



# “The Voyager Encounters” Teaching Supplement

Courtesy of ITech, Instructional Technology Dept.  
of Pensacola Junior College

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## Takes a Lickin’ ...

**Then:** At the time of their launch in 1977, the mission of the twin space probes Voyager 1 and Voyager 2 was the exploration of Jupiter and Saturn. However, after such amazing discoveries as the active volcanoes on Io, one of Jupiter’s moons, and the complexities of Saturn’s rings, their mission was extended to include visits to Uranus and Neptune.

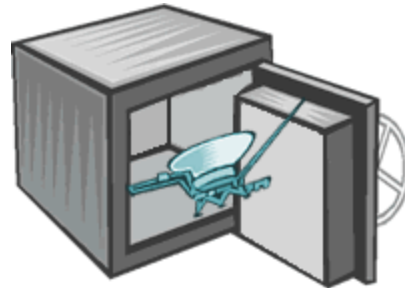
## ... but Keeps on Tickin’ !

**Now:** The twin spacecraft are currently celebrating their 25th birthday as they travel farther away from Earth and the Sun. In fact, Voyager 1 is now the most distant man-made object from the Sun. The spacecraft are nearing the heliopause, the region where the Sun’s dominance ends and interstellar space begins. As they speed through space at 38,000 miles per hour, both probes are still sending scientific information back to Earth.

## From the Voyager Vault:

Here are some fascinating facts and historical highlights that you might like to share with your students:

- Voyager 1 and 2 have sent approximately 86,000 photos back to Earth
- 5 trillion bits of scientific data have been sent back from the Voyagers; enough to encode over 6000 complete sets of the



- A digital watch operates at a power level 20 billion times greater than the strength of the signal that the Voyagers are sending back to Earth
- Each Voyager has over 65,000 individual parts which is the equivalent of 2000 color TV sets
- Voyager 2 used gravity-assist swing-bys, or slingshots, of Jupiter, Saturn and Uranus in order to reach Neptune 20 years sooner than the direct Earth to Neptune route

## Net Connection:

These NASA websites provide additional opportunities to learn more about the Voyager missions, past and present:

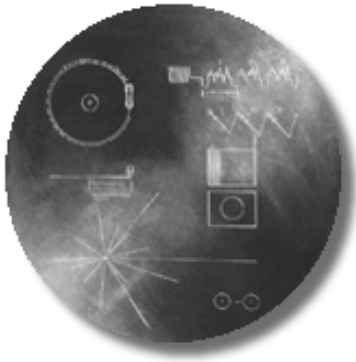
<http://voyager.jpl.nasa.gov/index.html>

<http://nssdc.gsfc.nasa.gov/planetary/voyager.html>

<http://www.jpl.nasa.gov/voyager/inter.html>

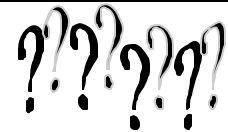
## Not So Trivial Pursuit:

These trivia questions can be posed before and/or after viewing “The Voyager Encounters” planetarium show. Answers are listed below.



1. How many times has Neptune orbited the Sun since its discovery in 1781?
2. Which planet(s) have rings?
3. What are the giant “eyes” or spots that appear on planets like Jupiter and Neptune?
4. When Galileo first saw Saturn through his telescope, what did he think its rings looked like?
5. What common household appliance uses roughly the same amount of energy as a Voyager probe?
6. What could scientists determine when the Voyagers “took the temperature” of planets or moons they visited?
7. How long did it take Voyager 2 to reach Neptune?
8. Other than Voyager 2, what other spacecraft have visited Uranus and Neptune?
9. How long has the Voyager mission been going on?
10. The Voyagers have one component that is made of gold. What is it?

- Answers:**
1. It has yet to orbit the Sun one time.
  2. Jupiter, Saturn, Uranus and Neptune.
  3. Violent storms.
  4. Ears.
  5. A hairdryer.
  6. What gases make up their atmosphere.
  7. 12 years.
  8. None - they are the only ones.
  9. 25 years.
  10. Voyager 1 (as of 2002).



## Ponder This:

Students might want to discuss these questions before and/or after viewing “The Voyager Encounters” planetarium show. There are really no right or wrong answers, only different viewpoints. Even though students may at first have difficulty discussing them, you may find that they continue to mull them over.

1. To date, the Voyager mission has cost the American public \$865 million (this is equivalent to 20 cents per US resident per year). Explain why you think this expenditure is or is not justified.
2. Affixed to each Voyager is a gold-plated disk containing sounds, images, and recorded messages in 55 languages from different cultures and eras. Since it might be 40,000 years before the Voyagers approach another planetary system, who do you think might someday play this disk? Do you think that they will be able to interpret the images and messages? What do you suppose their reaction might be?
3. The Voyagers have completed their planetary explorations and are now extending their journeys to explore the heliopause, the region that extends beyond the Sun’s influence, and onward to interstellar space. Why should (or shouldn’t) man want to explore this area and what might he discover? What do you think we might discover from this exploration?