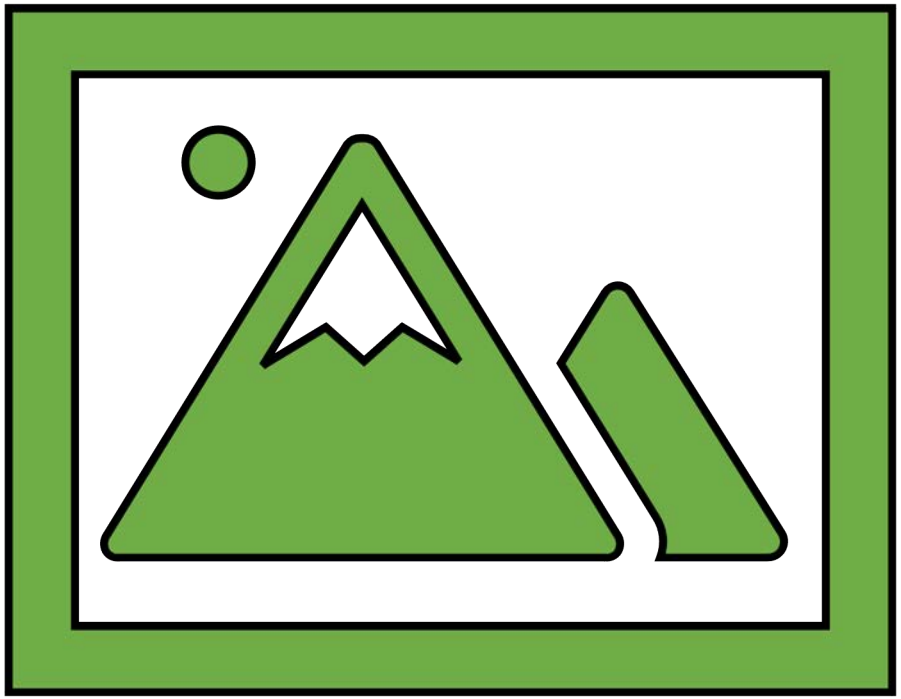
Displaying Artwork with Magnets



Session 1: Prep

Ferro-Magnetism

What are some objects attracted by magnets?

What are some ways magnets are used in museums?

How would the thickness of the object affect the amount of weight the magnet can hold?

How might you test this hypothesis?

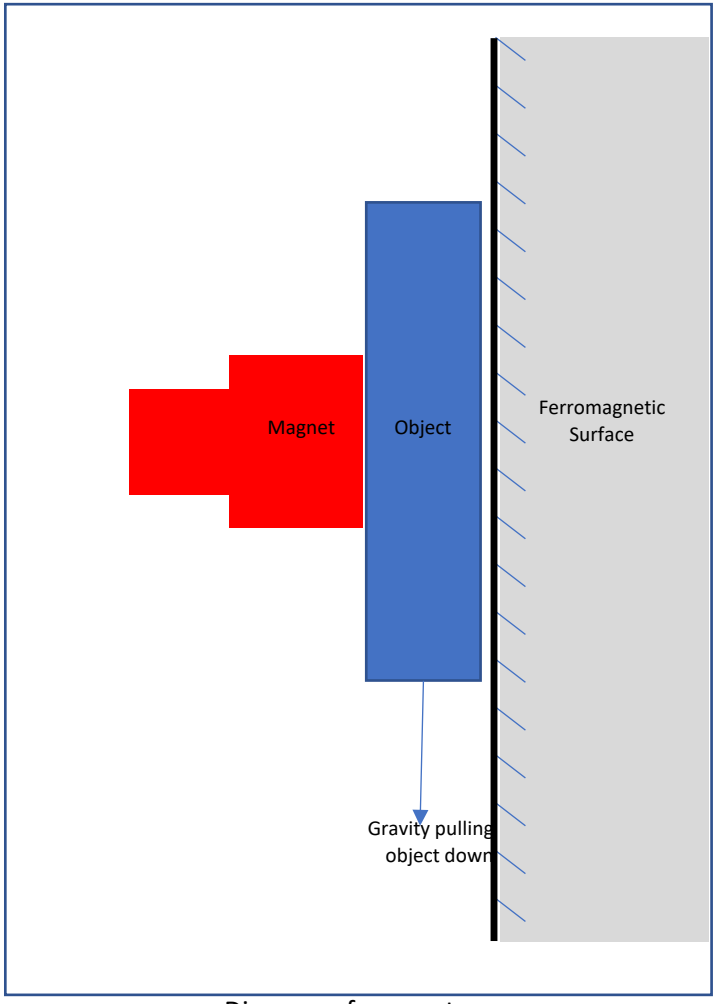
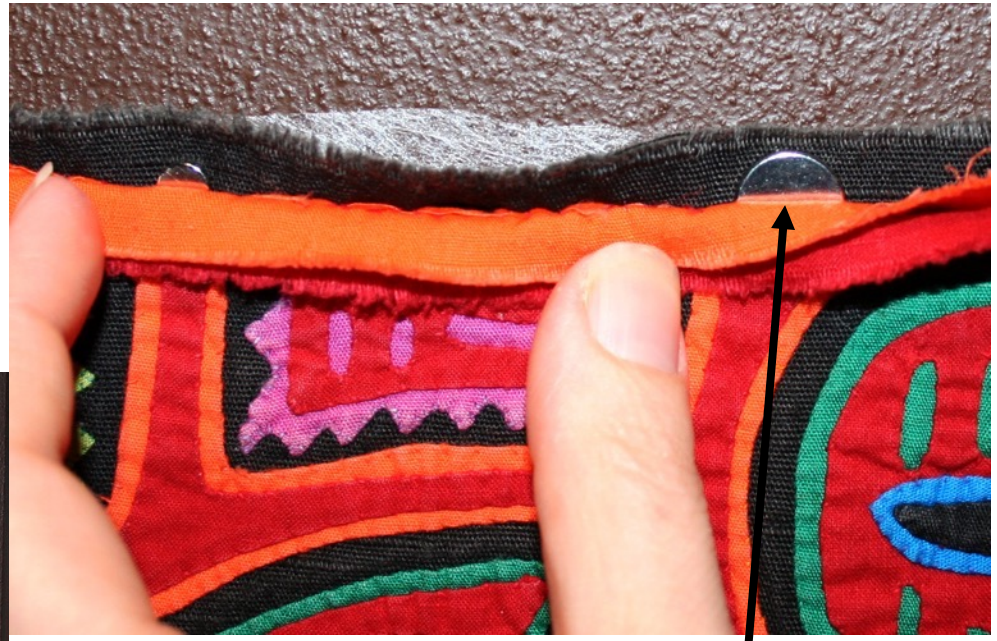


