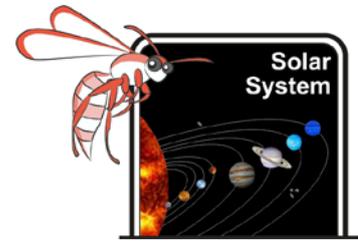


# Solar System Static – Teacher Notes



So far, our best explanation of the origin of the Universe is “The Big Bang Theory”. This suggests that a mighty explosion about 13 billion years ago sent hot dense particles streaming outwards from a central point of singularity. Some of this material came together to form giant stars that later exploded and again sent material flying out into space. One such explosion created a nebula (cloud) of stardust that travelled out to the western spiral arm of the Milky Way and came together to form our solar system. Our bodies, the food we eat, the air we breathe and the rocks we stand on are all made from that dust.

**Forces** cause other objects to move or change the direction of their movement. Two forces pulled the stardust together. Unlike a push or a pull, these forces do not have to touch the object but can act at a distance.

The first is a weak force called **static electricity**



When one piece of dust rubbed up against another, outer negatively charged electrons would be lost from one particle and passed onto the other. This would mean one piece of dust would have a different electrical charge than the other and they would be attracted together like little magnets. Static charge discharges immediately when the two objects touch. The plastic must be rubbed again for the attraction force to be recreated.

## Activity - Static Electricity – a weak force pulling objects together over a short distance

### Part 1 Comb & Paper

#### Materials per student or group

- A plastic comb (a plastic ruler works less well)
- Chads (paper circles) from a hole punch. These need to be separated into individual pieces (or very small pieces of torn paper). Static charge is weak so the paper pieces need to be small and light.
- An A4 sheet of paper
- A willing student with a good head of hair



**NOTE** *Static electricity does not flow like the current electricity we use in houses. It discharges instantly. The comb needs to be rubbed again if it is to be used again.*

#### Method

1. Separate paper chads and spread in a thin layer on the desk.
2. Comb hair vigorously for about 20 seconds.
3. Hold the comb just above the paper pieces. They should not touch.
4. Observe any changes.
5. Repeat but use the whole sheet of paper.
6. Observe any changes.

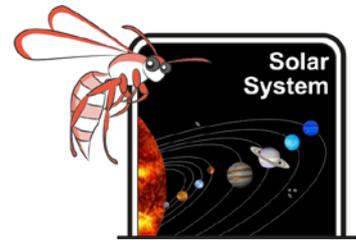
#### Prediction

What do you think will happen?

[Any reasonable answer.](#)



# Solar System Static – Teacher Notes



## Observations

The paper pieces “danced” and some rose to stick to the comb.  
The force of attraction was not sufficient to raise the sheet of paper.

## Conclusion

Did a force cause a change in the chads of paper?  
Yes. The paper danced and was attracted towards the comb  
Did the force act close up or at a distance?  
Close up  
Is static electricity a strong force or a weak force?  
A weak force

## Part 2 Balloon & Metal Can

### Materials

- An inflated balloon (a plastic ruler works less well)
- An empty aluminium can (other metals are too massive for this weak force)
- A willing student with a good head of hair



### Method

1. Lay the aluminium can on its side on the desk surface.
2. Rub the balloon on the student’s hair vigorously.
3. Place the balloon close to the can (about 2cm) and then move it slowly away.
4. Observe what happens to the balloon.
5. Move the can to 4cm from the balloon and repeat.
6. Observe what happens to the can.

### Prediction

What do you think will happen?  
Any reasonable answer.

### Observation

What happened when the balloon was slowly moved away from the can?  
The can started to roll following the retreating balloon when it was close but if the can was moved further away it did not move.

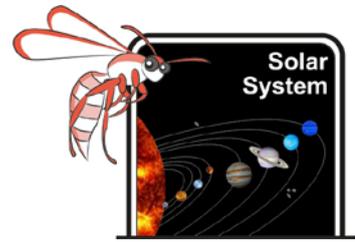
### Conclusion

Did a force cause a change in the can? Explain your answer  
Yes. The can was attracted to the balloon. It caused it to move.

What force caused the can to be attracted to the balloon and the paper to be attracted to the comb?  
Static electricity

Repeat these experiments and find out how close the two objects have to be for the force to work.  
What did you find out?  
The objects had to be very close together/less than 2cm.

## Solar System Static – Teacher Notes



### Discussion

Could static electricity bind together small objects of different kinds of material?

Yes.

Could static electricity bind together the planets and the Sun in our solar system? Explain your answer

No. The objects are too massive and too far apart. A stronger force is necessary

The first step towards building the solar system had been taken when static electricity bound together the fine dust of the proto-planetary disc and created more massive clumps.