SPASH ASTRONOMY
CHAPTER 8: INTRODUCING THE PLANETS -- MERCURY
OVERHEAD LECTURE NOTES

Make up sentences to help remember the order of the planets of our solar system. Ten points apiece (Max. of fifty points) Here's some of my favorites from the past.

Most Volcanoes Erupt Magma, Just So Unsuspecting Natives Panic. (Sheila Kokkeler)
Many Very Energetic Men Jump Straight Up, Not Pretty. (Robb Kolodziej)
My Video "European Mom" Just Sold Unlimited New Packages. (Josh Hall)
Many Violent Eagles May Journey Silently Using Nocturnal Procedures. (Chance Chang)
Many Vacations End Marriages Just Simply Under Nonsense Problems. (Kevin Fitzgerald)
Many Very Ecstatic Monkeys Jump Sideways Up Numerous Pedestals. (Casey Taggatz0
My Vet Eats Mice Just So Ugly Nurses Puke. (Holly Somers)

Note that **S.U.N.** is a member of the order of planets.

1. What are some easy facts to remember about the solar system?

The Sun is about 10 times the diameter of Jupiter, and Jupiter is about 10 times the diameter of the Earth. Whereas the **Sun is a star**, composed of gas and **emitting radiation** by its won internal energy sources, **planets are** bodies at least partly **solid**, **orbiting the Sun**, and known to us primarily by **reflected sunlight**. **Satellites**, in turn, **are solid** bodies **orbiting the planets**.

2. Planets are divided into two groups, namely:

Terrestrial planets are the **four inner planets**, Mercury through Mars. These inner planets most nearly **resemble Earth in size and in rocky composition**.

Giant planets are the **four large planets of the outer solar system**, Jupiter through Neptune. These are **much bigger** than the terrestrial planets, instead of rock they are **rich in icy or gaseous hydrogen compounds** such as methane (CH_4), ammonia (NH_3), and water (H_2O).

Pluto falls into neither category, being a **special, mysterious case**.

3. Size of other large objects in our solar system include:

Jupiter's moon Ganymede and **Saturn's moon Titan**, with diameters over 5000 km. They are **both bigger than the planets Mercury and Pluto**. Also, **the large asteroid Ceres** (diameter 1020 km), which orbits the Sun in a planetlike orbit between Mars and Jupiter, **is bigger than half the known satellites of the solar system**. Figure 8-1 Page 161-162 shows **26 worlds in the solar system larger than 1000 km across**.

4. What is planetology?

Planetology is the study of individual planets and systems of planets.

Comparative Planetology is a **systematic study of how planets compare with each other**, why they are different, and why certain planets have certain similarities; what type of environment evolves if you start with a certain mass, with a certain composition, at a certain distance from the Sun. Such scientists then try to **use this knowledge to clarify our understanding of the Earth.**

5. How does the size of Mercury compare to Earth and the Moon?

Mercury is the ~~second~~ smallest planet in the solar system. It is only about 40% the size of Earth and about 40% bigger than the Moon.

6. How do we know so much about Mercury?

In 1974 and 1975, the American spacecraft **Mariner 10** sailed past Mercury on three different occasions **to reveal that Mercury is a world much like the Moon**, pocked with craters, marked with giant multi-ring basins and lava flows, and with virtually no atmosphere.

7. How does Mercury's day compare to its year?

Mercury has gotten locked into a **59-d period of rotation**, which is just two-thirds of its **88-d orbital revolution period**. At the above rates it **takes the Sun 176 d to go from noon until the next noon. Note overhead transparency. Mercury has gone once around the Sun in 88 d**, but it is **now midnight** on the mountain, since the mountain faces directly away from the Sun. **Another 88 d** are necessary to bring the mountain back **to noontime**. Figure 8-4 Page 162.

8. What is the hard to solve problem involving Mercury?

The **perihelion (the point nearest to the Sun)** shifts in position slowly around the Sun from year to year. This movement is called orbital precession. **Mercury has an excess shift of 43 seconds of arc each century** not explained by Newton's laws. The solution can in 1915, when Albert Einstein showed that the great mass of the Sun disturbs the orbits of nearby planets in a way unpredicted by Newton's laws. Thus Einstein's contribution to solving the puzzle of Mercury's precession played a major role in the acceptance of his theory of relativity.

9. How hot does the surface of Mercury get?

Temperatures in the upper few millimeters of soil range well above 500 K (441°F) in the "early afternoon" near perihelion to lows of about 100 K (-279°F) at night. In some areas, depending on soil type, the temperature might exceed 600K (621°F).

10. Would there be molten metal on the daylight side?

No, because the melting point of lead is about 600 K; that of aluminum is 832 K and the temperature slightly below the surface is only 314 to 446 K because of the insulating effect of the overlying soil.

11. What did Mariner 10 find out about Mercury that resembles our moon?
Mercury has an abundance of rugged craters.
Mercury has huge multi-ringed craters known as basins.
Evidently the same impact and lava flow processes occurred on Mercury as on the Moon some 3.5 to 4.5 billion years ago. From this discovery, most scientists believe all planets suffered an intense bombardment by interplanetary debris at the close of the planet-forming process.

12. What would one see differently from Mercury than from Earth?
The sky is black, dominated during the nearly 88 day period of sunlight by a Sun looking about 2.5 times bigger in angular size.
Besides the Sun, two jewel-like planets, much brighter than any stars, occasionally dominate the sky. These are yellowish-white Venus and bluish Earth.

13. What is one Internal Property about Mercury that is different from the moon's?
Huge faults (cracks in the surface) suggest that the lithosphere (the solid rocky layer in a partially molten planet) was just thin enough to fracture when Mercury contracted as it cooled.
Aside from these faults, the rest of Mercury's surface is very lunar-like.
The main thing to remember about Mercury is that in terms of most surface and crusted properties, it more or less resembles our Moon.

14. Does Mercury have a magnetic field or an iron core?
Mercury has a weak magnetic field - about 1% as strong as Earth's. The field's magnetic axis is tilted about 7° to the planet's rotation axis.
Scientist believe that Mercury has an iron core, which also accounts for Mercury's high mean density (5500 kg/m^3)
high compared to the Moon (3300 kg/m^3).

15. Does Mercury have any water since it appears it gets so hot that the water would boil off?
Mercury has essentially no atmosphere but there is a local concentration of gas atoms around the planet that are probably knocked off the surface (mostly sodium atoms) continually by gases streaming from the Sun.
In 1991, Caltech scientists bounced radar waves off Mercury and discovered a spot exactly at its north pole that reflected radar much better than any other spot on Mercury- a property that could be explained by ice on (or just under) the surface. Because Mercury's polar axis is normal to its orbit, the Sun never rises fully above the horizon, as seen from the pole. Thus many polar areas remain shadowed and cold, and the polar soil temperature may be as cold as 125 K (-148 °C or - 234 °F).

16. Might there be an Earthlike planet on the opposite side of the Sun from Earth that UFO's could come from?
The make-believe planet Vulcan that is suppose to be about half the size of the moon inside Mercury's orbit has been proven not to exist. Also, spacecraft exploration has proven that there is no Earthlike planet on the opposite side of the Sun from Earth.