



DAWN ACTIVITY LEADER GUIDE

ACTIVE ACCRETION

Goal:

Play tag to model the accretion (clumping) of specks of matter in our early solar system into asteroids.

Estimated time:

15-30 minutes

Who to do it with:

Ages: 6-Adult

Numbers: 10 or more!

What you need:

Per participant

- 1 Dust Student Role Card

Per group

- Several Meteoroid and Asteroid Role Cards

Advanced preparation:

1. Print student role cards that appear at the end of this document. Print on cardstock if possible.
2. Read some of the background information from the teacher guide (found at: <http://dawn.jpl.nasa.gov/DawnClassrooms/>).

Getting started:

1. Go to <http://discovery.nasa.gov/musical/index.cfm> and play the *Planetary Posse* clip.
2. Ask participants how these diverse planets came to be.
3. Explain that scientists think that our solar system was a big cloud of gas and dust at the beginning its formation. Share other information from the introduction of the educator guide as appropriate.
4. Explain that next participants actively model the accretion (clumping) process that describes one theory of how asteroids (and protoplanets and dwarf planets) formed in the early solar system.
5. The game is similar to tag, tag played in orbit around the Sun.

Who's seen dust in your home?
Who's seen the dust clump into those dust bunnies that skitter under the bed or in the corner? Similar to what it was like in the early solar system, the dust particles "accrete" - or gather together.



