University of Oviedo
MEILIC Natural Science
PROGRAMME
2025 - 2026

Universidad de Oviedo
Departamento de Ciencias de la Educación
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UNIT 3

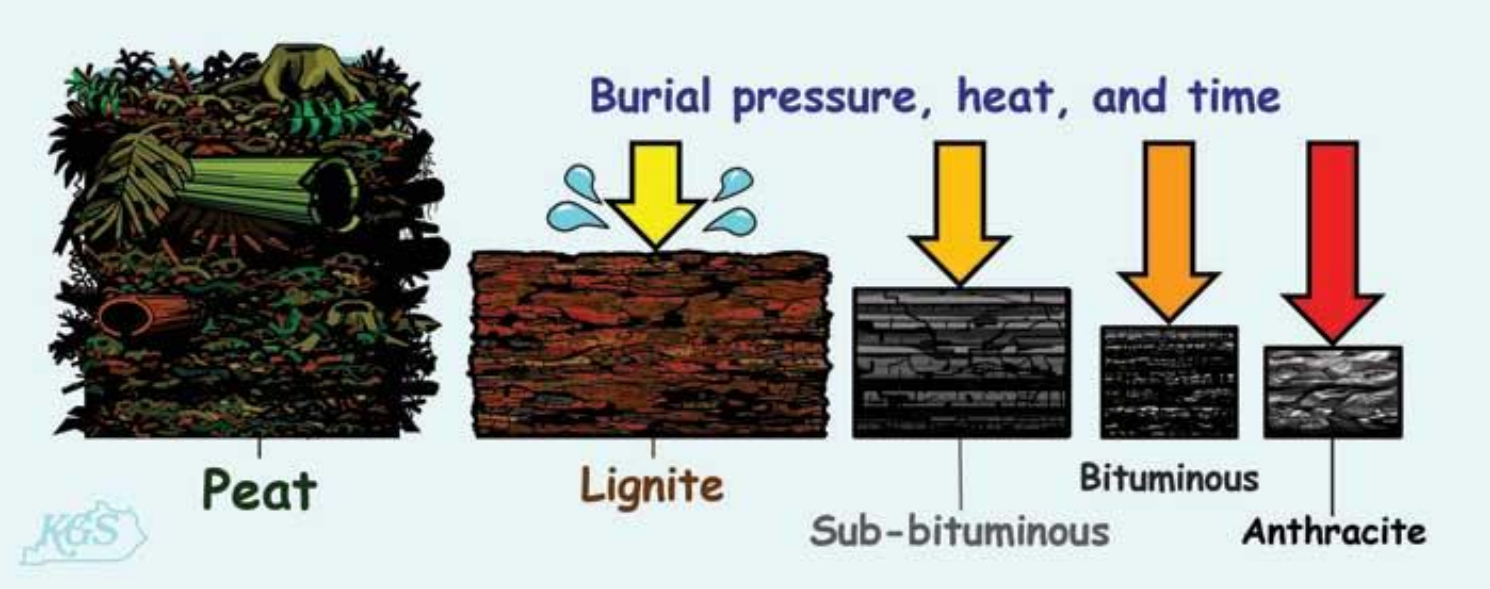
- Homework – A collection

- Show & Tell
- The Big Ideas in Science
- The teacher's role, teaching theories
- Activities and more activities – Let's Try!
- A topic carousel - Sound

- Reading, homework

UNIT 2 HOMEWORK – A Collection

Coal Classification



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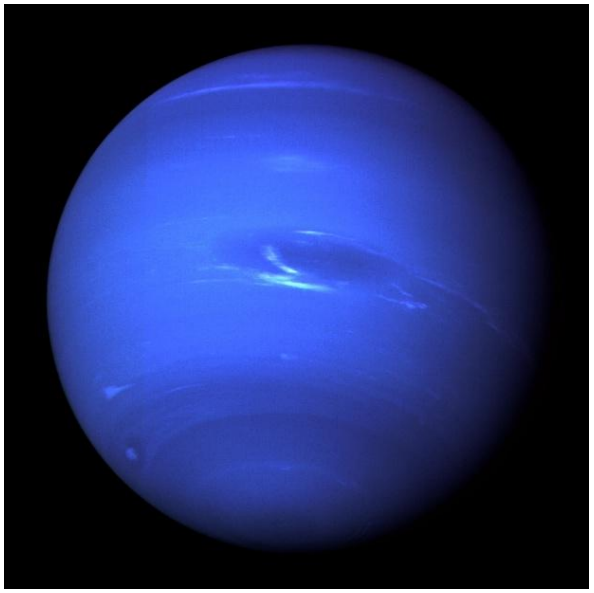

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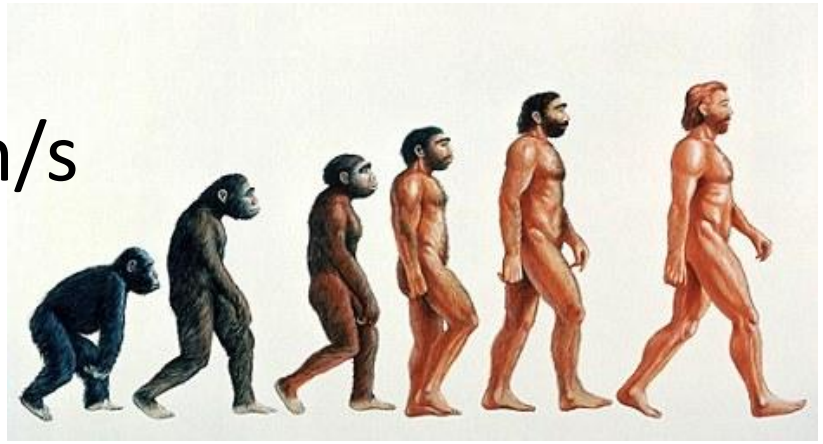


What is Science?

- Observation (casual → ordered)
- Organized play / learning
- Repeatable

My definition – looking under a rock

TEACHER

Knowledge and Enthusiasm
(and safety)

SCIENCE TEACHER

Inquisitive
ASK WHY?

ACTIVITY-BASED

The Science Curriculum - UK

Year 1	Plants	Animals Inc. humans	Everyday Materials	Seasonal Changes	
Year 2	Plants	Animals Inc. humans	Everyday Materials	Working Scientifically	
Year 3	Plants	Animals Inc. humans	Rocks	Light	Forces & Magnets
Year 4	Living things & habitats	Animals Inc. humans	States of Matter	Sound	Electricity
Year 5	Living things & habitats	Animals Inc. humans	Properties/ changes of Materials	Earth and Space	Forces
Year 6	Living things & habitats	Animals Inc. humans	Evolution and inheritance	Light	Electricity

The Science Curriculum - Spain

Block 1	Introduction to scientific activity: procedures, attitudes, and common values.
Block 2	Human health, the body, developing healthy habits.
Block 3	Living things, animals, plants, their relationships and classification, the influence of humans on nature, developing habits of respect and care for living things.
Block 4	Matter and energy, materials, light, sound, energy sources, physical phenomena, and chemical changes.
Block 5	Technology, machines, discoveries, inventions and their impact on social development, information and communication technology.

SHOW AND TELL

Bring an OBJECT from home to the class and explain its function and importance.
DISCUSS its place, history, age, uses, significance to your society, your family, and you.

List 6 bullet-point facts/comments

SHOW AND TELL

The Rosetta Stone

a granite rock stele fragment

found in the Nile delta by Napoleon's troops in 1799

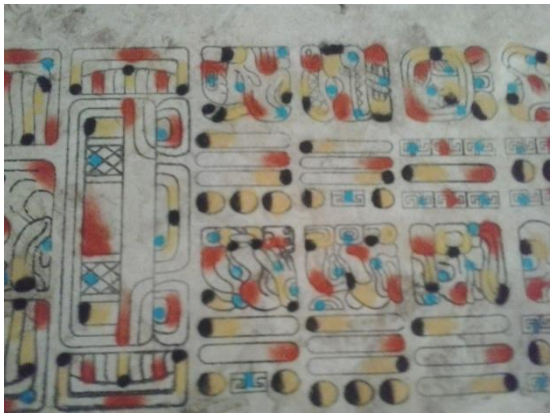
depicts a royal decree from 196 BC (in the time of King Ptolemy V)

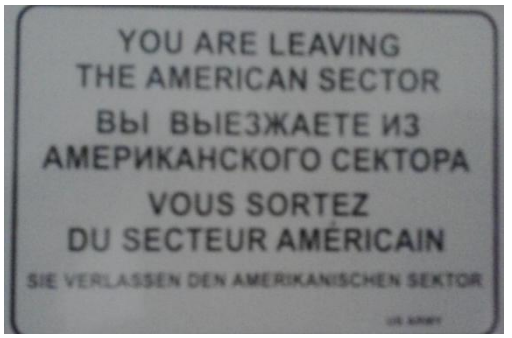
was the key to deciphering Egyptian hieroglyphs

hieroglyphic, Demotic script (Egyptian), Ancient Greek

now resides in the British Museum in London

Show and Tell





SHOW AND TELL

"Objects are of central importance in teaching and may be used for a variety of teaching purposes. In history they are useful for teaching some of the skills and processes of historical enquiry. Because of their appeal to the senses, they are particularly suitable for children in the early years."

– **Rosie Turner-Bisset,** ***Creative Teaching: History in the Primary Classroom***

"Why teach with objects? As an addition to other forms of classroom materials, teaching with objects offers a **direct, tactile** experience for students. … In addition, some children respond more readily to objects than they do to other, more abstract teaching materials."

– **Ellen Sieber,** ***Teaching with Objects and Photographs: Supporting and Enhancing Your Curriculum***

OBJECTS

Objects are of crucial importance in teaching.

"In history they are useful for teaching some of the skills and processes of historical enquiry, especially for children because of their appeal to all senses (hearing, taste, touch, sight and smell)."

Turner-Bisset, R., *Creative teaching: History in the primary classroom*, 2005.

OBJECTS

The use of objects develops **SKILLS:**

- Locating, recognizing, identifying, planning.
- Handling, preserving, storing.
- Observing and examining.
- Discussing, suggesting, hypothesizing, synthesizing, predicting, generalizing.
- Experimenting, deducing, estimating, comparing, concluding, evaluating.
- Relating structure to function, classifying, cataloguing.
- Recording through writing, drawing, labelling, photographing, filming, computing.
- Responding, reporting, explaining, displaying, **presenting, summarizing, criticizing**.

OBJECTS

The use of objects extends **KNOWLEDGE:**

- Different materials and their uses.
- Techniques and vocabulary of construction and decoration.
- The **social, historic, and economic** context within which the items featured.
- The physical effects of time.
- The meaning of symbolic forms.
- The way people view/viewed the world.
- The existence and nature of particular museums, galleries, sites, and collections.
- Symbol, pattern, colour.
- Appropriateness: i.e., the use of a rucksack compared to a handbag.
- **Appreciation of cultural values**.

OBJECTS

The use of objects develops **CONCEPTS:**

- Chronology, change, continuity, and progress.
- Design as a function of use, availability of materials and appearance.
- Aesthetic quality.
- Typicality, bias, survival.
- Fashion, style, and taste.
- **Original, fake, copy**.
- Heritage, collection, preservation, conservation.

OBJECTS

Activities:

-Drawing and labelling (slow down the pace of looking).

-Comparing old and new: looking for (5) similarities and (5) differences (continuity and change).

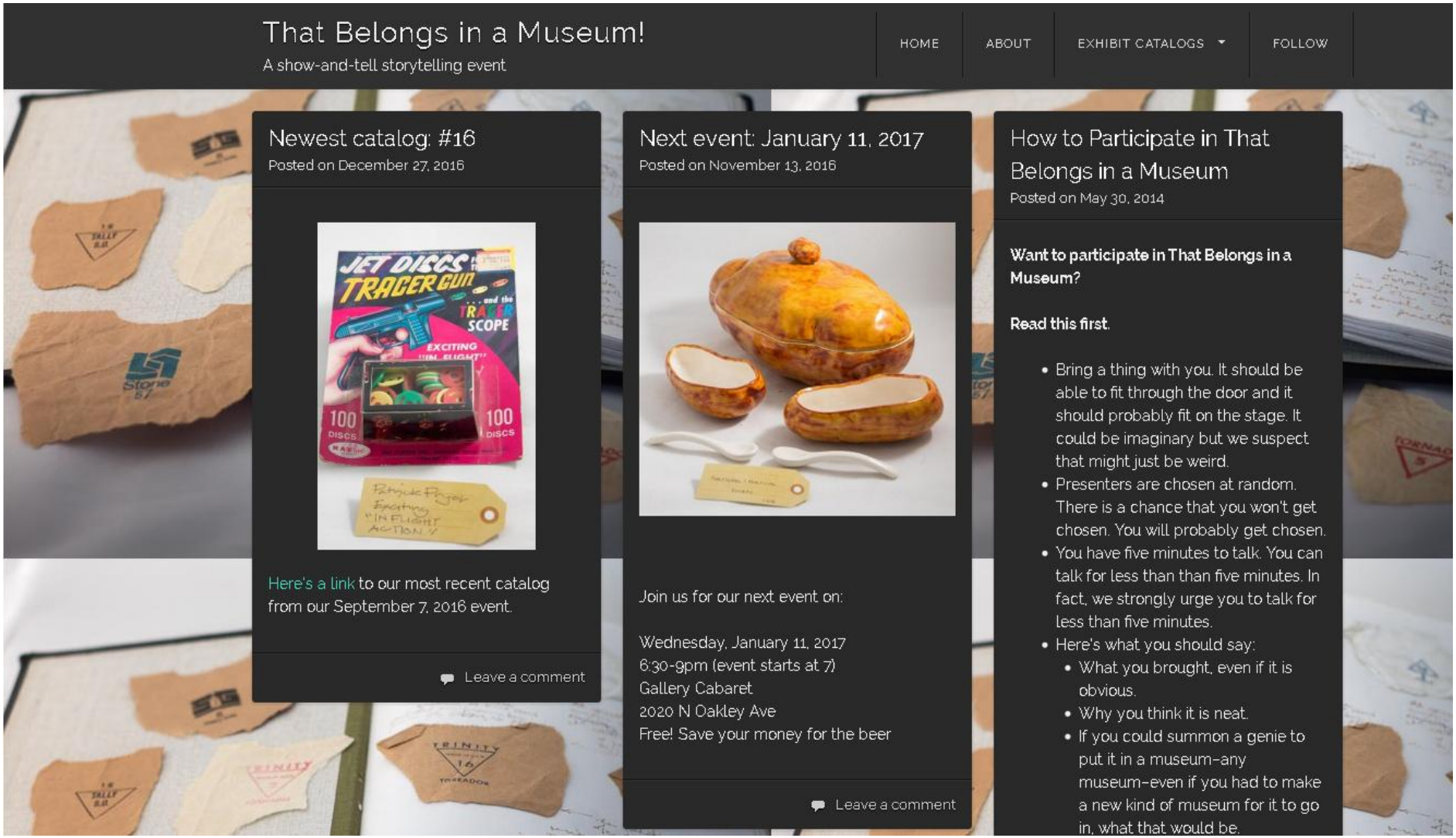
-Sequencing objects: sequence objects from the oldest to the most recent.

