

## University of New Hampshire University of New Hampshire Scholars' Repository

---

Day 01

Fire and Ice

---


2016

# 1.0.C Hands-on Temperature Sensation

Chris F. Bauer

*University of New Hampshire*, [chris.bauer@unh.edu](mailto:chris.bauer@unh.edu)

Follow this and additional works at: <https://scholars.unh.edu/day1>

 Part of the [Educational Methods Commons](#), [Scholarship of Teaching and Learning Commons](#), and the [Science and Mathematics Education Commons](#)

---

### Recommended Citation

Bauer, Chris F, "1.0.C Hands-on Temperature Sensation" (2016). *Day 01*. 11.  
<https://scholars.unh.edu/day1/11>

This Report is brought to you for free and open access by the Fire and Ice at University of New Hampshire Scholars' Repository. It has been accepted for inclusion in Day 01 by an authorized administrator of University of New Hampshire Scholars' Repository. For more information, please contact [nicole.hentz@unh.edu](mailto:nicole.hentz@unh.edu).

## KEEPING AN EVEN TEMPERATURE

Tactile sensation of temperature

Concepts: Hot and cold are human perceptions.

Procedures: Using fingers to feel and describe water temp

The idea is to keep the water temperatures unknown, so that the students can't anticipate their particular situation. This makes it more intriguing to do, otherwise, it's kind of ho-hum.

The idea is to acclimate their fingers to either hot or cold (cups A and C), and then the immersion into room temperature water (cup B). The procedure sets up having opposite observations (warm or cool) about the water in cup B. And that should start a conversation leading to questions for the Question Bank.

-----  
At each table place 3 green mtn mugs, lids on loosely.

One mug containing water at room temp

One mug containing ice water (no ice in it)

One mug containing hot water

The cooling/heating must be done out of sight.

The water must all look the same at first glance.

Fill up to near rim -- allow room for 2 finger displacements

Heat the hot water in a beaker on hot plate to about 50-60 degrees, or in microwave, then balance with cooler water. Will large storage container.

Make ice water slurry in large storage container. Make sure mugs do not have ice in them.

Room temperature water right from the tap – let sit out.

For debriefing, have sheet on wall for Question Bank.

**Recorder:** Record observations and comments on the Recorder Report Form.  
Write each group member's name and role on the sheet.  
All comments must be complete sentences.

**Manager:** Read the brief procedure below to your group.  
Check for readiness to proceed, then go ahead.  
There are copies of this handout for everyone to have afterwards.

**Spokesperson:** You will report to the class regarding your group's observations.

---

**PROCEDURE:** There are 3 plastic mugs. All contain water.

**WITHOUT ANY DISCUSSION OR COMMENT THROUGH THE PROCEDURE**

Carefully remove the lids of all three cups.

Two people in your group will use cup A. Two will use cup C.  
Immerse your pinky finger CAUTIOUSLY in your cup (A or C)

Keep it there for count of 10, or until you can't stand it any more.

Everyone at about the same time, remove your finger from that cup.  
Immerse that same finger in the cup in the center of table (B)

Be prepared to describe (not yet) how your finger feels now.

---

## **DISCUSSION**

1. One at a time, each group member should describe how his/her finger felt in the MIDDLE cup.  
If there is disagreement on that observation, you will need to find a way to resolve the disagreement.  
This may take additional experimentation on your part.  
Go ahead. Make a record of that.
2. Assume you just entered this room, having been outside without gloves on today.  
How would your pinky feel if inserted into each of the three cups?
3. Identify at least two other instances from your personal experience that are consistent with the observations you just made. Discuss them sufficiently to be sure that they are about the same phenomenon.
4. What is the central concept being explored by this experiment?

5. **Develop at least three good questions for the Question Bank that would extend our inquiry regarding your observations. These questions could go in ANY direction. Recorders should write those questions in the Bank.**

# RECORDER REPORT, Chem 444A "Fire & Ice"

Group Member Name

Role

Date: 1/20/15

Jon Tamposi     manager

Nicholas Bouchard     spokesperson

Amanda Graves     reflector

Taylor Witkiewicz     recorder

① Cup B felt ~~to~~ colder for cup C users and warmer for cup A users.

