



Theatre of Science Polar Regions 1: The Big Picture

Today we'll:

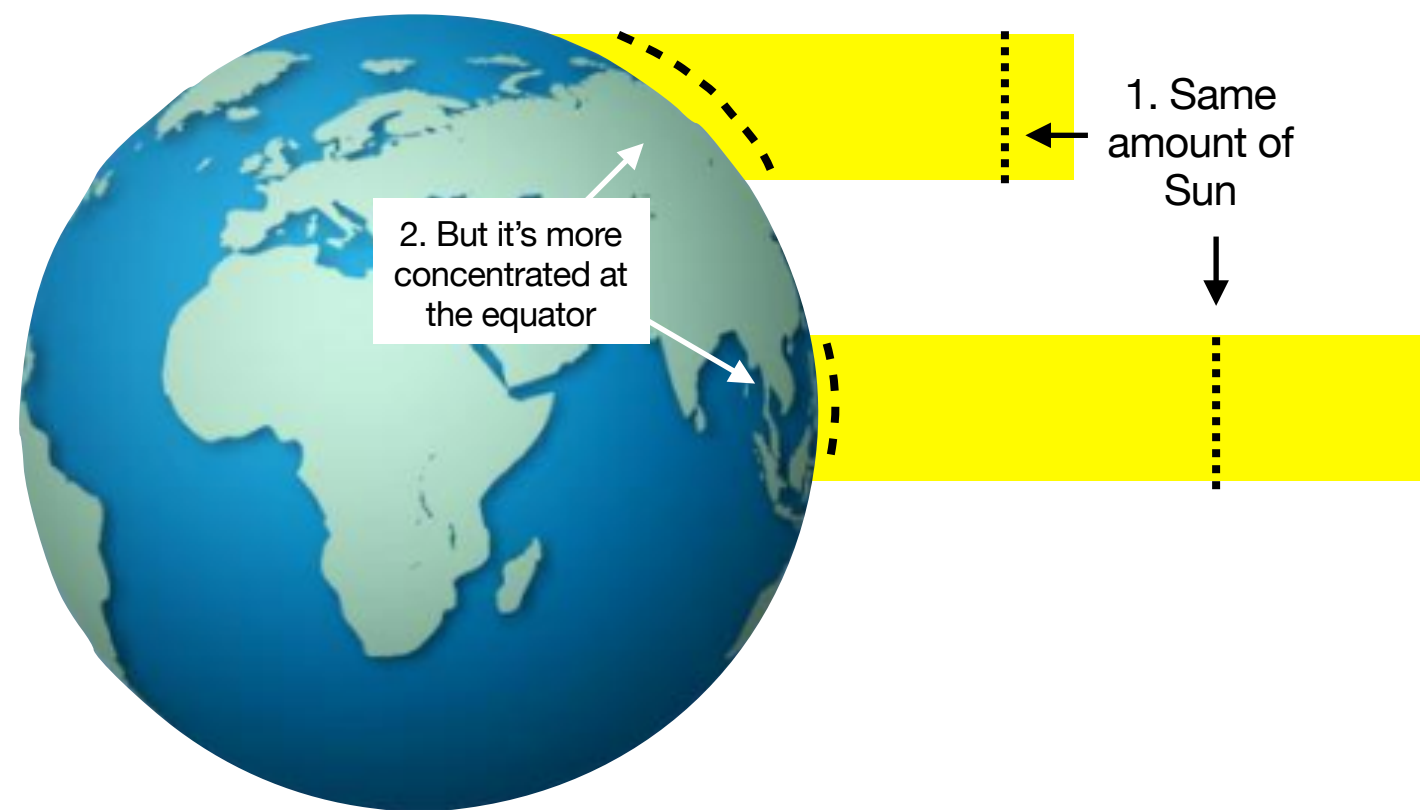
Describe factors that affect the temperature at Earth's poles. (By doing an activity and answering questions). Hear about Earth's ice ages and how the amount of ice on Earth changes over time. State why the poles are not the same temperature

To join in bring: A4 paper, scissors, pens

♥ If you enjoy these lessons, please consider chipping in £5 a month towards my wages! I'll send you Theatre of Science magazine, rainbow glasses, and all my gratitude. Search 'Theatre of Science Ko-fi' for details x

Why is it cold at the poles?!

Reason one



The Sun's rays have to cover more ground at the poles because Earth is curved. Sunlight spread over a larger area = cooler.

Why are the poles so cold? Circle any sentences that help to explain.

