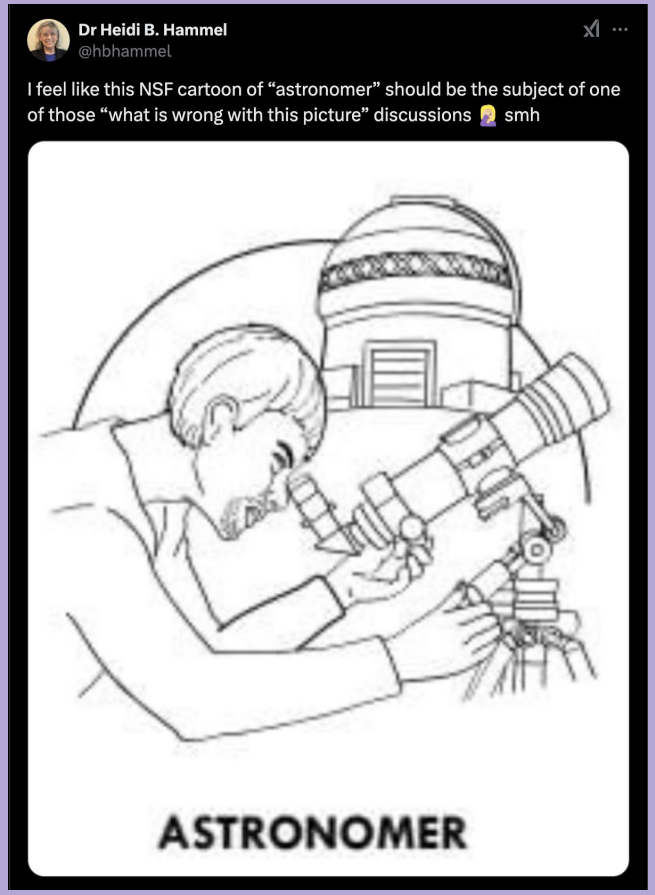
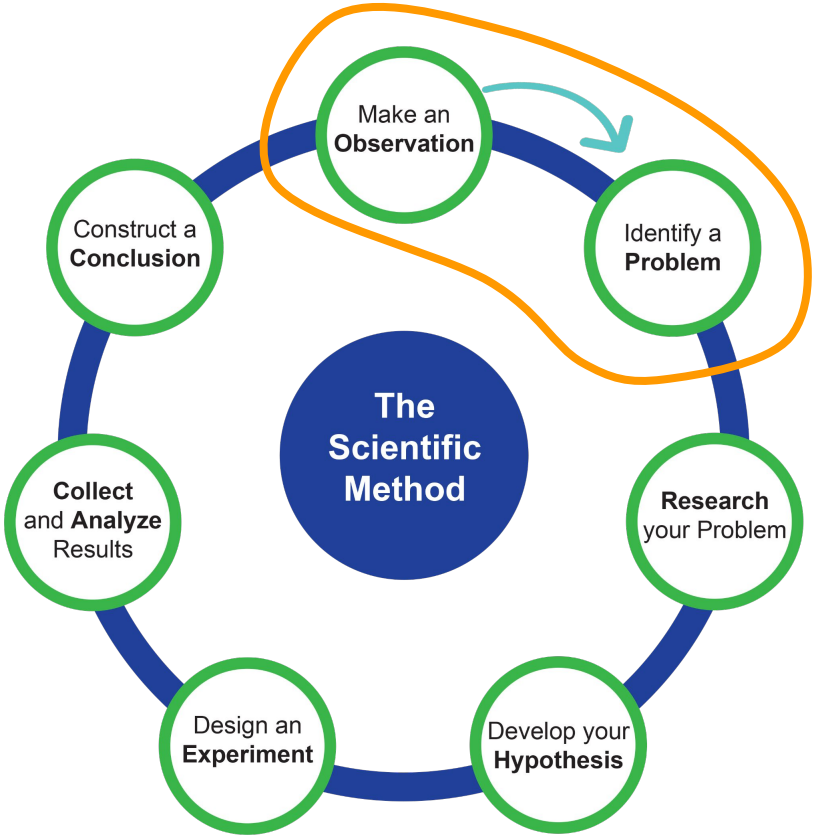
What exactly is astronomy research?