② Cup A would still feel cold. Cup B would feel ~~to~~ warmer than before.  
Cup C would feel too hot.

③ When you get into a hottub after being in a cold pool the hottub feels warmer than if you just went in the hottub and not the pool first.  
When you come inside from the cold and wash your hands, the water feels hotter than usual.

④ The central concept is how we perceive temperature depending on the temperature of your previous environment.

⑤ Why does glass break when it experiences a drastic change in temperature?  
In what situations? Hot to cold? Cold to hot?

When should you ice an injury and when is it better to heat it?

What parts of the body react to temperature changes the most?

Christopher F. Bauer, Principal Investigator.

This material is based upon work supported by the National Science Foundation under Grant No. 1245730.

Any opinions, findings and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

Licensed: <http://creativecommons.org/licenses/by-nc-sa/3.0/>

# RECORDER REPORT, Chem 444A "Fire & Ice"

Group Member Name

Role

Date: 1/20/15

<u>Take</u>	<u>manager</u>
<u>Samantha</u>	<u>recorder</u>
<u>Emma</u>	<u>spokesperson</u>
<u>Becky</u>	<u>reflector</u>

① Take felt a neutral temperature in the middle cup. Samantha also felt a neutral temperature in cup B. Take and Samantha both started in cup A. Emma felt cup B to be slightly cold. Becky also felt cup B to be slightly cool. Emma and Becky both started in cup C. The middle cup felt differently to both groups because one group started in cold water and the other started in warm water.

② Cup C would feel the warmest, and cup B would also feel warmer than the current temperature of your hands. Cup A would feel either neutral or slightly colder.

③

- If you are at the beach on a hot day, and the sand is too hot, then once you go to the water and come back onto the sand it isn't as hot as before.
- If you are outside in the winter and come inside you feel warm, but if you come from outside in the summer you feel cooler.

④ The central idea would be that temperature, and heat is relative. We also think it is important to note that ~~our~~ homeostasis changes depending on the environment.

⑤

1. Why does one relative temperature seem different from the other?
2. What is the temperature threshold to notice a difference?
3. What are the temperatures of the 3 cups? ~~and~~
4. Were the temperatures chosen for a specific reason?

# RECORDER REPORT, Chem 444A "Fire & Ice"

Group Member Name	Role	Date: <u>1/20/15</u>
<u>Charles</u>	<u>Recorder</u>	<ul style="list-style-type: none"> <li>• Are there exams / final?</li> <li>• What is the point system in collaboration awards?</li> </ul>
<u>Tim</u>	<u>Spokesperson</u>	
<u>Heather</u>	<u>Reflector</u>	
<u>Sean</u>	<u>N/A</u>	
<u>Miriam</u>	<u>Manager</u>	

- 1) Finger in cup B

(A) (X) Miriam: It felt fairly warm, and then changed to room temperature

(C) (A) Charles: It felt a little cold.

(C) (A) Tim: It also felt cold.

(A) (X) Heather: It felt warm, and then changed to room temperature.

(A) (X) Sean: It started warm, then went to "nothingness" as if it couldn't be felt.

  - We switched cups in order to see the difference between cups A and C, and found that A was cold and C was warm.
  - B is fairly like warm
- 2) ~~A~~ Though it is relative to everybody, it can be assumed for the most part that there would be a scale. A would feel cold, B would feel less cold, and C would start to feel warm.
- 3) When you go skiing, then jump into a hot tub, the water will feel even warmer. If you go from a warm pool, to a hot tub, then back to the pool, the pool will feel colder than before.
- 4) ~~The concept~~ <sup>The concept</sup> being explored it is that the feeling of temperature depends upon the ~~variables~~ <sup>variables</sup>. For example, depending on where somebody was at one ~~place~~ <sup>point</sup> in time, determines how they'd feel if they went to a sauna.

Christopher F. Bauer, Principal Investigator

This material is based upon work supported by the National Science Foundation under Grant No. 1245730.