The sun's rays are more spread out at the poles

The snow and ice at the poles reflect sunlight

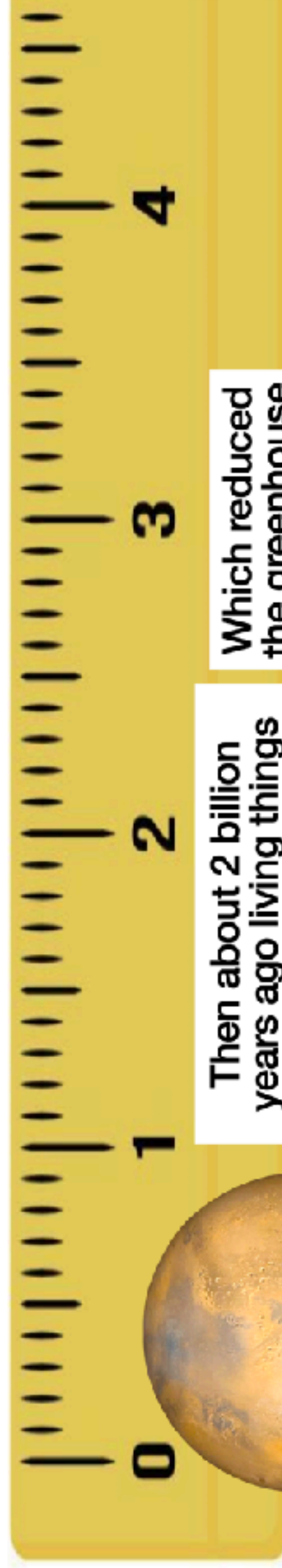
Earth gets closer and further away from the Sun throughout the year

Earth's poles face away from the Sun sometimes.

Earth is tilted

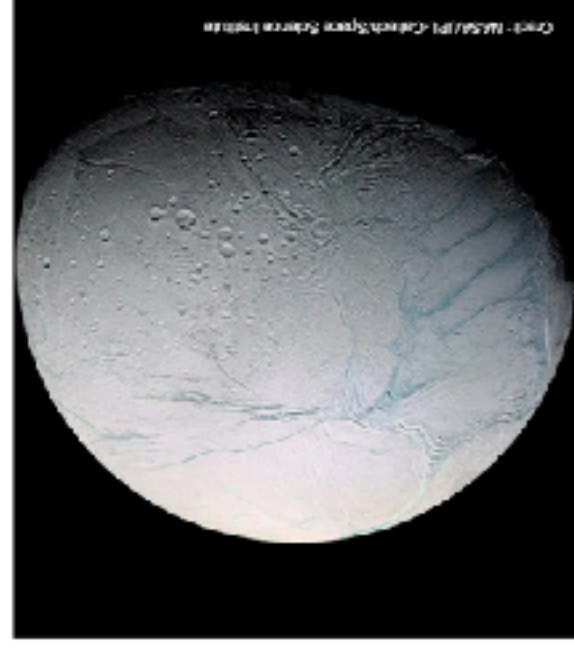
Notes: did you miss any?

Earth is 4.5 billion years old



First it was really hot (the atmosphere contained a lot of greenhouse gases)

Then about 2 billion years ago living things started giving off oxygen!



Which reduced the greenhouse gases and turned Earth into a giant snowball

(‘Snowball Earth’ is the proper scientific name for it!)

We think that was the first of at least 5 major ice ages. (Not all were snowballs. Some were slush balls. Also an acceptable scientific name).

Quiz: What’s the Hidden Word?

The South Pole is colder than the North pole, partly because...

- N: It’s at the bottom of the planet.
- R: It’s not, the North Pole is colder.
- L: It faces away from the Sun for half the year.
- M: It’s very high above sea level.

What word describes the time DURING an ice age when Earth is slightly warmer?

- J: Glacial
- B: Interglacial
- T: Galactic
- S: Intergalactic

Which of these is NOT a fact about the Arctic?

- U: It gets more sunlight than Antarctica
- I: It’s ice surrounded by land
- A: It’s warmer than Antarctic
- E: The North Pole is there

Which of these is correct?

- B: An ‘ice age’ means there is ice at Earth’s poles
- S: An ‘ice age’ means a lot of Earth is covered with ice.
- P: There has always been ice at Earth’s poles
- F: There has always been an equal amount of ice at Earth’s poles

If you get some wrong (and I always hope you will because you remember things better if you get them wrong the first time!) you might want to make some notes on the side explaining why you were wrong (or why you were right!).



Theatre of Science Polar Regions 2: ICE!

I just want you to guess first then correct it at the end if you need to.

To join in bring: Lots of ice cubes! Glass, jug of water, cereal bowl, and a few hours before if poss, fill an empty food can with water & 4tbsp of salt and put in freezer!

