

The Lion King



Grab a Sheet of Paper

Handwrite your reflection of these three quotes re the stars the characters see:

Timon

They're fireflies. Fireflies that, uh, [*Timon gestures vaguely.*] got stuck up in that big bluish-black thing.

Pumbaa

Oh, gee. I always thought they were balls of gas burning billions of miles away.

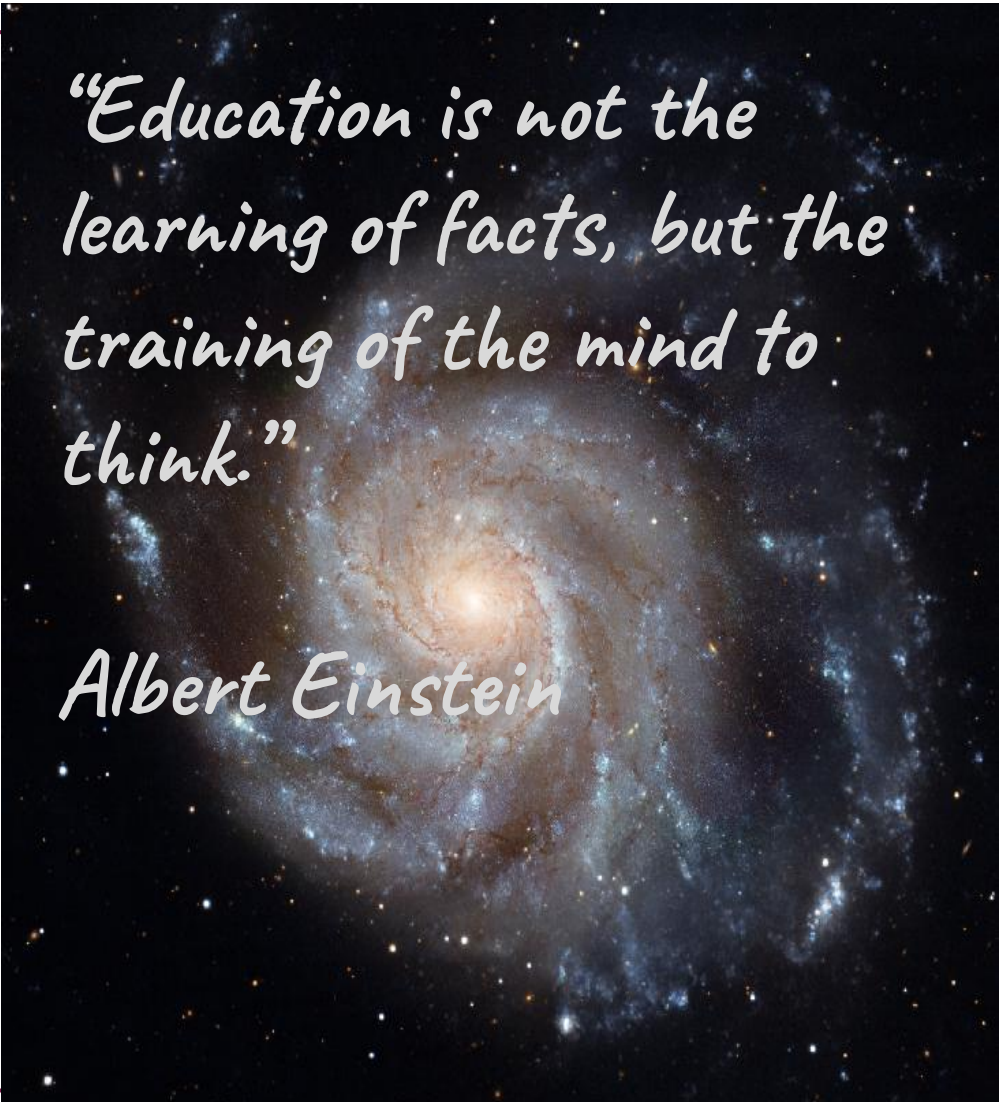
Simba

Well, somebody once told me that the Great Kings of the Past are up there, watching over us.