ASTR 2910 ⋆ Week 1


Dr Heidi B. Hammel
@hbhammel
I feel like this NSF cartoon of “astronomer” should be the subject of one of those “what is wrong with this picture” discussions 🤦‍♀️ smh
ASTRONOMER


Claire Lamman
@ClaireLamman
I fixed it
MemoryError
stackoverflow
ASTRONOMER

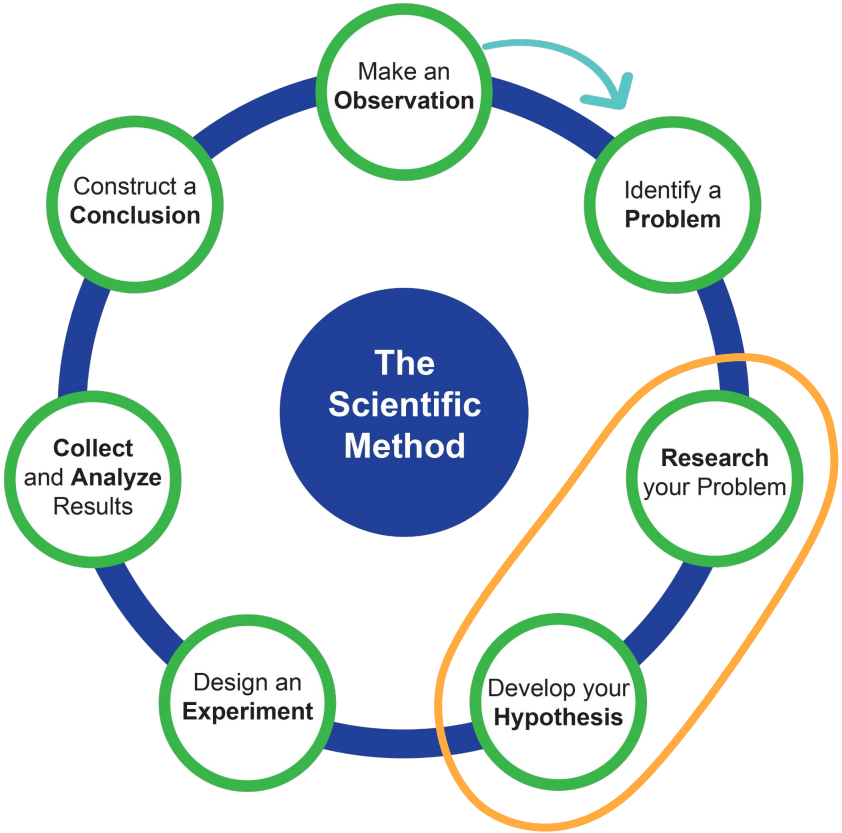
The process of astronomy research



Inspiration for research questions comes from:

- Previous work
- Reading literature
- Collaborators

The process of astronomy research



"Hypothesis" = idea of what the possible outcomes are based on current knowledge

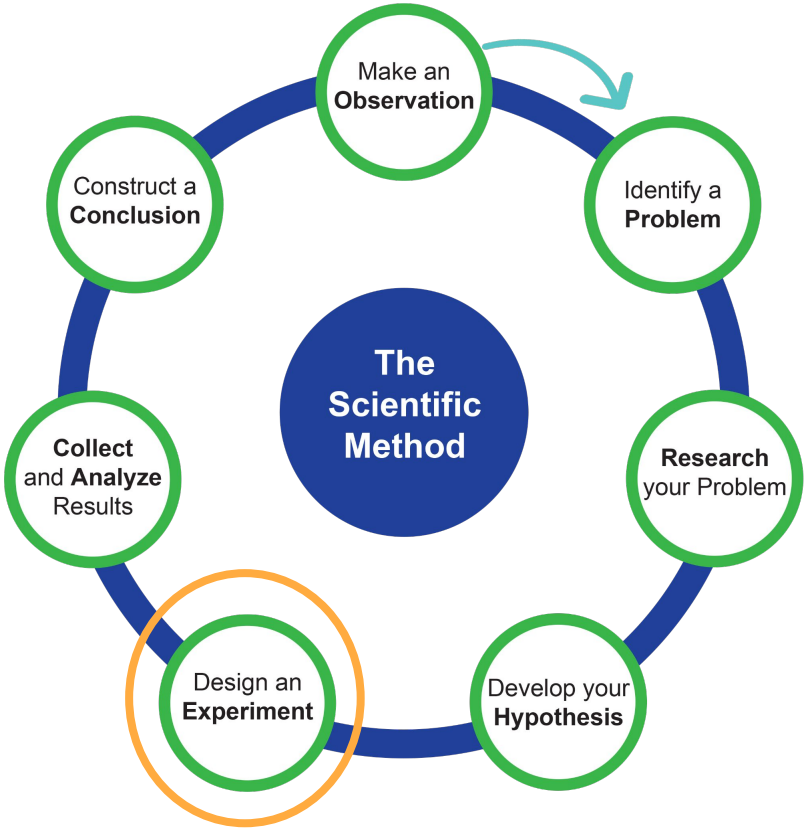
Not always specific

The process of astronomy research

Astronomy research typically can't be conducted in a lab.*

Our "experiments":

