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# 18.0.E Posters Research Conference Consumer Product Assessment

Christopher F. Bauer

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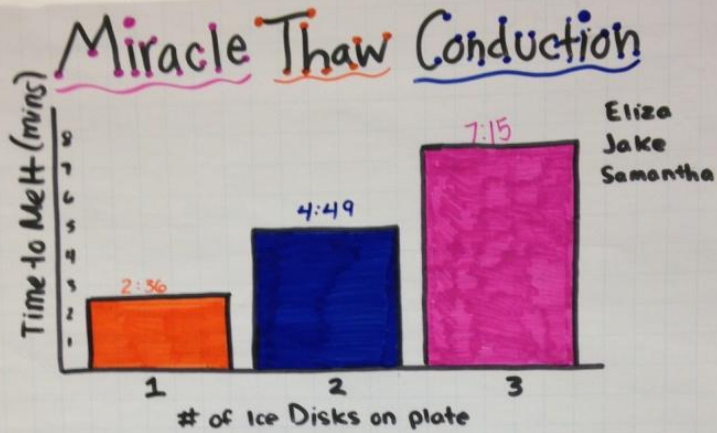
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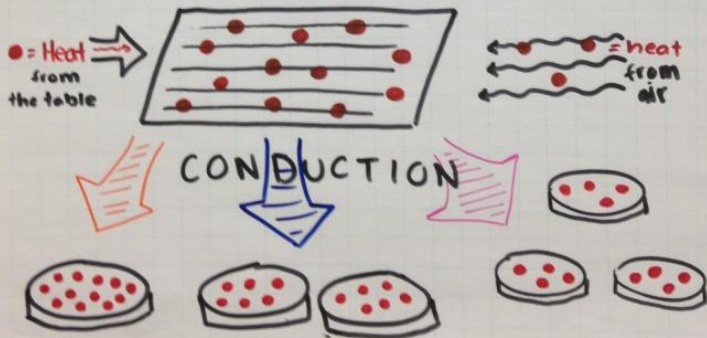
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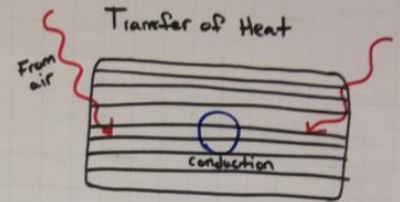
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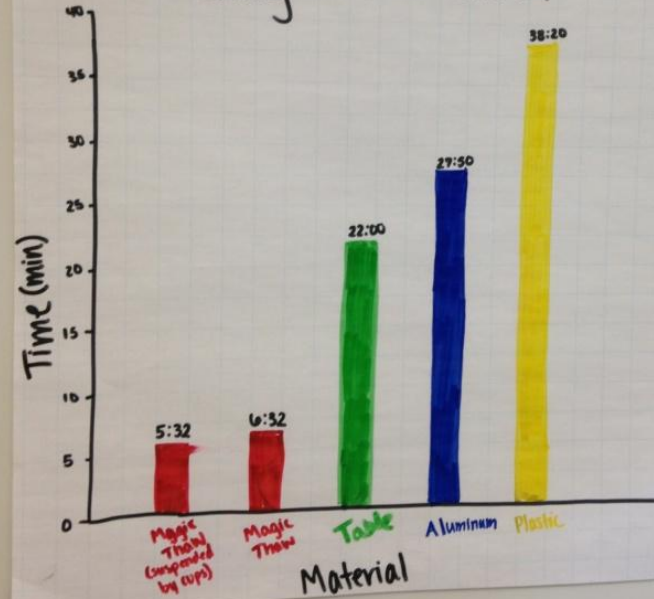
First Law of Thermodynamics: Conservation of Energy



Material	Initial Temp. °F
Magic Thaw	75.4
Table	73.6
Aluminum	71.0
Plastic	71.2



## Melting Time vs. Material



Nick B.  
Emma A.  
Charles C.