-The feely bag. Keep the object in a cloth bag and let students touch it without looking and try to describe it and guess what it is.

-Storytelling

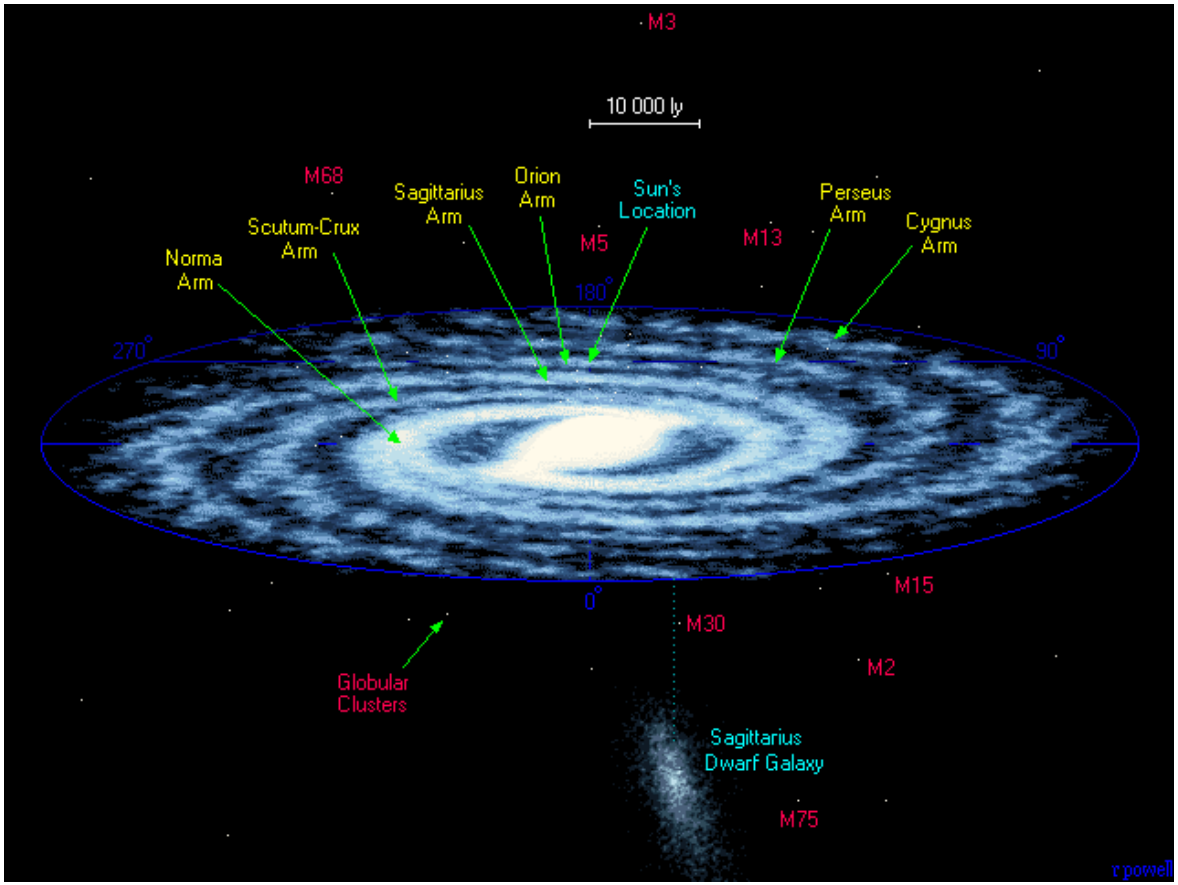
CREATE A CLASSROOM MUSEUM

What is the criteria for a museum piece?



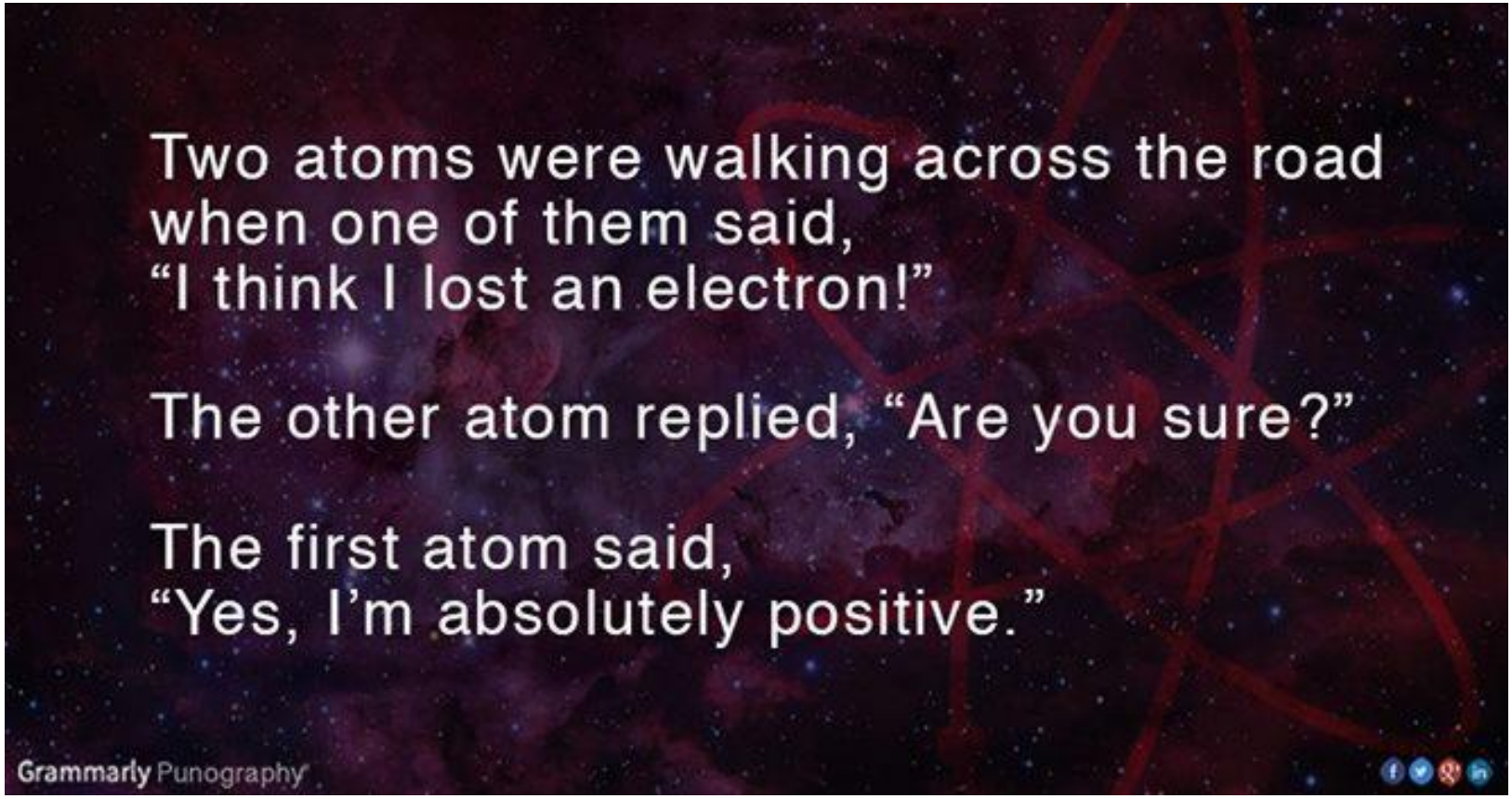
The Big Ideas in Science

- Our solar system is one small part of a vast universe composed of billions of other galaxies.



The Big Ideas in Science

- All matter is made of very small particles.



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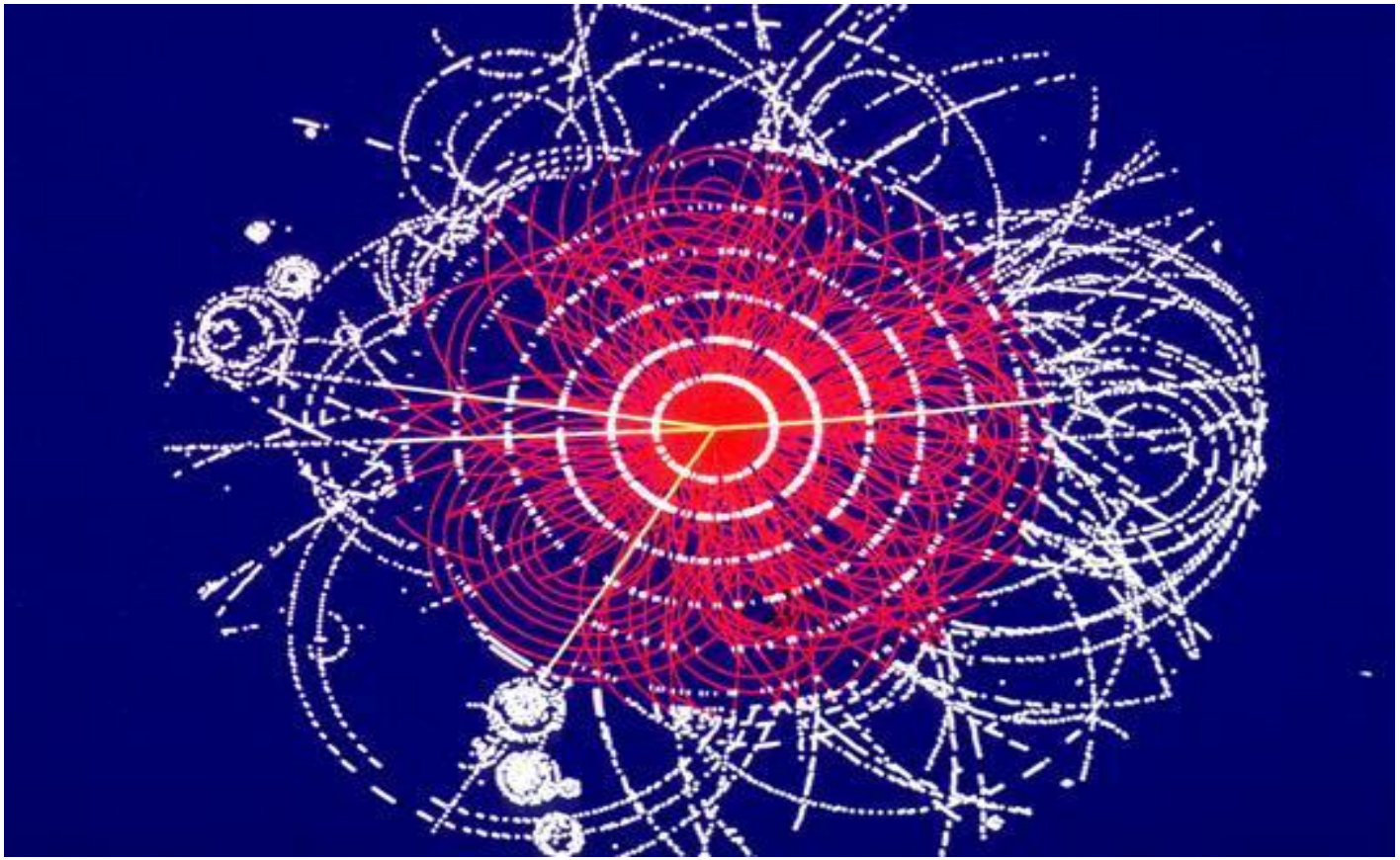
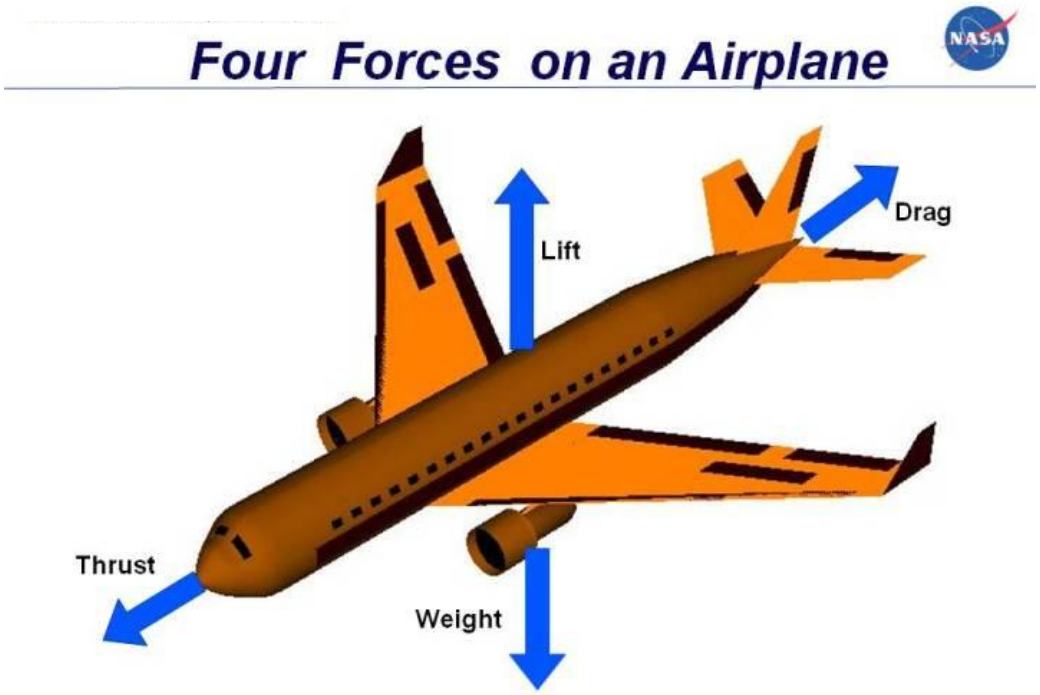


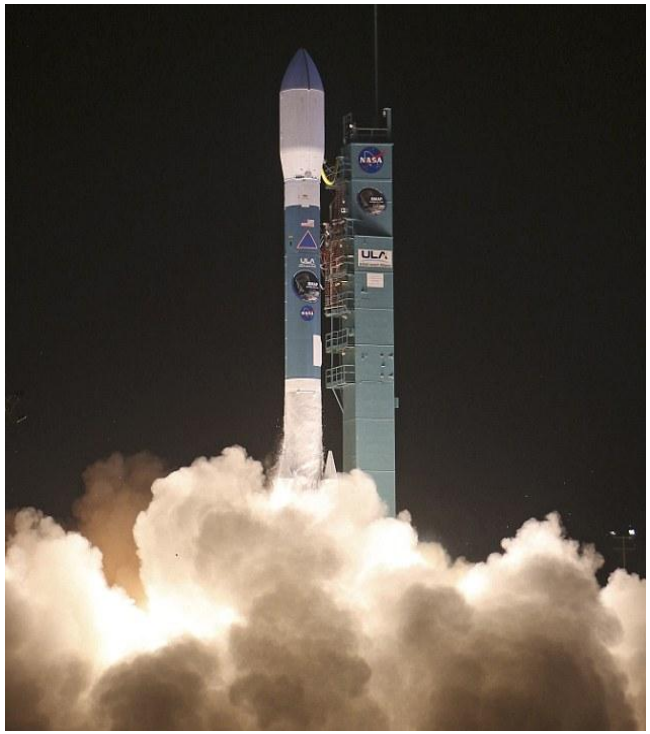
The Big Ideas in Science

- Objects affect other objects at a distance ($1/r^2$).