Before the lesson:
Is ice a crystal? Y / N
Is it a mineral? Y / N

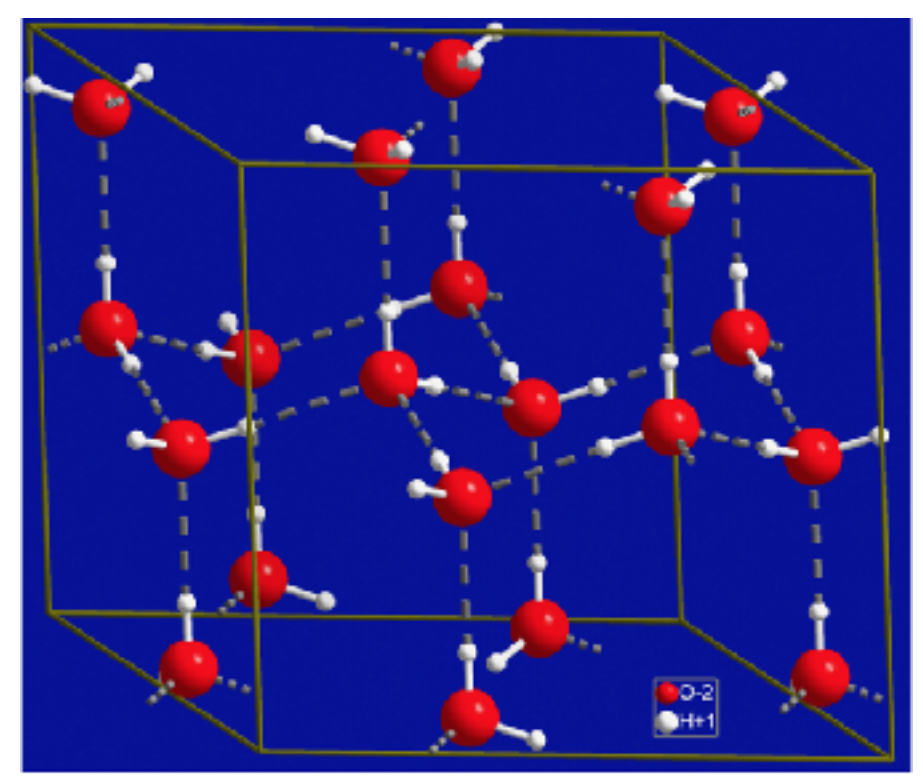
Tick a box for each type of ice!

Today we will:
Learn about how the particles are arranged in liquid water and water ice.
How ice forms in the Arctic and what an ice cube can teach us about Arctic ice.

What will happen when the ice cubes melt?



- a) Water will overflow
- b) Water level will go down
- c) Water level will stay the same



The structure of ice; oxygen atoms are red, hydrogen is white.

If these melt ↓	What will happen? →	Sea level will rise	Sea level will go down	Sea level will be pretty much the same
Land Ice				
Sea Ice				
Icebergs				

Already know? Don't tell anyone; try and explain it in words or pictures here!

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Sea Ice

Frozen sea water. Starts as tiny crystals which float on the ocean and bond together.

Older sea ice is _____
and contains less _____.

There's no flag or permanent buildings at the _____ pole because it's sea ice which moves around too much!



Ice on Land

Glaciers form on land. Snow falls and doesn't melt. It builds up and up, gets squashed into sheets of ice, then slowly flows towards the sea!

Ice shelves are where glaciers meet the ocean.



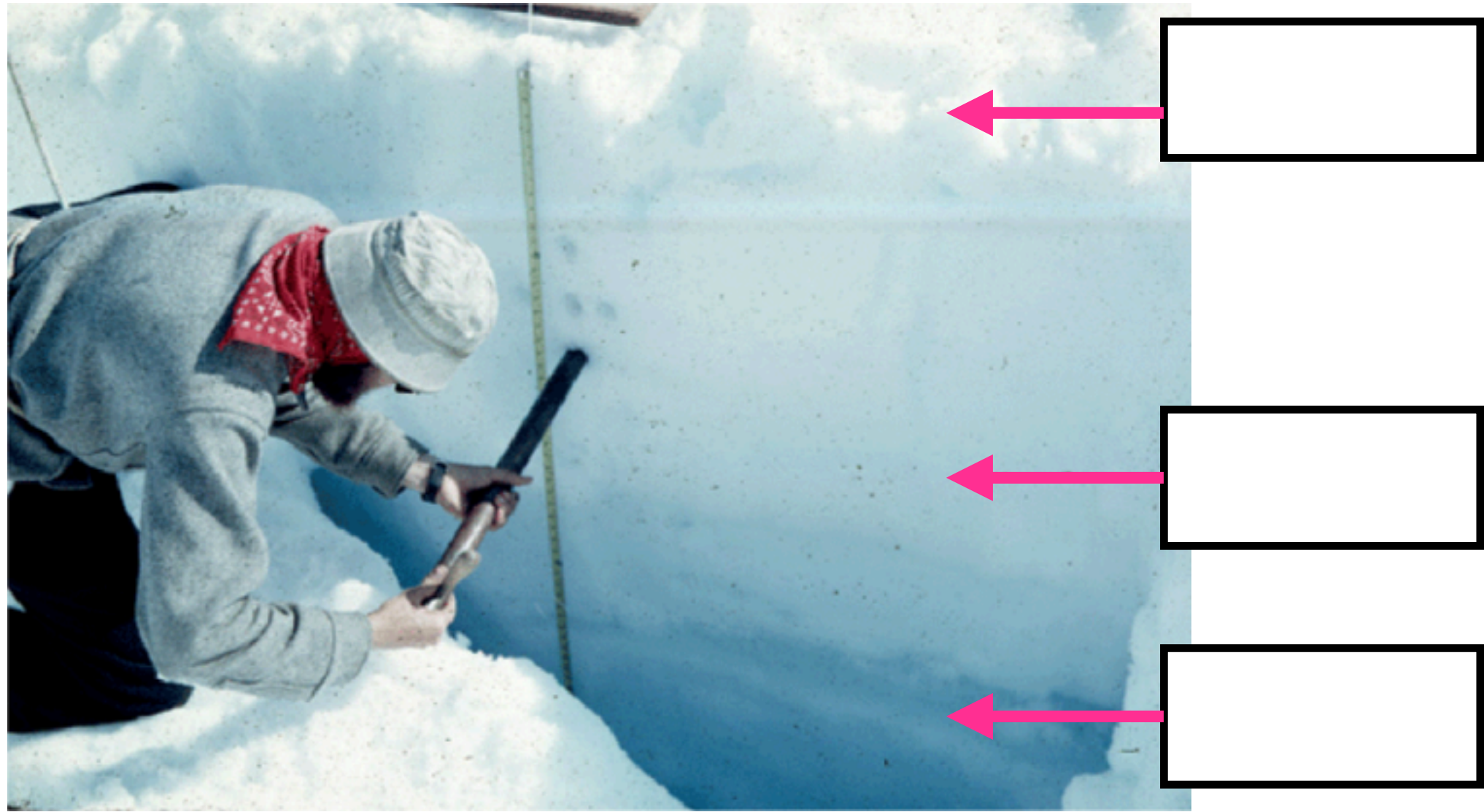
An ice sheet is a glacier over 19 000 square miles.