Diagram of our system



Rare earth magnet
used for mounting

Textile Mola
Panama, 20th century
Carlos Museum

Here is an example from the Carlos Museum of an object that was mounted for display using hidden magnets!

Flexible magnetic strip
used for mounting

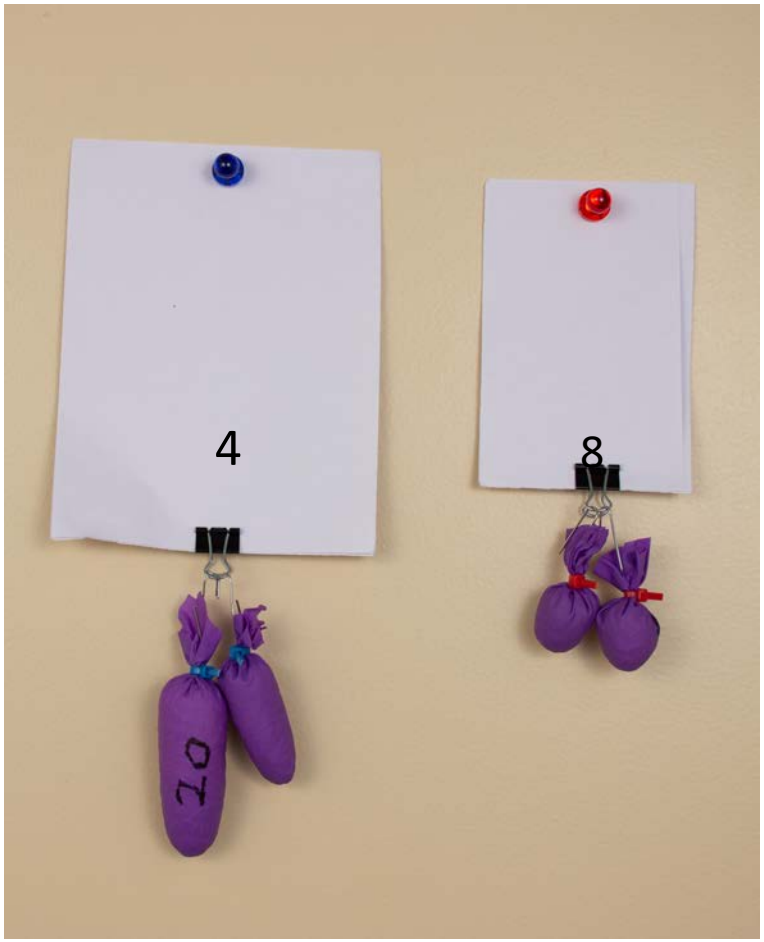
Paper Map
Italy, 16th century
Carlos Museum

This paper map is another example of an object that can be displayed using magnets.

