), crossed-nicols, SMH-05-33, 63.5 m (core), BGS borehole 81/43 (LK25). **Fig. 7.** *Kokia borealis*, crossed-nicols, SMH-19-28, 12684 ft (core), UK 22/21-4 (LK30). **Fig. 8.** *Kokia curvata*, crossed-nicols, SMH-19-31, 12684 ft (core), UK 22/21-4 (LK30). **Fig. 9.** *Nannoconus oviformis*, crossed-nicols, SMH-18-27, 12683 ft (core), UK 22/21-4 (LK29).

- When possible, orient fossils in the same direction
- Photograph in the same color (all black and white or all color). It is OK to add a color gypsum plate image of the same specimen
- Try to take pictures of specimens that do not have other material stuck to them
- Include species name, scale bar, sample depth, and well/core either on the plate or in the caption (see journal style requirements). Include repository number if available

Conclusions

- Can be in paragraph form or as bullet points
- Be concise and state the most important aspects of the paper
- Do NOT add any new ideas, thoughts, etc. These should be in the Discussion.
- Do NOT use the exact same wording as what is in the Abstract



REFERENCES

- Double check to make sure that ALL of the papers you reference in the main body are in the References section and that all references in the Reference list are actually in the text. **This includes any references used in figures!**
- Make sure the References are in the correct format for the journal—for some journals, this is up to you, not the journal or the Editor! If required, add the DOI!
- Make sure the reference citations (e.g. Self-Trail et al., 2022) in the body of the paper are done correctly. It can be different for each journal
- Species citations are NOT included in references. For example, *Pemma papillatum* Martini, 1959: Martini, 1959 is NOT included in the references
 - **Exception:** *Watznaueria barnesiae* (Black in Black & Barnes, 1959): Black and Barnes 1959 needs to be in the references. This happens whenever there is an “in” as part of the species citation

Acknowledgements & Data Availability



- These are two separate sections that journals may (or may not) require
- You should include the following in your acknowledgements:
 - **PLEASE acknowledge the reviewers in the Acknowledgements**, even if they are anonymous. It is the polite thing to do!
 - Acknowledge the organization who funded your work
 - Acknowledge any lab technicians/artists who helped make slides, graphics, etc.
- Any data collected and used in your publication should be available, either through the journal or an outside data archive such as Pangaea or Zenodo. Data archiving sites should provide a DOI when you deposit your data, which should be included in your manuscript. Make sure you (or the journal) provide this link to the data so it can be downloaded!

Help with English and Grammar

- There are companies that do this (for a cost). Some suggested ones are:

Cambridge Proofreading and Editing

Geowriters

Rock Paper Editing

- Ask an English first language colleague (but not too many times; do not assume they have time to do this)



How to Respond to a Review



- Write a response letter that addresses all of the points raised by the reviewers
 - BE gracious! You do not have to agree with all of the reviewers' points but thank the reviewers for their efforts
 - Explain how you addressed each point
 - You do not have to take all of the reviewers' suggestions, but you **MUST** justify any changes you do not make. **If you do not address the reviewers' points, your paper may be rejected!**
 - For language and grammar suggestions, you can indicate that you have addressed them all without having to respond to each
- Be sure to follow any guidance and rules provided by the journal for manuscript revision and response to reviewers!

How To Review a Manuscript

If you expect to publish in peer reviewed journal then you **MUST** be prepared to do reviews when asked. This is how the peer review process works!

Some Basic Guidelines:

- If you agree to do a review for a journal, please do it in a timely manner—**less than 30 days!** Do NOT make the editor hunt you down
- For a comprehensive review: **go through the manuscript 3 times!**
- For every paper YOU publish, agree to do TWO reviews.
- Check everything. This includes grammar, science, figures, tables, supplementary data, fossil plates, and references

How To Review a Manuscript

Go through the manuscript three times! Different people do this differently but here are some suggestions:

Check references,
figure/tables/plates
(callouts and
captions)

Read 1

Gain an overview
and write initial
paragraphs

Check the
grammar and
make editorial
comments

Read 2

Check the science
and outline major
and minor points

Check the science
and outline main
points

Read 3

Check grammar,
references,
figure/tables/plates
(callouts and captions)

How To Review a Manuscript

Some Basic Guidelines:

- Write a Word document with main review points. Make sure you add some comments on what the author did correctly (e.g. nice plates, the figures really help, etc.). **It is always nice to get some positive feedback!** A review typically includes:
 - Brief summary of the article (what did the authors do, why is it important)
 - Mention what the authors did well, what could be improved, and make an assessment
 - Outline major and minor points for the authors to consider
- Additionally, **annotate the manuscript** and send this back to the journal when finished. If you wish to remain anonymous, make sure Track Changes is set to something that does not identify you. It is still OK to use pen on paper corrections and send in a scanned copy of the review.

