~~10 hard rules for writing a better paper~~

Stop thinking about rules
Think about readers

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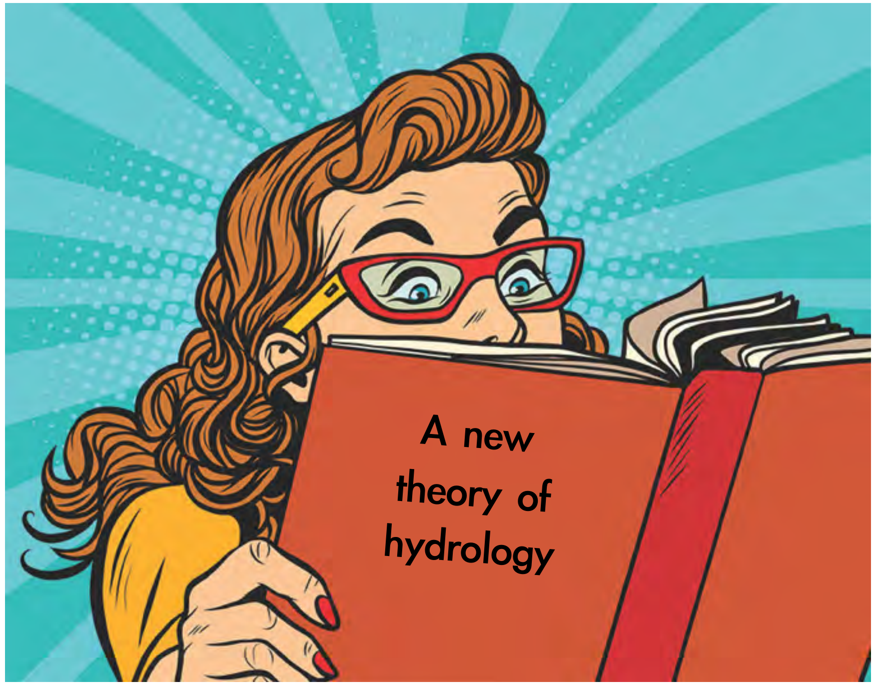
Writing is not about communicating your ideas

It is about changing readers' ideas



Inspired by: The craft of writing efficiently. University of Chicago

Readers have to be picky

Readers read / Journals publish } things that are valuable to them

Paper 1

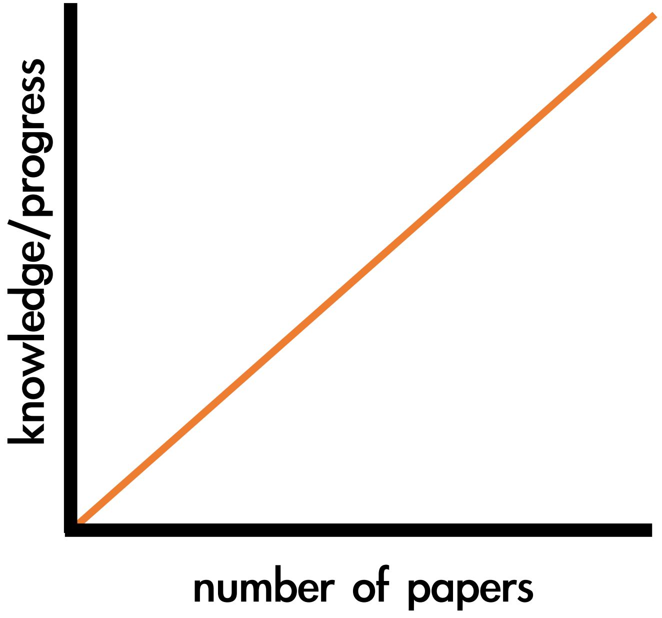
I have always had interest in ****insert topic**** and here is what new knowledge I have to contribute to this topic

