SASTA OLIPHANT SCIENCE AWARDS

SOUTH AUSTRALIAN SCIENCE TEACHERS ASSOCIATION

Highly Commended

Scientific Inquiry

Year 3-4

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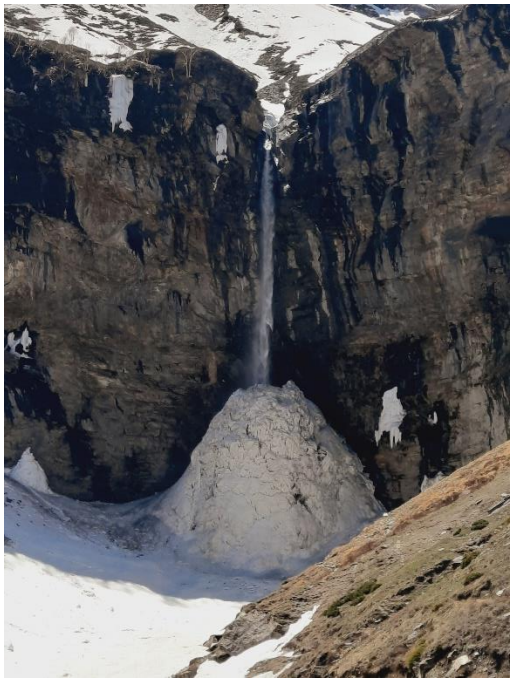
Ice Age: Race to Melt: What's really Heating our Planet?

By Abhyuday Ramchuritter & Atharv Dhadook

Background

In April, we went on a special holiday to India. Our uncle lives in Himachal Pradesh and planned a trip to the Himalayan mountains to make this trip even memorable. We were excited to see snow and even built a snowman!

At Sissu Water fall having fun in snow building snowman in April 2025



We finally climbed up to the Sissu fall! It was very hard to climb in snow. When we reached there, we realised that there was a walking trail leading to the fall. We did not have to climb in snow. But it was a great adventure!

Image credit: our sister, Apala Dhadook 😊!

At Sissu Waterfall, Mum told us that the water in this fall comes from glaciers in the Himalayan peaks. We wondered: why is the ice melting if it's still cold on the peaks? This made us think not just about ice, but a bigger question, what's really heating our planet and melting glaciers? Is it just the sun, or are there other environmental factors like air temperature, water, or even the surfaces around us?

We remembered our Year 2 OSA project where we learned about global warming. Pollution and greenhouse gases trap heat in the Earth's atmosphere. Even in the Ice Age movie, rising Earth temperatures caused ice to melt. Maybe warmer air from global warming is reaching the mountains and melting the glaciers, not just the sun!

When we came back home, we wanted to know more about melting glaciers. We collected some data on Himalayan and Glaciers melting:

- Some Himalayan peaks are over 7,000 metres high, but they are still warming up faster than other parts of the world.
- The Himalayas have lost over 40% of their glacier ice in the past 50 years.
- This melting can cause floods, less drinking water, and big changes to rivers.

We decided to do a science inquiry to find out what makes the ice melt faster.

Our Inquiry Question:

What environmental factor makes ice melt the fastest: sunlight, air, or water?

Our Hypotheses and Reasons:

Environmental factor	Hypotheses	Reasons
Sun heat	1) Sun heat will make the ice melt the fastest.	1) Sun heat is the hottest of all.
Air	2) Air at the same temperature will not make the ice melt faster than the sun heat. 3) The air at the same temperature will make ice melt faster than the normal temperature water.	2) Sun heat is hotter than the air. 3) Air on a sunny day is hotter than room temperature tap water.
Water	4) Room temperature water will not melt ice faster than the sun heat or air at the same temperature.	4) Room temperature water is colder than the sun heat or air.

Experiment 1: Melting Race

Materials

- 2 plates
- 1 bowl of room temperature water
- 3 same-sized ice cubes
- Timer

Method:

1. Set up trays and a bowl of water outdoors:
2. One tray in sunlight
3. One Tray in shade
4. Bowl of water in shade
5. Place an ice cube in each, then start the timer.
6. Record time to melt.
7. Repeat three times.