Chapter 1: Science and the Universe: A Brief Tour

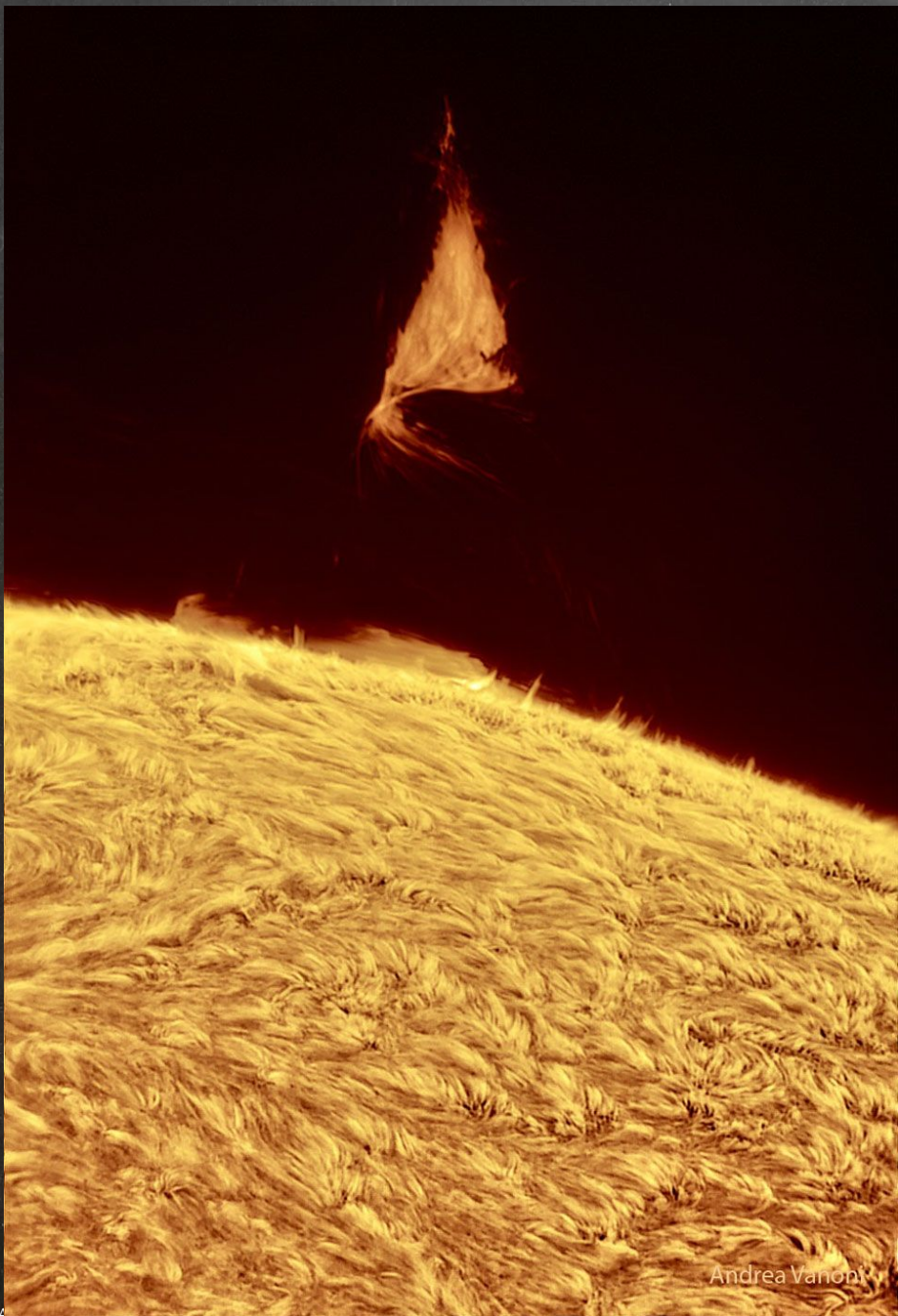
Critical thinking is an essential skill to develop in order to fully contribute to society as a citizen.

This astronomy course is a way to develop **critical thinking skills** while learning about awesome (and sometimes a little overwhelming) topics.



“Education is not the learning of facts, but the training of the mind to think.”