Round rare earth magnet

Female Effigy Spout and and Bridge Vessel
Early Intermediate Period (1 – 400 AD)
South America, Central Andes, North Coast
Carlos Museum

Magnets can also be used to hold pieces of an object together during repair, as seen with the ceramic vessel here. Magnets were placed on the inside and outside of the object to hold the break in alignment. Would you use the same magnet used to display the paper map to hold ceramic pieces in place? Why or why not?



Let's design an experiment to test the strength of different magnetic systems.

What variables are we testing?

What variables are we keeping constant?

Changing the thickness between magnet and surface. Keeping the type of magnet and magnetic surface (this can be a changing variable too or the teacher can choose to have students use the same surface) constant as well as the weight of the object. Weight attached to the packets just measures the strength of the system. Image shows two different paper packets being tested on the same metal door with the same type of magnet.

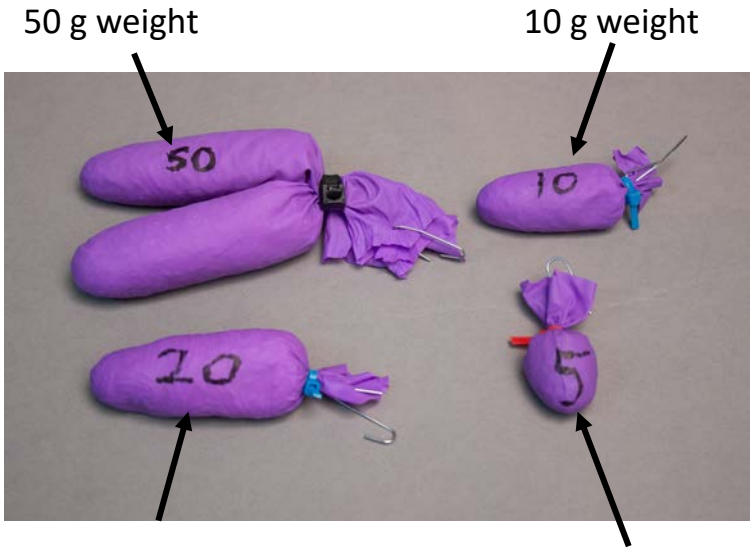
Preparation:

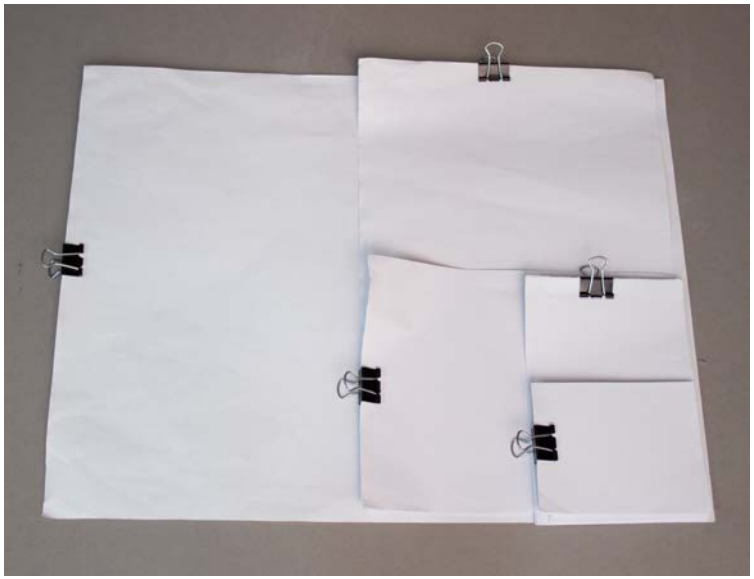
In your groups, create the weight bags we will use in our experiment.

We will need:

- Five 5 g bags
- Five 10 g bags
- Four 20 g bags
- One 50 g bag
- Five paper “packets” (see teacher instructions)

Weigh each packet as you go and measure the thickness. Record these values in your worksheet.