The Big Ideas in Science

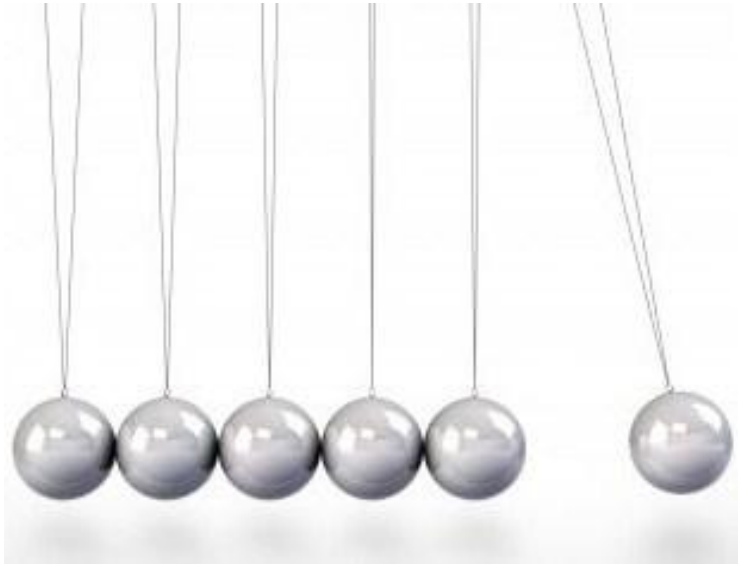
- Objects move when acted on by an unbalanced force.





The Big Ideas in Science

- Energy can not be created or destroyed; it can only be changed from one form to another.



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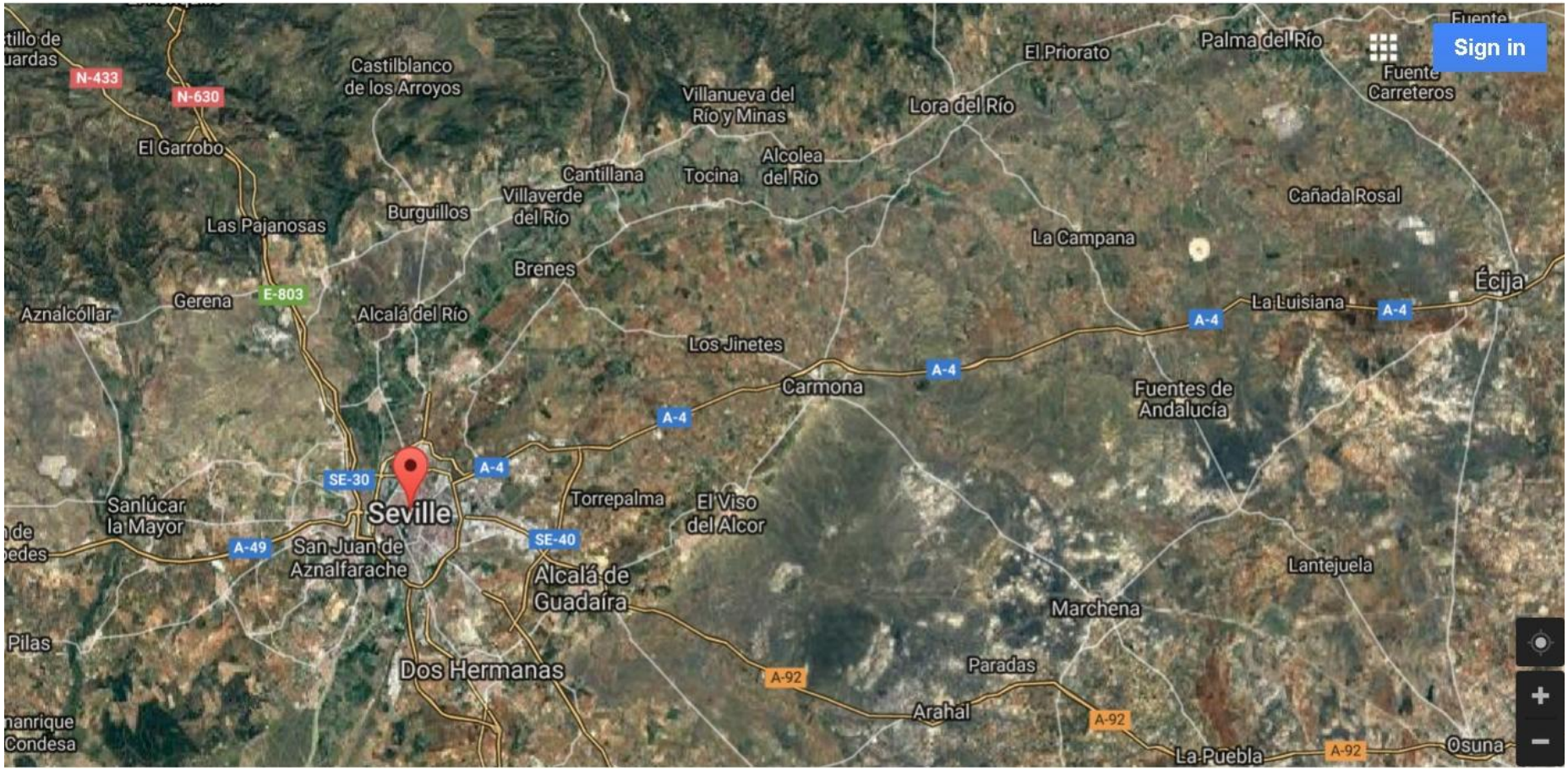
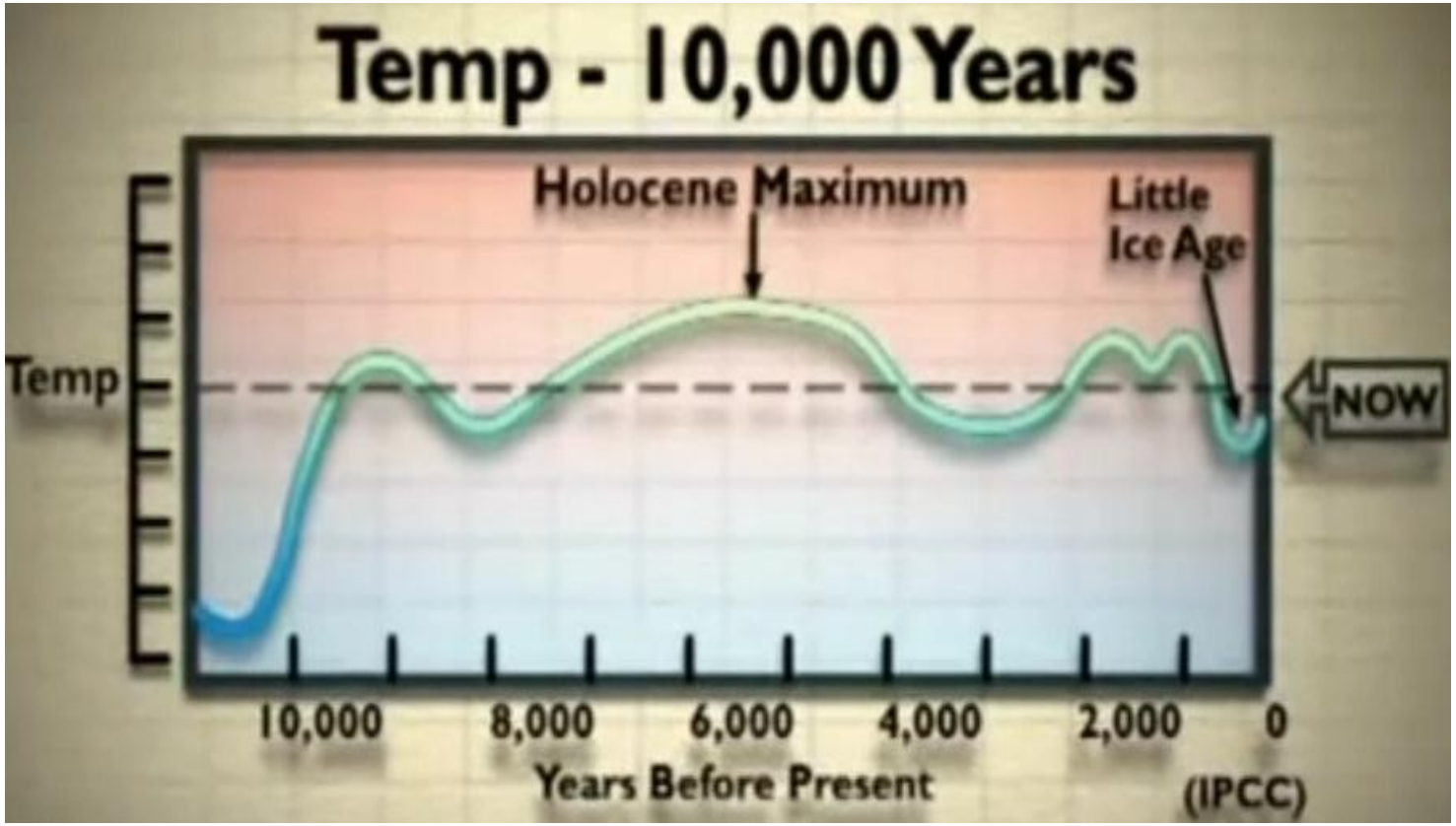


Google Maps (Satellite): Andalusia, Spain

The Big Ideas in Science

- Global warming and climate change?



