

HOMEWORK: DUE
MONDAY 3/8

Read, highlight and summarize each page with 3 bullet points (including information in the margins).

Summarize the entire reading in 3 sentences.

Answer the 2 questions related to the order of the planets

MOST SCHOOLROOM charts show the planets coming one after the other at neighbourly intervals, but this is a trick to get them all on the same piece of paper.

The solar system consists of the Sun, the eight planets, their moons, three dwarf planets, including Pluto, and their four moons, and billions of asteroids, comets, meteoroids and bits of interplanetary dust.

Journey into space

Let's imagine, for purposes of entertainment, that we're about to go on a journey by rocketship. We won't go terribly far – just to the edge of our own solar system – but we need to get a fix on how big a place space is and what a small part of it we occupy.

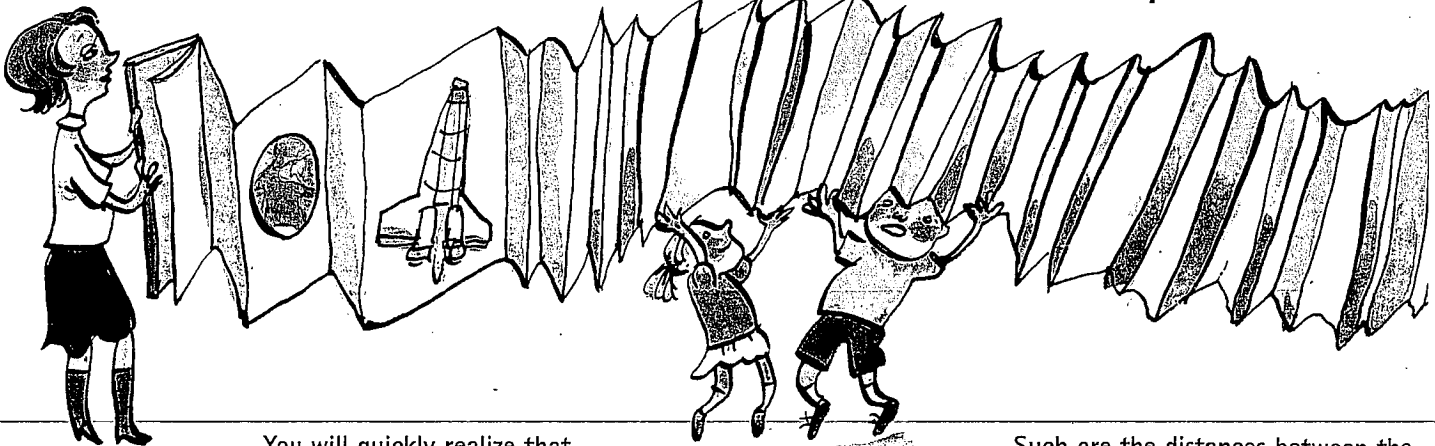
We'll need to get up some speed

Even at the speed of light, it would take seven hours to get to the dwarf planet of Pluto. But of course we can't travel at anything like that speed. We'll have to go at the speed of a spaceship, and these are rather more lumbering. The best speeds yet achieved by any human object are those of the *Voyager 1* and 2 spacecrafts, which are now flying away from us at about 56,000 kilometres an hour.

Space is – well – space!

Now, the first thing you are likely to realize is that space is extremely well named and that there's not a lot going on out of the window.

Lots of empty boring space . . .



You will quickly realize that none of the maps you've ever seen of the solar system were drawn remotely to scale.

Such are the distances between the planets, in fact, that it isn't possible to do so.

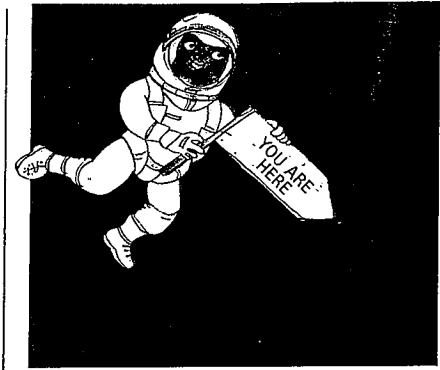
Lost in space

Our solar system may be the liveliest thing for trillions of miles, but all the visible stuff in it – the Sun, the planets and their moons, the billion or so tumbling rocks of the asteroid belt, comets and other bits and pieces of drifting dust – fills less than a trillionth of the available space.

And on and on . . .

By the time we reach Pluto, we have come so far that the Sun has shrunk to the size of a pinhead. It's little more than a bright star. And you will notice as we speed past Pluto that we're not stopping. Check your itinerary and you'll see that this is a trip to the edge of our solar system and we're not nearly there yet. Pluto may be the last object marked on schoolroom charts, but the system doesn't end there. In fact, it isn't even close.