How To Review a Manuscript

Some Basic Guidelines:

- Even if the manuscript is in poor shape, **do NOT be mean about it.** Explain nicely what needs to be done to improve it.
- Do not be afraid to Reject a manuscript. Some are not ready for publication.
 - Do provide concrete comments about how the authors can improve the manuscript so that it might be accepted



Accept



Refuse

Rock units versus time units...WHAT?!



Rock Units vs. Time Units

This always throws people off! Here are some pointers:

1. Use lower/middle/upper when referring to the rocks
2. Use early/middle/late when referring to geologic time
3. If the part of the Geologic Time Scale that you are discussing has been formally ratified, then it is CAPITALIZED.

Example 1: the time/position for the Cretaceous HAS been formalized:

Time unit: **Late** Cretaceous is correct; **late** Cretaceous is NOT correct

Rock unit: **Upper** Cretaceous is correct; **upper** Cretaceous is NOT correct

Example 2: the time/position for the Maastrichtian stage has NOT been formalized:

Time unit: **late** Maastrichtian is correct; **Late** Maastrichtian is NOT correct

Rock unit: **upper** Maastrichtian is correct; **Upper** Maastrichtian is NOT correct

Rock Units vs. Time Units

How to know when to use age (Early/Middle/Late) vs. position (Lower/Middle/Upper)

Early/Middle/Late refers to TIME. For example:

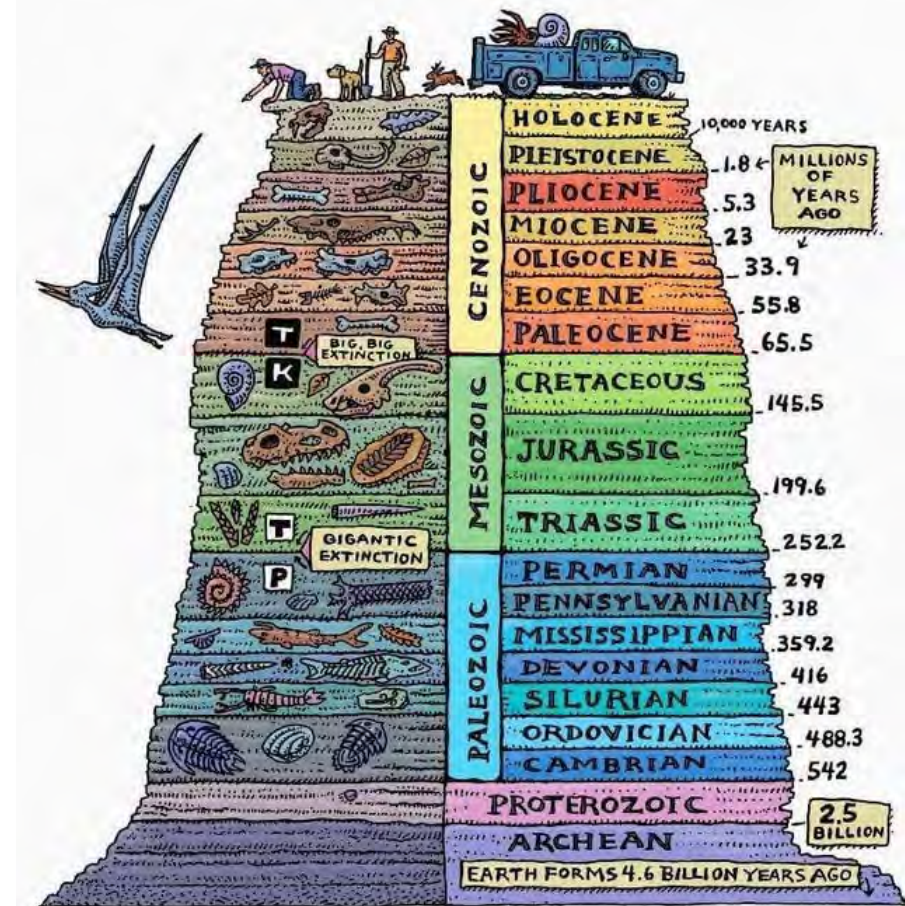
The Peedee Formation is late Maastrichtian in age (correct)

The Peedee Formation is Late Cretaceous in age (correct)

Lower/Middle/Upper refers to ROCKS. For example:

Sediments of the Peedee Formation are included in the Upper Cretaceous sands (correct)

The Peedee Formation consists of upper Maastrichtian sands and silts (correct)



Is this correct?

The sediments of the Brightseat Formation are Early Danian in age and consist of coarse sands and silts that unconformably overlies the clayey silts of the early Maastrichtian Severn Formation.

The sediments of the Brightseat Formation are **early** Danian in age and consist of coarse sands and silts that unconformably overlies the clayey silts of the **lower** Maastrichtian Severn Formation.



Other things to consider...