The Big Ideas in Science

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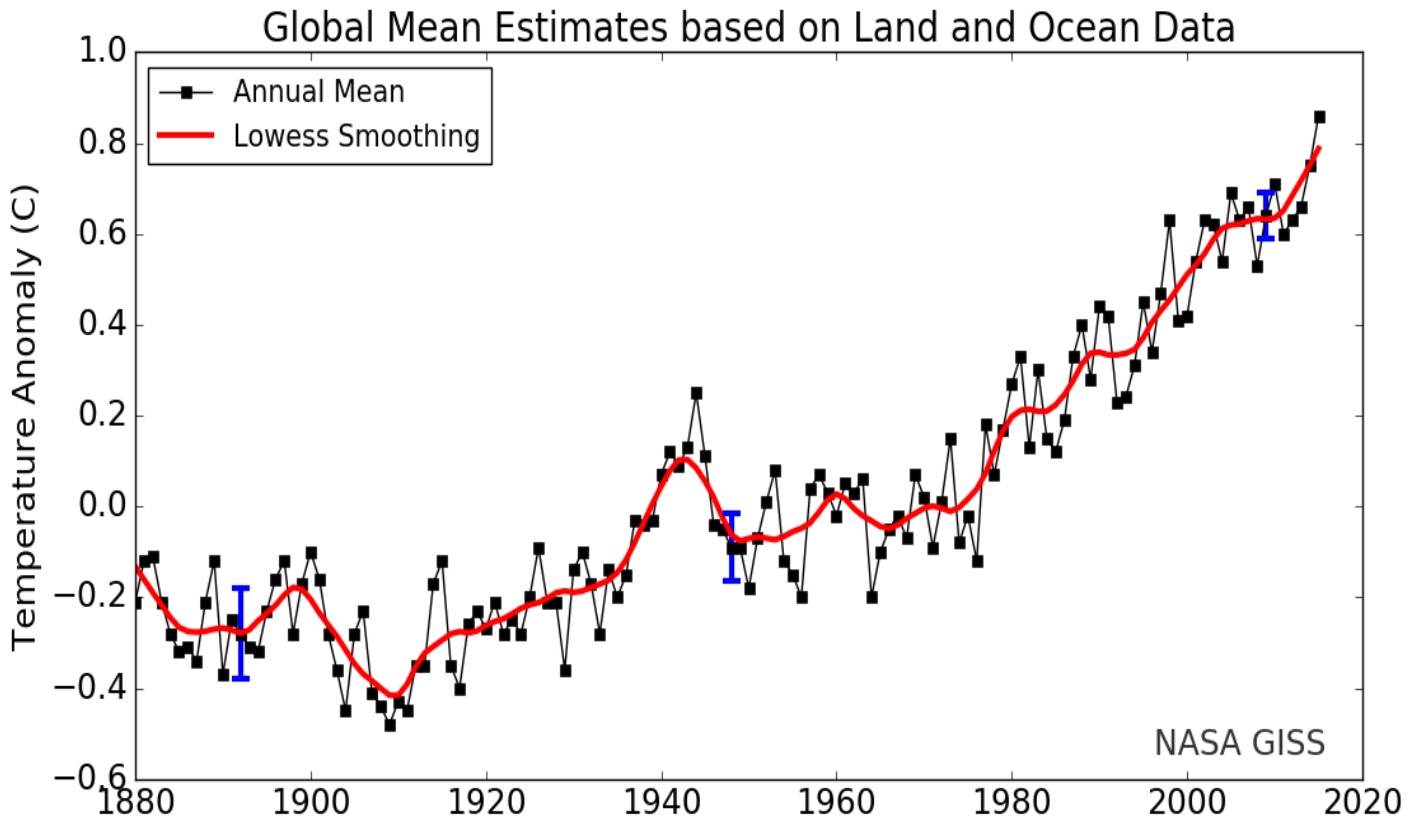
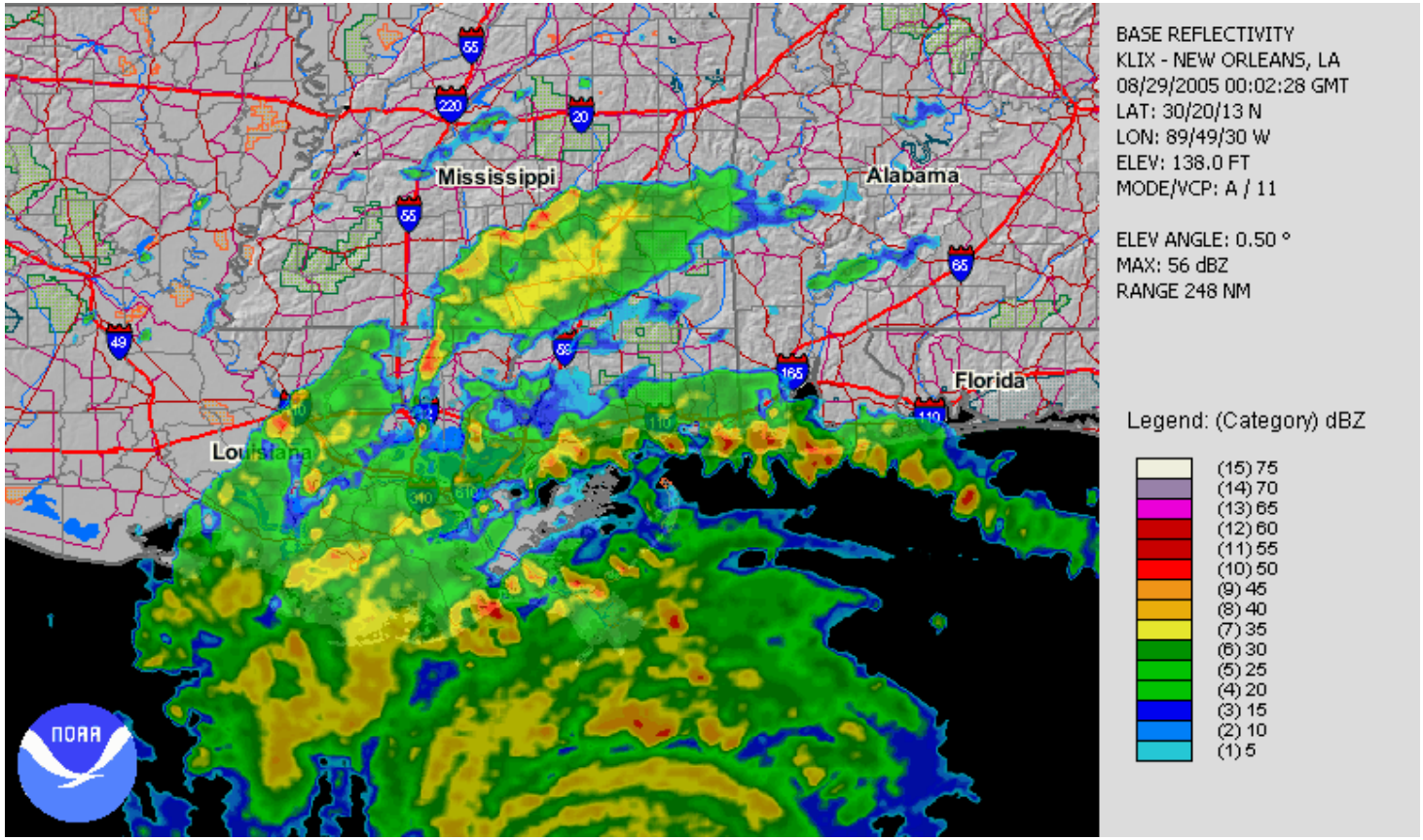


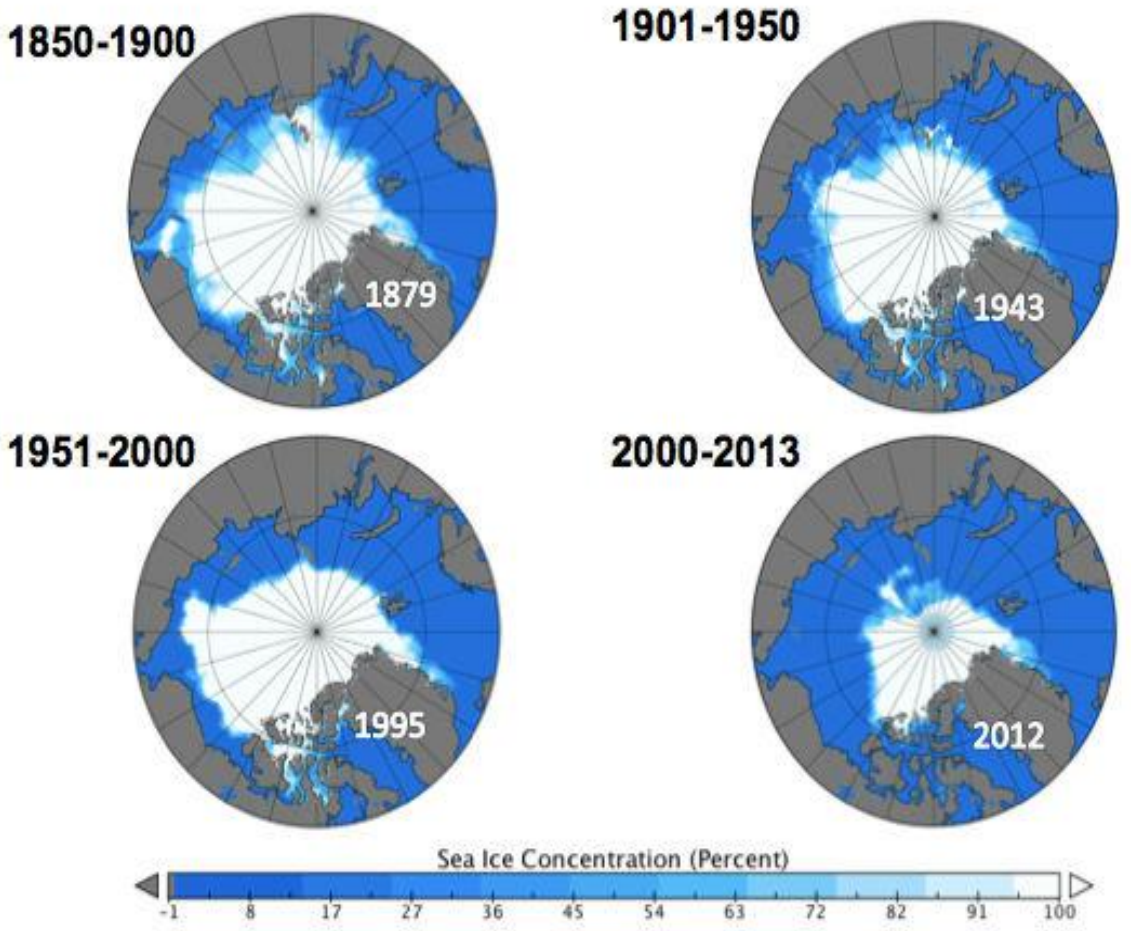
The Big Ideas in Science

- The Earth and its climate are shaped by everyday processes.



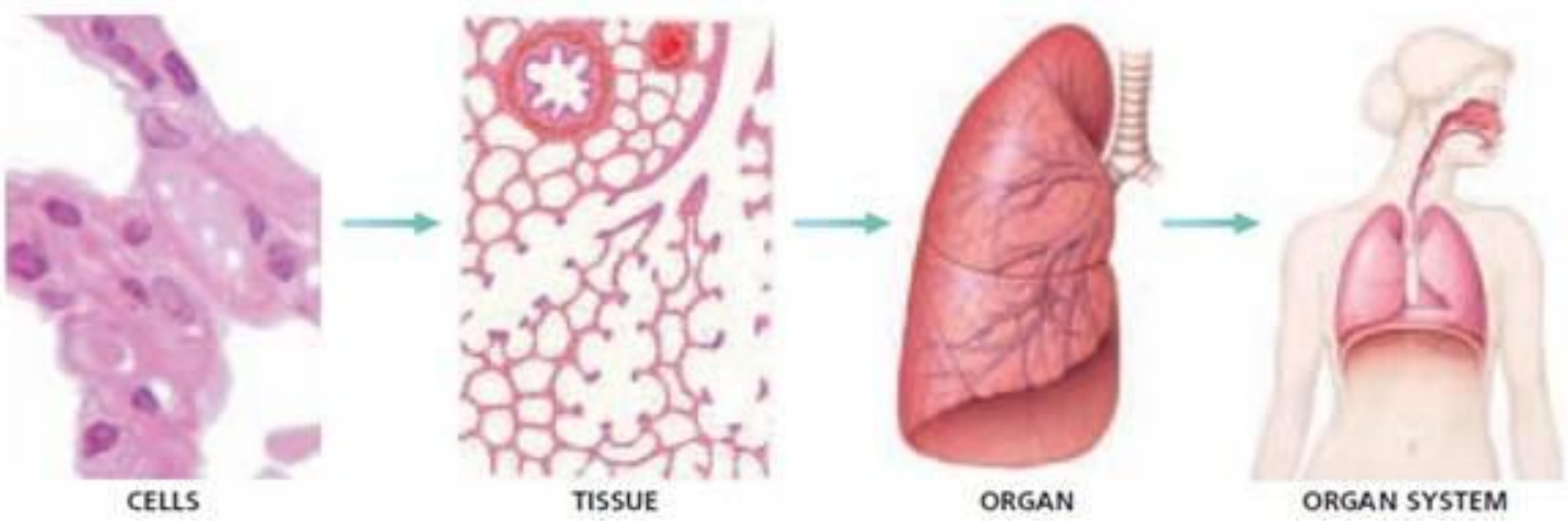
The Big Ideas in Science

- Our dying cryosphere (Sept. sea-ice minimum)



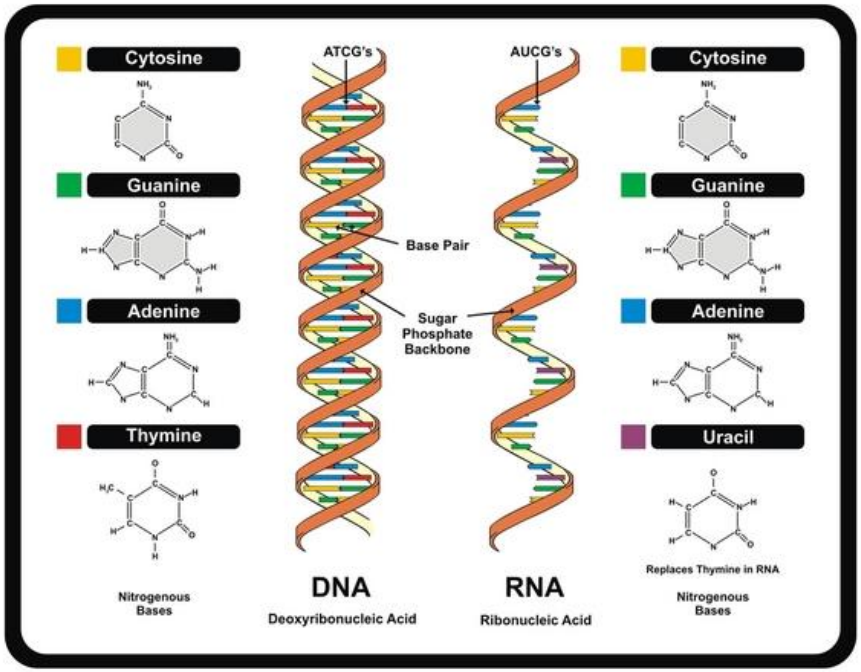
The Big Ideas in Science

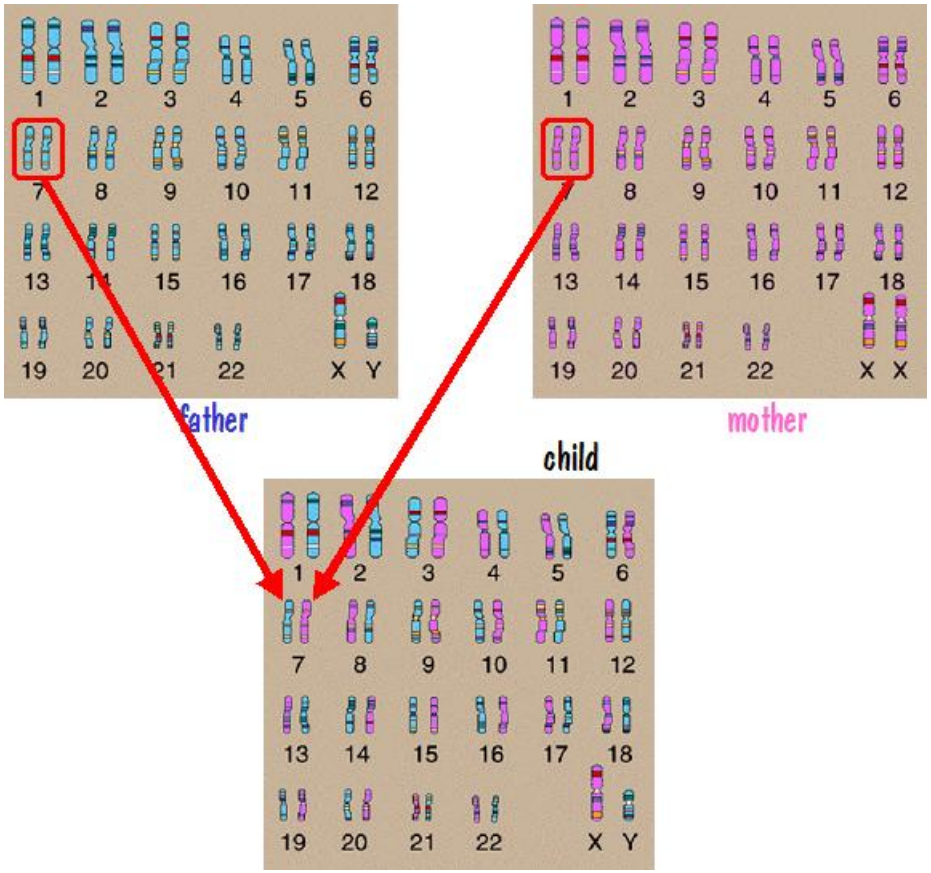
- All organisms are organised on a cellular basis.