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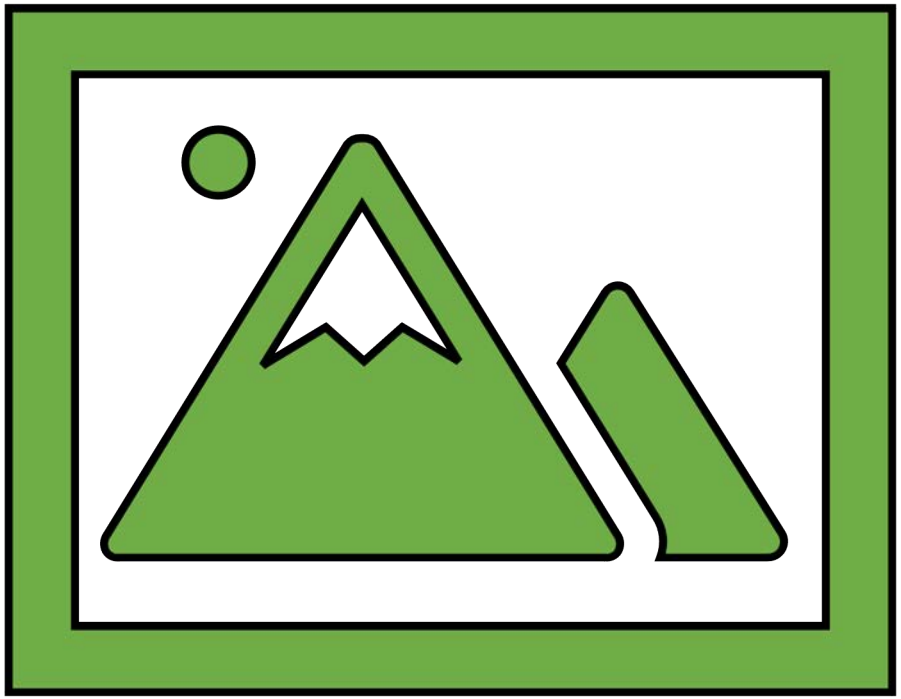


Session 2: Experiment

Ferro-Magnetism

What are some objects attracted by magnets?

What are some ways magnets are commonly used?

How would you expect the size of the magnet to affect the amount of weight it can hold?

How might you test this hypothesis?

How would the thickness of the object affect the amount of weight the magnet can hold?

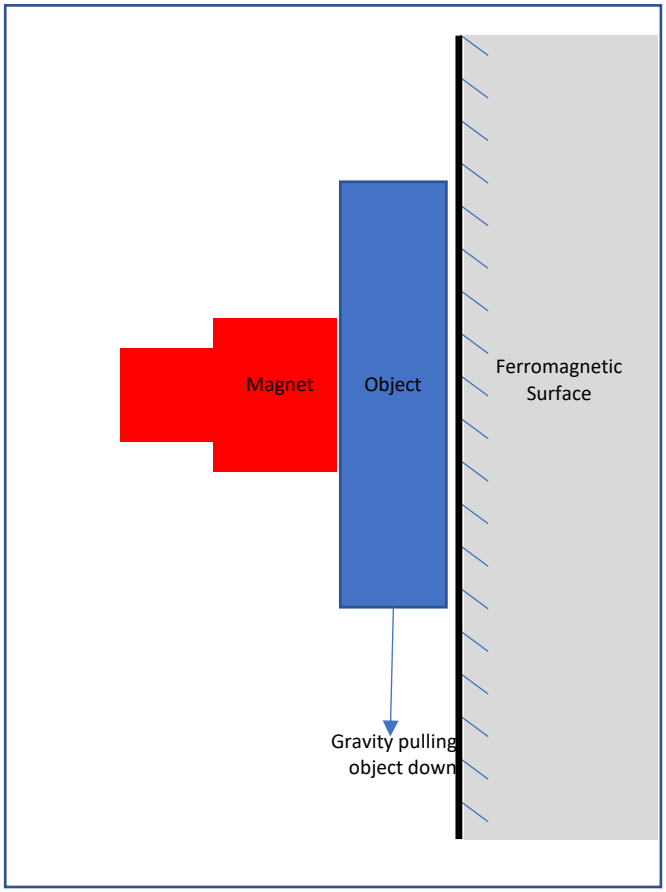
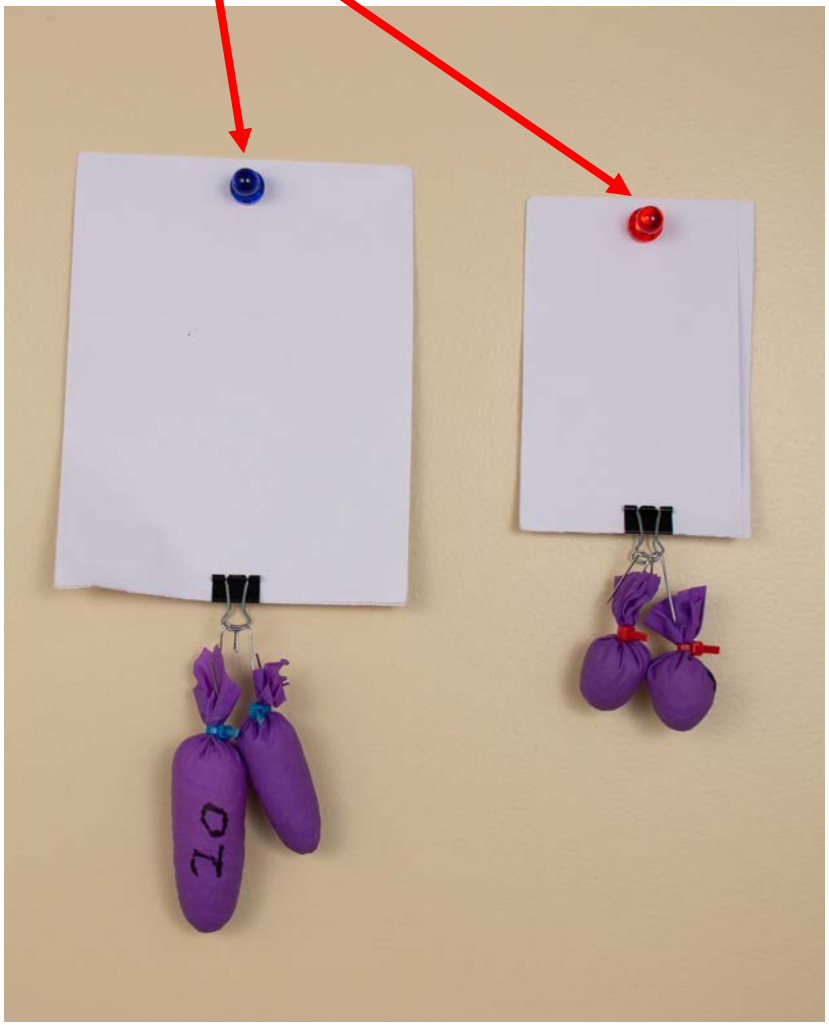