Christopher F. Bauer, Principal Investigator.

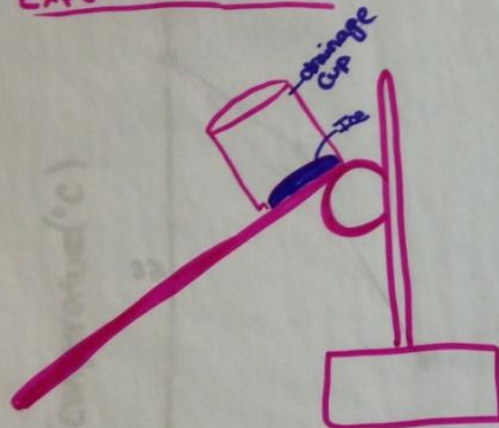
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# Do the Ridges in the Thaw-Matic Have an Effect on its Ability to Melt Frozen Substances?

## Experimental Setup



Conditions	Results
Flat Ridged Side	5 min and 5 sec
Flat Non-Ridged Side	6 min and 7 sec
Tilted Ridged Side	3 min and 14 sec
Tilted Non-Ridged Side	3 min and 50 sec

## Conclusions

Draining the water puddle shortened melting time for both sides.

Less water in between the ice and the Thaw-Matic allows for more contact with the ice.

- \* Possible sources of error \*
- The temperature of the Thaw-Matic between experiments
  - The coating of the ridged side vs. the non-ridged side

Emily K  
Kyk R  
Cole F.



# Experiments

• Miracle thaw  
vs  
tabletop

• Miracle thaw  
vs  
aluminum tray on metal stand  
vs  
aluminum tray on tabletop

• ice on metal ring stand  
vs  
ice on miracle thaw

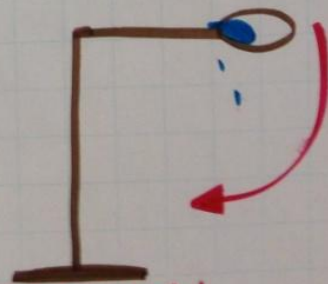
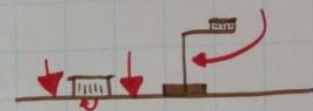
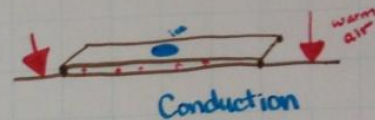
# Results

• Faster on Miracle  
thaw than  
tabletop (5:30)

• fastest on miracle  
thaw, 2<sup>nd</sup> fastest  
was aluminum tray  
on tabletop

• fastest on Miracle  
thaw.  
↳ ice touching  
Metal ring stand  
melted quicker  
than the portion  
of ice exposed  
to air

# Conclusions

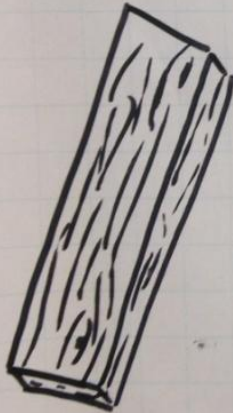


Heather Price, Beck Pettis, Mandy Graves **Conduction > convection**

JON  
MARISA  
MIRIAM

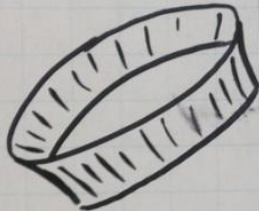
# Conductivity Levels By Materials (Black)