Any opinions, findings and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

Licensed: <http://creativecommons.org/licenses/by-nc-sa/4.0/>

- 5) 1. Could hand temperature affect what we feel when the pinky is placed into water.
2. Why do ~~some~~ some people not feel ~~cold enough~~ <sup>as cold</sup> as other people's?
3. ~~Why do~~ would the experiment change if the body part was changed from the pinky?
4. How long does it take the body to adapt to temperature changes?  
i.e. moving from New England to Florida.
5. More painful to burn to death or freeze to death?

Christopher F. Bauer, Principal Investigator.

This material is based upon work supported by the National Science Foundation under Grant No. 1245730.

Any opinions, findings and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

Licensed: <http://creativecommons.org/licenses/by-nc-sa/3.0/>

# RECORDER REPORT, Chem 444A "Fire & Ice"

Group Member Name

Role

Date: 1/20/15

<u>Marisa</u>	<u>Manager</u>
<u>Emin</u>	<u>Recorder</u>
<u>Amanda</u>	<u>Spokesperson</u>
<u>Calé</u>	<u>Reflector</u>

---

## Observations

1) nity In mug C: felt ~~soft~~<sup>warm</sup> and wet, in B it felt cold.

Minde: In A: cold + wet, in B it tingled

Calé: In B it felt ~~like~~ like the same temp at first and then felt colder

Marisa: In ~~B~~ C ~~it~~ it felt warm and then cold in B.

C = warm      B = room temp      A = cold

2) When pinky is cold:

A: would feel fine

B: would feel warmer

C: would feel hot, tingly, almost hurts

3) Examples: ① when your feet are cold and you get in the shower  
② when touching something really hot like a burner or hair straightener

4) Central Concepts: How the sensation of temperature is affected by body temp.

Questions: ① In moving from one extreme to another (more exaggerated than this experiment) what would be the body's response?

② In treating burns, you do not use ice because of the potential for frostbite. Are these perceptual concepts behind this practice? →



⑤ Does your body react more quickly to hot or cold temperatures?  
respond?

Christopher F. Bauer, Principal Investigator.

This material is based upon work supported by the National Science Foundation under Grant No. 1245730.

Any opinions, findings and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

Licensed: <http://creativecommons.org/licenses/by-nc-sa/3.0/>

RECORDER REPORT, Chem 444A "Fire & Ice"

Group Member Name

Role

Date: Jan 20 2015

Eliza Sneed      Manager

Emily Koester      Recorder

Kyle Beisert      Spokesperson

Kaleigh Zukowski      Reflector

1)

EK - It was cold when I put my finger in the middle cup

KR - Yeah, same.

ES + KZ - Both say it felt slightly warmer, but it was not a big difference.

no one disagrees

The group agrees the water in mug C is warm, the water in mug A is cold, and the mug ~~in~~ in the middle is room temp.

2)

The cold mug would feel normal, the room temperature mug would feel warm, and the warm mug would feel hot.

3)

1) washing your hands after being out in the cold is like going from mug A to mug B.

2) going from a hot tub to a pool is like going from cup C to cup B.

Christopher F. Bauer, Principal Investigator.

This material is based upon work supported by the National Science Foundation under Grant No. 1245730.

Any opinions, findings and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

Licensed: <http://creativecommons.org/licenses/by-nc-sa/3.0/>

1) Ambient external temperature impacts how we perceive sudden changes in temperature.

## ⑤ Question Bank :

- 1) How does this concept relate to how the body maintains homeostasis ?
- 2) At what degree of change does this experience become uncomfortable ?
- 3) What is the evolutionary benefit of feeling pain ~~with~~ with this type of stimulus ?
- 4) How does the use of water affect the sensation, as compared to air temperature ?
- 5) What is the difference between going from hot to cold and cold to hot? Is one perceived more strongly? ~~or~~
- 6) Does knowing what is going to happen change how we perceive it ?

\* Need to buy eye protection  
on Thursday

June 20, 2010

### Task 1

We're all from NH

Kyle - cut off part of his finger

Emily - has a horse named  
Blue

Kaleigh - has a twin

Eliza - Participated in breaking world record in longest Canoe  
line on ice

### Task 2 Read Syllabus

- ES = kind of nervous about lack of structure
- KR = his chem class was <sup>structured</sup> like this
- ES = wanted to be in chem in ~~class~~ High School
- Group wondering how tests will work → "challenges"