

The Practice of Scientific Writing

(some thoughts by a non-native writer)

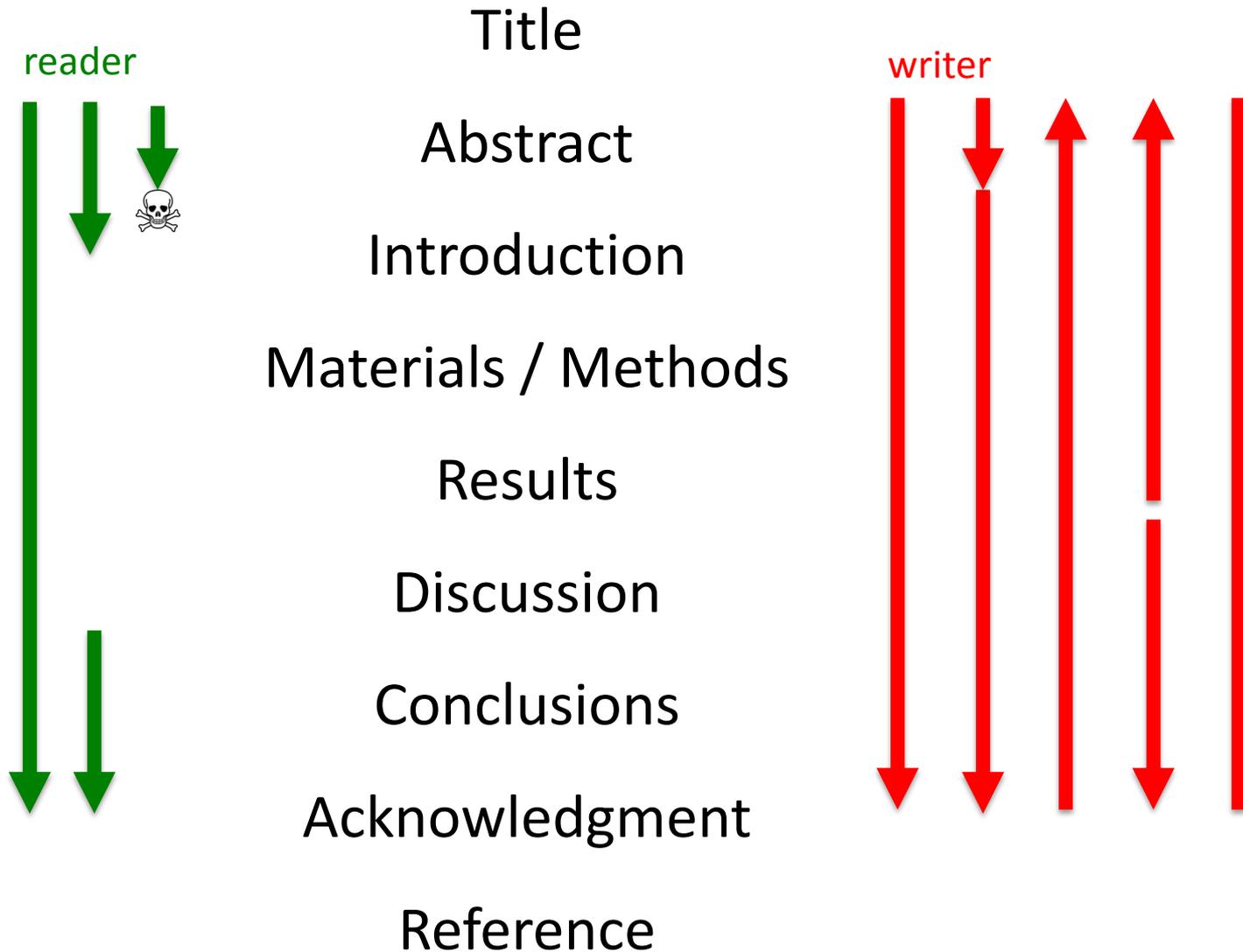
Motivation to write ... well

- I want to **impress** my ...
- I want to **communicate** my research results
- I want my research to have **impact**
- Writing helps me **organize** my thoughts
- I want to get **closure** and move on to next project
- I want to **get credit** for my accomplishments
- My supervisor makes me write papers (**PMP**)
- **Publish or perish** ([h-index](#))

Preaching to the writer

- Write for the **reader**
- Reading requires **energy**
- It is the *writer's* **responsibility** to save the reader's energy
- Energy is saved by writing according to the reader's **expectations**
- Expectations are met if **content** and **structure** coincide

What did you expect?!?!