Diagram of our system

Experiment



Hold each paper packet against your ferromagnetic surface using one rare earth magnet.

Place a binder clip at the bottom.

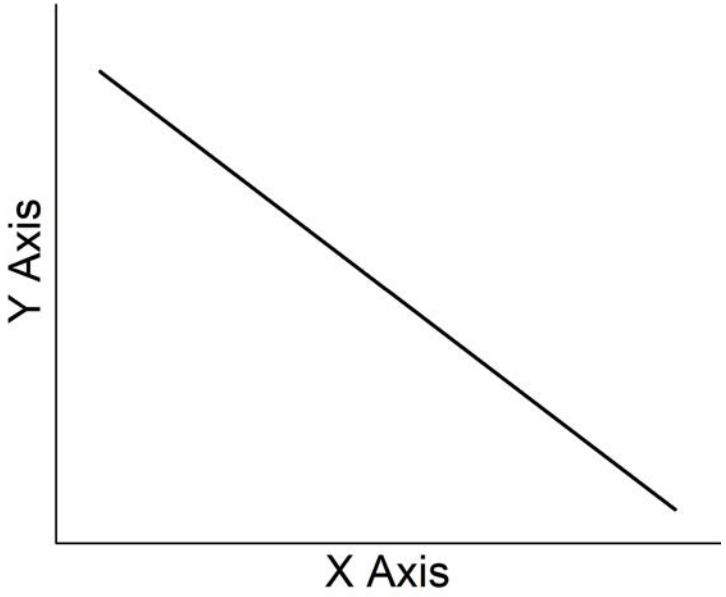
Add weights one at a time until the system fails and the paper packet falls.

Record the number of sheets in the packet and weight needed for the system to fail on your worksheet.

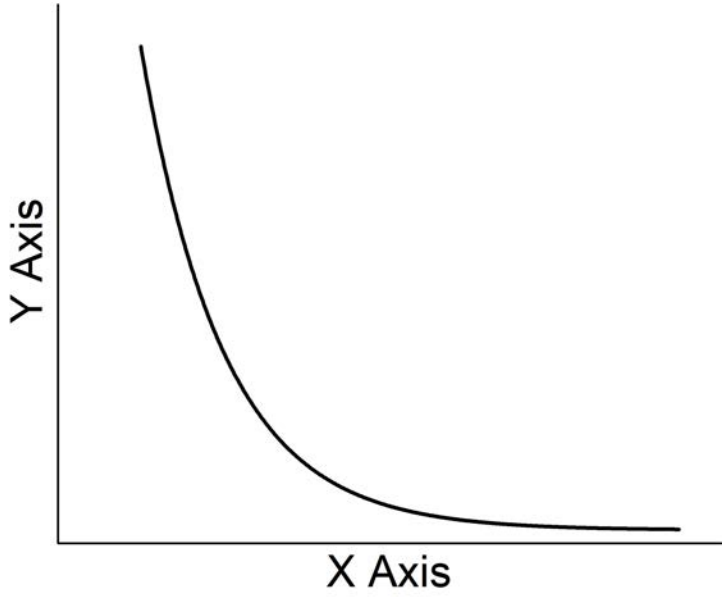
Repeat for each packet and then follow the instructions on your worksheet to make a line graph!

Tip: Start with smaller weights, these can be swapped out for heavier weights as you go!

How does your graph look?