Wood



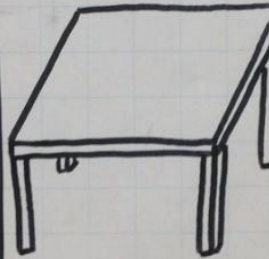
Time to melt: ~ 30+ mins

Aluminum  
Pan



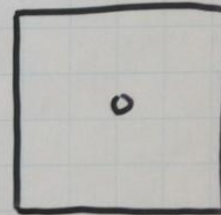
Time to melt ice: ~ 25+ mins

Lab Table



Time to melt ice: 15+ mins

Metal sheet

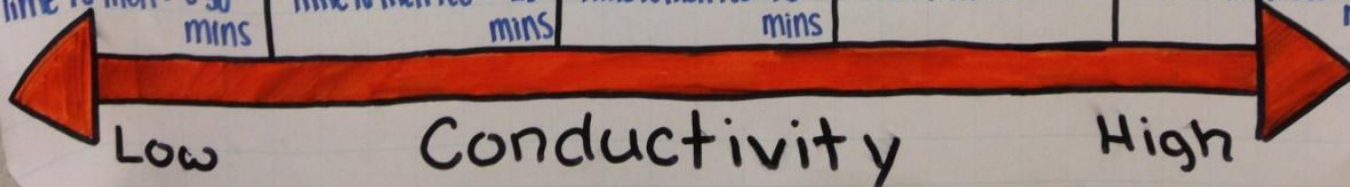


Time to melt ice: 13 min

Miracle Thaw



Time to melt ice: 3-15 mins



Christopher F. Bauer, Principal Investigator.

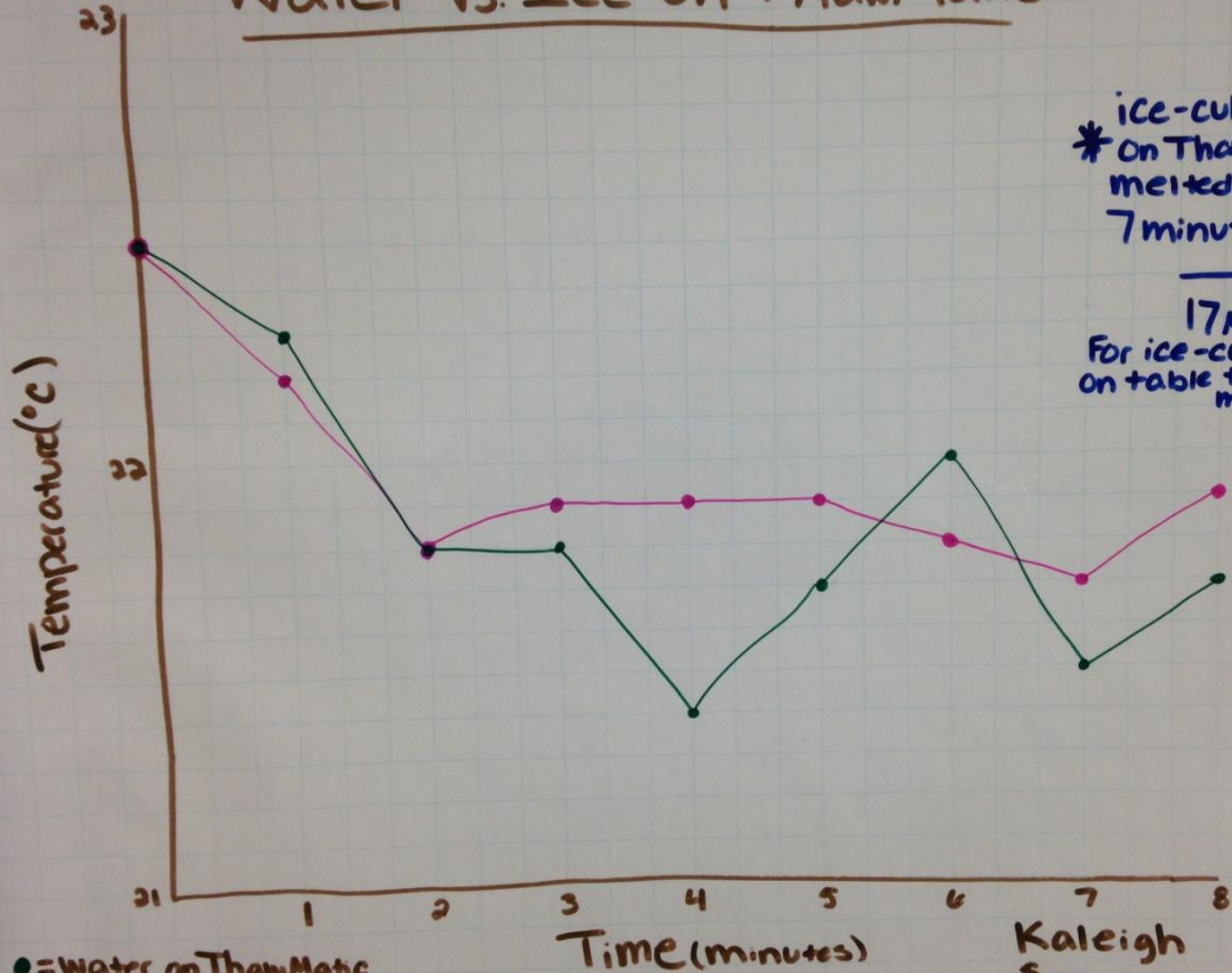
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# Water Vs. Ice On ThawMatic