Albert Einstein



Andrea Varioni

Amare, Boston University



Francisco Soler



Mars



Saturn Behind the Moon



Galileo's Drawings of the Moon



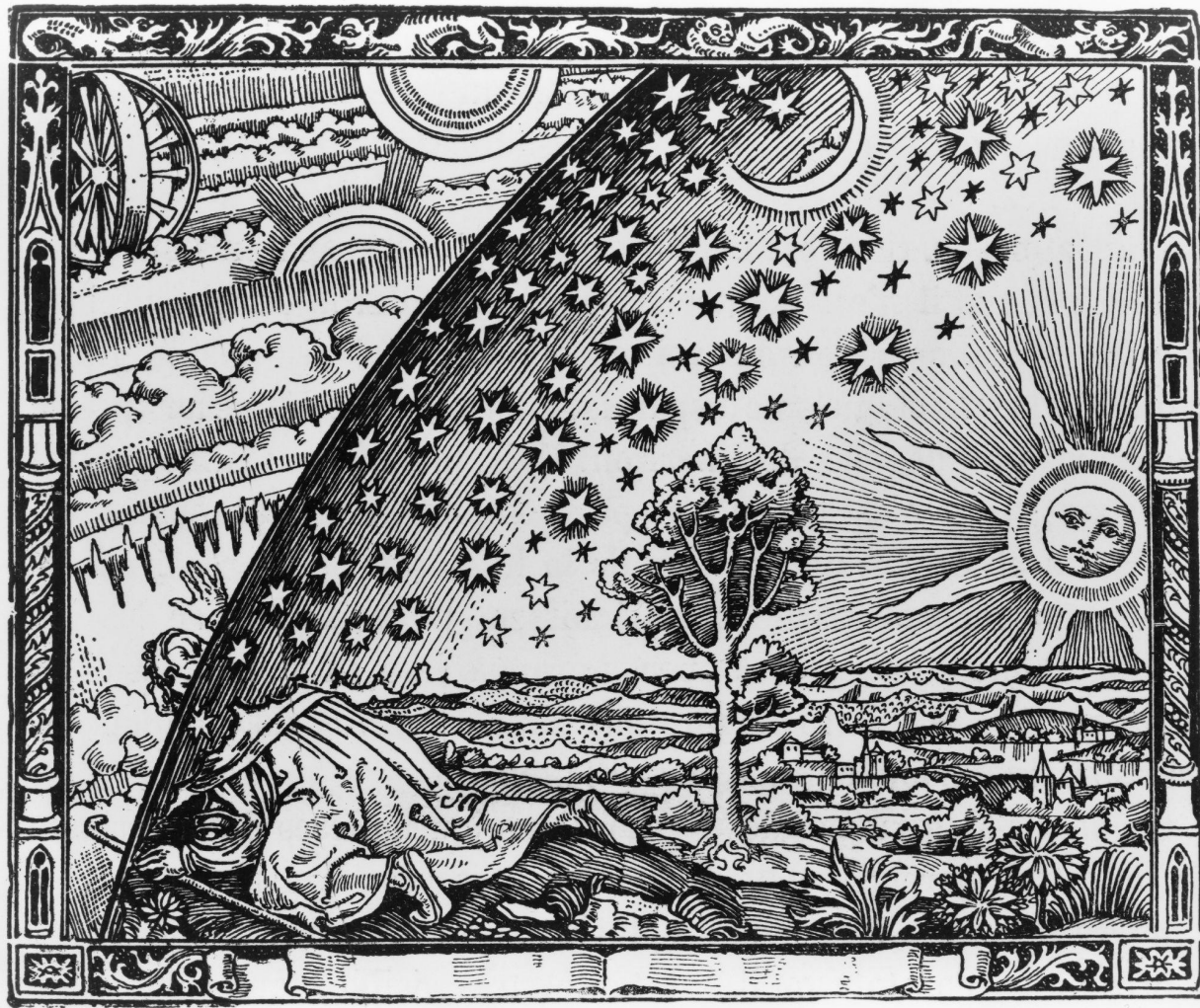
First Quiz

True/False: Science is a process collecting and organizing facts and data in order to find the Truth.