The Big Ideas in Science

- Genetic information is passed down from one generation to another.

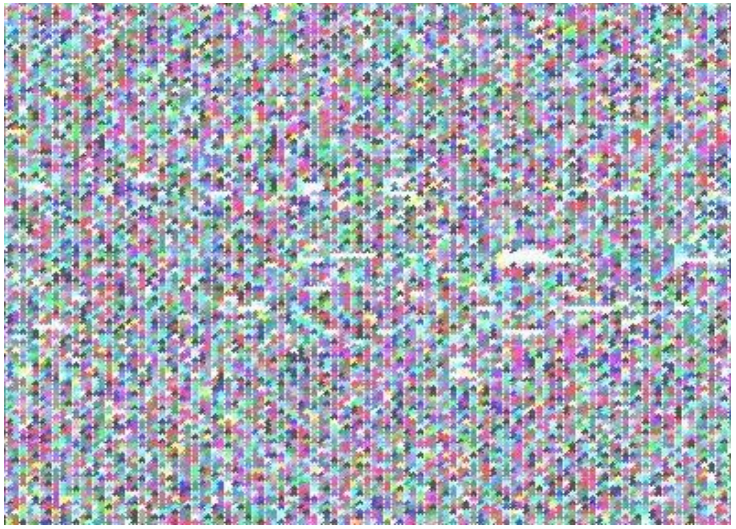




Scientific Inquiry

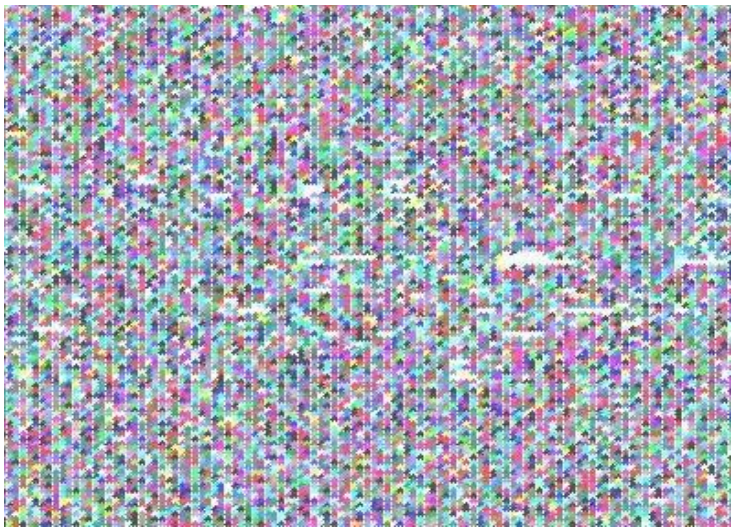
Understand the nature, processes, and methods of science:

- Observation over time
- Pattern seeking
- Identifying, classifying, and grouping
- Comparative/fair testing



Scientific Inquiry

- **Focused observation**: Children need to be taught how and what to observe
- **Discussion**: Time for reflection, rehearsal, clarification, and for eureka moments. Can also reveal a lack of understanding
- **Use of secondary sources**: Direct experience can lead to new questions
- **Co-operation**: Develop teamwork, good communication, and the ability to reason, listen, present, and defend.



Scientific Inquiry

Develop an understanding of scientific ideas by:

Key Stage 1	Lower KS 2	Upper KS 2
Asking questions Making observations Noticing patterns Grouping/classifying Testing Using secondary sources	**Asking questions** Exploration Discussion Testing and developing ideas about everyday phenomena	**Asking questions** Exploration Discussion Analysing functions, relationships, and interactions

Methods of teaching and learning

- Children have natural curiosity and want to make sense of the world
- Children should understand what they are learning especially as the material is built on each year

To promote learning and engage students

Lessons should:

- Be interesting, relevant, and appealing
- Build on prior knowledge/experience and promote progress
- Use senses, action, reflection, and make meaning
- Encourage talk, dialogue, and communicating ideas in various forms
- Help develop scientific concepts, inquiry skills, and attitudes about science
- Provide opportunities for working together and sharing ideas with others.

???

The Teacher's Role

- The physical environment
- Groupings
- Classroom culture
- Using prior knowledge
- Holding group discussions
- Guiding record taking
- Helping plan an investigation
- Helping analyse results
- **ASKING QUESTIONS (of and by)**

The Teacher's Role – Prior knowledge

All children come to school with some scientific knowledge. It may be incomplete, naïve and/or wrong, but …

- Stones grow
- Taller people are older than shorter people
- The sun turns into the moon at night
- Food comes from supermarkets

The Teacher's Role – Group discussions

Things to consider when discussing in pairs, small groups, or with the whole class:

- Seating
- Speed of the discussion
- Dynamic of the discussion
- Teacher's questioning

The Teacher's Role – Guide recordings

Things to consider when guiding children's record taking:

- Why do children need to record?
- Who records?
- What form does the record take?
- How will it be marked?

The Teacher's Role – Guide plans

Things to consider when guiding children's investigation plans:

- Whole class activity
- Equipment
- Identify question(s) to be explored
- Factors to be identified
- What **ONE** thing should be varied
- Importance of repeated investigation

The Teacher's Role – Help analyse

Things to consider when helping children reach valid conclusions from data:

- Which is best…?
- Is there a pattern in…?
- What happens when…?
- I wonder why…?
- How can we…?

Aim: knowledge becomes deeper and more reliable

The Teacher's Role – Asking questions

"A good question is the first step toward an answer; it is a problem to which there is a solution. A good question is a stimulating question, which is an invitation to a closer look, a new experiment or a fresh exercise…I would like to call such questions 'productive' questions because they stimulate 'productive activity'."

"Primary Science: Taking the Plunge," Jos Elstgeest

Guidelines for 'productive' questions

1. Study the effect on children of asking different kinds of question so that you can distinguish the 'productive' from the 'unproductive'.
2. Use the simplest form of productive question (attention-focusing) during initial exploration to help children take note of details that they might overlook.
3. Use measuring and counting questions to nudge children from purely qualitative observation towards quantitative observation.
4. Use comparison questions to help children order their observations and data.
5. Use action questions to encourage experimentation and the investigation of relationships.
6. Use problem-posing questions when children are capable of setting up for themselves hypotheses and situation to test them.
7. Choose the type of question to suit the children's experience in relation to the particular subject of enquiry.

“Primary Science: Taking the Plunge,” Jos Elstgeest

Guidelines for 'why' and 'how' questions

1. When asking questions to stimulate children's reasoning, make sure they include 'what do you think about' or 'why do you think'.
2. Don't ask questions of this type until children have had the necessary experience they need so that they can reason from evidence.
3. When children ask 'why' questions consider whether they have the experience to understand the answer.
4. Don't be afraid to say you don't know an answer; or that no one knows (if it is a philosophical question).
5. Break up questions whose answers would be too complex into ones that concern relationships the children can find out about and understand.
6. Take children's questions seriously, as an expression of what interests them; even if the questions cannot be answered, don't discourage the asking.

“Primary Science: Taking the Plunge,” Jos Elstgeest

The Teacher's Role – Inquiry skills

- Children are forming ideas about the world around them from birth and will use their own ideas in making sense of new events and phenomena they encounter;
- Direct physical action on objects is important for early learning, gradually giving way to reasoning, first about real events and objects and then later about abstractions;

"Helping children's development of inquiry skills,"

Wynne Harlen

The Teacher's Role – Inquiry skills

- Children learn best through mental and physical activity, when they work things out through their own thinking in interaction with adults or other children, rather than receiving instruction and information to memorise;
- Language, particularly discussion and interaction with others, has an important part in the development of reasoning skills and ideas.

"Helping children's development of inquiry skills,"

Wynne Harlen

SOME ACTIVITIES

LET’S TRY!

Teachers' Resources – Everything

Learn to collect elastic bands, paper plates, jars, jar lids, boxes, card board, straws, cups, stir sticks, …., **STUFF!**

EVERYTHING is a potential art/science resource

SOME ACTIVITIES

- A Topic Carousel – Sound
- Paper snowflakes
- The hoop glider
- Ball drop experiment
- A trip to the …
- A TV weather report
- Science, math, and art (the bino race)
- Element BINGO

A Topic Carousel – SOUND

A carousel of direct-experience activities to help children think about a topic.

1. Box guitar
2. Straw flutes
3. Bottle flutes
4. Water xylophone
5. Broken telephone

1. Box guitar

To investigate how to make sounds of different pitch.

- Wrap four elastic bands around an empty tissue box
- Twang the strings. Discuss in pairs the sounds you've made, thinking specifically about the **pitch**.

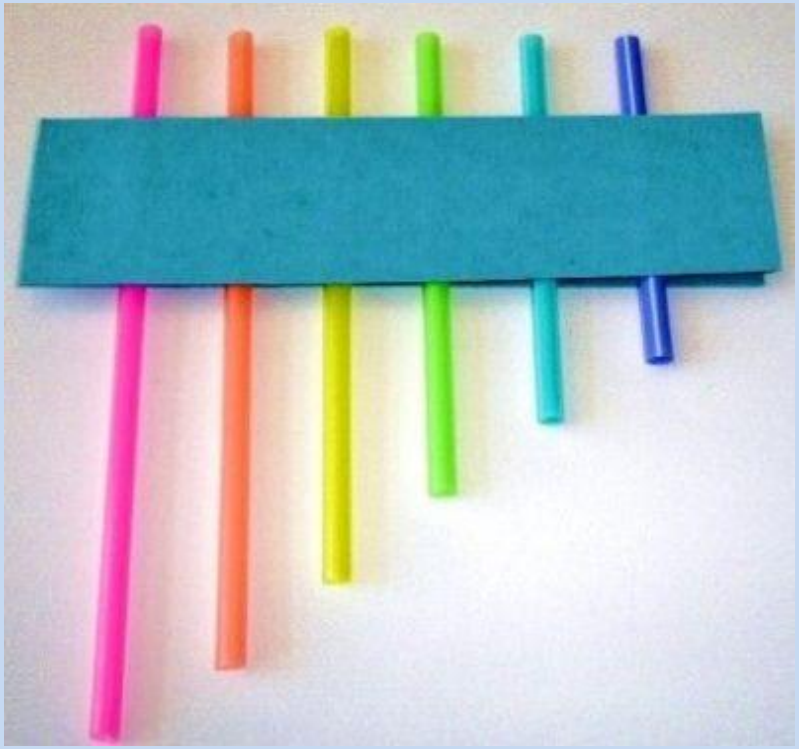
What happens?

2. Straw flutes

To investigate how to make sounds of different pitch.

- Blow across the top of a straw to produce a sound.
- Using three or more straws, can you make an instrument that produces sounds of both high and low **pitch**?

What happens?



3. Bottle flutes

To investigate how to make sounds of different pitch.

- Fill a series of bottles with different amounts of water.
- Try to make a whistle by blowing across the top of the bottle opening.
- How do the sounds vary for each bottle?

What happens?

4. Water xylophone

To investigate how to make sounds of different pitch.

- Add different amounts of water to a series of glasses. (use food colouring to get a *rainbow* xylophone).
- Tap the side of each glass in turn. What do you hear?

What happens?

5. Broken Telephone

To investigate how sound travels.

- Start with a student in the first row and whisper a message to him or her.
- Have each student whisper the message they hear in turn to a neighbour.

Did you get the same sentence/message at the end?

Can you construct a string/tin-can phone?