ice-cube  
\* On ThawMatic  
melted in  
7 minutes

→  
17 Mins  
For ice-cube  
on table to  
melt.

● = Water on ThawMatic  
● = Water in Cup

Kaleigh  
Sean  
Taylor

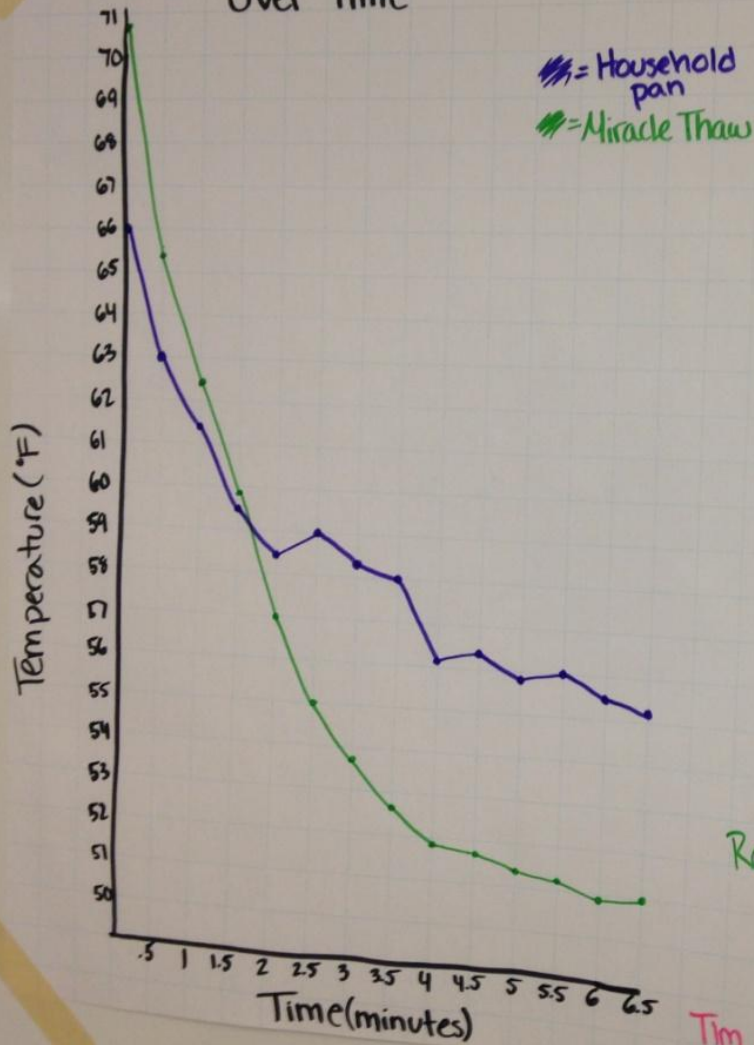
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# Surface Temperature Over Time