FALSE: Science is a provisional process, a method to help better understand the natural world

True/False: Science is essentially seeing and asking.

TRUE: Science starts with an observation, subsequent curiosity and questions, leading to explanations/models/theories (i.e., knowledge)

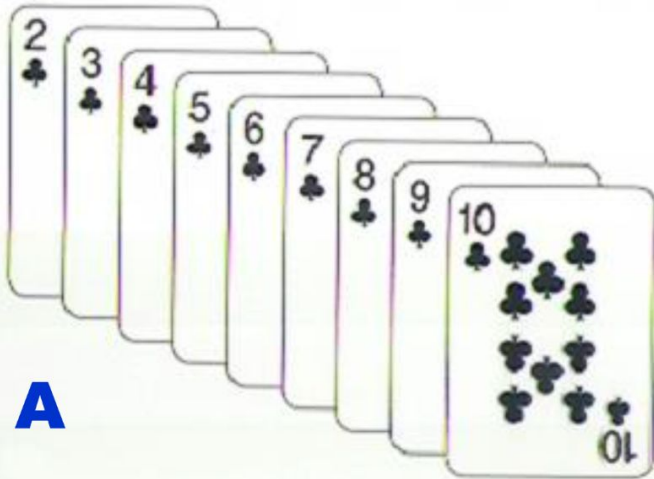


Science starts
with curiosity
...something
that is born in
all of us

The starting
point is to find
patterns in the
natural world

Observe the Patterns (like a curious scholar)

