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Day 03 Jan 29 The thermometer.  
Chemothermal sensation.

Fire and Ice

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2016

### 3.0.A Daily Outline

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Purpose:

Recognize effort of doing assigned reading

- Observations about readings about development of T devices and scales
- Collect notes – I indicated I would “credit” so collect these some times.

Reinforce importance of group process

- Continue to use nametags
- Introduce jigsaw structure and focus on content knowledge building

Address in some way some of the Question Bank questions from Tuesday

- Initiate model of exploring resources (group notes, posting), then apply resources to some application and product
- Readings come from whatever I could find from the web that I thought were content rich, accurate, readable for this audience, and complementary in focus (so as to provide information about different aspects of the phenomenon). The complementarity is an important aspect for the jigsaw structure.

Have a chance to play with an unusual substance (liquid nitrogen)

- Because it’s fun, but it also raises questions about the effect of “cold” on materials, eventually linking to thermal motion
- Sets up homework of exploration of KMT (using PhET simulation)

Board

Please sign in – regular routine

Find place with your name – same group, same location to start

Make a stick-on name tag with first name as well

Folder at table has last Recorder Reports, handouts (Qbank, assignments)

Materials

Name tags

Premade name cards

Poster paper

Poster markers

White board markers

Folder loaded with feedback on group work and new materials, incl recorder reports

Returns

Return group notes from Day 2 in their folders

Distributions

- Organized Q Bank from Day 1 and 2
- Standing Assignment [did not indicate how to turn in]

Starting Comments 3 minutes max

- Acknowledge survey completions
- Comment on group notes quality
- Asked about checking individual notes on Thurs: I did when you weren't looking. Everyone was fine. I will collect to review more specifically but not every time. I do want the notes you brought for today. [This raised question because they have it hardwired into notebook as written notes. I mentioned noticing this and that many of them mentioned in their "get to know you survey" that they like to be organized. So, I said I'd rethink how to handle this.]
- Standing assignment – how to turn in – I may not comment on content, at least yet. Record of your ideas at that moment. [format for filename: BauerCMoDy]
- PhET play: who was successful in getting access and playing? Who not? [not all do]
- Q Bank Day 1 and 2 – organized. Continue to develop as a resource for us, potential ideas for end-of-semester project for you.
- Answer a few questions from earlier:
  - Testing the waters: why those temps. Wanted extreme but not harmful. Easy to set up. About 20 C or 40 F differently, more than enough to feel the differences. Prepared as ~2 C, ~ 45 C, room T (~25 C). Then they sat for about 30 minutes.
  - What is "quicksilver"? Mercury [interesting: no one guessed it]

10 min max Activity One Comment on readings for today

Take 6 minutes. Each person in group share something in reading they found interesting or perhaps which addressed a question that arose last class. Use Recorder Report. Spokesperson reports out.

Today whoever was the Spokesperson on first day is the Manager today. Other people take a role you have not yet taken.

Information that might expand the discussion

- Up to now, idea that certain principles were at work in determining properties was long-standing idea: earth, air, fire, water principle of heat, cold, liquids salt, sulfur, mercury  
Primum Frigum --- primary cold principle -- essence of cold
- Elements that were known as substances up to mid 1600s
  - Liquids available: waters, oils, spirits, mercury, mineral acids [mentioned this]
  - Freezing point of mercury (- 38.8 C, - 37.8 F) bp (357 C, 674 F) [skipped this]

[Group seemed to get into this. It took about 7 minutes for talk. Then another 6 to hear comments and for me to acknowledge those comments. It was important to do, but it took time away from the rest of the agenda. The things they mentioned were all important issues: the use of familiar materials, lack of an agreed-upon scale or reference points for T measurement, the fact that a Romer scale existed and F came before C scales.]

## Activity Two

Last class you developed an expertise at each table. Take a few minutes to review your group notes (in folder) from last week. Then you will be split up. Managers, let me know when you are ready.