Let's review the literature review

- **Purpose of research:** Discover something new and useful
- Identify **domain** where you want to make a contribution
- **Literature review:**
 - Categorize major research themes within problem domain
 - Compare papers within category
 - Identify **knowledge gaps** and research needs
- Formulate explicit **objectives** linked to knowledge gaps
- **Methodology:** What was done to meet *objectives*
- **Results:** Findings in relation to *objectives*
- **Conclusion:** Meaning of findings in relation to *objectives*

Maier, H.R., *Env. Modelling & Software*, 43: 3-4, 2013.

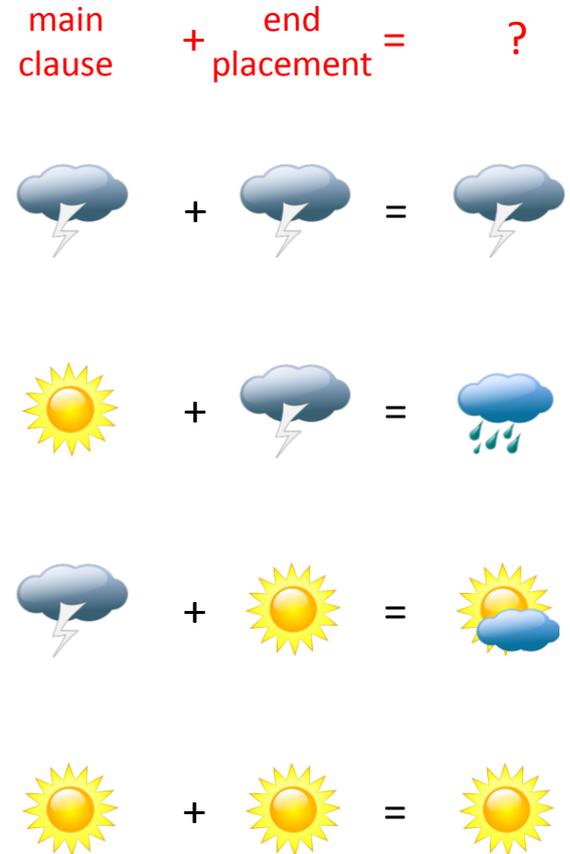
Each unit of discourse
should make a **single** point

Unless you are Bertolt Brecht, don't use “das Prinzip der abgebrochenen Spitze”

- *“The method for mapping out local minima to search for the global minimum by traversing regions of first-order saddle points on the objective function surface...
... is presented.”*
- **Subject–verb separation**
 - **Expectation:** Reader wants syntactic resolution
 - **Consequence:** Everything between subject and verb is considered a “distraction”
 - **Therefore:** **Put verb as closely as possible to the subject**
- **Stress position**
 - **Expectation:** Reader considers material at the end important
 - **Consequence:** The end of a sentence is a stress position
 - **Therefore:** **Put important material at the end of a sentence**

How's the weather?

- *Although the sun is shining, the streets are still wet.*
- *The sun is shining, but the streets are still wet.*
- *The streets are still wet, but the sun is shining.*
- *Although the streets are still wet, the sun is shining.*



How's my model?

- *“Even though the model matches the data well, the predictions are highly uncertain.”*
- *“Even though the predictions are highly uncertain, the model matches the data well.”*
- Emphasis:
 - End placement
 - Main clause
 - Length
 - Repetition
 - Modifiers and connectors

What's today's topic?

- *“NASA invented Teflon”*
- *“Teflon was invented by NASA”*
- Is this a story about **NASA** or **Teflon**?
- The topic of the sentence is introduced at the beginning of the sentence.
- The topic should be linked backwards and provide context for the rest of the sentence.

Old and New

- The reader expects the **story** to be about whoever/whatever shows up at the beginning of the sentence, i.e., in the **topic position**.
- The topic position is generally occupied by **old information**.
- Information that is **new** should be placed at the end of the sentence, i.e., the **stress position**.
- The stress position emphasizes the new information, which soon will be old news, ready to occupy the topic position of the next sentence.

Old and New

- The **reader** expects the story to be about whoever/whatever shows up at the beginning of the sentence, i.e., in the **topic position**.
- The **topic position** is generally occupied by old **information**.
- **Information** that is new should be placed at the end of the sentence, i.e., the **stress position**.
- The **stress position** emphasizes the new information, which soon will be old news, ready to occupy the topic position of the next sentence.