Analogy for discovery of patterns in nature



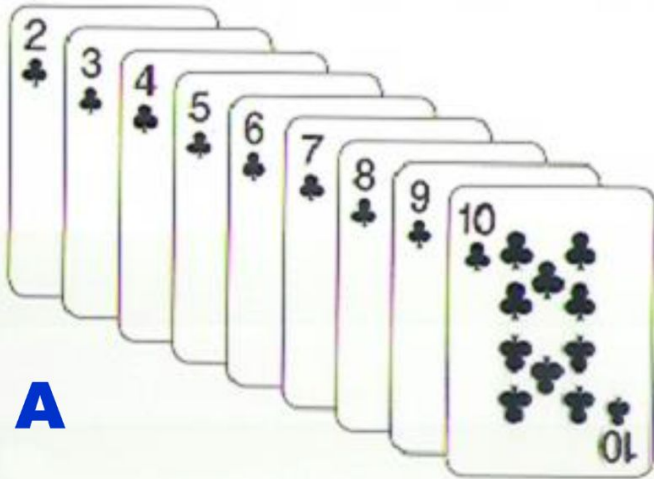
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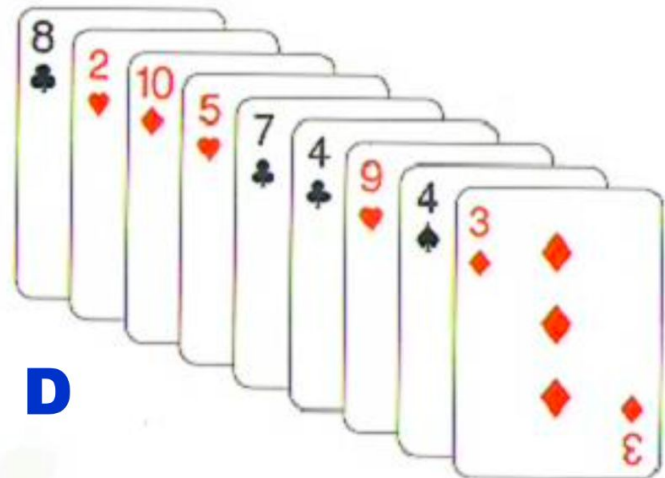
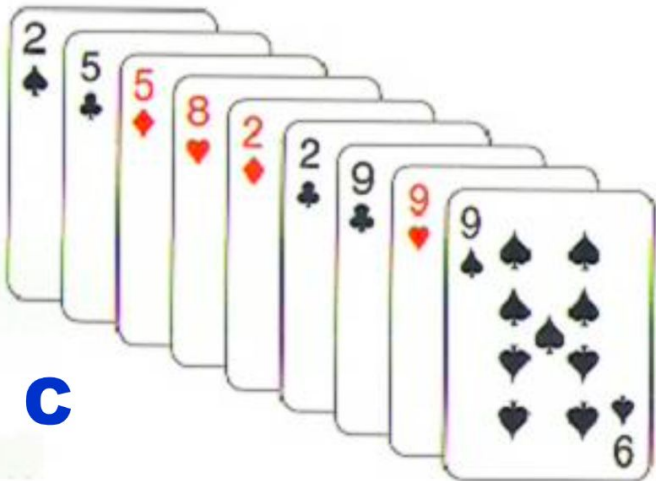
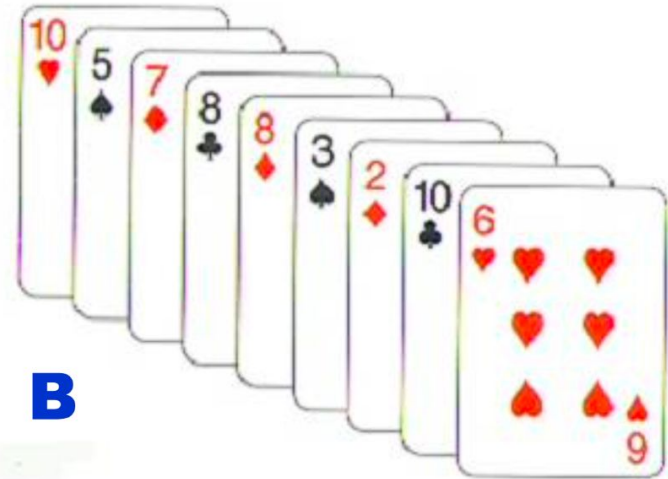
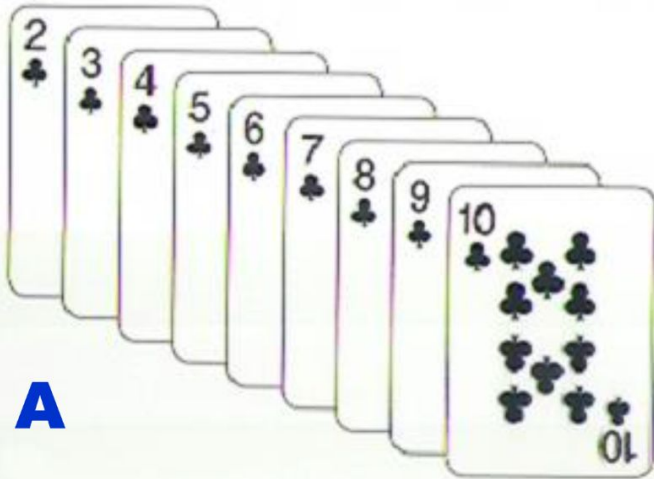
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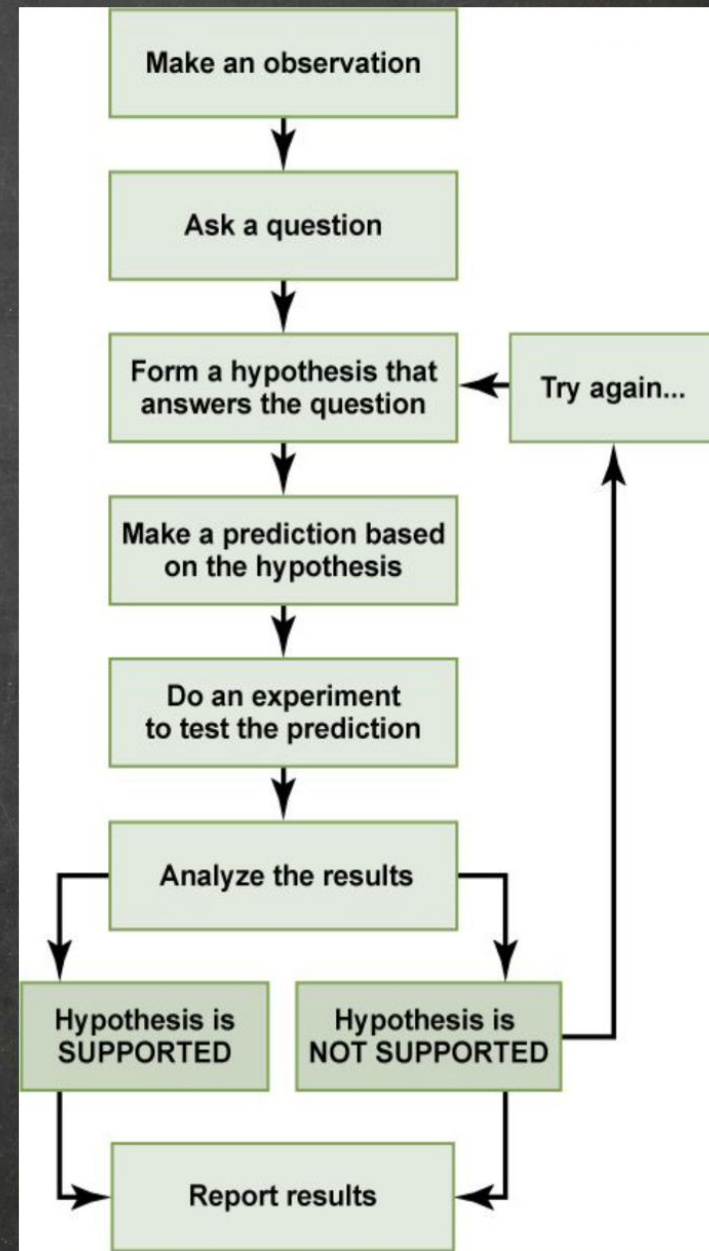
Observe the Patterns (like a curious scholar)