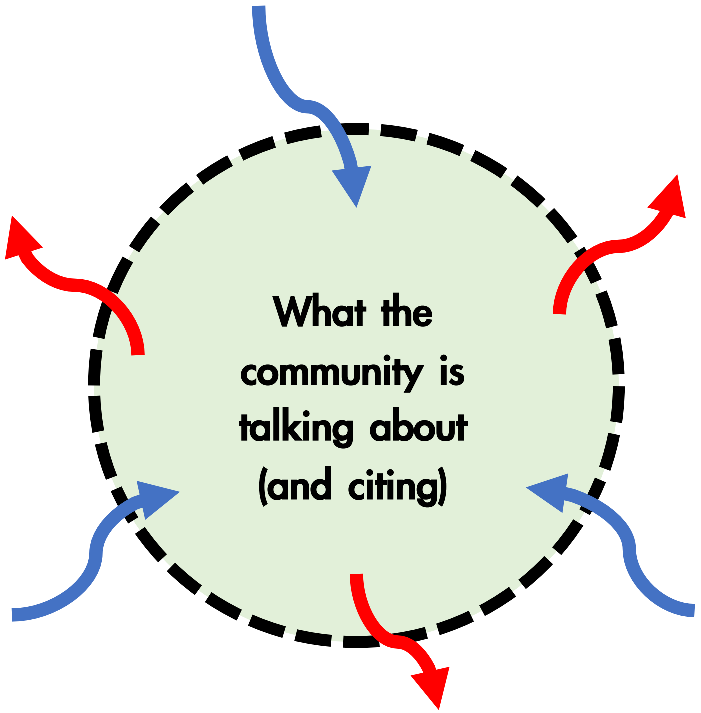
Paper 2

Given what studies have reported before, my findings indicate you should think differently about the world (because you were wrong)

Inspired by: The craft of writing efficiently. University of Chicago

What is scientific knowledge?





Inspired by: The craft of writing efficiently. University of Chicago

Make a good first impression…(the title)

Bad? **On comparing streamflow and groundwater heads**

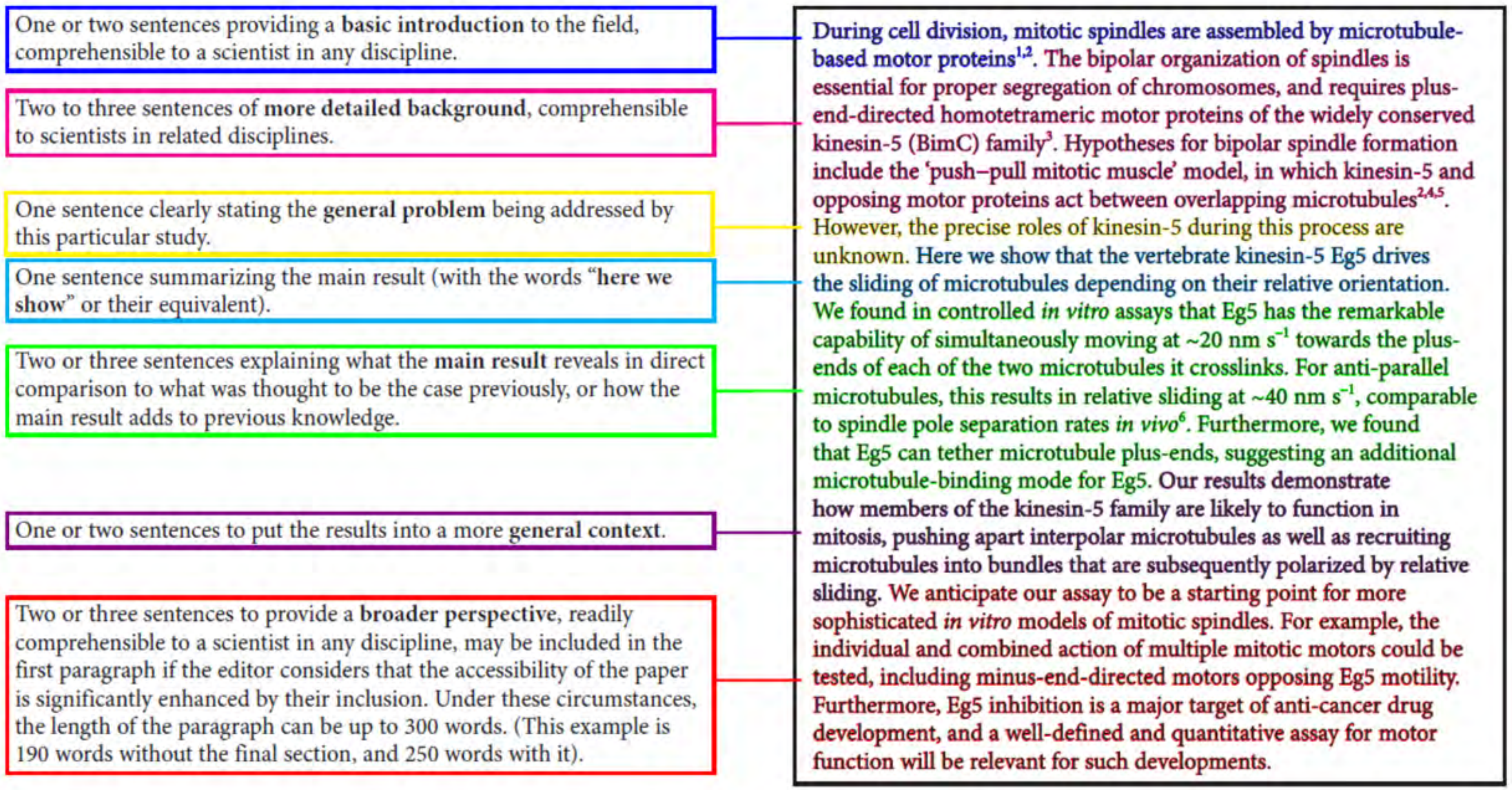
Better? **A systematic comparison of streamflow and groundwater heads across the USA**

