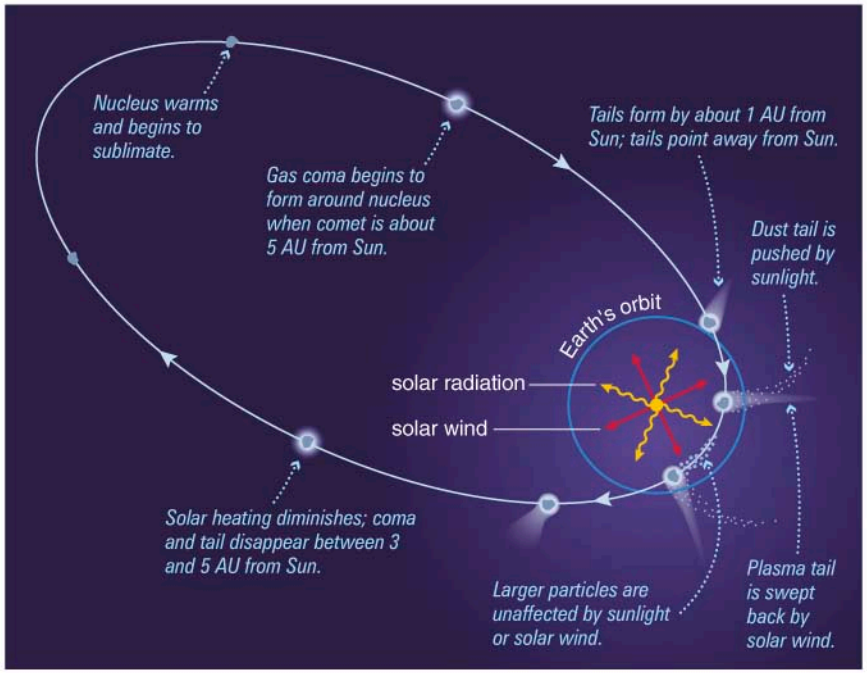
Comets

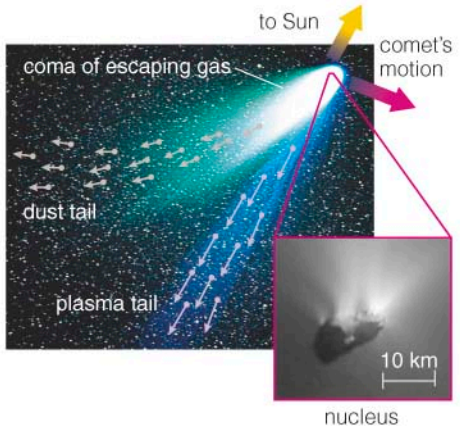
Vanderbilt Student Volunteers for Science

Fall 2018 VINSE/VSVS Rural Training Presentation

Introduction

- Comets are left over debris from the period of the early formation of our solar system.
- Comets may have brought water and carbon-based molecules to earth. These are the molecules that make up living things.
- Most comets are too small to be seen without a telescope.
- Comets orbit the sun.