Platform	Time to thaw
Table	17 mins
Miracle Thaw	6 mins 46 sec
Ring stand base	6 mins 21 sec
Household pan	6 mins 33 sec

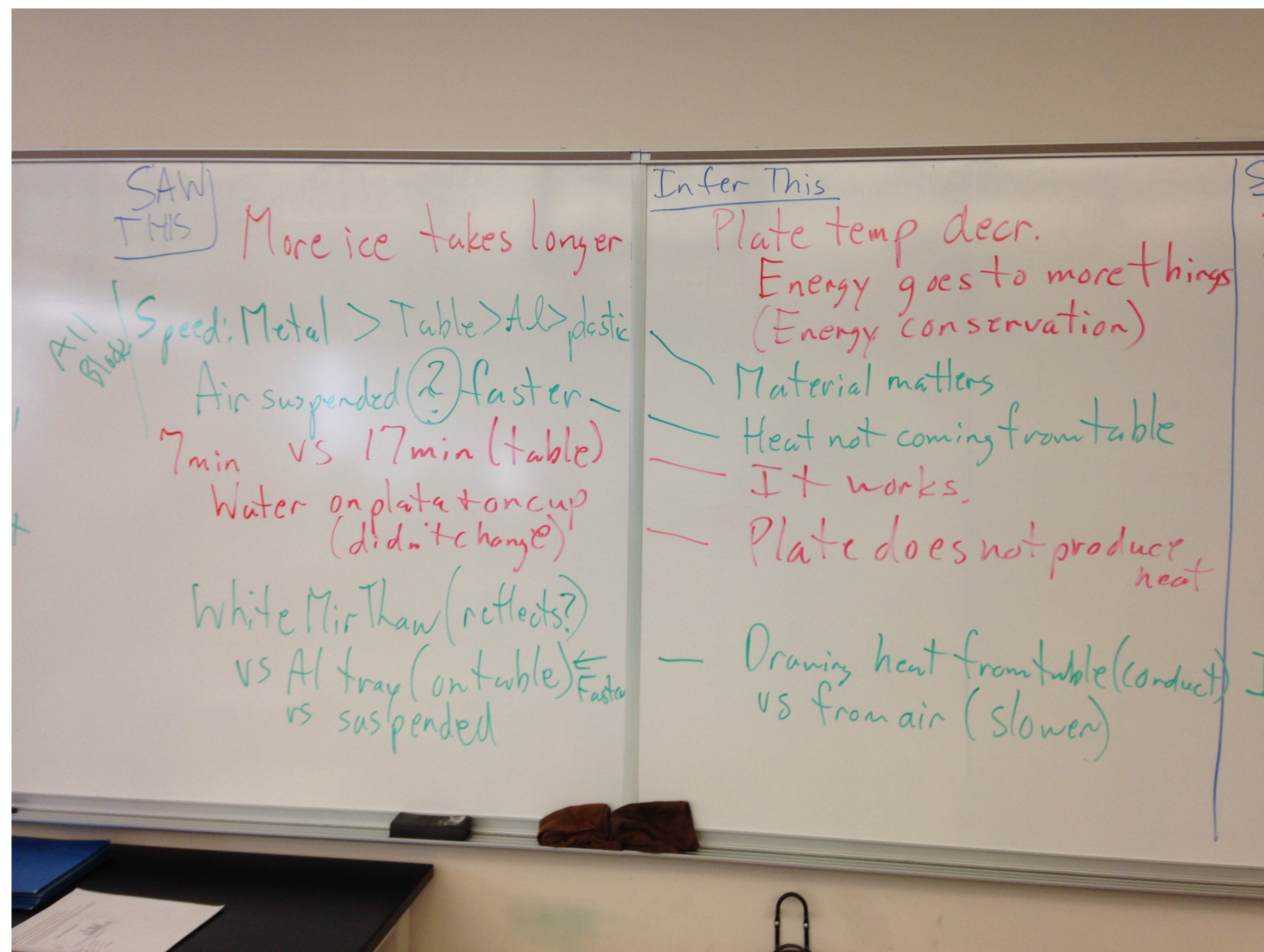
Platform	Temp. Surface
Table	78.3°F
Miracle Thaw	70.7°F
Ring stand base	64.8°F
Household pan	66°F

Findings: Common metal items melt ice (thaw meat) at approx. the same rate as Miracle Thaw.