Best? Widespread potential loss of streamflow into underlying aquifers across the USA

….by stating what you discovered

Based on: Jasechko et al. (2021) Nature

Make a good first impression... (the abstract)


Annotated example taken from *Nature* 435, 114–118 (5 May 2005).

One or two sentences providing a **basic introduction** to the field, comprehensible to a scientist in any discipline.

Two to three sentences of **more detailed background**, comprehensible to scientists in related disciplines.

One sentence clearly stating the **general problem** being addressed by this particular study.

One sentence summarizing the main result (with the words "**here we show**" or their equivalent).

Two or three sentences explaining what the **main result** reveals in direct comparison to what was thought to be the case previously, or how the main result adds to previous knowledge.

One or two sentences to put the results into a more **general context**.

Two or three sentences to provide a **broader perspective**, readily comprehensible to a scientist in any discipline, may be included in the first paragraph if the editor considers that the accessibility of the paper is significantly enhanced by their inclusion. Under these circumstances, the length of the paragraph can be up to 300 words. (This example is 190 words without the final section, and 250 words with it).

During cell division, mitotic spindles are assembled by microtubule-based motor proteins[1,2]. The bipolar organization of spindles is essential for proper segregation of chromosomes, and requires plus-end-directed homotetrameric motor proteins of the widely conserved kinesin-5 (BimC) family[3]. Hypotheses for bipolar spindle formation include the 'push–pull mitotic muscle' model, in which kinesin-5 and opposing motor proteins act between overlapping microtubules[2,4,5]. However, the precise roles of kinesin-5 during this process are unknown. Here we show that the vertebrate kinesin-5 Eg5 drives the sliding of microtubules depending on their relative orientation. We found in controlled *in vitro* assays that Eg5 has the remarkable capability of simultaneously moving at ~20 nm s^{-1} towards the plus-ends of each of the two microtubules it crosslinks. For anti-parallel microtubules, this results in relative sliding at ~40 nm s^{-1}, comparable to spindle pole separation rates *in vivo*[6]. Furthermore, we found that Eg5 can tether microtubule plus-ends, suggesting an additional microtubule-binding mode for Eg5. Our results demonstrate how members of the kinesin-5 family are likely to function in mitosis, pushing apart interpolar microtubules as well as recruiting microtubules into bundles that are subsequently polarized by relative sliding. We anticipate our assay to be a starting point for more sophisticated *in vitro* models of mitotic spindles. For example, the individual and combined action of multiple mitotic motors could be tested, including minus-end-directed motors opposing Eg5 motility. Furthermore, Eg5 inhibition is a major target of anti-cancer drug development, and a well-defined and quantitative assay for motor function will be relevant for such developments.