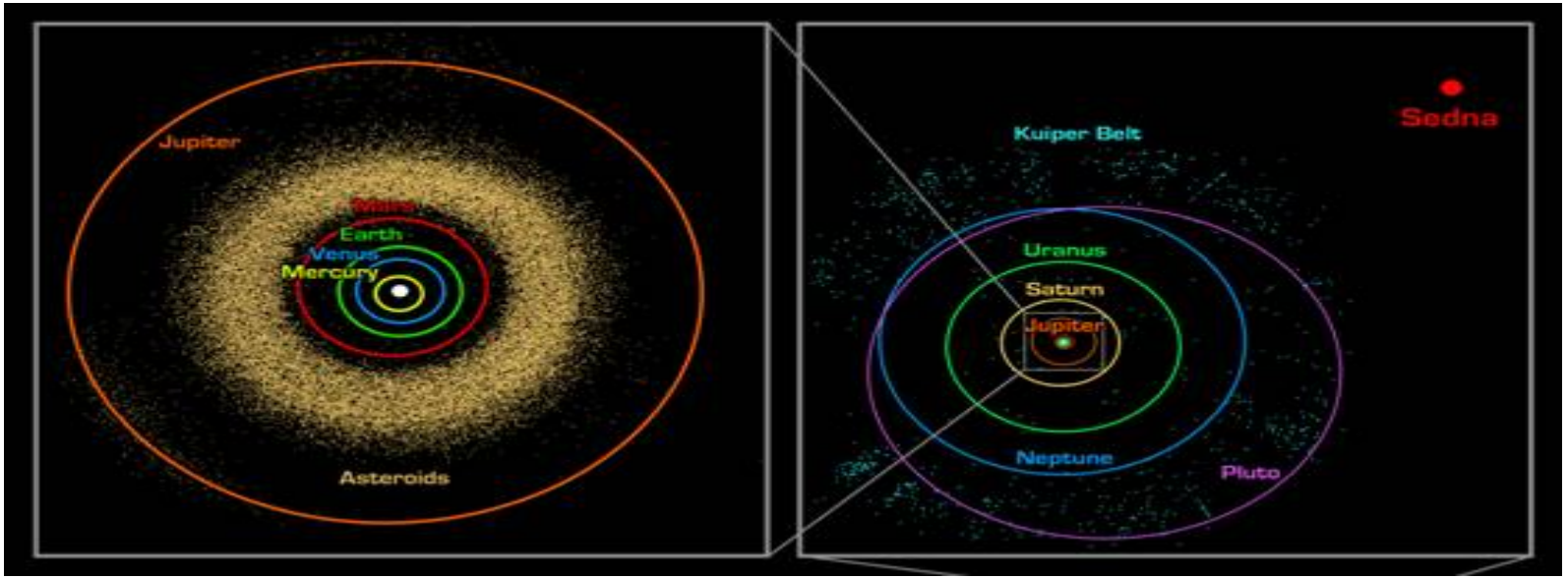


b (Above) Anatomy of a comet. The larger image shows a ground based photo of comet Hale-Bopp. The inset shows the nucleus of Halley's comet photographed by the *Giotto* spacecraft.

a (Left) This diagram shows the changes that occur when a comet's orbit takes it on a passage into the inner solar system. (Not to scale.)

Where Comets are found

- Comets spend most of their time out past Pluto.



- Gravity can pull a comet closer to the sun.
- It is rare to see one come close to Earth, but it does happen.
  - In 1986 the first picture of the interior of a comet was taken by the Giotto spacecraft. It was found that a comet's surface is not smooth, but very rough, full of holes, and lumpy.

What a comet is made of

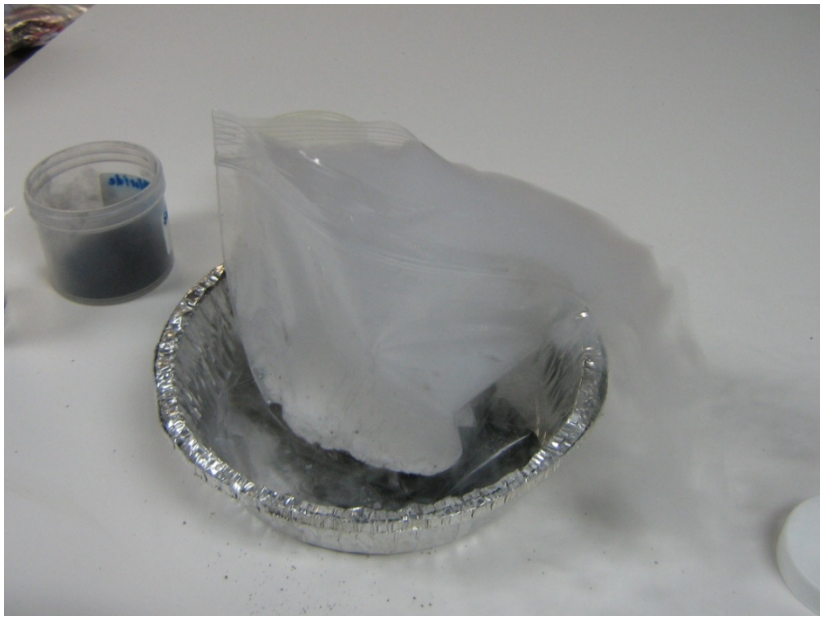
- A comet is a dirty ball of ice!
- The comet has a small nucleus in the center.
- The nucleus is the solid center (50% is ice and 50% is dust and rock).
- The nucleus is surrounded by a coma (this is formed when the comet gets close to the inner solar system).
- The comet may have 1 or 2 tails
  - The dust tail is produced as the ices evaporate and drag dust particles off the surface of the comet.
  - The ion tail is produced by the solar wind which converts some of the comet's gases into electrically charged particles called ions.