Ice caps sit on top of mountains and are smaller

Icebergs

Fresh water ice that has broken off from a glacier and is now in the sea.



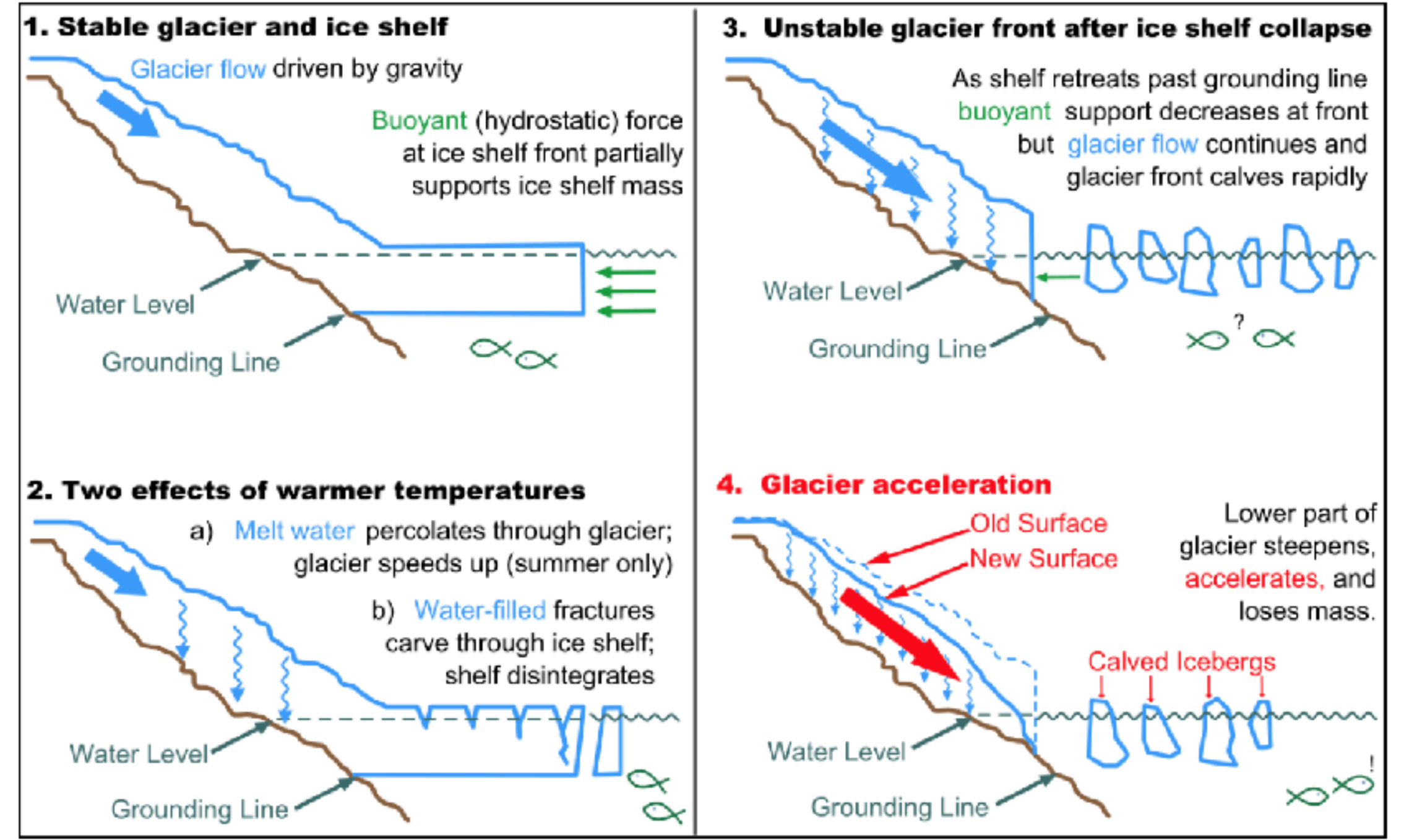


Where's the snow, firn and ice? (Roughly!)