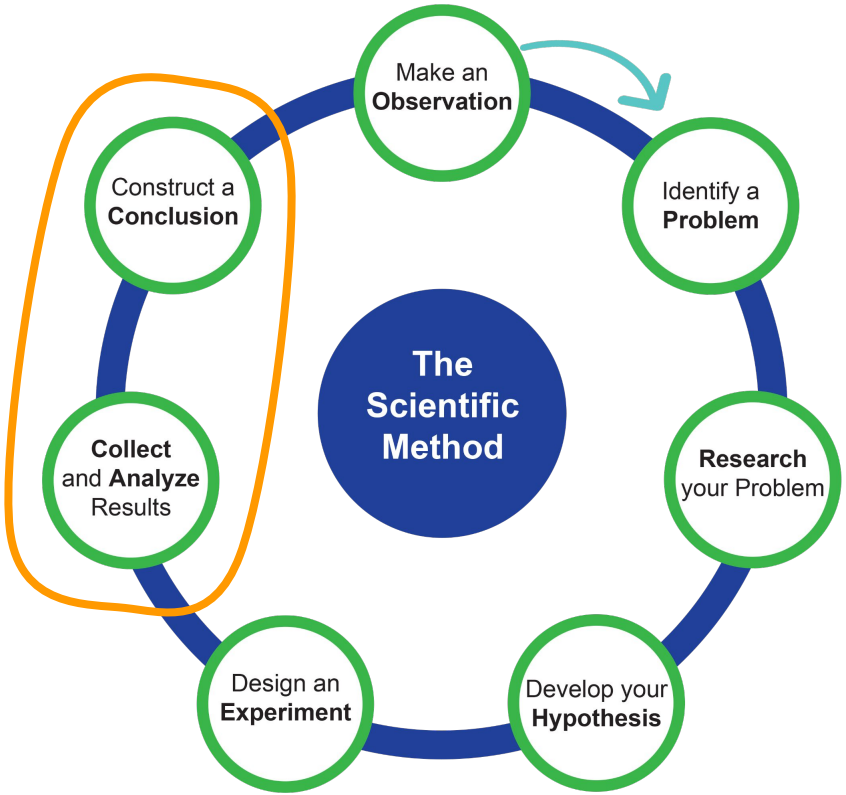
- Gathering data with telescopes
- Running simulations
- Pen-and-paper calculations



The process of astronomy research

Once you have data (real or simulated):

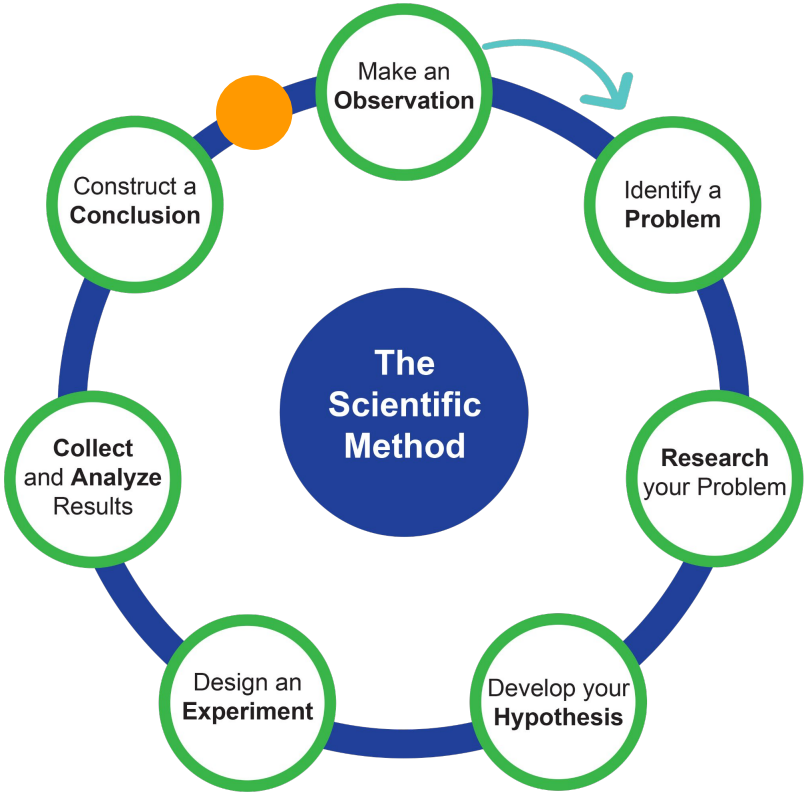
1. Get the data in a usable format (reduction)
2. Perform computational analysis