Linear decrease



Exponential decrease

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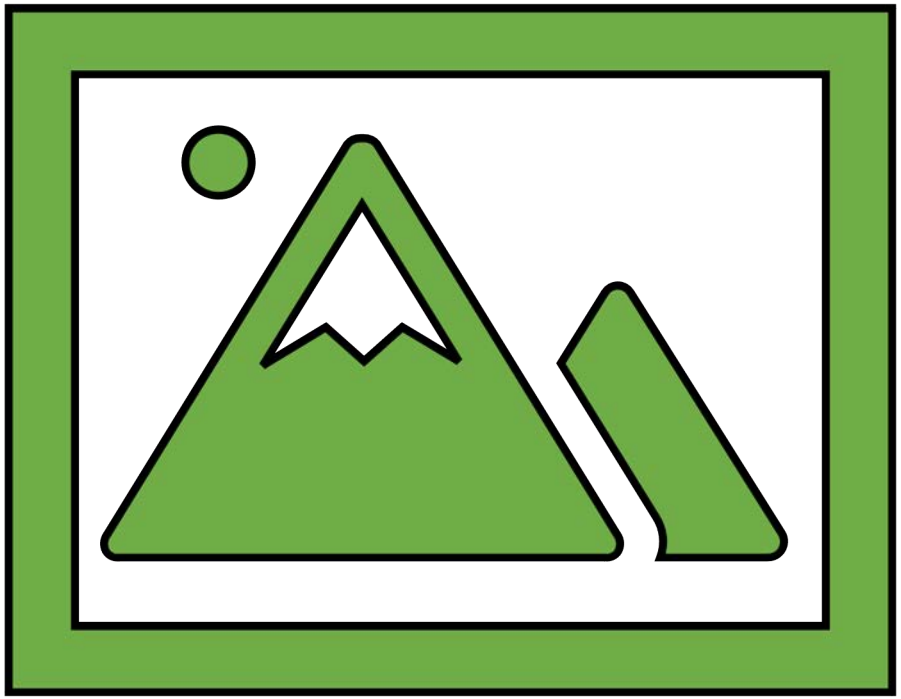


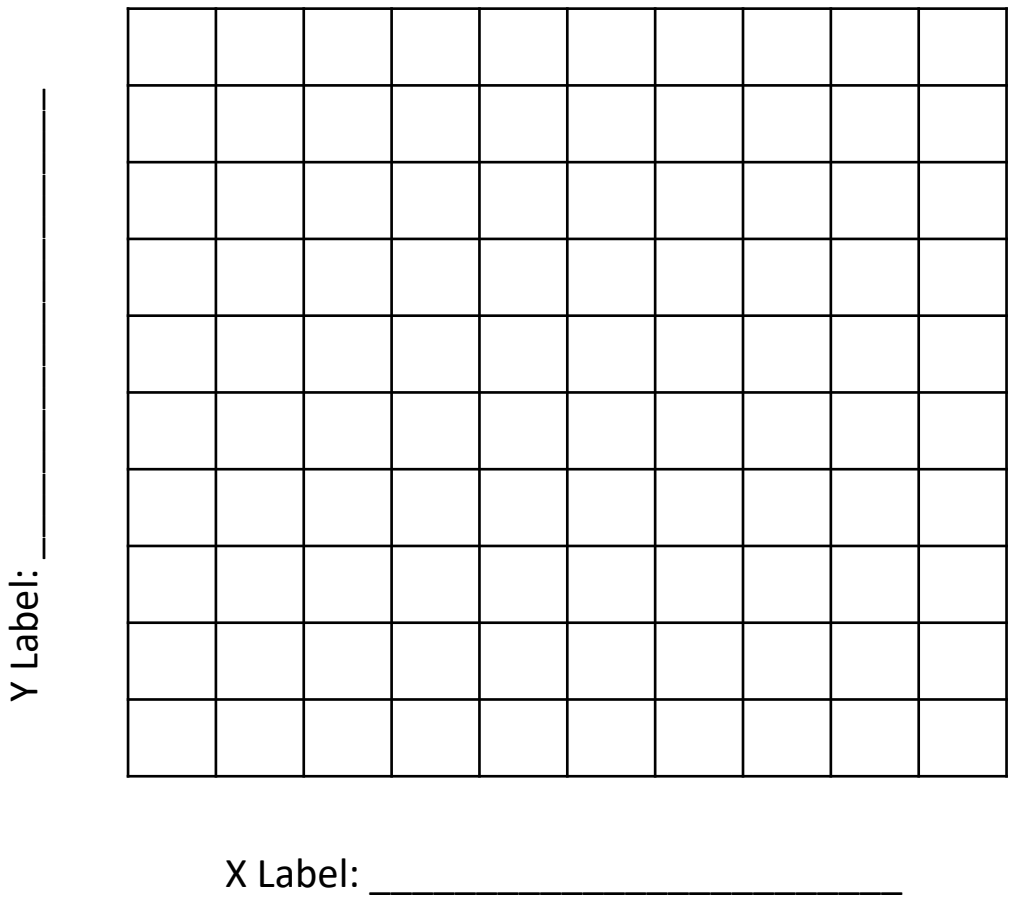
Session 3: Compare

Compare

What ferromagnetic surfaces did you use?