- Do not use slang!
- Do not say “Cambro-Ordovician”: say “Cambrian-Ordovician”
- Do not abbreviate “Formation” or other formal rank names:
 - Brightseat Formation is correct; Brightseat Fm. is NOT correct
- Do not use geologic unit names to imply time: do not say “the pre-Paleogene unconformity” or “Brightseat time”
- Do not say “the lower Choptank Formation” which implies you have 2 different formations: use “the lower part of the Choptank Formation”
- British English vs. U.S. English (e.g. grey vs. gray of colour vs. color): this is dictated by the journal. Check the journal’s Suggestions for Authors to see which they use

Writing a manuscript—the process

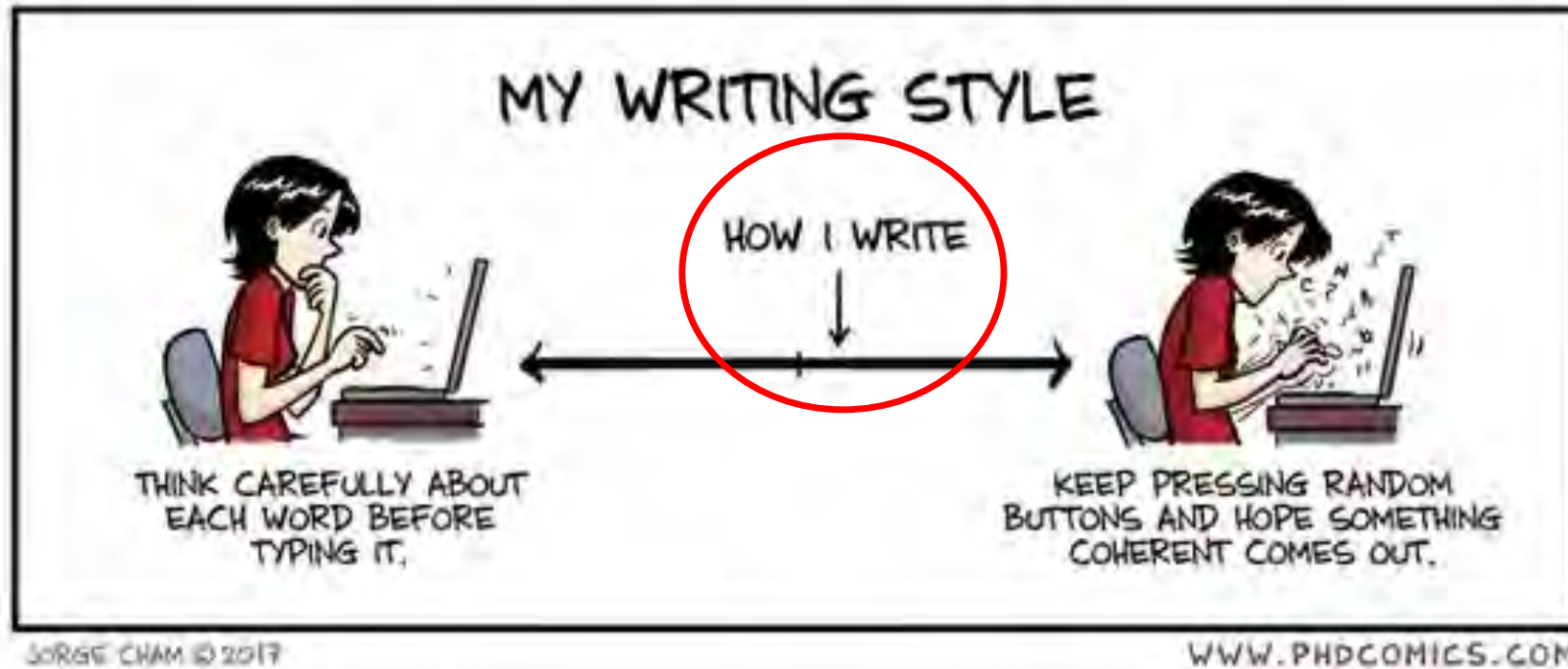


WWW.PHDCOMICS.COM

This message brought to you by that manuscript you're supposed to be writing.

(it doesn't have to be like this!)

What is writing?



Writing is NOT:

- Editing or wordsmithing
- Finding references
- Making figures

The point of writing is to put **WORDS ON PAPER!**

Tips to help you get words on paper:

Disconnect from the internet and other distractions

Set aside a time (or two) each week to write (and do it regularly)

Short sessions (20–30 minutes) can be more productive than long ones

Start a writing group with your friends/colleagues

Do not try to force the words sound nice—wordsmithing is a separate step from writing

Have a plan! Make an outline and decide which section you will work on before you start writing. Makes notes to help you pick up where you left off.



REMEMBER: You do not have to write the manuscript in the outline order!

- Methods are often written first
- Finalize figures **BEFORE** writing Discussion
- Write the Abstract last!