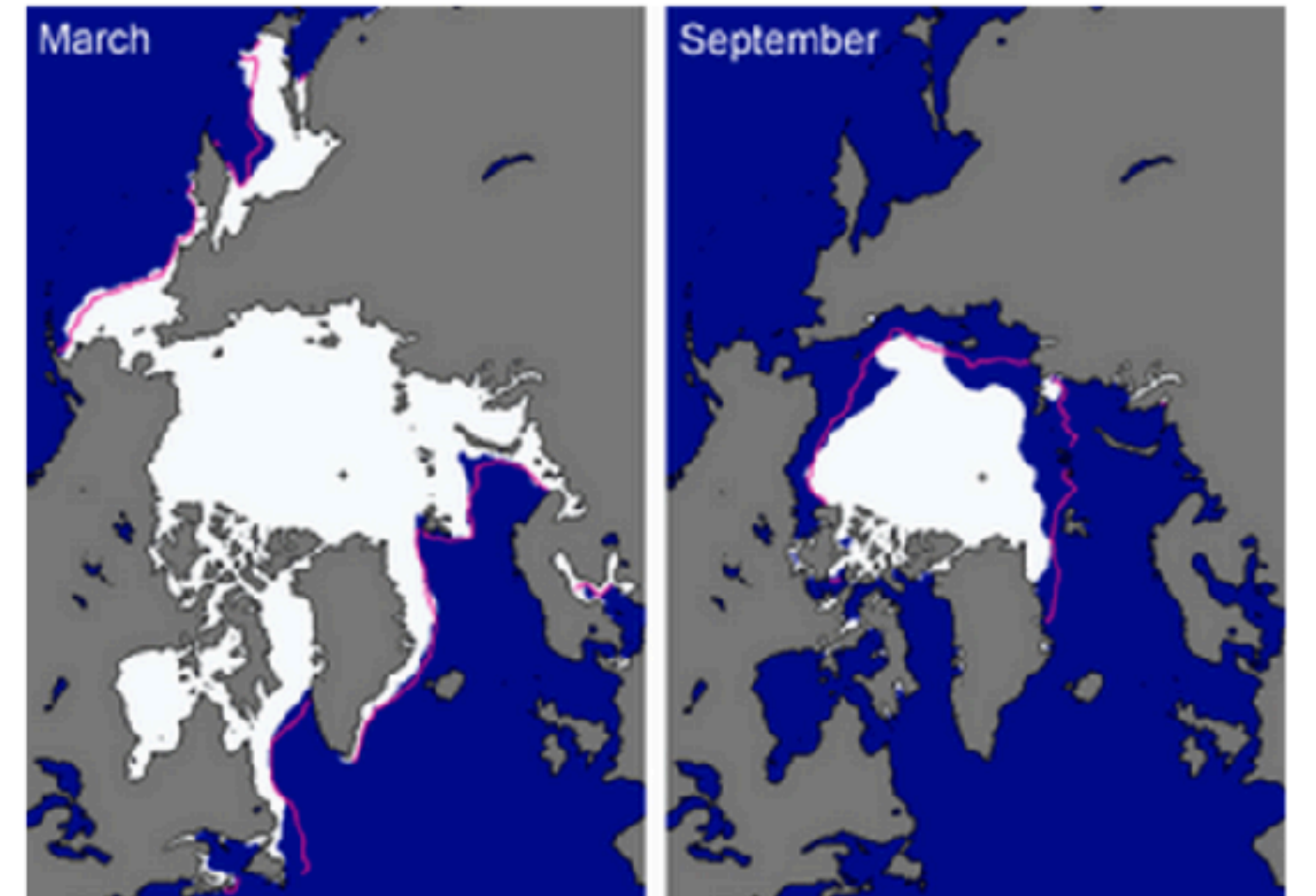


Map of Antarctic ice shelves.

Complicated diagram but gives you a good idea of how glaciers can behave if they are out of balance.



Map of spring and autumn Arctic ice in 2013. The red lines are where it was in 2010. Image by NASA.





Theatre of Science Polar Regions 3: Arctic Animals!

To join in bring: Two ice cubes, butter or margarine (any), teaspoon, way of washing butter or marg off your hands! And a metal and wooden spoon!