Room Temperature was 74.2°F

Tim Closson, Emily Dwyer, Amanda Jones





SAW THIS

More ice takes longer

All Blue

Speed: Metal > Table > Al > plastic

Air suspended (?) faster

7 min vs 17 min (table)

Water on plate + on cup

(didn't change)

White Mir Thaw (reflects?)

vs Al tray (on table) ← faster

vs suspended

Infer This

Plate temp decr.

Energy goes to more things

(Energy conservation)

Material matters

Heat not coming from table

It works.

Plate does not produce heat

Drawing heat from table (conduct)

vs from air (slower)



Table > Al > Wood  
(30 min)

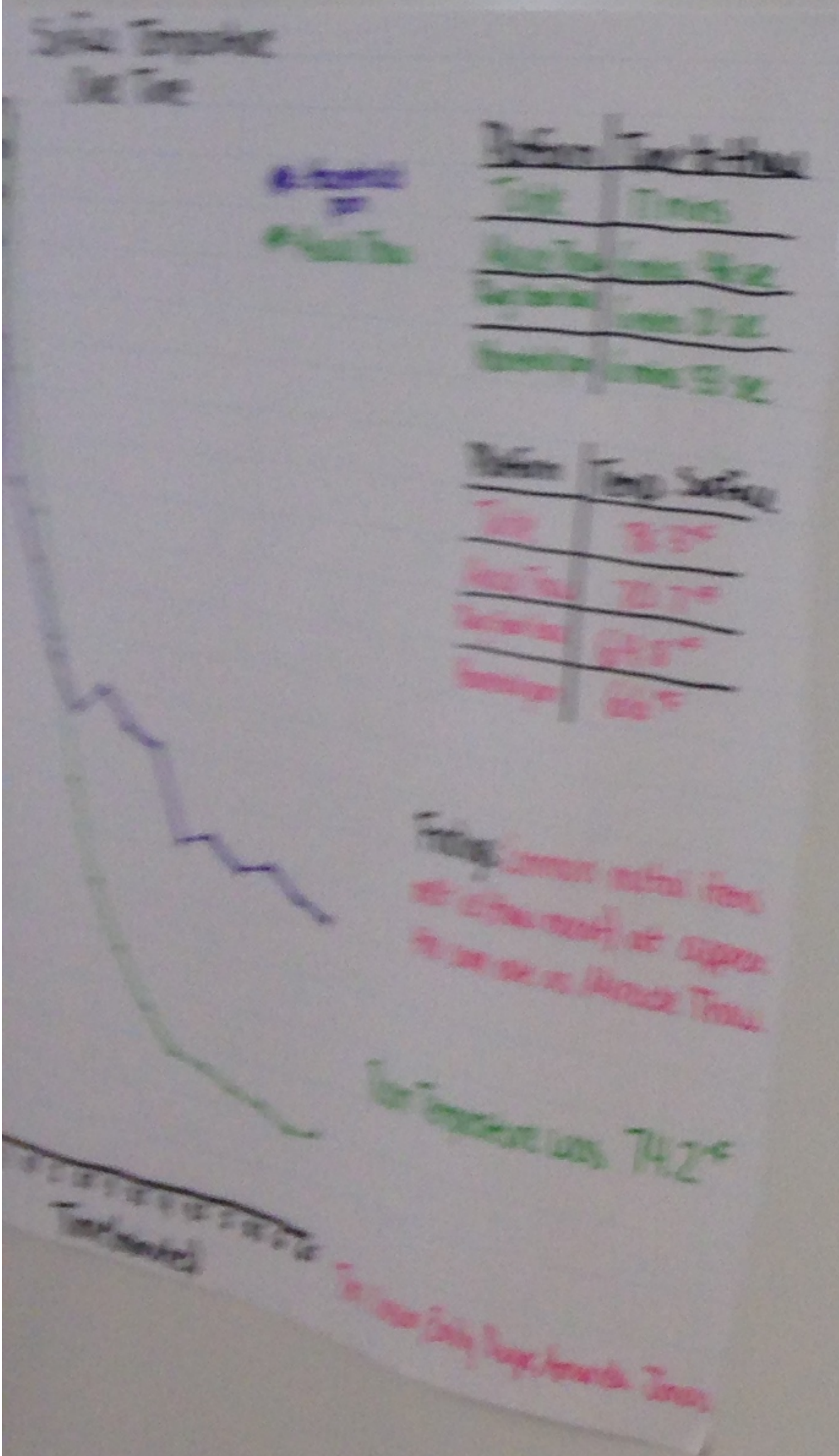
Sheet  
metal

MIT  
(IR gun)

Metal not always  
faster  
(may differ metal  
to metal)

Confirms heat  
loss

All  
Black





Research Conference Findings – Performance of MagicThaw and Thawmatic Consumer products

Collection of observations and inferences about how the products work

It is possible that I have reworded or rephrased these for clarity vs original notes

The product is call MT below for shorthand

A couple of **notes in red** bring your attention to some aspects we did not test.

Observation (what we saw)	Inference (what we think it means)
In all experiment, air was in contact with the ice and any underlying material. Melting always occurs where the ice contacted the underlying material.	Air contact alone does not transfer heat to any great extent. <b>[What could we have done experimentally to test this directly?]</b>
Several independent groups found that ice on MT melted in 5-7 minutes, faster than many other materials	MT does promote melting
Several groups found that melting took ~17 minutes on table top	A black surface alone (light absorption as source of heat) does not promote melting
A couple groups found that other metallic materials promoted melting nearly as fast as MT (iron skillet, ring stand base)	The MT is not necessarily special in its composition since routine metal objects achieve the same outcome