Analogy for discovery of patterns in nature



Science and the Scientific Method

Science (from the Latin *scientia*, meaning “knowledge”): *knowledge* that covers general truths or the operation of general laws, especially when acquired and tested by the *scientific method*.



Ch. 1.1 The Nature of Astronomy

Astronomy is a field of science. Science is not a set warehouse of knowledge to memorize, but rather a **method** by which we acquire new knowledge about how things work. Unlike chemistry, biology, or physics, astronomy requires **observations** of distant objects more than lab experiments.

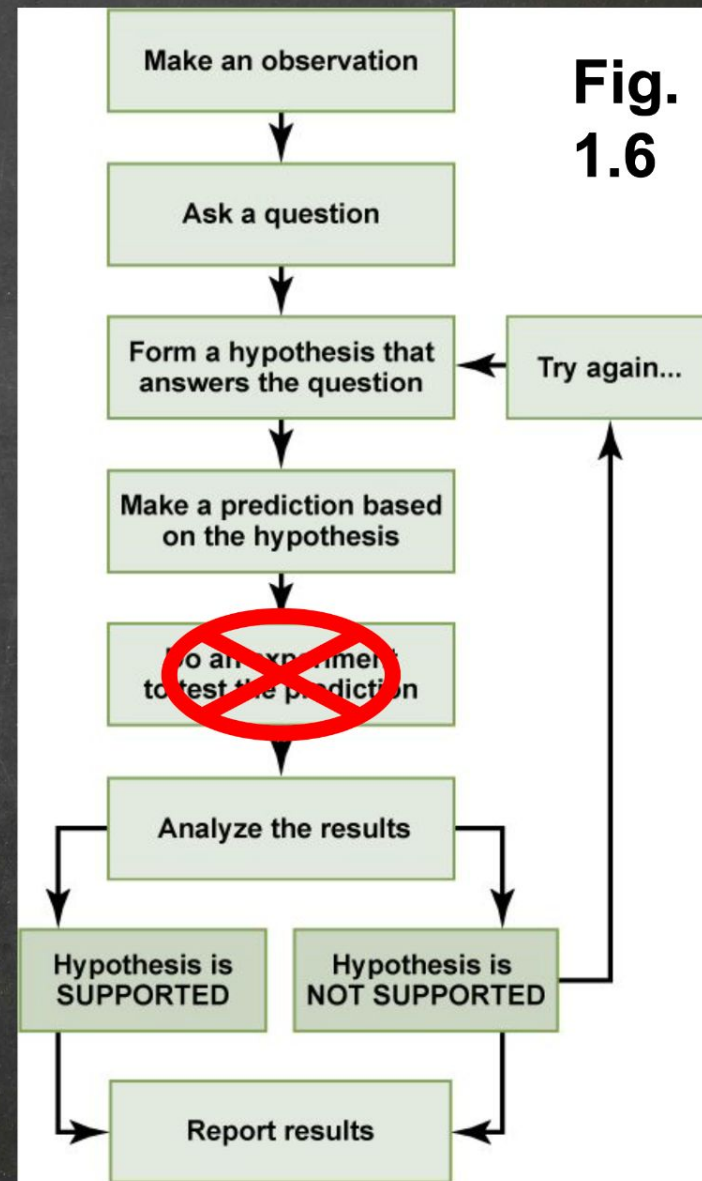
As we gather **observations**, we can build ideas or **models** to help us understand them. When a new model describes observations and is **testable**, it is called a **hypothesis**.