Form new groups and will be given a unique challenge to handle. Remember, in the new group, you may be the only person with critical information to help address the challenge. You will have 25 minutes to produce a poster.

Move to make new groups of 5 – same color gather together. [ID the tables ahead of time]

On board:

I recommend that you start by having each person describe what they learned in Stage One. [Decided NOT to do this: I suggest this order: group 1, group 2, group 5, group 4, group 3 – let them make own decisions]. Then, think through the problem using what you know. Then figure out how to turn that into something visual.

You will need to identify a TIME KEEPER to let you know how much time left. And a Spokesperson, who can walk us through your poster in a 2 minute overview.

[Monitor their progress and the clock. Have to leave time for liquid nitrogen play.]

[This work went until about 4:40, and all groups has a good start on their posters. I stopped them and asked whether they would prefer to finish posters today or play with liquid nitrogen today. They wanted the liquid nitrogen, so they had a chance to explore the material – trying food items, hand lotion, water, paper, up to and beyond end of class.]

<u>Group</u>	<u>Challenge</u>
Green	A popular Scandinavian thing to do is to go from a sauna and then jump into a pond through a hole cut in the ice. Explain what that person experiences. You must incorporate as much of the Stage One information as possible.
Pink	A popular Scandinavian thing to do is to go jump into a pond through a hole cut in the ice, and then get out and go into a sauna. Explain what that person experiences. You must incorporate as much of the Stage One information as possible.
Yellow	Everyone probably has experienced chewing or handling something that contains menthol, which creates a sensation of coolness. Propose an explanation for how that happens. You must incorporate as much of the Stage One information as possible.
Violet	Everyone may have had the has experience of eating something that contains capsaicin (e.g. in chili peppers), which creates a sensation of heat. Propose an explanation for how that happens. You must incorporate as much of the Stage One information as possible.

Each Spokesperson should walk us through the poster, identifying most critical features (2 minutes each presentation, 2 minutes each questions from rest of class)

Posters will be photographed, and placed on BB as record of this work.

**Green**            A popular Scandinavian thing to do is to go from a sauna and then jump into a pond through a hole cut in the ice. Explain what that person experiences. You must incorporate as much of the Stage One information as possible.

**Pink**            A popular Scandinavian thing to do is to go jump into a pond through a hole cut in the ice, and then get out and go into a sauna. Explain what that person experiences. You must incorporate as much of the Stage One information as possible.

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Table 1

Neurons carry signals via action potentials. What is that?

What processes happen to initiate an action potential?

Are they constant or temporary?

How does it travel?

What distinguishes a strong stimulus from a weak one?

Table 2

What is the structure of neurons?

How do neurons work?

What turns a neuron on?

What does it mean that sensory receptors “adapt”? What is the consequence of that?

Where on the neuron is the “on” switch?

Table 3

What are thermoreceptors and where are they found in the body?

What kinds are there? How do they differ?

How does sensation change as a function of exposure temperature?

What exactly do they respond to?

Table 4

What are thermoreceptors and where are they found in the body?

What kinds are there? How do they differ?

How are they connected to the brain?

How does this relate to sensation?

Table 5

What are receptors on neurons?

How do they work?

Specifically, what are thermoreceptors and how do they work?



Your folder contains enough copies of materials for each of you to have a set.

Today's tasks:

- 1) There will be some initial discussion around reading assignment on thermometers and scales

Did I need to spend time on this?

- 2) Return to the jigsaw activity to complete the second stage. Here are same instructions as I gave you last time.

#### Stage Two of Jigsaw

The groups will re-arrange and take on the next task.

While they are getting started, compare your observations about the groups during the first stage.

What did you notice that would lead you to believe that learning was happening?

Did you end up noticing aspects of behavior that you had not planned on?

Each of you pick one table and eavesdrop during Stage Two. After five minutes rotate.

After the full rotation, get together and think about what would be most valuable to do once the posters are created.

- 3) Play with liquid nitrogen

You can monitor up close or from a distance.

Take note of how students behave and what they say.

Why am I doing this activity?