We did the same test indoors with

- One tray on sunny windowsill
- One tray indoors not in sun
- One bowl of water not in sun

Observations and Results:

We recorded all the data on table (see table 1, table 2, comparison graphs and recordings of first trial comparison. See the next page.)

Our observations:

- Ice cube in water melted the fastest, both indoors and outdoors even without direct sunlight.
- Ice cube in sunlight melted faster than in just on the tray in air, both indoors and outdoors.
- Ice cube outdoors in sun melted faster than the sun through windowsill.
- Ice in air indoors melted faster than air outdoors.

Table 1 Ice Melting Time Outdoors

Outdoors Data Table

Environmental Factors	Trial	Melting time Hr : min : sec	Time Rounded in minutes	Average Time
Direct Sun	1.	00 : 24 : 43	25	25+23+23 / 3 = 23.66
	2.	00 : 22 : 53	23	
	3.	00 : 23 : 28	23	
Water (in shade)	1.	00 : 18 : 29	18	18+20+20 / 3 = 19.33
	2.	00 : 19 : 45	20	
	3.	00 : 20 : 15	20	
Air (in shade)	1.	01 : 23 : 21	83	83+86+85 / 3 = 84.66
	2.	01 : 25 : 31	86	
	3.	01 : 24 : 35	85	

① Sun: 3)71 → 23.66; -6, 11, -9, 20, -18, 20, -18, 2

② Water: 3)58 → 19.33; -3, 28, -27, 010, -09, 10, -9, 1

③ air: 3)254 → 84.66; -24, 14, -12, 20, -18, 20, -18, 2

Table 2 Ice Melting Time Indoors

Indoors Data Table

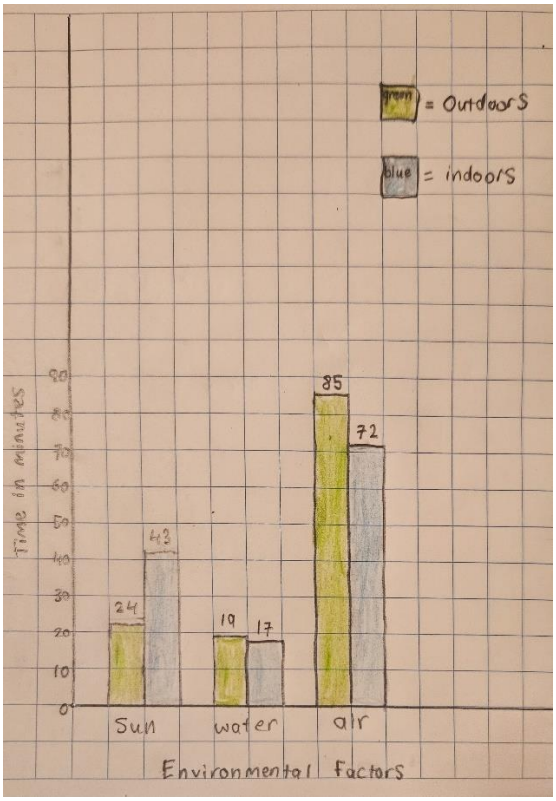
Environmental Factor	Trial	Melting Timer recording Hr. min. sec	Time Rounded in minute	Average Time
Direct sun (Window sill)	1	00 : 41 : 41	42	42+44+42 / 3 = 42.66
	2	00 : 43 : 52	44	
	3	00 : 42 : 09	42	
Water (no sun)	1	00 : 16 : 18	16	16+18+18 / 3 = 17.33
	2	00 : 18 : 15	18	
	3	00 : 17 : 38	18	
Air (no sun)	1	01 : 09 : 49	70	70+74+72 / 3 = 72.00
	2	01 : 14 : 18	74	
	3	01 : 11 : 38	72	

Sun: 42.66; 3)128.0; -12, 008, 6, 20, 18, 20, 18, 2

water: 17.33; 3)52.0; -3, 22, 21, 10, 9, 10, 9, 1

Air: 72; 3)216.0; -21, 006, 6, 0

Comparing Data using Graph:



Graph 1: Average Ice Melting Time

Trial 1 outdoors:

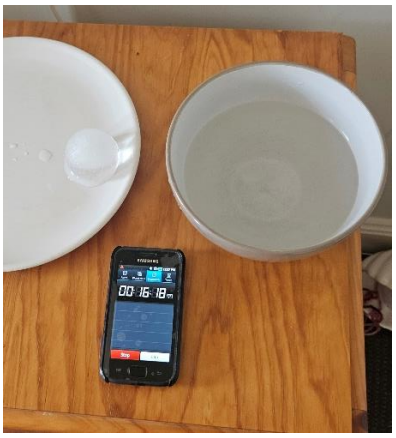
In the sunlight

In water (under shade)

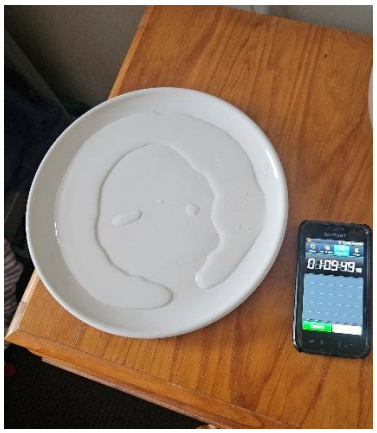
In air (under shade)

Trial 1 indoors:

In the sunlight at the windowsill



In water (no sunlight)



In air (no sunlight)

Discussion:

We were surprised that water melted ice the fastest both outdoors and indoors. Mum explained, “this was because of how heat transfers. The sunlight can be very warm, but it only heats the ice from the top and slowly through the air. But water gives the ice a full hug, makes it easy for heat to move faster!” We watched a few videos to understand this further (listed under resources)

Scientific Principle:

These videos helped us understand the scientific principles of heat transfer: “the better surface contact, faster heat transfer”. There are three ways the heat transfers (fig. 1):

- Radiation: Heat travels through invisible electromagnetic waves like sunlight. **Max Planck and Albert Einstein** explained how the sun's energy travels and warms things without touching them.
- Convection: Heat moves through liquids and gases like air and water. This was explained by **James Prescott Joule and Lord Kelvin**, who also explained how heat and energy move.
- Conduction: Heat moves through direct contact. **Joseph Fourier,** explained how heat flows through materials with direct contact.

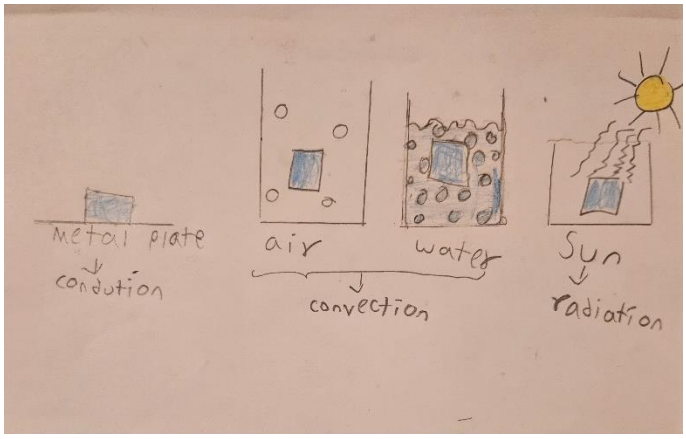


Fig. 1. Type of heat transfer

Experiment 2: Do Different Surfaces Change How Fast Ice Melts?

After our first experiment, we had another question. What if the surface that the ice is sitting on makes a difference too? So, we set up 3 different plates (metal, glass and ceramic) and placed ice cubes on each to see which one melts the fastest.

Results:

We found that the ice on the metal tray melted the fastest, followed by the glass plate. The ceramic tray was the slowest.

Discussion:

Our experiment showed us that the type of material underneath the ice affects how fast heat moves into the ice. Metal is a good heat conductor, so, it passes heat more easily to the ice.

We related all our observations to the science we learnt about heat transfer in the table 3.

Table 3: Scientific explanation of observations

Observation	Heat Transfer Type	Scientific Explanation
Ice melted fastest in **water (bowl in shade)**	**Convection + Conduction**	Water transfers heat efficiently through both particle movement (convection) and contact with ice (conduction). Water "hugs" the ice, giving more surface contact.
Ice in **sunlight (air)** melted faster than in air/shade	**Radiation + Convection**	Sun's rays transfer energy by radiation. Warm air circulates around the ice (convection), but not as efficient as water.
Ice in **air (shade)** melted slowest	**Convection only**	Air is a poor conductor and less dense than water. Heat is transferred slowly.