Metallic objects (including MT) seem to allow faster melting: slowest materials were found to be plastic, clay, bubble wrap, wood (~ 30 minutes)	Metals conduct heat better than plastic or wood. Suggested that metallic bonding (mobile electron sea holding atoms together) was responsible, vs covalent bonding (electrons held in fixed positions) – harks back to readings
No metallic objects were faster than MT, but some were slower (sheet metal), aluminum pans	Different metals may conduct heat more or less easily <b>[were the metal objects that were tested different in some other way besides composition?]</b>
Whether the surface (of anything) was white or black did not matter much	No evidence that absorption of room light (which would be better for black surfaces) provided more heat for melting
In aluminum pan, melting was faster when pan was directly on table top vs being suspended in air.	Conduction from table to pan to ice was more efficient than from air to pan to ice. Room air is poorer conductor, and convection of air was not a factor.
Ice placed on a ring-stand ring suspending in air melted faster where it contacted the ring, vs where air lie underneath.	The underlying surface, especially if metal, conducts heat by contact to a much larger degree than does air.
IR temperature sensor showed temperature of surface of MT adjacent to the ice decreased (confirmed by several groups)	Direct evidence of removal of heat from the MT.
When water that was forming under the melting ice was removed, melting occurred faster.	Direct contact with the metal surface led to more efficient heat conduction. When water is present, the heat is conducted through the water, which slows the process.
Room temperature water placed directly on surface of room temperature MT did not change temperature (measured by digital thermometer)	The MT is not producing heat by some unspecified internal process.
Comparison of rate of melting when starting with 1, 2, 3 disks of ice. Rate of melting slowed proportional to the number of disks of ice.	If MT has a fixed amount of energy available, that is apportioned to the other objects in is in contact with, lessening the overall rate of melting.