source: https://www.nature.com/documents/nature-summary-paragraph.pdf

...by again emphasizing what you discovered (and why it matters)

Make a good first impression…(fig

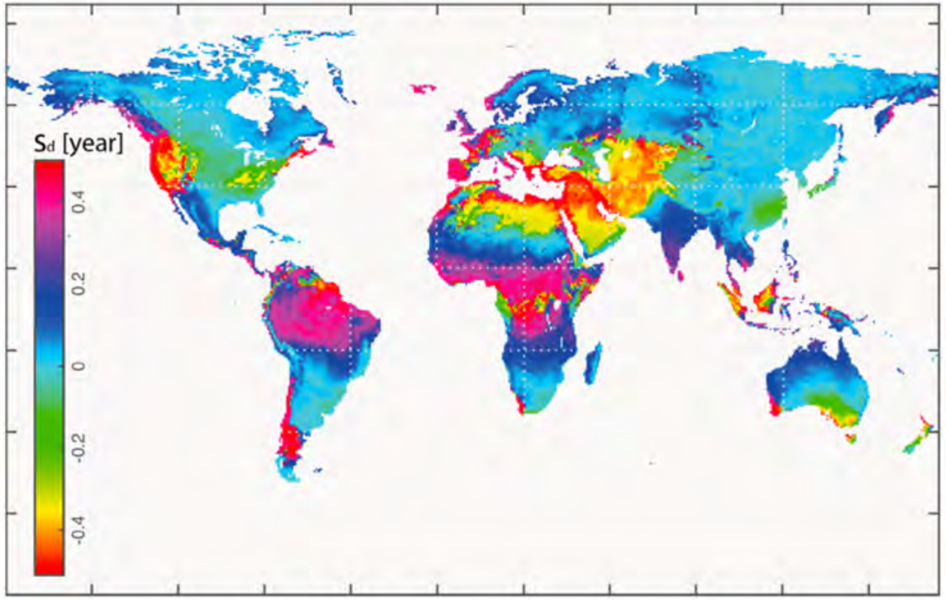
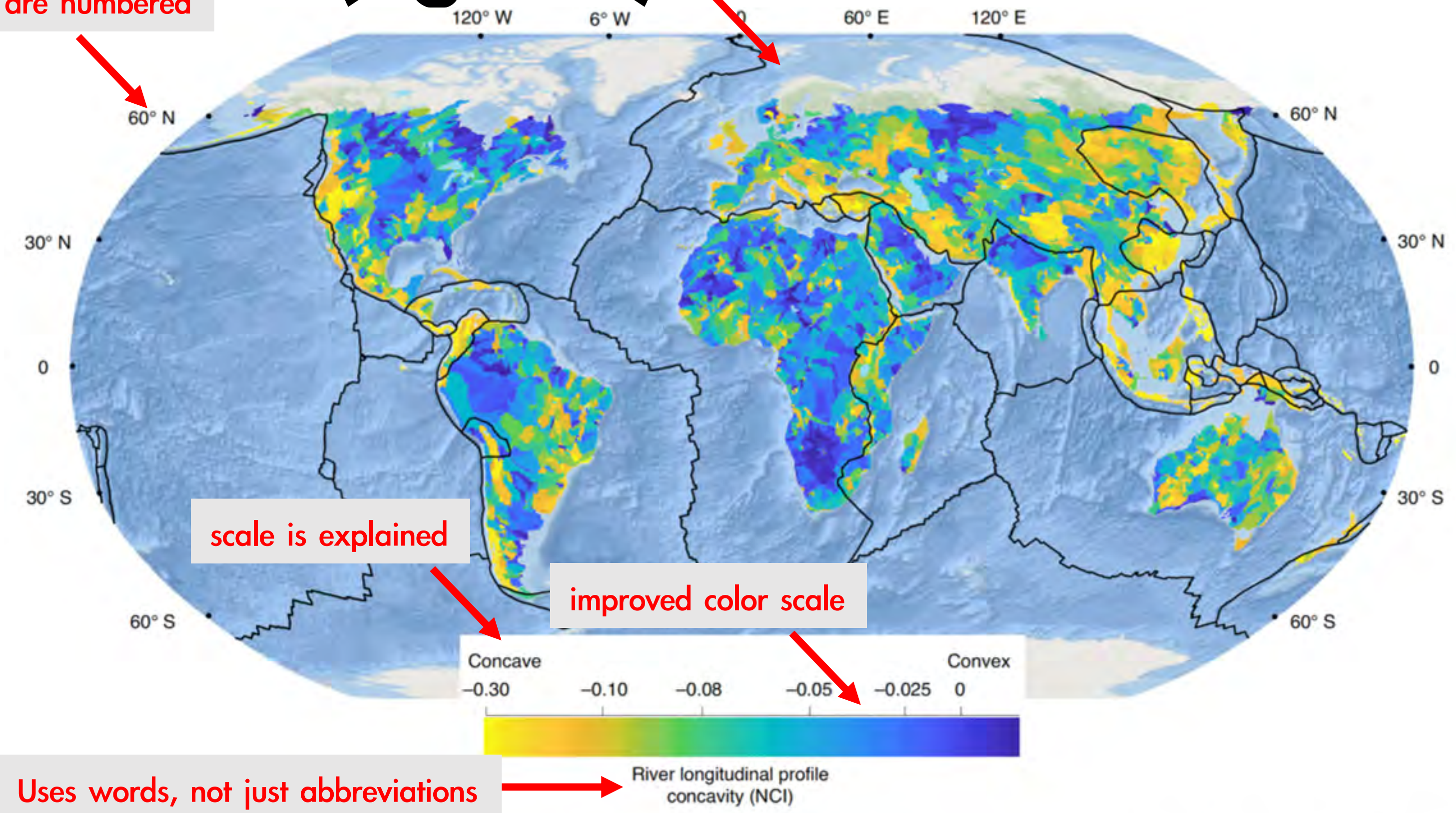


