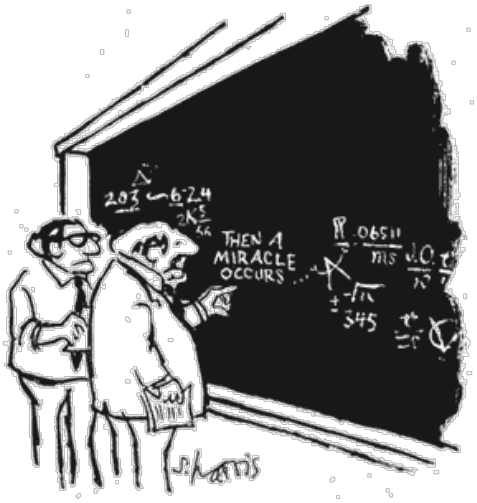
Lecture 1: Outline

- What is Astronomy?
- Science and the Scientific Method
- Mathematics Requirement?!!!
- Basic Definitions

What is Astronomy?

- An **exclusively scientific** study of things in the Universe and how they fit together on a large scale
- History of astronomy can be traced back more than 2000 years to early astrology
- Astronomy is a **science**; in contrast, astrology is an "*art* of prediction"(!)



The Nature of Science

- Based on **rational thought** and **objective reality**
- Scientific theories:
  - Must be testable/falsifiable
  - Must be continually tested
  - Should be simple and, if at all possible, *elegant* (**Occam's Razor**)
- Scientific theories can be proven wrong, but they can never be proven right with 100% certainty.
- Scientific theories are almost always based on **mathematics**, and they must be very *specific*, never vague.

The Scientific Method

- Scientists make **observations** and **measurements** (collect **data**), and then develop **theories** to explain the data
- Best scientific theories not only explain what has already been observed, they **predict** what can be observed next
- The theory must be **tested** by **experiments**: if new observations agree with its predictions, the theory is **supported**;
- If not, then the theory is **disproven** and must be abandoned in favour of a new and better theory.

- "A *good* theory is capable of ***evolving***." - Anonymous

The Scientific Method

The cycle of

1. observation (data)
2. analysis (explanation/*theory*)
3. prediction (and experimentation)
4. new observation (or conclusion)

is called the **scientific method**.

Table on p.194 of textbook

THE SUN AND ITS PLANETS

Object	Diameter (Earth=1)	Mass (Earth=1)	Density (water=1)	Distance from Sun (Earth's distance=1)	Rotation period†
SUN	109.1	332,946	1.41	—	25 to 35 days
MERCURY	0.382	0.055	5.43	0.387	176 days
VENUS	0.949	0.815	5.24	0.723	117 days
EARTH	1.000	1.000	5.52	1.000	24 hours
MARS	0.532	0.107	3.94	1.524	24h 39m
JUPITER	11.19	317.8	1.33	5.20	9h 50m
SATURN	9.41	95.2	0.77	9.54	10h 39m
URANUS	4.01	14.5	1.27	19.18	17h 14m
NEPTUNE	3.88	17.2	1.64	30.06	16h 06m
PLUTO*	0.19	0.0028	1.8	29.6 to 49.3	6d 9.3h

*Pluto, now classified as a dwarf planet, is included here for comparison