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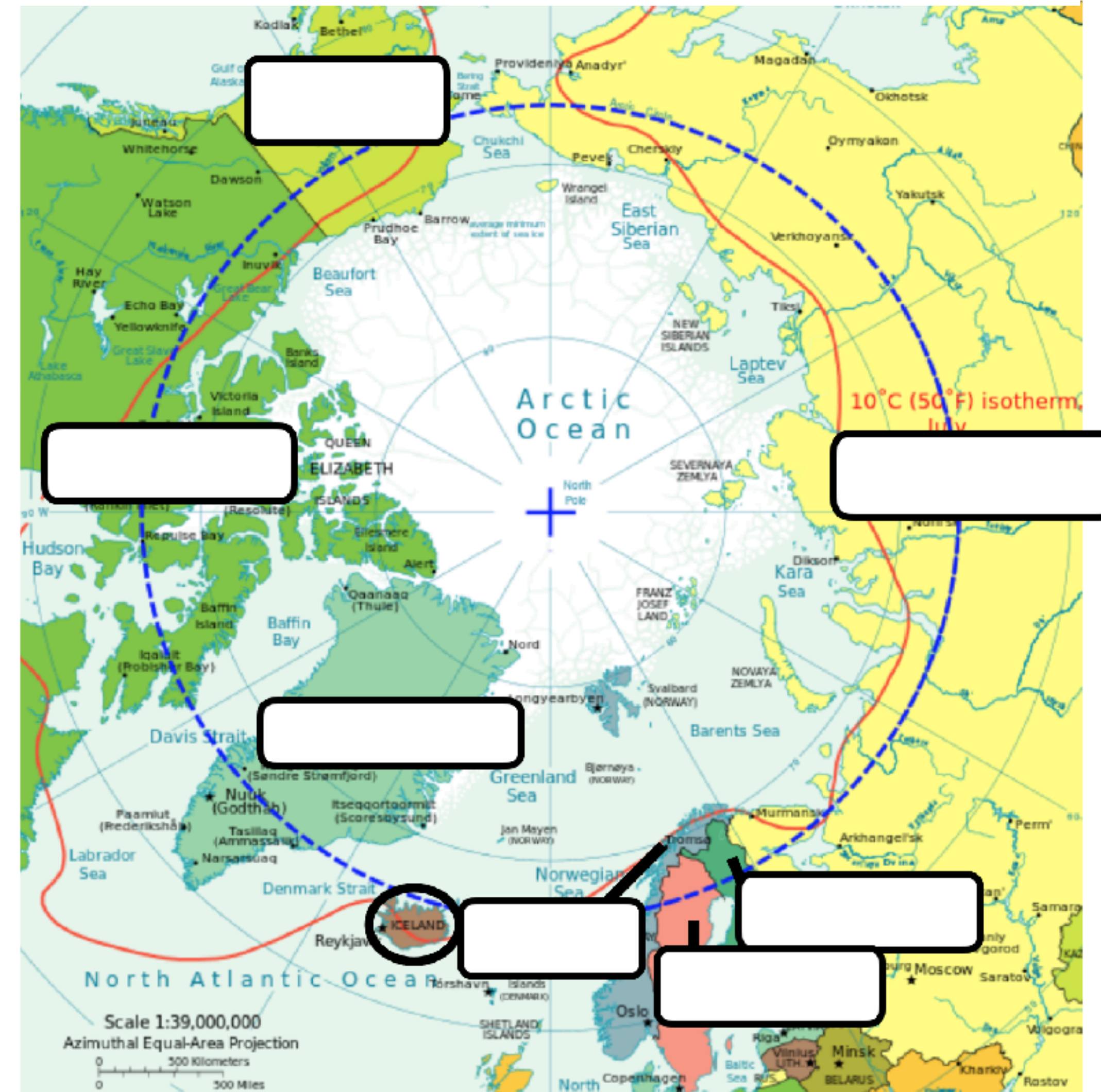
Today we will:
Hear about which countries are in the Arctic Circle and which animals inhabit those countries.
Learn about how Arctic animals have adapted to their surroundings to increase their chances of survival.
The definition of 'mammal' and 'marine mammal'.

Which animals live at the North Pole?

- A: Polar Bear
- B: Penguins
- C: Neither
- D: Both

Was that a trick question? (If you think yes: WHY?!)

Can you name all the countries in the Arctic Circle?



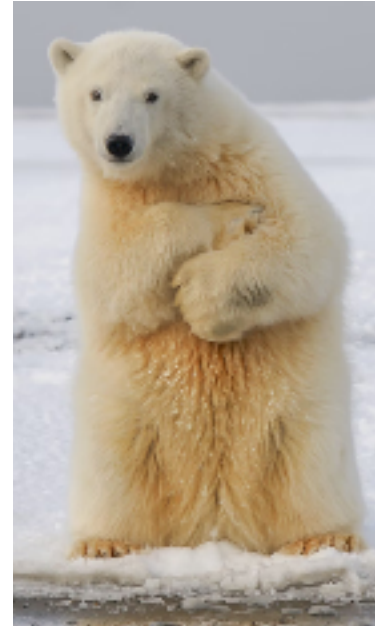
Which of these animals have blubber?