The process of astronomy research

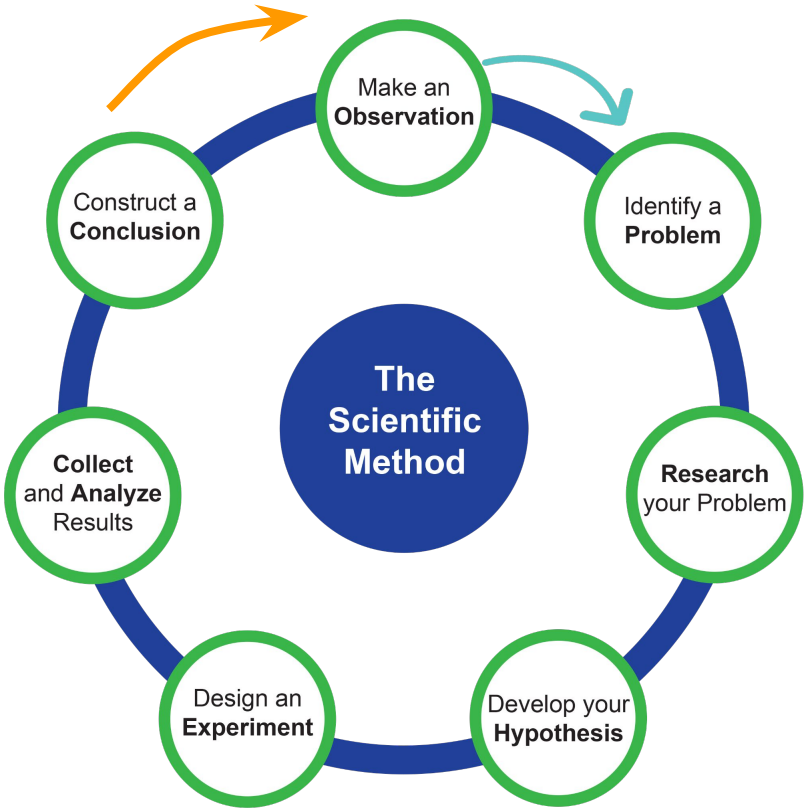
Communicate your results!

No one knows you did the work if you don't share it. Write a paper, go to conferences, etc



The process of astronomy research

Repeat the process with a new research question (maybe one that was inspired by your previous work).



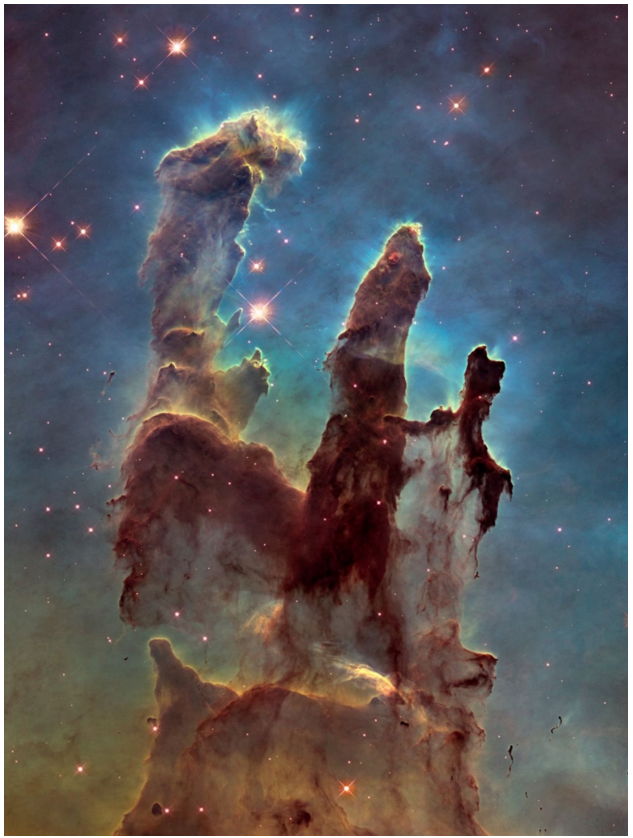
Astronomers tend to specialize by **method** and **topic**.

Two main “flavors” of methods

Observational

Theoretical

Observational astronomy



Using telescopes and instruments to gather information from the universe.