Non-Experimental Science and the Scientific Method

Science (More generally, the goal is to *describe, to predict, to explain*): fields of study that attempt to comprehend the nature of the universe.

Non-Experimental science can be:

- Observational
- Cross sectional
- Correlational



Ch. 1.2 The Nature of Science

While nothing in science can be proven 100% true, any **hypothesis** that has been supported by a large amount of observations and experiments is true “beyond a reasonable doubt” and only then is it called a **scientific theory**.

Scientists must always provide evidence to support their ideas, and these ideas are constantly being subjected to new tests to prove weak hypotheses wrong and to provide evidence for stronger hypotheses. **Science is provisional.**

One of the fundamental principles that we accept in astronomy is that the universe behaves by the same scientific laws *everywhere and for all time*.

Most of the universal laws in astronomy can be described by very simple equations. Throughout this semester, I will show these equations and describe in words and concepts the meaning behind them.

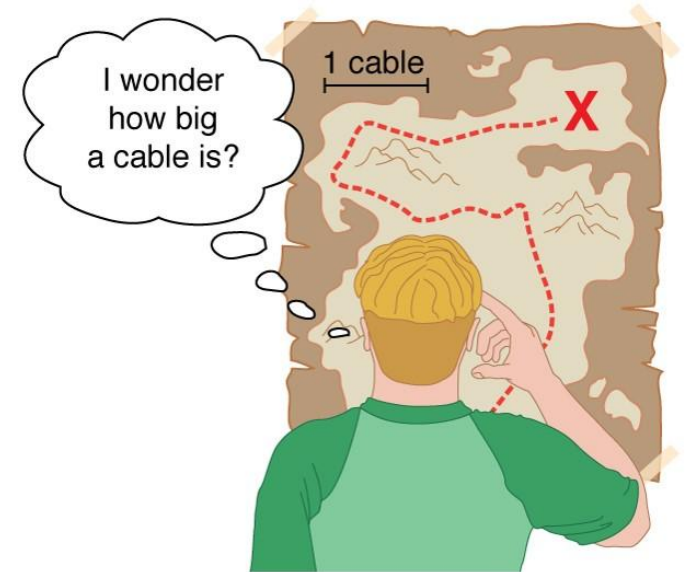
Ch. 1.4 Numbers in Astronomy

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If you ever have to find a value or look up a measurement, you should make sure that you know what units are associated with that number.

Distances in astronomy may be in:

- Kilometers (km)
- Astronomical Units (AU)
- Light-years (ly)
- Parsecs (pc)



Ch. 1.4 Numbers in Astronomy

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While on the subject of numbers, we also need to talk about **Scientific Notation**. This is a number-based written equivalent to using words like “trillion” to save time when speaking:

$$1,000,000,000,000 = \text{“one trillion”} = 10^{12}$$

Scientific notation is based on *powers of ten*, also called *orders of magnitude*. <http://janus.astro.umd.edu/astro/scinote/>

VIDEO LINK: <https://www.youtube.com/watch?v=8Are9dDbW24>

Grab a Sheet of Paper

Quotes we started with (ideas of the Celestial Sphere?):

Timon

They're fireflies. Fireflies that, uh, [*Timon gestures vaguely.*] got stuck up in that big bluish-black thing.