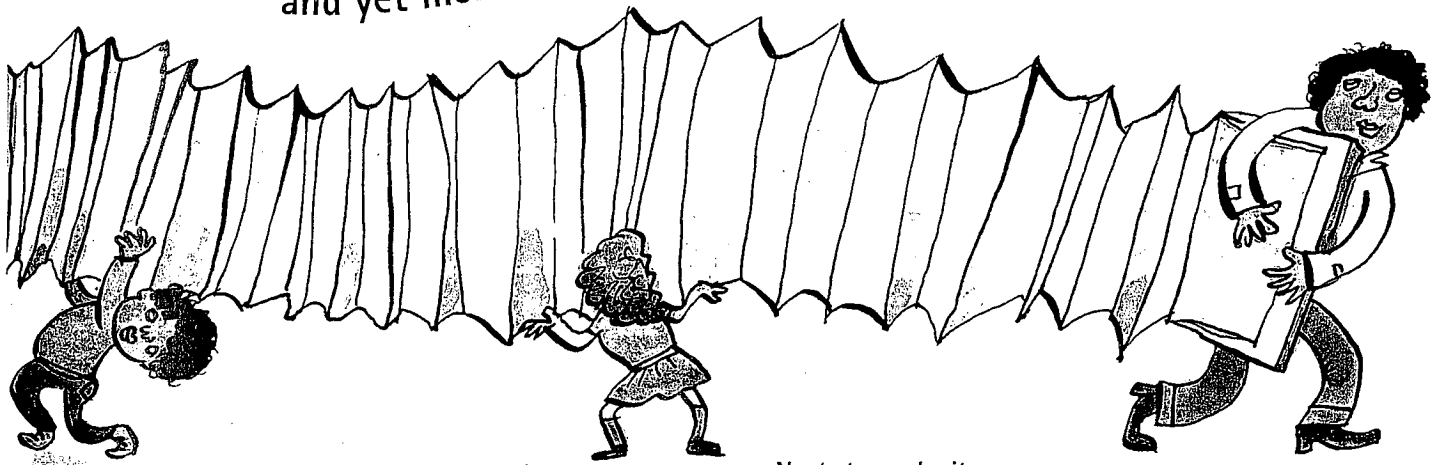
We won't get to the solar system's edge until we've passed through the Oort cloud, a vast celestial realm of drifting comets, and we won't reach the Oort cloud for another – I'm sorry to say – ten thousand years. So, the bad news, I'm afraid, is that we won't be home for supper.



Now, this may look the most boring picture ever, but it's a real photo of Earth taken by *Voyager 1* from more than one billion miles away.

Far from marking the outer edge of the solar system, as those schoolroom maps imply, Pluto is barely one five-thousandth of the way.

and yet more boring space . . .



Even if you added lots of fold-out pages to your textbooks or used a really long sheet of poster paper, you wouldn't come close.

Next stop – Jupiter – coming up in just 300 metres (less the size of this page).

The Flap Over Pluto

Sources: NASA and the International Astronomical Union.

News Flash (August 24, 2006)—

Pluto Demoted!

Misleading reports that Pluto was about to lose its status as a planet in January 1999 caused an unexpected public uproar and a subsequent stir over the planet's standing in the astronomical community. The flap began when some of the national media announced that Pluto was going to be reclassified as a minor planet or, even worse, a lowly asteroid. Although the proposal turned out to be false, the publicity generated by the media hype left many people confused about Pluto's official classification.

Since 1992, a substantial number of smaller objects have been discovered in the outer solar system, beyond the orbit of Neptune, with orbits and possibly other properties similar to those of Pluto. These characteristically "Pluto-like" bodies are known as Trans-Neptunian Objects (or TNOs).

The controversy over Pluto's designation began when an astronomer suggested that Pluto be assigned a number in a technical catalog or list of such TNOs so that observations and computations concerning these objects could be conveniently collated. This proposal was not in any way intended to change Pluto's standing as a planet. Unfortunately, the purpose of including it in a specialized listing became misinterpreted and was erroneously reported.

The hullabaloo that followed over Pluto's supposed demotion was soon denounced by the Paris-based International Astronomical Union (IAU), the organization that decides the classification of objects in the solar system, which promptly issued a statement confirming that Pluto will remain our ninth planet and that there was no such initiative to reclassify it as some lesser type of heavenly body.