Indoors – Ice on sunny windowsill melted faster than in shade	**Radiation through glass + Convection**	Sunlight through windows still warms objects via radiation; indoor air is warm and less ventilated.
Ice on **metal tray** melted faster than on ceramic	**Conduction**	Metal is a good thermal conductor, so heat transfers quickly through it into the ice.
Ice on **glass** melted faster than ceramic but slower than metal	**Conduction**	Glass conducts heat better than ceramic but not as well as metal.
Ice on **ceramic tray** melted the slowest	**Conduction (low)**	Ceramic is a poor conductor, slowing down heat transfer into the ice.

Real-World Connection: Melting Glaciers

These experiments helped us understand how glaciers melt in the real world. Glaciers are in contact with air, sunlight, rock, and sometimes even water. When global warming raises the temperature of the air, ground, and water around them, glaciers melt faster. Water from the melting ice can also create melt pools that warm the glacier even more, making it melt quicker. Glaciers sitting on warming rock may melt faster than those surrounded by snow.

That's why glaciers resting on dark rock or warming ground might melt faster than those on snow or soft ground.

Conclusion:

Our guess that sun melts fastest wasn't fully right. We learned that water melts ice fastest, and metal transfers heat well, helping ice melt quickly. This shows why glaciers can melt even when it isn't very hot. Through these simple ice experiments, we learned it's not just sunlight, but water, warm air and even surfaces like rock and metal that play a big role in how fast ice melts. This helped us understand how global warming affects glaciers and our planet in many ways.

Resources:

- Himalayan glacier ice: https://kids.britannica.com/students/article/Himalayas/274884/media?assemblyId=192232
- Impact of Climate Change on Himalayan Glaciers and Glacial Lakes https://www.youtube.com/watch?v=N_ZbAf_U7_c
- How Glaciers Change the World: https://www.youtube.com/watch?v=W1InAfn7am0

- 10 brrr-illiant glacier facts: https://www.natgeokids.com/uk/discover/geography/physical-geography/glaciers/
- Heat Transfer: https://www.britannica.com/science/thermodynamics
- Heat | Conduction, Convection, Radiation: https://www.youtube.com/watch?v=V2NP-aSl1kM
- What is heat | Conduction | Convection | Radiation https://www.youtube.com/watch?v=j8cDsWjSyQE

Acknowledgement:

Mum and Ishi helped with taking photos while we were conducting the experiments.

Ishi taught us how to create data tables and graphs and add pictures in the document.

Mum and Ishi reviewed the final document and helped uploading on the OSA website.

Mr Hern, Our Science teacher helped with all the OSA forms and entry.

SCHOOL: Vale Park Primary School

Activity: Give a brief outline of what you are planning to do.

We are planning to conduct set of experiments to investigate what enviromental factors effect the rate at which ice melts. It will help us to understand glacier melting in the real world.

Are there possible risks? Consider the following:

- Chemical risks: Are you using chemicals? If so, check with your teacher that any chemicals to be used are on the approved list for schools. Check the safety requirements for their use, such as eye protection and eyewash facilities, availability of running water, use of gloves, a well-ventilated area or fume cupboard.
- Thermal risks: Are you heating things? Could you be burnt?
- Biological risks: Are you working with micro-organisms such as mould and bacteria?
- Sharps risks: Are you cutting things, and is there a risk of injury from sharp objects?
- Electrical risks: Are you using mains (240 volt) electricity? How will you make sure that this is safe? Could you use a battery instead?
- Radiation risks: Does your entry use potentially harmful radiation such as UV or lasers?
- Other hazards.

Also, if you are using other people as subjects in an investigation you must get them to sign a note consenting to be part of your experiment.

Risks	How I will control/manage the risk
1. water spill from melted ice.	we will conduct the experment on hard surface that can be wiped.
2. Electrical risk with lamp	we will keep lamp cords away from water and dry hands before touching electricity.
3. Mild frostbite from icecube.	We will keep ice in hands for long time.

(Attach another sheet if needed.)

Risk Assessment indicates that this activity can be safely carried out

RISK ASSESSMENT COMPLETED BY (student name(s)): Abhyuday Ramchuritter and Atharv Dhadook