Figure 4. The phase difference between the precipitation and temperature regime (s_d).

States the conclusions of the figure →

Berghuijs & Woods (2016) IJOC



less distorted projection

tick marks are numbered

scale is explained

improved color scale

Uses words, not just abbreviations

Fig. 2 | Global distributions of basin-averaged river longitudinal profile concavity (NCI) and tectonic plate boundaries. River profiles tend to be strongly concave-up in tectonically active regions along plate boundaries, and straighter in tectonically passive regions far from plate boundaries. Tectonic plate boundaries are shown as black lines. World ocean basemap sources: Esri, Garmin, GEBCO, NOAA NGDC, and other contributors.

Seybold, Berghuijs, et al. (2021) Nature Geoscience

…by stating what to look for in the figures

Is the reader still interested?

Write simple and clear...

"research methods were deployed to analyze the quantity of the uncertainty of streamflow modeled by hydrological models"

vs.

"We quantified uncertainty of modeled streamflow"

...so the reader can focus on the content.

Create a logical structure…

within paragraphs

main message preferably stated upfront

Our meta-analysis of 77 local-scale studies (Supplementary Table 1) suggests that losing rivers may be more common where climate conditions are drier, topographic slopes are flatter, and groundwater withdrawals are greater (Fig. 1b). These hypotheses are confirmed, at the continental scale, by our analysis of 4.2 million wells and their nearest stream segments (Fig. 4). The fraction of well water levels that lie below the nearest stream—consistent with losing rivers—is significantly correlated with county-scale averages of groundwater withdrawals[32] (Spearman rank correlation $\rho = 0.32$), topographic slope[29] ($\rho = -0.33$) and precipitation divided by potential evapotranspiration[33] ($\rho = -0.38$; all correlations are statistically significant at $P < 0.0001$). Although these correlations exhibit considerable scatter (Supplementary Fig. 24), they suggest that all of these variables substantially influence the prevalence of losing streams at the continental scale.