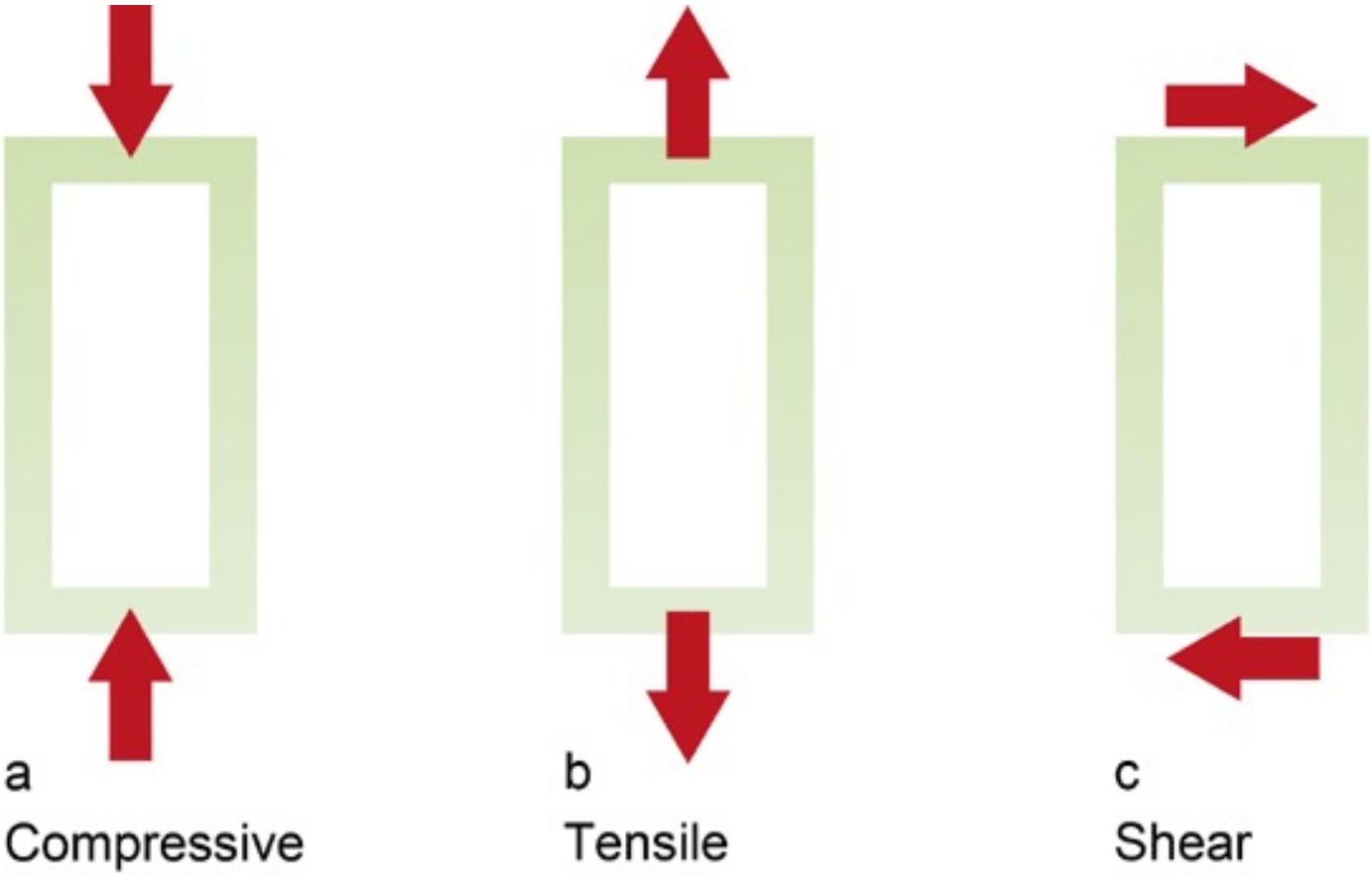
Which magnetic system (surface + magnet) was the strongest?

Did the same magnetic systems show similar results? Why or why not?



Let's graph our class data together. Choose one volunteer from your group to come to the board and graph your group's data. Have students use different colored markers or a different symbol to represent their ferromagnetic surface.