SOUND – References

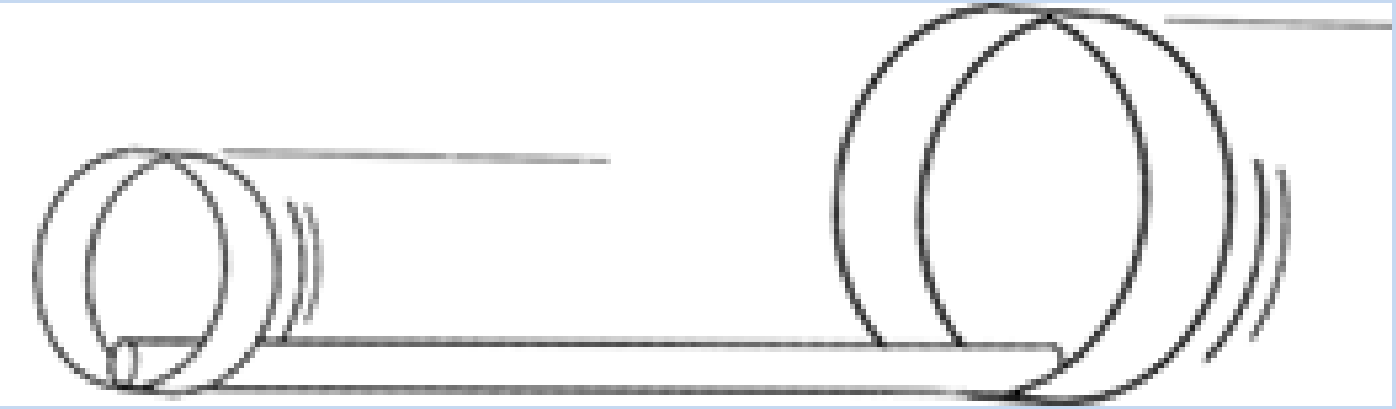
- **Box Guitar:** http://www.create-kids-crafts.com/musical-instrument-crafts-for-kids.html
- **Straw Flutes:** https://www.instructables.com/Straw-Flute/
- **Bottle Flutes:** https://www.instructables.com/Bottle-Boogie-Flute/

The Incredible Hoop Glider

Changing variables in a simple experiment

Materials: plastic straw, paper, tape, scissors

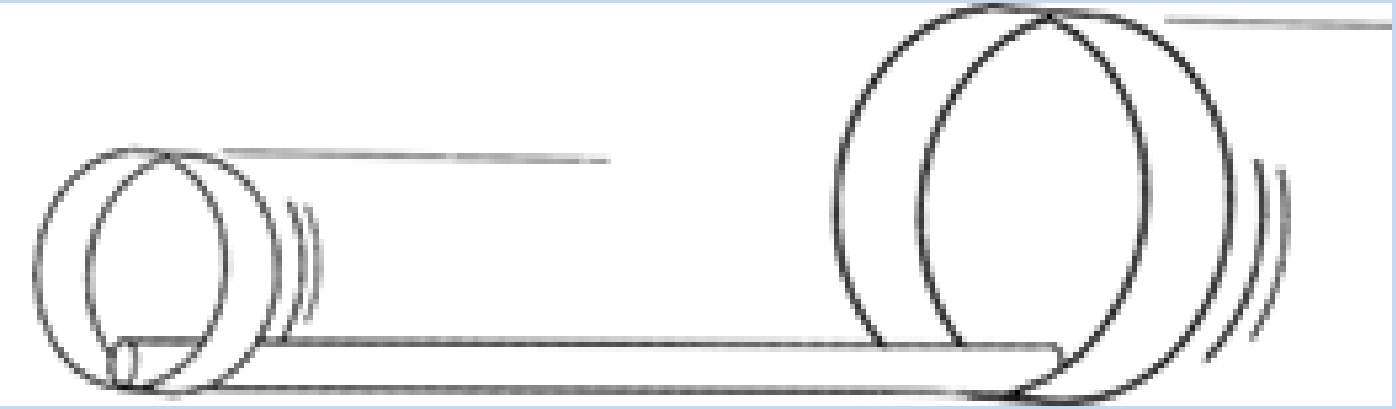
Construction: Tape two circular hoops (one big and one small) to the ends of a straw.



The Incredible Hoop Glider

Make an **experiment** from the **demonstration**

1. Does the placement of the hoops on the straw affect its flight distance?
2. Does the length of straw affect the flight? (You can cut the straws or attach straws together to test this)
3. Do more hoops help the hoop glider to fly better?
4. Do the hoops have to be lined up in order for the plane to fly well?



Ball drop experiment

An experiment:

- **Outline**
- **Hypothesis**
- **Materials**
- **Method**
- **Analysis**
- **Results/Conclusion**

Ball drop experiment

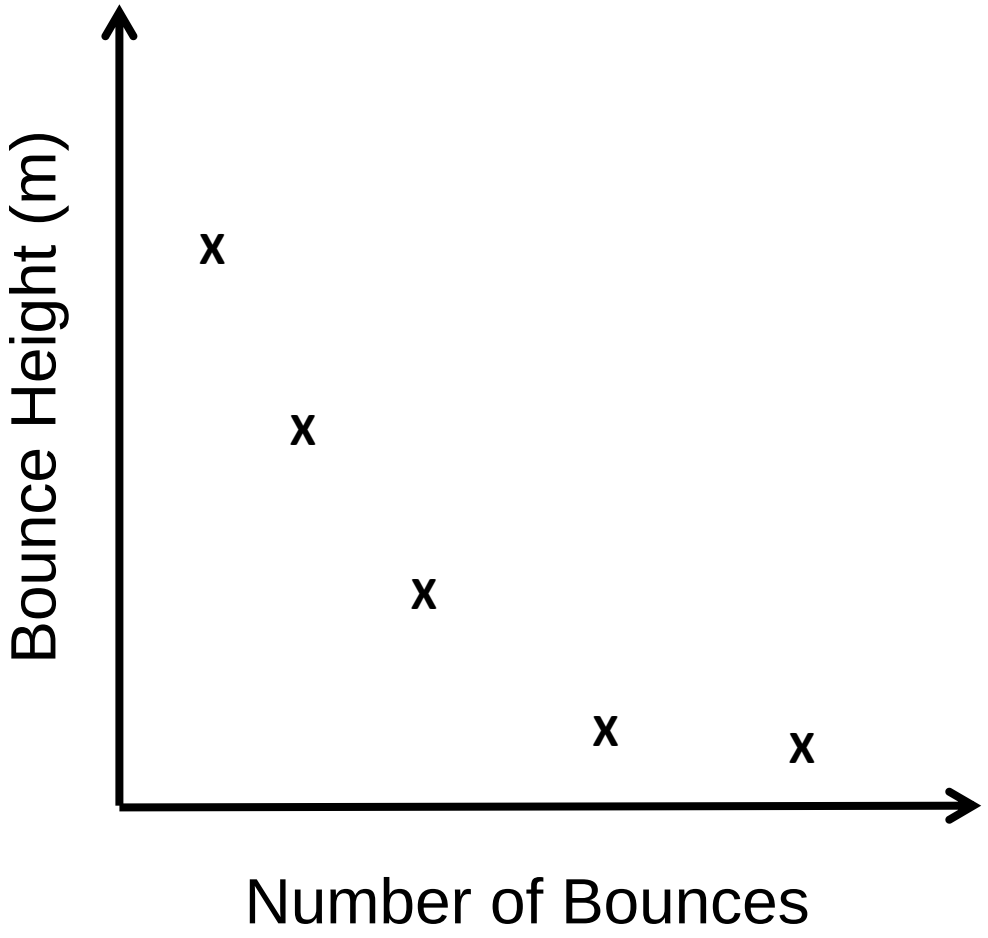
This experiment has all the elements of a scientific analysis without any complicated measuring (*e.g.*, temperature, speed, weight, …)

1. Hold a ball at an initial measured height (say 5 m).
2. Drop the ball and measure the height of four following bounces (you may have to repeat the drop to measure each bounce).
3. Mark the resultant height versus bounce number in a table and plot the data.

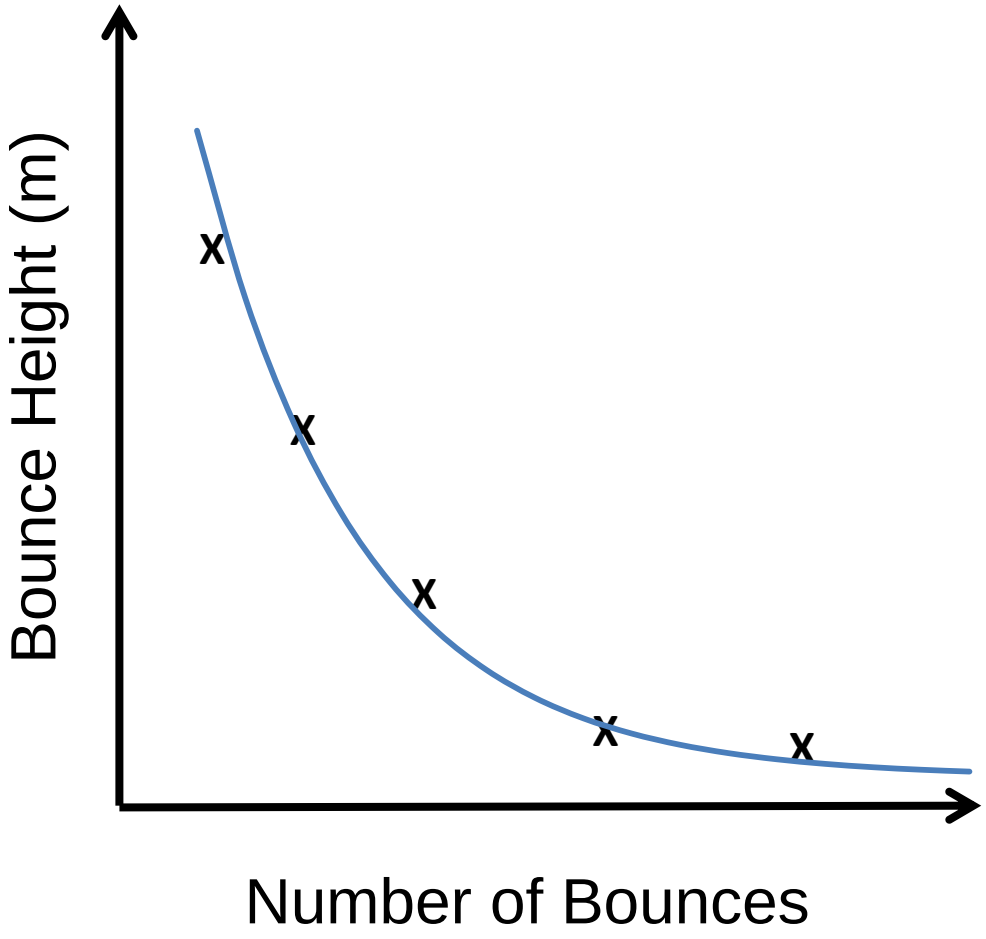
Can you draw a curve through the five points to represent how the bounce height decays?

Repeat the experiment with a different ball. What conclusions can you make?

Ball drop experiment



Ball drop experiment



A TRIP TO THE … coal mine

This is a fun memory list game.

1. Ask a student to tell you what you would find in a coal mine: *e.g.*, “I went to a coal mine and I saw … a train.”
2. Ask each student in turn to add a new item to the list. “I went to a coal mine and I saw a train, a tunnel, water, a miner’s hat, a pit, …”

Local trips are great which students recall from memory or can go with their families outside of school hours. Try other trips: steel mill, cider factory, farm, botanical gardens, …

Paper Snowflakes

A creative craft to investigate symmetry in nature.

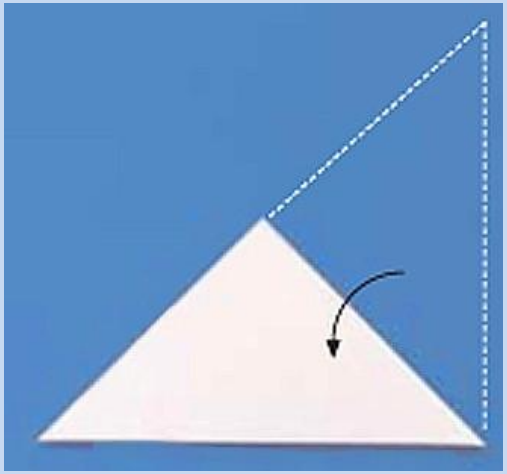
- Create a 6-point snowflake template (see following) and cut out a pattern.
- How elaborate can you make each snowflake?
- You can hang the snowflakes from the ceiling or stick them on the windows.

Can you make a snowflake with more than 6 points?

Paper Snowflakes

1

2



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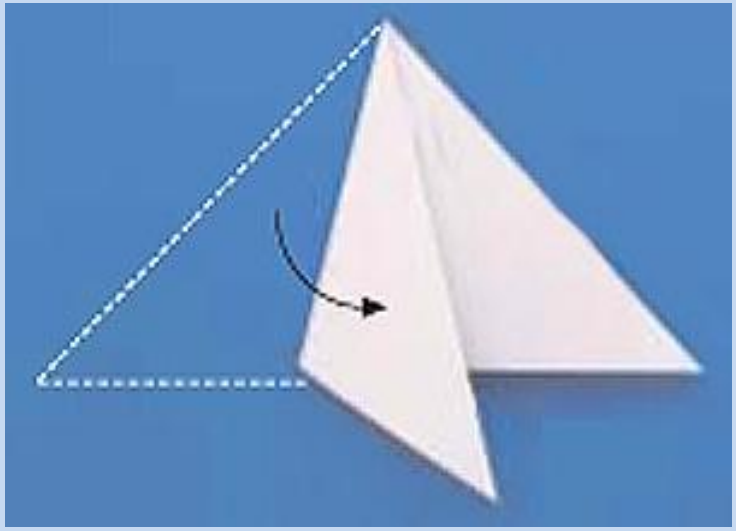