Jasechko et al. (2021) Nature

across paragraphs

the paragraphs' THMs create a logical story


WORKING LIFE

Paper writing gone Hollywood

“I ... ask the Ph.D. student or postdoc to play the role of would-be movie director.”

McDonnell (2017) Science

…so the reader can focus on the content.

Conclude using references to your figures...

4. Summary and Conclusions

When rivers flood, surrounding rivers often flood at the same time. Using annual flood data from several thousand European rivers, our analysis shows that the flood synchrony scale (Figure 1)—the distance over which multiple rivers flood near synchronously—far exceeds the size of individual drainage basins and varies regionally by more than an order of magnitude (Figure 2). Over the period 1960–2010 flood synchrony scales have grown by about 50% (Figure 3a), and years with spatially extensive floods tend to follow one another (Figure 3b). The synchrony of interbasin flooding is a largely overlooked dimension of flood behavior, because flood risks are typically assessed and managed at the scale of individual basins. Risk finance, flood forecasting, and interpretations of flood trends can be improved by accounting for how flood risks extend beyond the borders of individual drainage basins.

Berghuijs et al. (2019) GRL

... so it is easier to understand what backs up your claims

Convey 1 main message… (not 10)

410 citations

Berghuijs et al., (2014) Nature CC

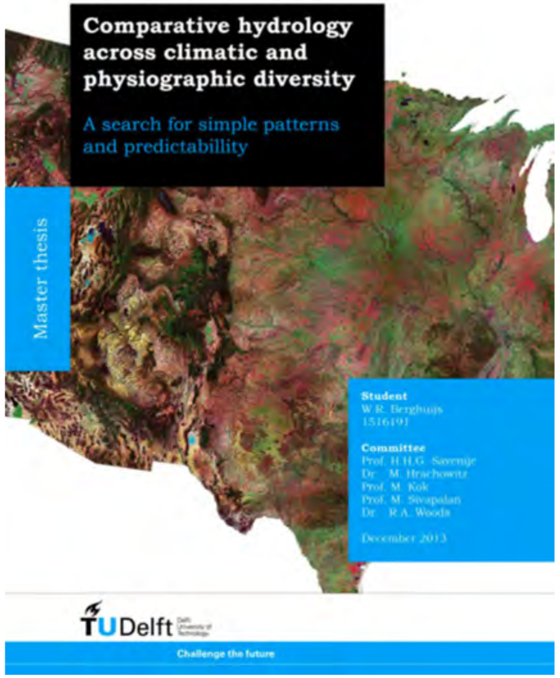
which was
Figure 9c of

134 citations

Berghuijs et al., (2014) WRR

which was
Ch 3 of

0 citations



Berghuijs (2013) MSc Thesis

… so readers know what to focus on

Stop thinking about rules.
Think about readers

- Your work should change how readers see the world

- Communicate your findings in the title, abstract, and figures

- Once these conditions are met we can worry about the detailed writing

- No hard rules exist, but make the readers' lives as easy as possible

References

- The craft of writing efficiently. University of Chicago
- Berghuijs et al. (2019) Growing spatial scales of synchronous river flooding in Europe. Geophysical Research Letters
- Berghuijs & Woods (2016) A simple framework to quantitatively describe monthly precipitation and temperature climatology. International Journal of Climatology
- Jasechko et al. (2021) Widespread potential loss of streamflow into underlying aquifers across the USA. Nature
- McDonnell (2017) Paper writing gone Hollywood. Science
- Seybold, Berghuijs et al. (2021) Global dominance of tectonics over climate in shaping river longitudinal profiles. Nature Geoscience