(And can you explain why?! Quite hard!)



Walrus

Guess:
Y/N
Answer:
Y/N



Polar Bear

Guess:
Y/N
Answer:
Y/N



Ringed Seal

Guess:
Y/N
Answer:
Y/N



Arctic Fox

Guess:
Y/N
Answer:
Y/N



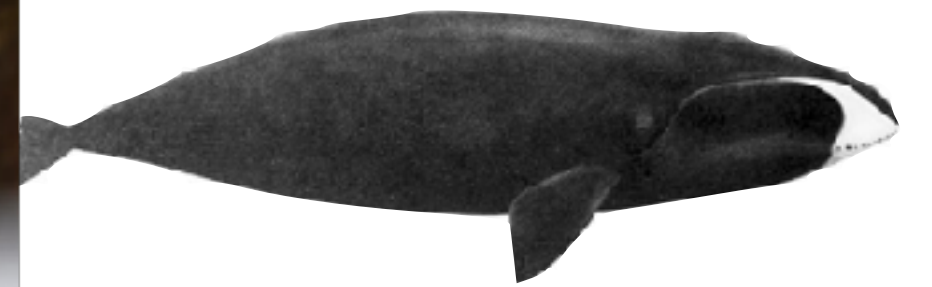
Snowy Owl

Guess:
Y/N
Answer:
Y/N



Snowshoe hare

Guess:
Y/N
Answer:
Y/N



Bowhead Whale

Guess:
Y/N
Answer:
Y/N

Space in case you
want to make notes

How many different species of animal are there on this page?





Theatre of Science Polar Regions 4: Antarctic Animals!

Africa North America The Americas Antarctica South America South Africa

Draw lines!

Country Continent Neither

To join in bring: A4 paper, scissors, glue or tape, pens (including yellow, black, orange & red).

Today we will: Understand how large Antarctica is and be able to recognise different parts, including major mountain ranges and ice shelves. Hear about how penguins are distributed around Antarctica, how to tell different penguin species apart.

Which animals live at the South Pole?

- A: Polar Bear
- B: Penguins
- C: Neither
- D: Both



Emperor Penguin



Gentoo Penguin



King Penguin



Chinstrap Penguin



Adelie Penguin

Know your penguins!

Look at the photos / clues and work out which penguin it is. Then match it to a letter and find the hidden words.



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- S**
Emperor Penguin
- T**
Adelie Penguin
- E**
Gentoo Penguin
- R**
Chinstrap Penguin
- A**
King Penguin



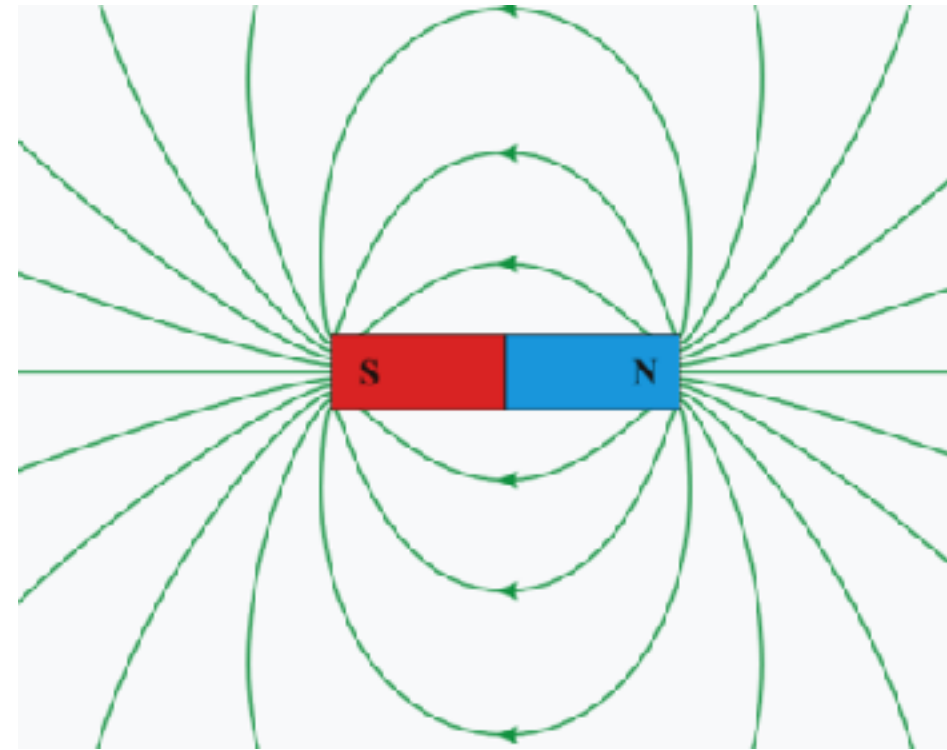
Theatre of Science Polar Regions 5: The Aurora!