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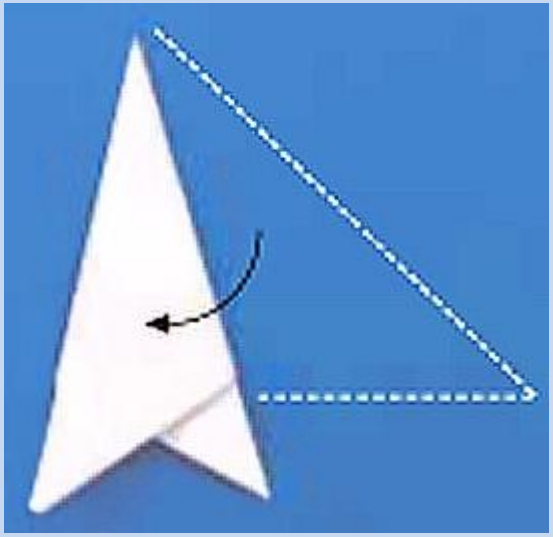
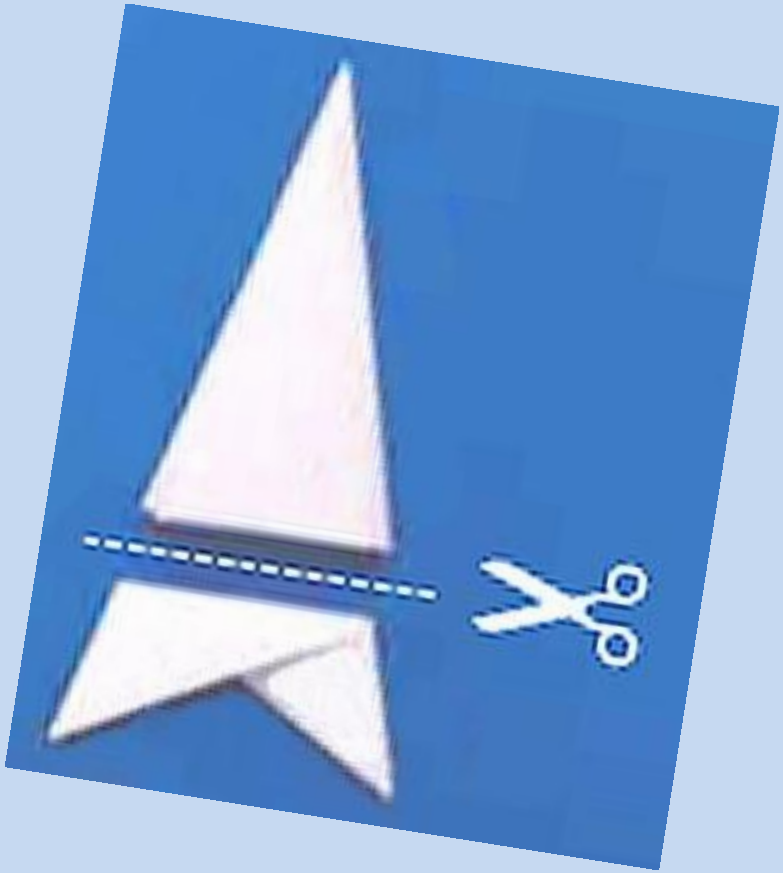
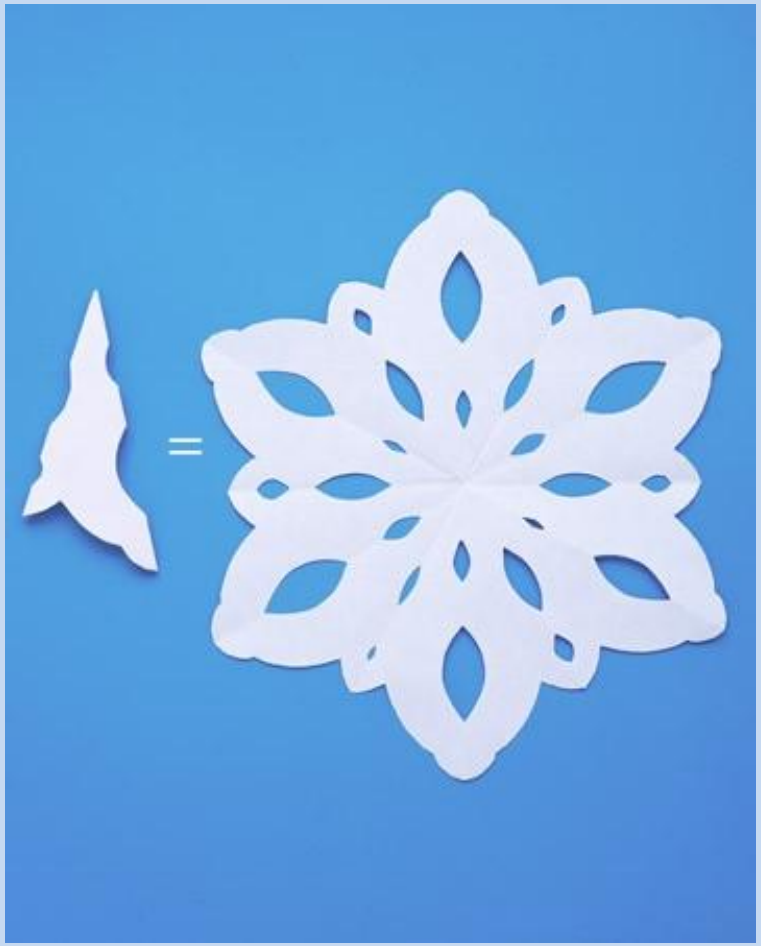


Paper Snowflakes





Thanks to Martha Stewart for the simplest template explanation!

A TV Weather Report

A TV Weather Report

This is a role-playing game for groups of four.

1. Start with a weather vocabulary list.
2. Each group appoints an anchor, 3 local weather reporters, and picks a country.
3. Each group presents the weather as in a TV report using a Google map for their chosen country.

A TV Weather Report

Sample Vocabulary

Blizzard	Frost	Rain
Climate	Gale	Shower
Cloud	Global warming	Sleet
Desert	Hail	Smog
Dew	Heat wave	Snow
Drizzle	Hurricane	Storm
Drought	Ice	Thunder
Flood	Lightning	Tornado
Fog	Mist	Wind

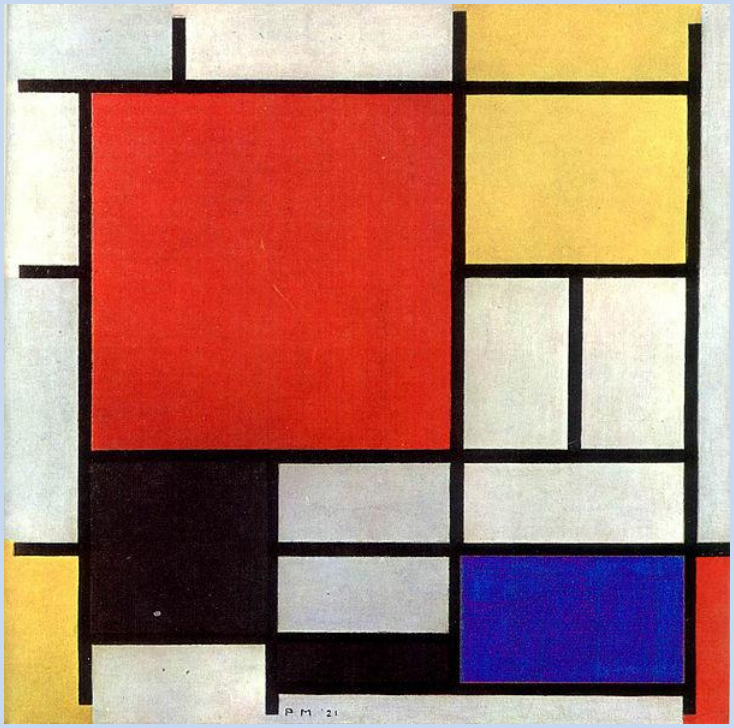
A TV Weather Report

Sample Weather Quiz

1. A thermometer is a device used to measure what?
2. Breeze and gale are common terms used to describe the speed of what?
3. What is the name of a scientist who studies weather?
4. Trying to predict the weather is known as weather _____?
5. True or false? You see lightning and hear thunder.

Science? Math? Art?

Math and science meet in the middle – art.



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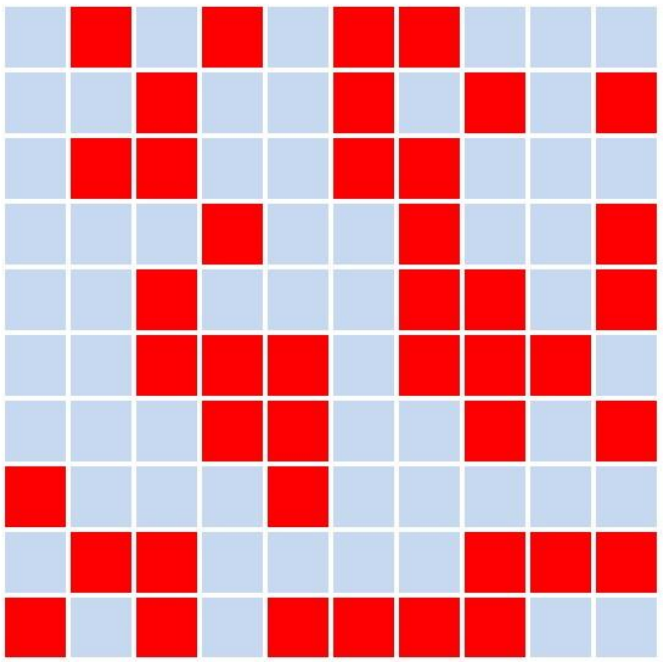

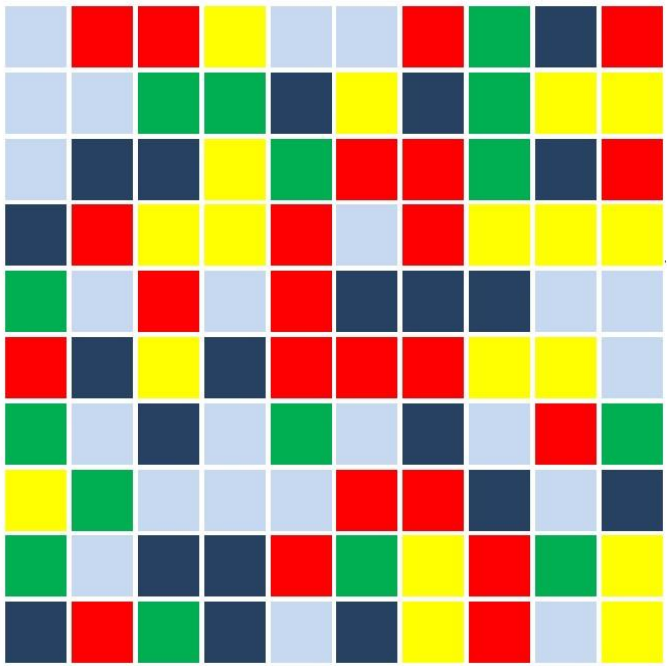

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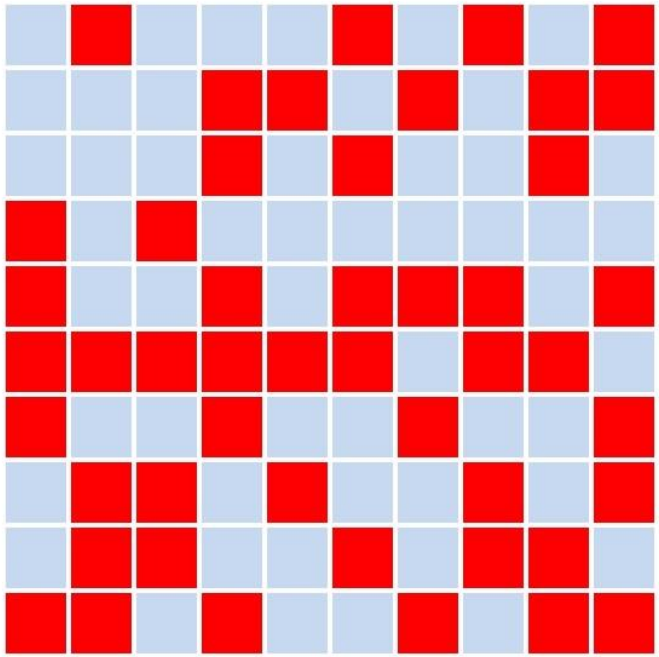

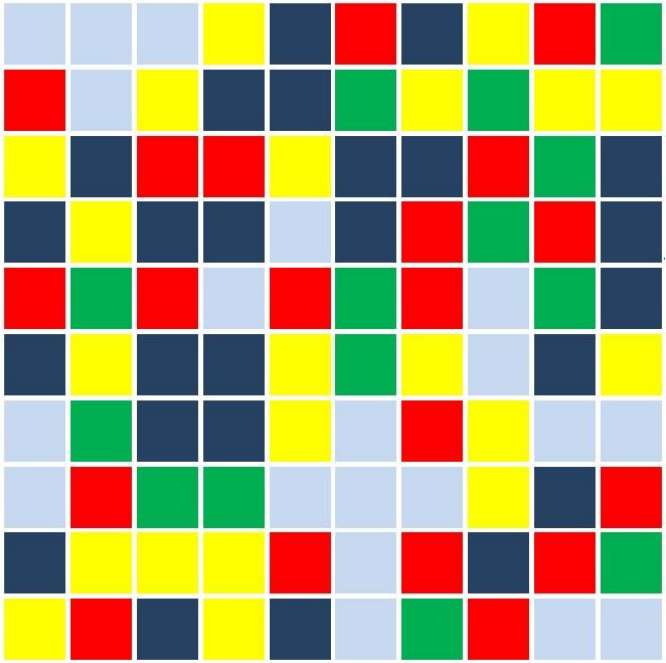

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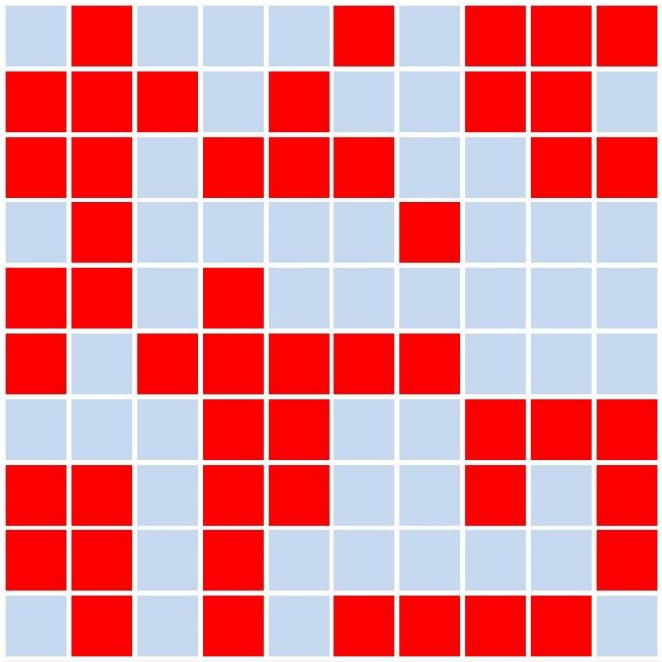