Making a Comet

- Put on goggles.
- Add 50mL of water to a sandwich bag
- Add 2 tsp of non-organic material (sand/dirt) to the water.
- Stir well until the water and the sand is blended.
- Add 1 spoon of ground charcoal. Stir well.
- Add a squirt of ammonia.
- Continue to stir.

Making a comet contd

- Put on the working gloves.
- Add the powdered dry ice to the bag and place the bag on the plate. Agitate gently.
- Wait until the mixture is almost frozen (it will stop bubbling).



Making a comet contd

- Lift the bag up and shape it into a snow ball by holding the bag tightly. Add more water if needed.
- Unwrap the comet and put on the plate.

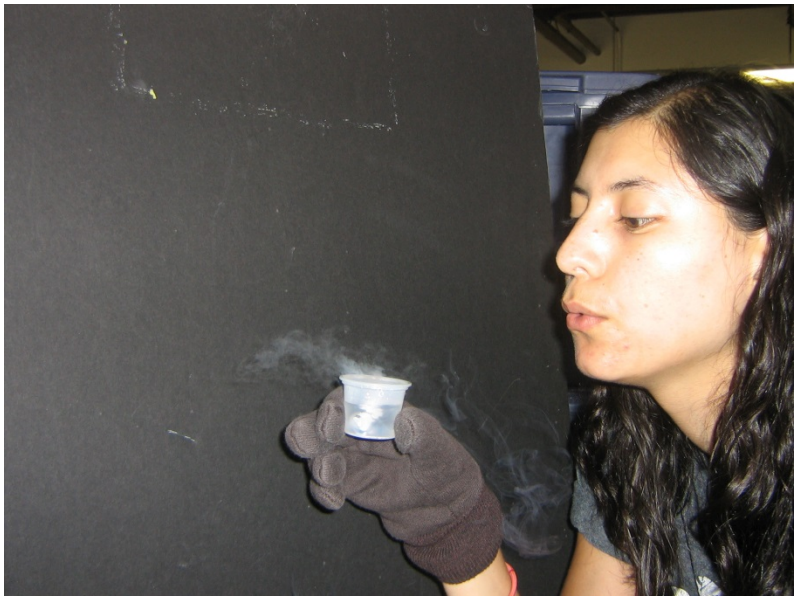
Final comet

Seeing the Tails

- Distribute 1 oz cup with a piece of dry ice to students.
- Add some water to the cup of dry ice so that a trail is developed.
- Tell one member of the group to hold the cup and move it in the air.
- Students should notice a trail behind the piece. This would represent the dust/gas cloud that is always behind the comet.

Seeing tails

- Tell another student in the group to represent the sun and to blow across the path of the dry ice pieces. Students should see another cloud in a different direction. This represents the ion cloud that can be seen when comets get near the sun.



Asteroids and Meteoroids

- Asteroids do not have much ice and do not have tails
- Meteoroids are similar to asteroids but much smaller. They are probably pieces of asteroids.
- Trace the orbit of the asteroid belt.
- Show the students the meteorite samples and tell them that it was found in Odessa, Texas.

Clean Up

- Collect all dirty comets and place in trash bag.
- Tie the bag and then poke a few holes in the top. This should prevent the bag from exploding!
- Please take it out of the VSVS kit when you get back to the lab and hand it to a VSVS lab assistant.
- Place all cups in another trash bag and return to the lab. They will be reused.