DAWN ACTIVITY LEADER GUIDE

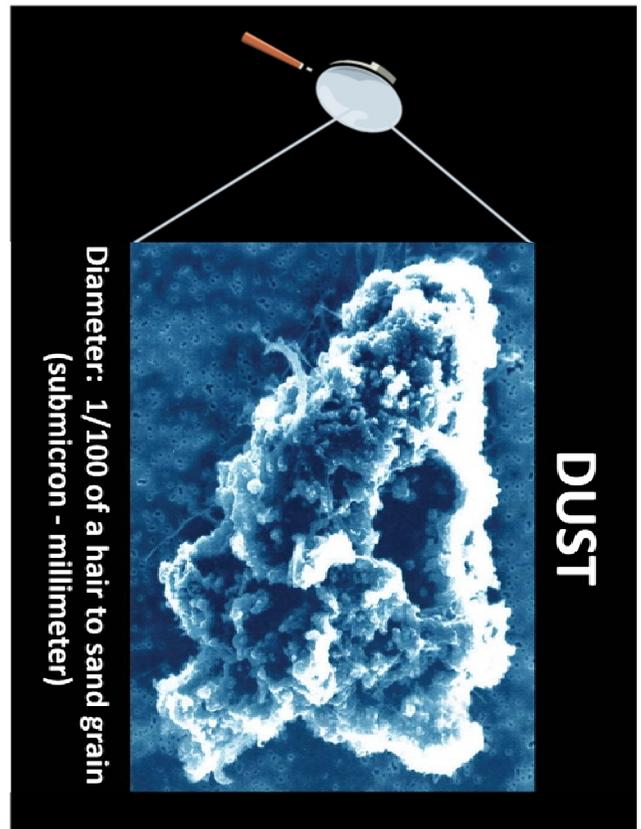
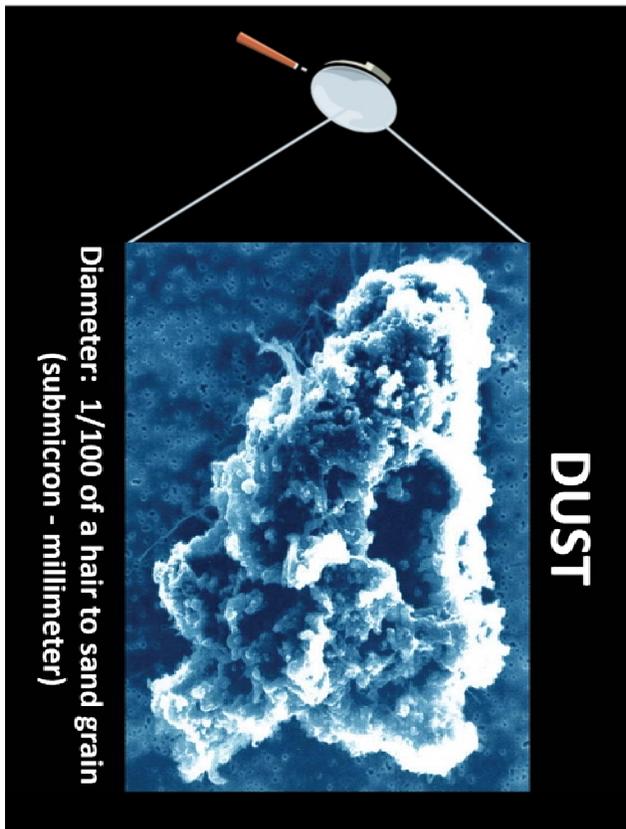
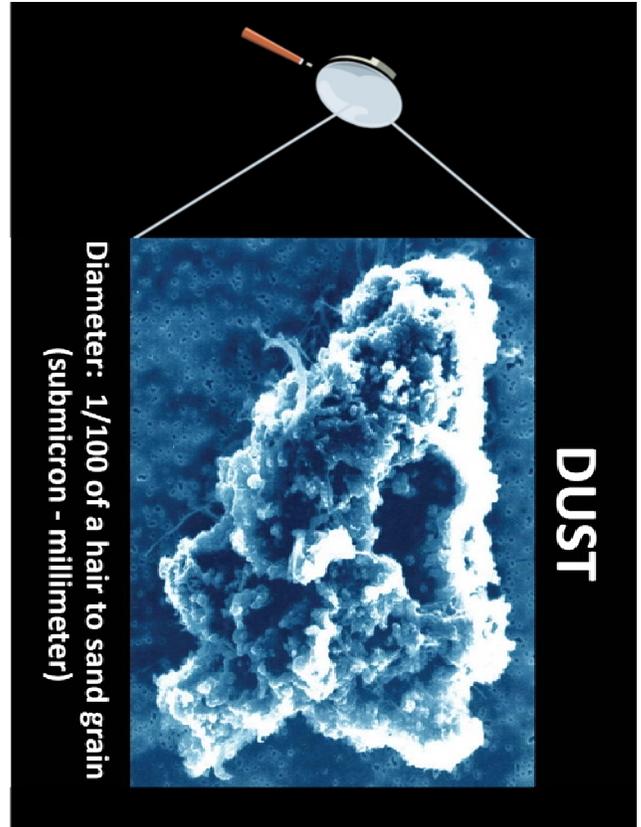
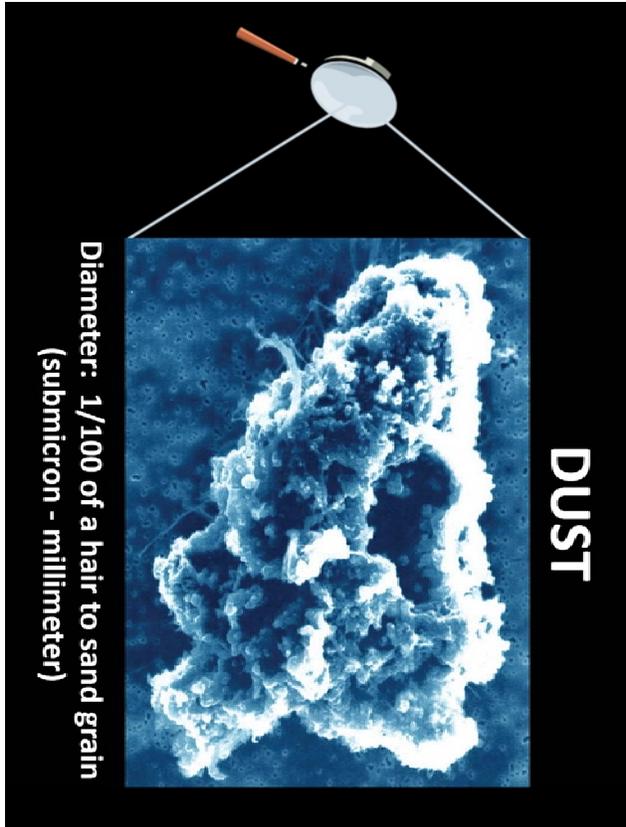
How to do it:

1. Distribute dust student role cards to each player.
2. Have one person be the Sun, located in the middle of a large playing area.
The other participants:
 - a. Take twenty paces from the Sun in all directions. This is your orbit - more or less the tag game takes place in this ring around the Sun.
 - b. Begin to orbit the Sun in a counter-clock-wise direction (like planets and asteroids!).
 - c. Keep your arms at your side unless you can tag someone.
 - d. When you tag a person they have to stay near, linking arms as you form larger and larger circular particle clumps.
3. After a few minutes stop the game and have the largest clumps trade in their dust student role cards for meteoroid role cards. Explain that meteoroids are spherical balls of minerals.
4. Continue the game as before.
5. After a few more minutes call time again. Give the largest group an asteroid card.
6. Explain that asteroids are as old as the solar system and that some are made up by meteoroids colliding and "sticking."
7. Repeat the game and see if the results change.
8. Ask participants:
 - a. What happened to the dust particles at the beginning of the game?
 - b. Compare the movement of dust particles, meteoroids, and asteroids in the game.
 - c. What did you notice about the dust particles at the end of the game?