Pros: Real data, fewer assumptions, possibility of discovering something new

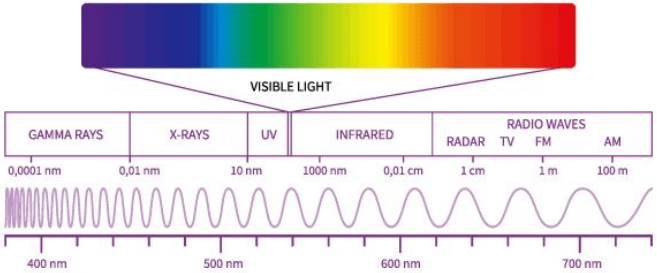
Cons: Limited by time/detectability, hard to get telescope time, hard to get good data, hard to know what's going on behind the scenes

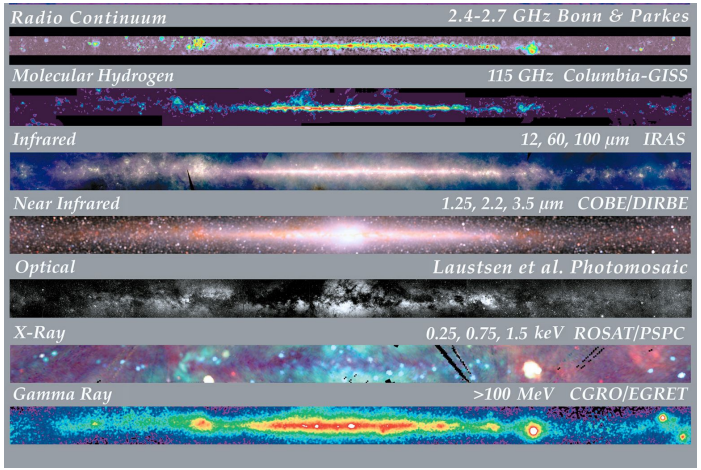
Observational astronomy

Additional specialization:

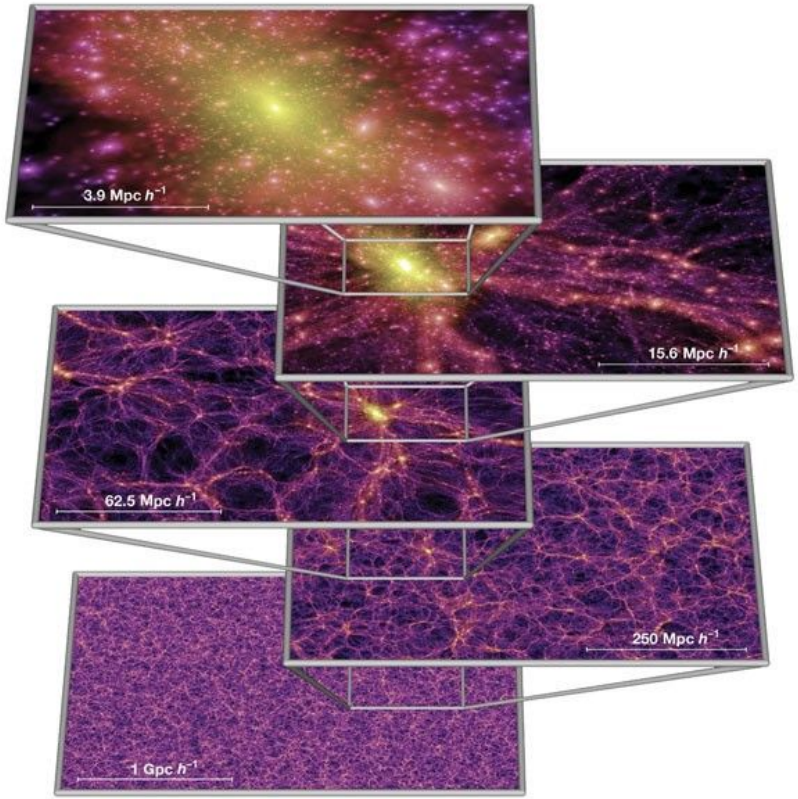
1. By messenger (type of information that reaches us)
   a. EM radiation, cosmic rays, gravitational waves, neutrinos, physical objects
   b. By specific portion of the EM spectrum

2. By type of data
   a. Spectroscopy, photometry, polarimetry, astrometry, etc.





Theoretical astronomy



Building models of the universe and studying the resulting behavior.

Pros: Control over experiment, ability to change conditions/assumptions, can study the unobservable

Cons: Requires assumptions about physics, limited resolution, can be expensive to build/run

Observational

Theoretical

Topics/subfields