To join in bring: Bowl of water, magnet (any!), small leaf, needle or pin. Candle, way to light it, salt. Adult supervision if necessary!

Is the Sun...?

- A: Solid B: Liquid
- C: Gas D: Something else?

(If D: what?! _____)



Magnets have a north pole and a south pole

Like poles repel



Opposite poles attract



Today we will:
Understand what causes the aurora by looking at:
What is meant by 'Earth's magnetic field', 'solar wind' and 'magnetosphere'.
How the solar wind and Earth's magnetosphere interact.

What's weird about the north pole of a compass needle pointing to the North Pole?



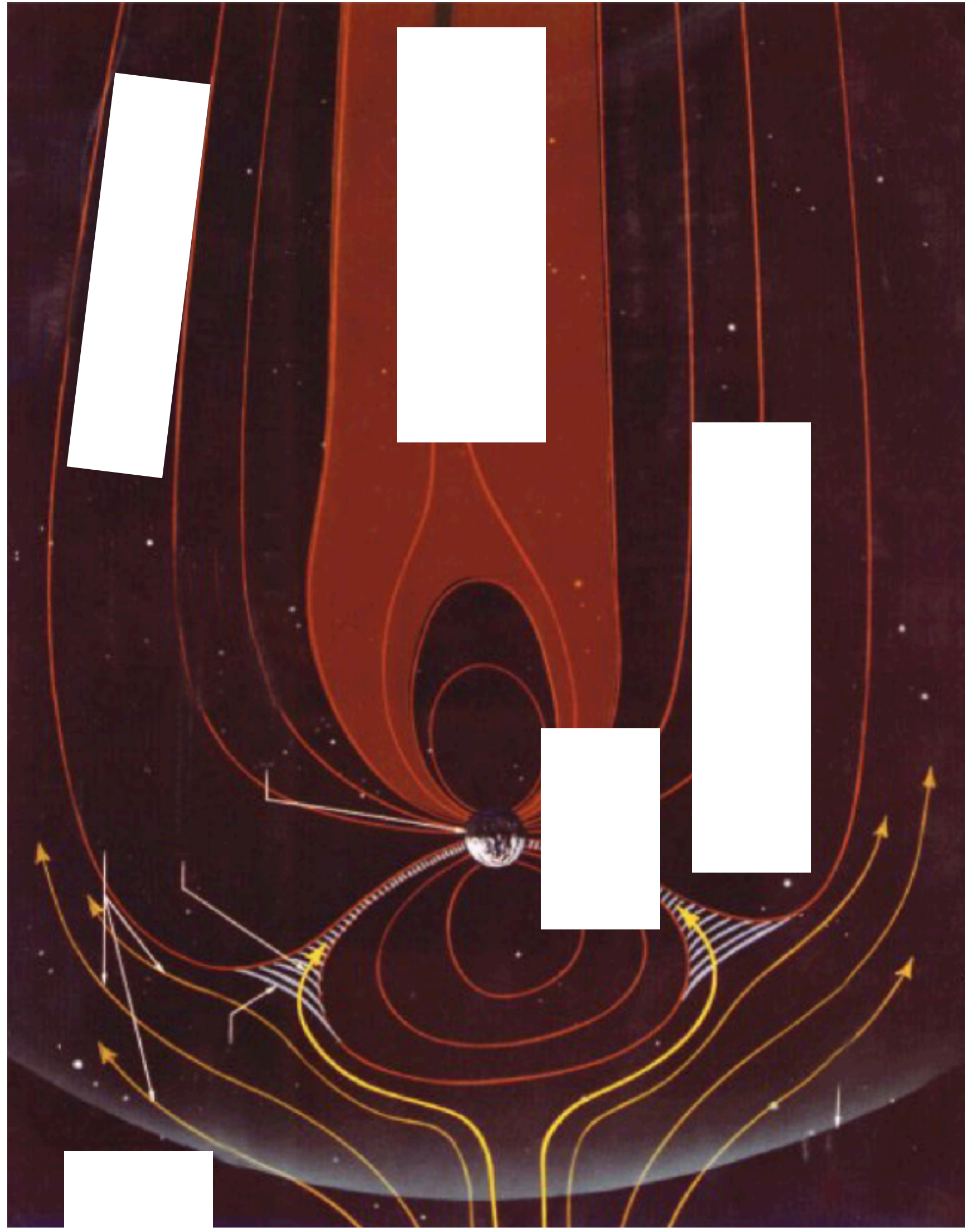
Earth is a giant magnet! The geographic _____ pole is the magnetic _____ pole and the _____ south pole is the _____ north pole.

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The Magnetosphere (White bits are room for your notes, not specific labels)



Bingo!

Solar wind	South Pole	Magnetic	Magnetic field
Field line	Plasma	Electrified	Every year
Every day	Electron	Bow Shock	Magneto sphere
Geographic	Excited	Solar fluffy	North Pole