The Reproducibility crisis:Does it affect Astronomy?

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What is the reproducibility crisis?

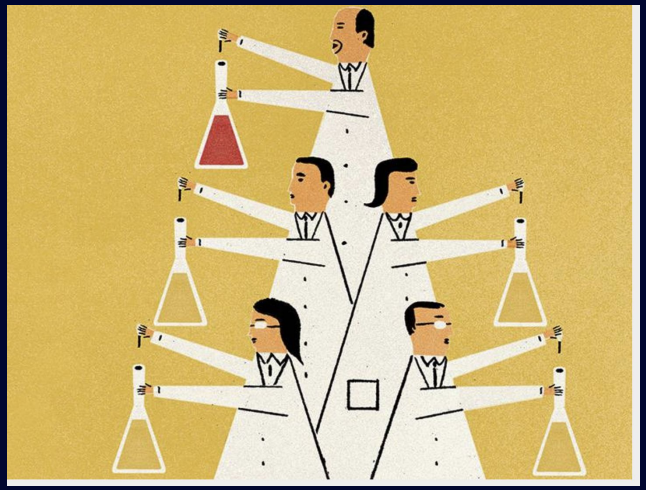
- Refers to the inability to replicate/reproduce results in science
- Reproduction vs replicability-can you get the same results from analysis or can you get the same results doing the experiment the exact same way?
- Has been a discussion for decades-term coined in the 2010s

How do you define reproduction/replicability?

- Direct replication-exactly following the experiment and trying to find the same results
- Systematic replication-intentionally changing something to try to find the same result
- Conceptual replication-changing the approach completely to test the same hypothesis
- No matter which approach, you take, attempts at these have failed across the sciences

What fields have been most affected?

- Psychology-experiments on extrasensory perception,experiments on benefits of walking etc
- Medicine/biology-Scientists from Amgen and Bayer report very low replication rates(11-20%) for most vital findings in the field
- Chemistry-87% of researches reported failing to reproduce other scientists experiments in their career-2016 Nature Survey
- 69% of physicists/engineers reported something similar
- What are the causes of this-can this be linked to Astronomy?



Causes

- The main probable causes of this crisis are p-hacking/publish or perish culture
- Insufficient descriptions in papers etc
- Commodification of science? Interesting idea
- Low statistical power of datasets

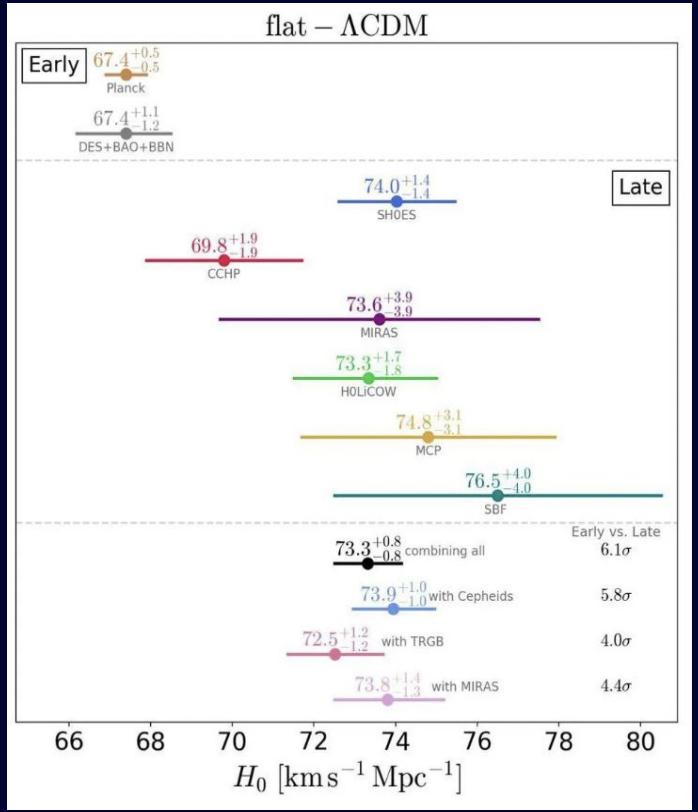
"If you don't reveal some insights soon, I'm going to be forced to slice, dice, and drill!"

Does this apply to Astronomy?

- Depends on what one thinks of Astronomy research philosophy
- Astronomy is believed when multiple people find the same result
- Harder to have a replication crisis if no one believes individual findings in the first case
- Can single studies truly prove anything when we are often looking for connections regardless?
- Human vs observational data-does this change things?

Case Study-Hubble Tension-does this count?

- Does the fact that values for the Hubble constant disagree constitute a reproducibility crisis?
- Testing the accuracy-not the precision-of a value
- Systematic biases in observations? Testing different replications methods
- Given that late-time and early-time groups tend to differ-maybe not-but still some claim they are unable to get SHOES results



Final thoughts/conclusions

- Reproducibility crisis commonplace in other sciences-but different philosophy in Astronomy prevents it from being as much of an issue
- The Hubble tension is perhaps the most noteworthy and famous possible case
- Reanalysis of datasets is relatively common in Astronomy-no famous examples I could find of differing results
- In general, distrusting results is more commonplace in Astronomy so perhaps this is less of an issue-although over time this could become an issue

Resources

Wikipedia

Nature Article

Vox Summary

Hubble Tension Summary

Questions?