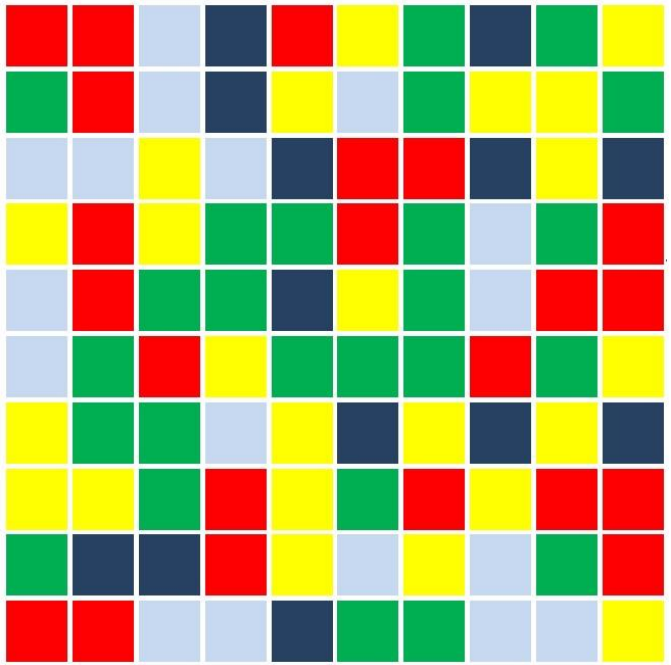

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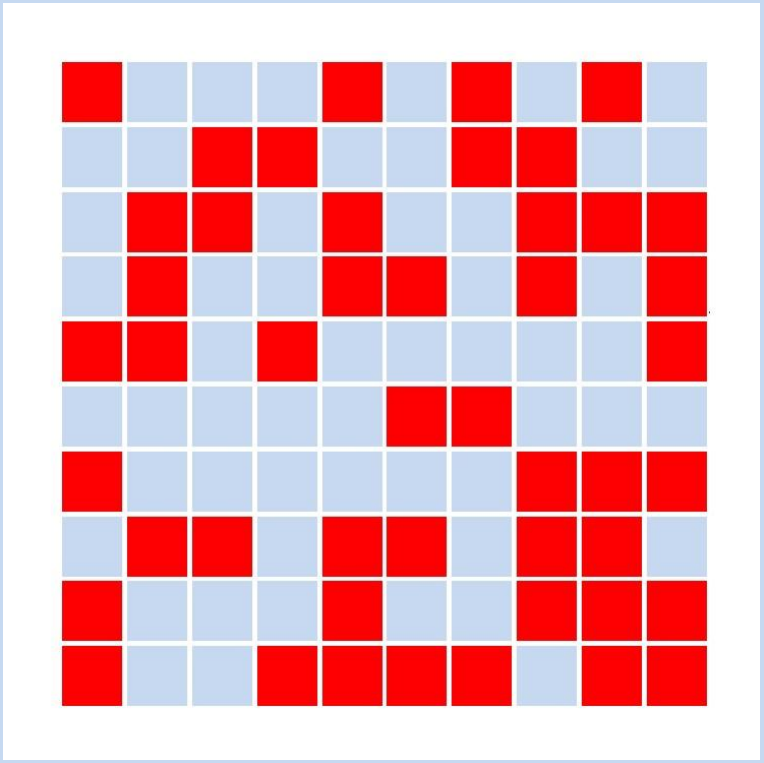

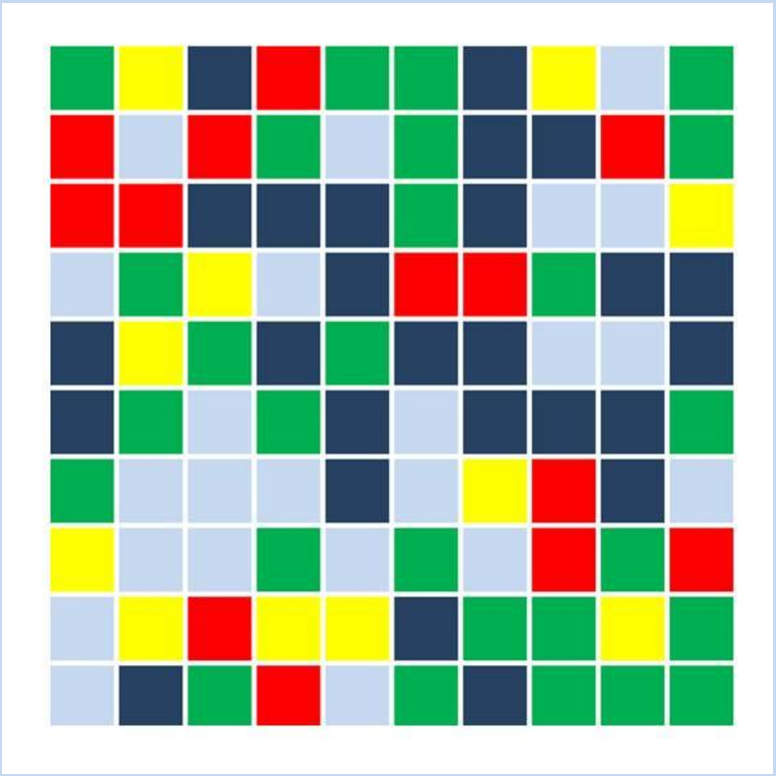

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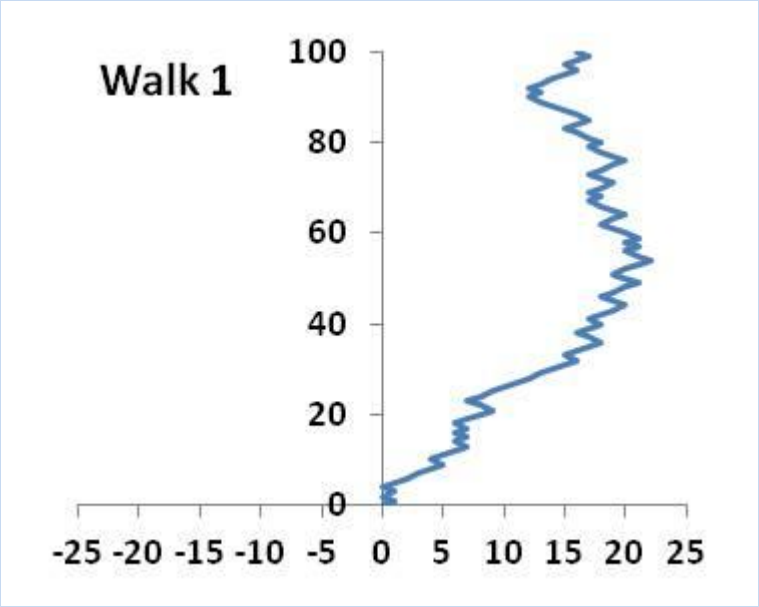

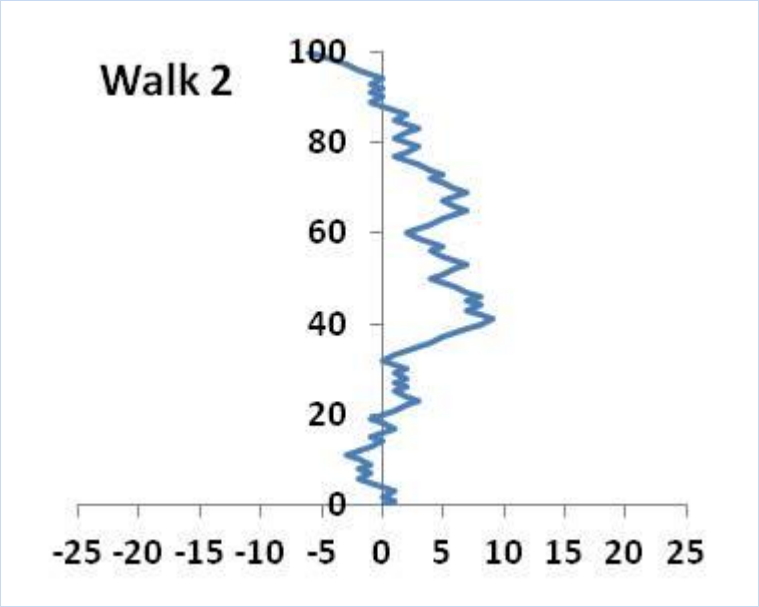

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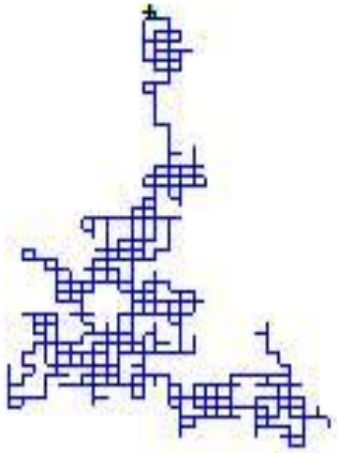
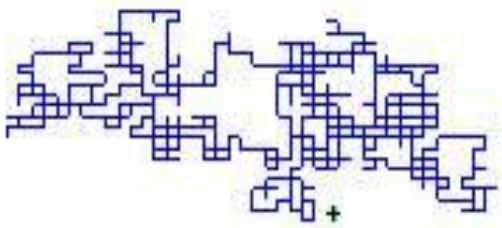
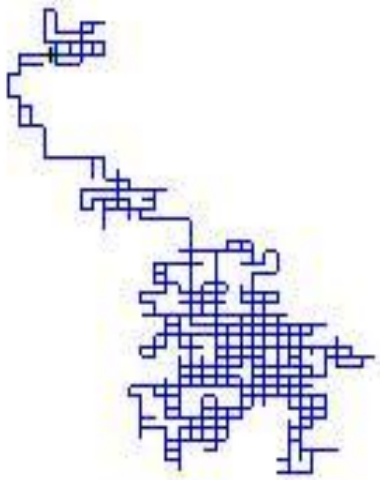






Element BINGO

This is bingo with a twist – using chemical elements.

1. Hand out an element bingo card to each player (or pair of players).
2. Roll a die to move to a new element, and call out the element, *e.g.*, for a roll of 6, “6, C, Carbon.” Instruct each player to write the element name on their bingo card when called.
3. A player calls out bingo for a complete row, *e.g.*, “1A, hydrogen, lithium, sodium, potassium, rubidium, caesium, francium.”
4. Continue playing until bingos for all rows are called and a full card.

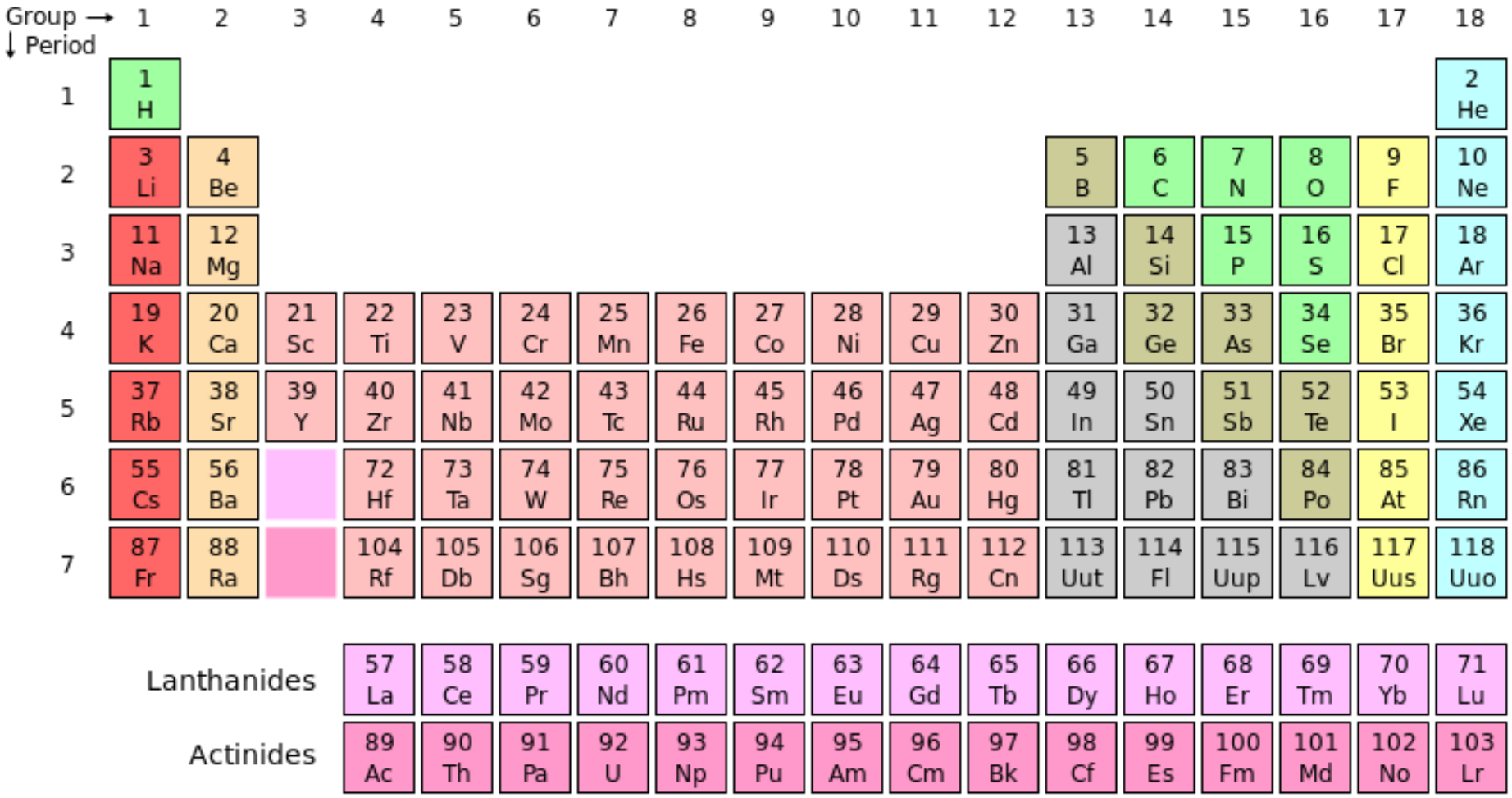
There is a master template with all the elements plus 30 different element cards. Use the element name page to correlate an element symbol to its name. Note that the lanthanides (57-71) and actinides (89-103) are not included in this version.

Element BINGO Sample Card

Element Bingo 1

	I A	II A	III B	IV B	V B	VI B	VII B	VIIIB		I B	II B	III A	IV A	V A	VI A	VII A	VIIIA
1																	2 He
2	3 Li											5 B		7 N			
3		12 Mg											14 Si	15 P		17 Cl	18 Ar
4	19 K			22 Ti		24 Cr		26 Fe		28 Ni		31 Ga			34 Se		
5		38 Sr	39 Y		41 Nb		43 Tc		45 Rh				50 Sn		52 Te	53 I	54 Xe
6	55 Cs			72 Hf		74 W		76 Os			79 Au		81 Tl		83 Bi		85 At	
7		88 Ra	89 Ac		105 Db		107 Bh		109 Mt	110 Ds	111 Rg	112 Cn		114 Fl		116 Lv		118 Uuo

Element BINGO



Reading / Bibliography

- "Primary Science: Taking the Plunge," Wynne Harlen, Jos Elstgeest
- "Helping Children's Development of Inquiry Skills," Wynne Harlen
- ScienceBob.com. Experiments, science fair ideas, science Q & A
- Casa de las Artes y Sciences (Luarca: Severo Ochoa, Margarita Salas)
- Astronomy Picture of the Day, NASA