For the record

- A story about NASA

“A lot of people think that NASA invented Teflon. While Teflon was actually invented by DuPont, NASA invented memory foam. NASA’s memory foam is the preferred material to sit on”.

- A story about Teflon

“A lot of people think that Teflon was invented by NASA. While NASA invented memory foam, Teflon was in fact invented by DuPont. Teflon outperforms memory foam as a coating material on frying pans.”

Use connectors and modifiers...in fact, use them frequently...however, they are dangerous...therefore, make sure you use them correctly

- Connectors and modifiers are the **logical glue** between sentences; they serve a *communicative function*, indicating:
 - **addition** (besides, in addition, apart from that, furthermore, moreover, at the same time, as well, also, too ...)
 - **parallel** (equally, similarly, likewise, by the same token, ...)
 - **contrast/alternative** (alternatively, by contrast, conversely, on the contrary, however, though, instead, nevertheless, yet, rather, ...)
 - **cause** (accordingly, as a result, consequently, hence, so, as a consequence, therefore, thus, thereby, ...)
 - **order** (first/second, lastly, finally, in conclusion, to sum up, then, ...)
 - **emphasis** (above all, actually, indeed, of course, in fact, surely, in particular, truly, let alone, to put it mildly, without exception, to say the least, ...)
 - **modification** (as a rule, according to, for the most part, by all accounts, to some extent, to the best of my knowledge, ...)
- Connectors greatly help the reader navigate the logic of a paragraph
- Nevertheless, they greatly confuse the reader if used incorrectly
- Therefore, they are often used ineffectively or incorrectly

This or that or the other?

*“A seismic **event** monitored during the stimulation of a geothermal **reservoir** contains valuable **information** about the **formation**, such as the **extent** of the stimulated fracture **network**. Incorporating **this** into the numerical model helps improve the reliability...”*

This or that or the other?

You tell me!!!

*“A seismic event monitored during the stimulation of a geothermal reservoir contains valuable **information** about the formation, such as the extent of the stimulated fracture network. Incorporating **this information** into the numerical model helps improve the reliability...”*

This or that or the other?

You tell me!!!

“A seismic event monitored during the stimulation of a geothermal reservoir contains valuable information about the formation, such as the extent of the stimulated fracture network.

This allows us to infer...”

*This **fact** allows us to infer...”*

This

(concept/observation/assumption/approach/hypothesis/contradiction/etc.) ...

Action Hero

“With the clock ticking down and sweat running down his face, the decision was made by the hero to cut the blue wire...

...a moment later, the explosion of the bomb occurred!”

- Put actions into verbs
- Put the agent of the action into the subject

Action Hero

*“With the clock ticking down and sweat running down his face, the **hero** **decided** to cut the blue wire...*

*...a moment later, the **bomb** **exploded!**”*

- Put actions into verbs
- Put the agent of the action into the subject

The **Passive** **Activist**

- Active voice should be used to emphasize the **agent** of an action
- *“The world was almost completely destroyed by Others et al. (2012); fortunately, it was saved (Me and I, 2013).”*
- *“While Others et al. (2012) almost completely destroyed the world, Me and I (2013) saved it!”*

Noun or Verb?

- “Temperature *increases* and salinity *changes*...
...*affect resistivity*”
...*as hydrothermal fluids enter the reservoir*”
- “*Changes in temperature and salinity affect resistivity*”
- “*Salinity and temperature are changed as hydrothermal fluids enter the reservoir*”
- “*Hydrothermal fluids entering the reservoir change salinity and increase temperature*”

The Grumpy Reviewer

- et al.
- i.e. vs. e.g. ... etc.
- “...was demonstrated by (Einstein, 1916).”
- $k = 4.719375321 \times 10^{-16} \text{ m}^2$
- Abstract, first sentence: “*Geological carbon sequestration has been an important research topic for the last two decades.*”
- “...for a time period of 30 years.”
- Anything that makes it obvious that the writer did not read what (s)he wrote in the first.
- Bad science!

Have your manuscript reviewed...
review your peer's manuscripts

Finally: The End

- Have something to write about!
- Write with the reader in mind
- Be aware of reader expectations and meet them
- Make a single point in each unit of discourse
- Provide perspective and context in topic position
- Provide new material and closure in stress position
- Use logical connectors
- Put action into verb; agent into subject
- Have your manuscript reviewed – review manuscripts