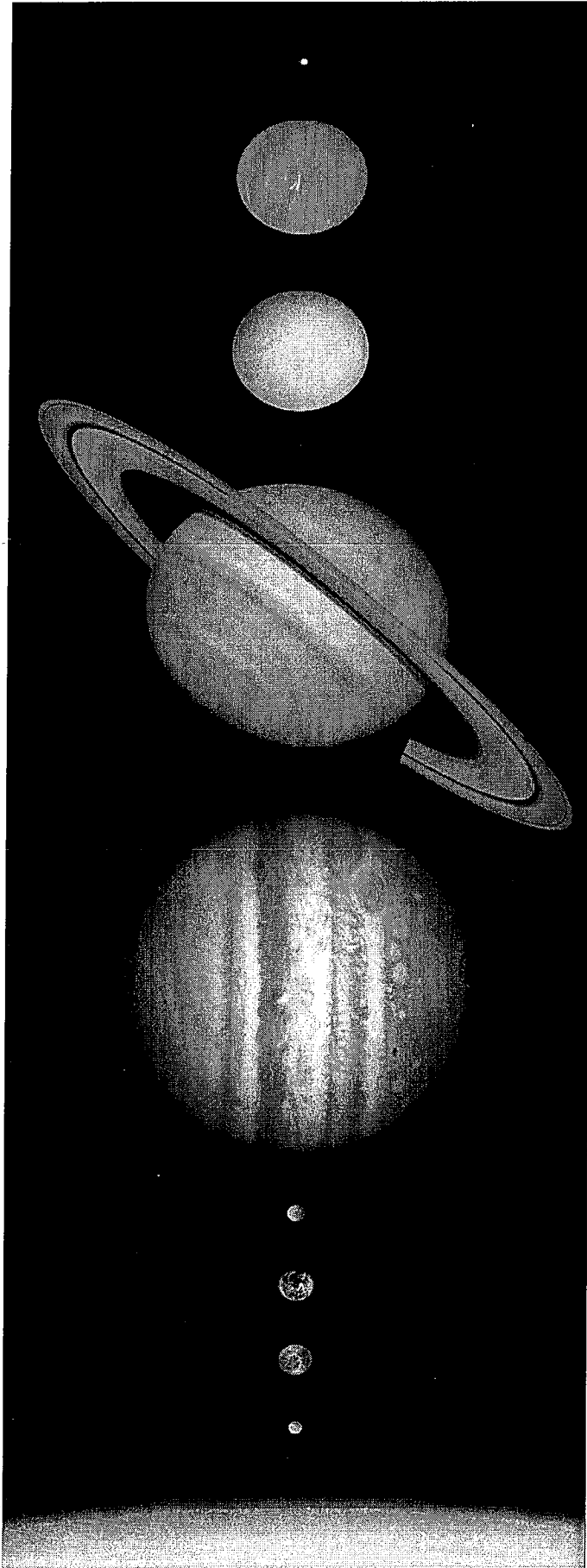
Surprisingly, there is no set scientific law as to what constitutes a planet, but as a rule of thumb, a planet: 1) must directly orbit a star; 2) must be small enough that it has not undergone internal nuclear fusion (i.e., it is not a star or starlike object); and 3) must be large enough that its self-gravity gives it the general shape of a sphere.

Pluto, the smallest planet in the solar system (it's smaller than Earth's moon), has remained enigmatic since its discovery by astronomer Clyde Tombaugh in 1931. It is so unique in comparison to its eight siblings that it almost defies classification. Though it orbits the Sun, Pluto neither qualifies as a terrestrial nor as a gas giant planet. All the other planets in the outer solar system are gaseous giants, whereas Pluto is a small, solid object. Although it behaves like a comet by periodically warming and losing its atmosphere into space, Pluto is far too large for that category. Astronomers speculate that Pluto may be the last survivor of a lost population of objects called "ice dwarfs" that inhabited the primeval solar system.

Pluto's satellite, Charon, discovered in 1978, is larger in proportion to its planet than any other satellite in the solar system. Pluto and its moon are also considered a "double planet system," which occurs when two bodies are reasonably close in mass and so orbit around a common center of gravity (or barycenter), analogous to two children balancing on a

teeter-totter. It is thought that Charon may have been born through a head-on collision between Pluto and another large ice body, in much the same way as the Earth–Moon system is believed to have formed.

Pluto is the only planet whose orbit crosses that of another planet (Neptune, normally the eighth planet). Pint-sized Pluto's elliptical orbit takes 248 years, and carries it as close as 2.8 billion mi from the Sun and as far as 4.6 billion mi from the Sun. In September 1979, Pluto crossed within Neptune's orbit again, making Neptune the farthest planet. Pluto remained closer to the Sun than Neptune for most of the 1980s, reaching its closest point (perihelion) to the Sun by late 1989. According to NASA, the last time Pluto was this close to the Sun, George Washington was a boy! In February 1999, Pluto crossed Neptune's orbit again as it headed away from the Sun and regained its status as the most distant planet. NASA's New Horizons Pluto-Kuiper Belt mission was launched in Jan. 2006 to study Pluto and Charon as well as the Kuiper Belt beyond Neptune's orbit.



1. What is the order of the planets based off of this information?

Planet
 Mars
 Venus
 Earth
 Pluto
 Jupiter
 Mercury
 Uranus
 Neptune
 Saturn

Diameter (miles) **Distance to Sun (miles)**
 4240 141293120
 7600 67,207,188
 8000 92956000
 1520 3643875200
 89680 483371200
 3040 38,973,972
 32080 1784755200
 31040 2788680000
 75600 890518480

2. Do you think that Pluto should be considered a planet? Why or why not?