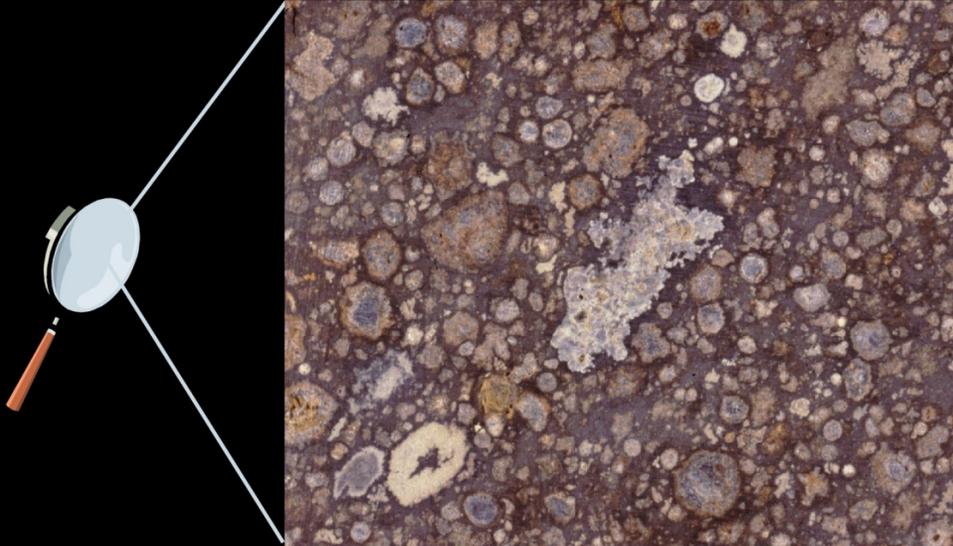
Why do it:

Asteroids and protoplanets, like Vesta, are thought to have formed from the process of accretion. Eventually, the bigger planets were made by asteroids and protoplanets colliding in the same way! Active Accretion is a great way to teach cool science concepts about our solar system's early formation, and the development of asteroids and planets, while burning off energy.

DAWN ACTIVITY LEADER GUIDE

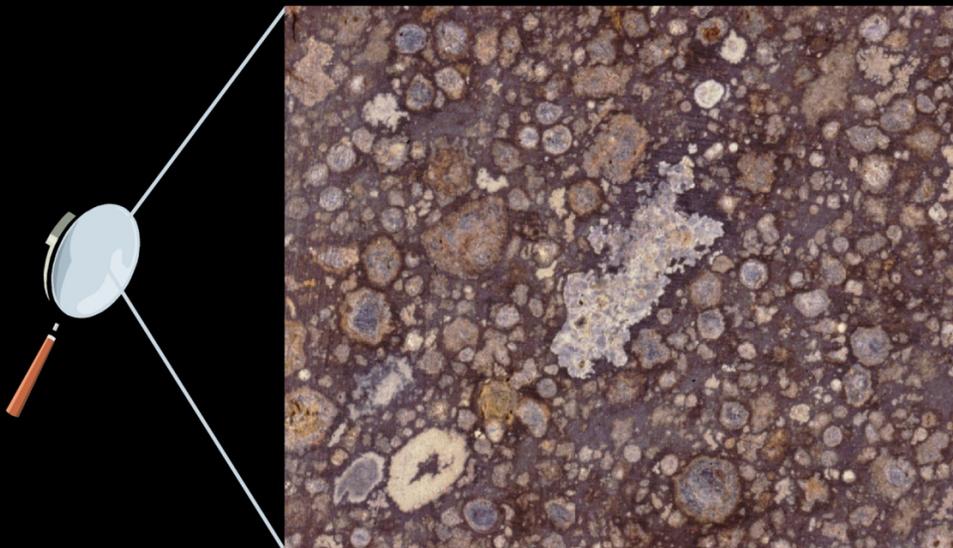


CHONDRULES



**Diameter: sand grain to pebble
(millimeter - several centimeters)**

CHONDRULES



**Diameter: sand grain to pebble
(millimeter - several centimeters)**

Meteoroid



**Diameter: pebble to boulder
(centimeter - tens of meters across)**

Meteoroid



**Diameter: pebble to boulder
(centimeter - tens of meters across)**

ASTEROID



**Diameter: boulder to the state of Arizona
(Asteroid Eros is 13 x 13 x 33 km)**