Mechanical Strength



Type of strengths (tensile, shear, compressive etc.) Important for conservation research, finding the right adhesives for treatment. Which mechanical strength looks most similar to our experiment set up? (Tricky, compressive strength of magnetic system)

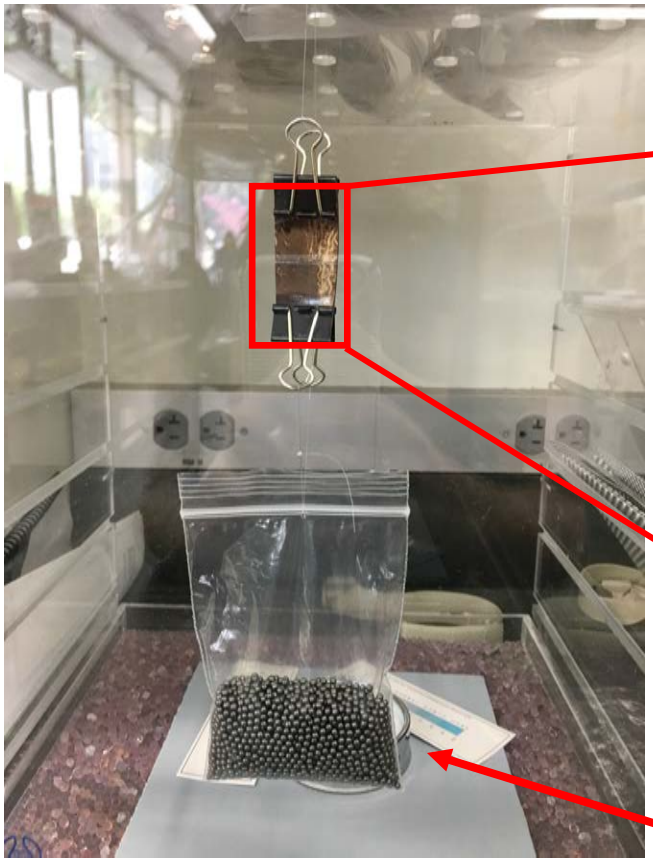
Conservation Research

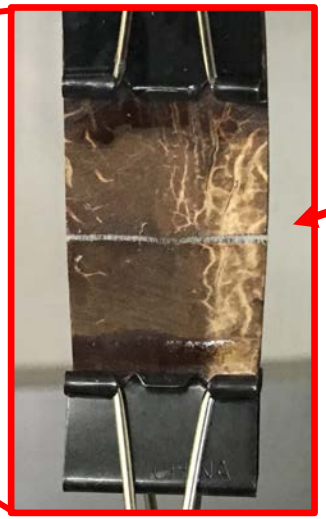
Mechanical testing is used regularly in art conservation research to evaluate:

1) adhesives for repair
2) magnetic systems for mounting
3) fillers for cracks and losses

Testing adhesive strength for conservation treatment

Testing the strength of adhesives used to bond together coconut shell.





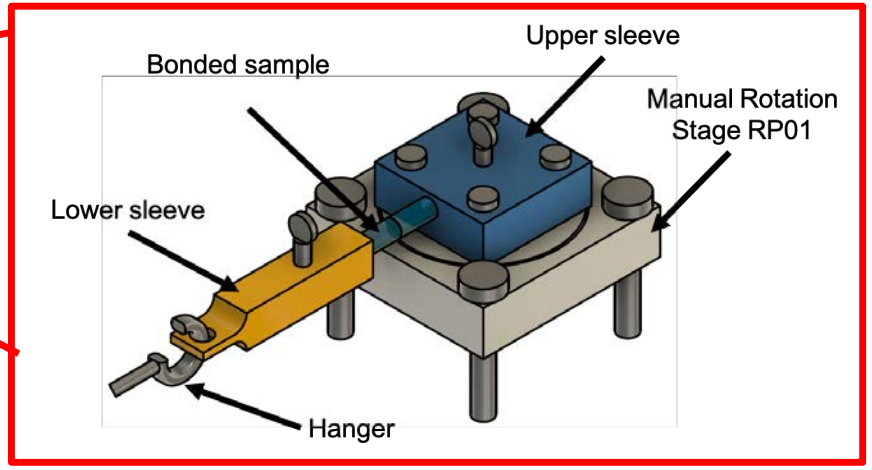
Tested bond

Applied weight

Images courtesy of Elena Bowen.

Examples of research done for conservation purposes; Masters thesis testing adhesives with coconut shell testing the tensile strength of adhesive. This helps conservators to choose appropriate adhesives for different materials. In this case, it was finding the best adhesive for coconut shell.

Testing adhesive strength, Materials Science



Tested bond

Applied weight

Emory student Olivia Boyd (’20) pictured with her CATS test machine, which was used to test the strength of acrylic adhesive used to bond together glass rods.

Materials scientists can design machines to test adhesive and material strength for conservation and industry use. Here is an example of of an Emory student’s honor’s thesis research. She designed a conservation adhesive tensile to shear tester to test the strength of different mixtures of adhesive with added fumed silica powder. Glued samples are hung in the machine and have weight attached to the bottom under the join breaks. The top piece spins so shear and tensile strength can be tested.

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