Paper Writing Tips

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Elements of a scientific paper

Title

Abstract

Body

- Introduction
- Methods
- Results
- Discussion
- Conclusion

Appendices

What order should you write these in?

I am begging you to not write your paper in the order it is presented

1. This is wildly inefficient
2. This is not how anyone will read it
3. This is (very likely) not how you developed your project

This is wildly inefficient

- Exaggerated extreme — “I cannot write a new sentence until the preceding sentence is perfect”
- What is a “perfect” sentence?

- More practical example — “I cannot write the methods section until the introduction is done”
- When is an introduction done?

This is wildly inefficient

Advice: Write, write, write

- Write whatever is easiest to write
- Write what you know
- You will always be able to fix/edit it later

Which is easier to edit later?

<insert exoplanet transit method description>

Exopanelt does front of the star cause dip in the light curve. Light curve is the fulx we detect from star as function of time

This is not how anyone will read it

IF someone looks at your paper, they will (likely) read:

Title

IF someone reads your title, they ***might*** read:

Abstract

IF someone reads your abstract, they ***might*** look at:

Your Figures

IF someone looks at your figures, they ***might*** read:

Conclusions

This is not how anyone will read it

IF someone made it that far (or further)…

There is a very high chance they are a co-author or the referee

This is not how anyone will read it

Advice: Reduce the barrier to understanding to the floor

- You need to succinctly convey what you're doing in the title
- Your abstract should hit the main points
- One should be able to determine the main points but looking at figures (and maybe reading captions)
- Your conclusions should be easily (i) located and (ii) understood

This is not how anyone will read it

Advice: Reduce the barrier to understanding to the floor

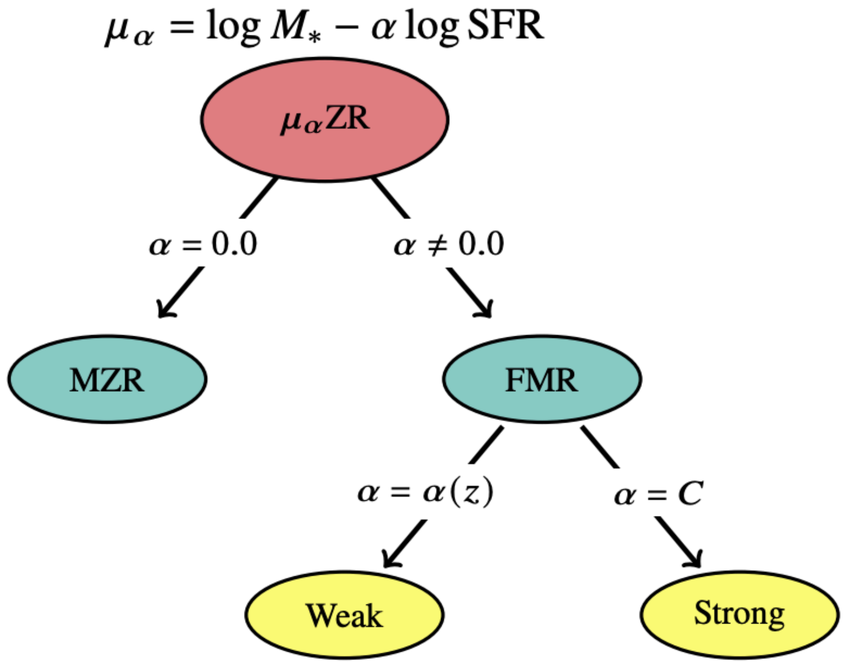

Figure 1. Decision tree for the μ_αZR, see Section 2.5 for full details. This shows the different relationships that can be included under the umbrella μ_α metallicity relation (μ_αZR; see Equation 1). First is the traditional MZR

5 CONCLUSIONS

We select central star forming galaxies with stellar mass $8.0 < \log(M_* \ [M_\odot]) < 12.0$ with gas mass $\log(M_{\rm gas} \ [M_\odot]) > 8.5$ from $z = 0 - 8$ in the cosmological simulations Illustris, IllustrisTNG, and EAGLE. We investigate the extent to which the M10 parameterisation (see Equation 1; μ_αZR) of the fundamental metallicity relation (FMR; Equation 1) holds. The parameter of merit in the μ_αZR is $\alpha_{\rm min}$, which is a parameter tuned to minimize scatter in the relation. Physically, $\alpha_{\rm min}$ sets a projection direction of the mass-metallicity-SFR space to a 2D space with minimal scatter. Many observational studies have claimed that this projection direction does not evolve with redshift (Mannucci et al. 2010; Cresci et al. 2019).

We discuss a new framework in which to examine the μ_αZR as a superset of the MZR ($\alpha = 0$) and FMR ($\alpha \neq 0.0$). We further define both a strong and weak FMR. A strong FMR indicates that $\alpha_{\rm min}$ is constant as a function of redshift. Conversely, the weak FMR is where $\alpha_{\rm min}$ varies with redshift (see Figure 1 for complete illustrated relationship of μ_αZR). More generally, the strong FMR states the the M10 parameterisation can describe both the scatter and noramlisation of the MZR at the same time.

Our conclusions are as follows:

- We find that $\alpha_{\rm min} \neq 0$ for all redshifts in Illustris, TNG, and EAGLE. This shows that there is an FMR in each of these simulations. We note, however, that the uncertainty in $\alpha_{\rm min}$ in TNG at $z = 0$ includes $\alpha_{\rm min} = 0.0$. We attribute this to the increased suppression of low redshift star formation in the TNG model.
- Furthermore, we find that there is non-negligible evolution in $\alpha_{\rm min}$ as a function of redshift (Figure 2). This result suggests that the FMR in Illustris, TNG, and EAGLE is a weak FMR.
- We find that the weak FMR ($\alpha_{\rm min}$ determined at each redshift

This is (very likely) not how you developed your project

- Starting with a literature search is common, but…

Do you understand what is relevant to your project before you develop the methods?

Do you understand what previous results are relevant before you have your results?

Do you know the title/abstract before you know your conclusions?

This is (very likely) not how you developed your project

Advice: Write only after you've developed the narrative in your mind

- Develop your key ideas (usually ~1 key idea / plot!) first
- Write the title and abstract ~last
- Write your methods as you develop them**
  - **not too carefully! You'll change what you're doing a number of times

Final Advice

You’re in charge