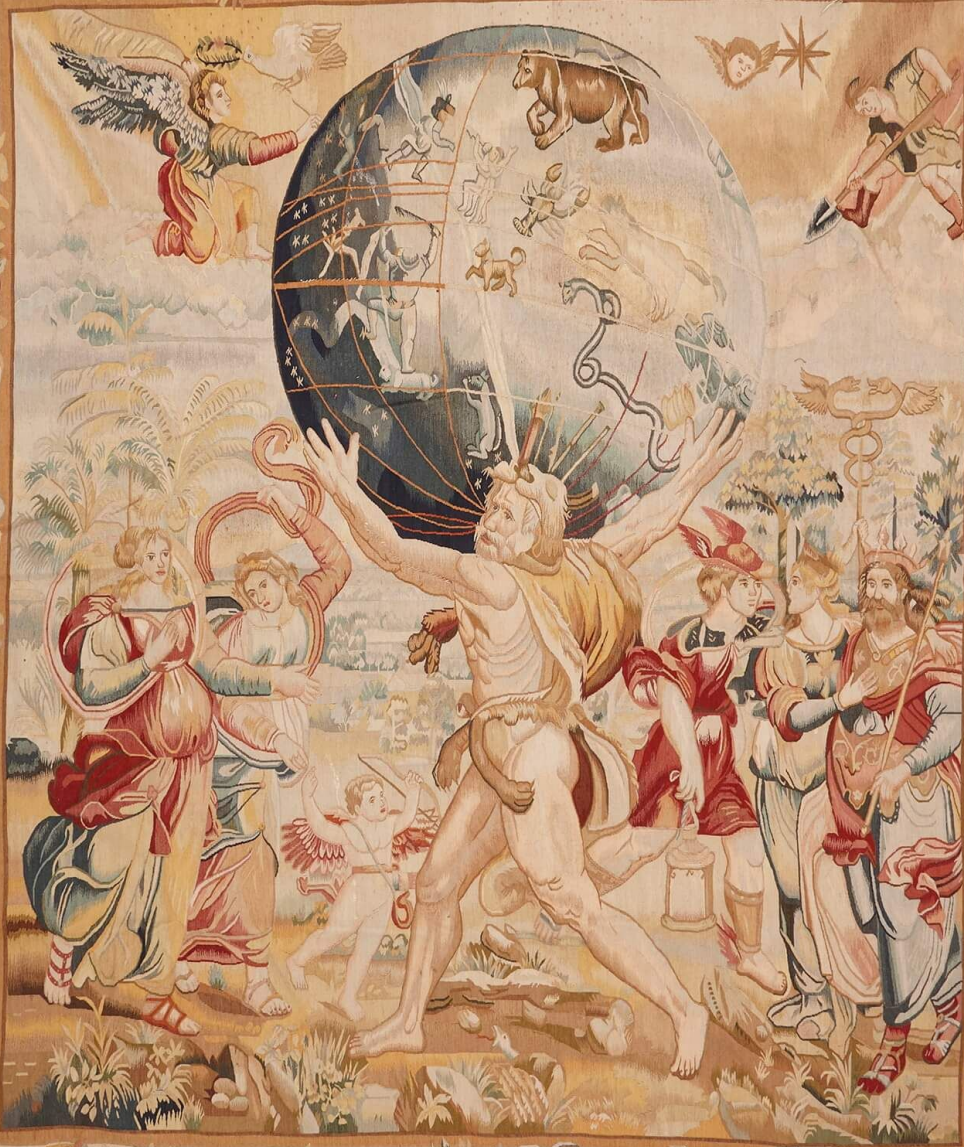
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Oh, gee. I always thought they were balls of gas burning billions of miles away.

Simba

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MAGNA VIRTUS SED
ALIENÆ OBNOXIA



altres los cōte amilers los altres los cōte acultes O Das tot es. i. ciu
 tat: **G**aula dels esvays dell mon:

