Ask an Elder

Name: _____

Invite a group of elders to your classroom to share their knowledge about the northern lights. **Take notes** on what you learn. If the elders share stories, be sure to note where or from whom the elder learned each story.

Elder's Names:	Where Elder is From:

NOTES:
Children's stories about the northern lights:

_____

_____

_____

Adult stories and understandings about the northern lights:

_____

_____

_____

Songs and/or dances related to the sun, stars or northern lights:

_____

_____

_____

Experiences and observations of the northern lights:

_____

_____

_____

Question:
How do the stories and information that the elders shared relate to your life in northern Alaska?

_____

_____

_____

CULTURAL
CONNECTIONS
The Northern Lights

Thank you for sharing your knowledge about the northern lights with us!

Word Games Instruction Sheet

VOCABULARY SWAP:

1. Distribute one card to each person.
2. Practice the word on your card, then find a classmate. Teach them the word on your card and learn the word on their card. Trade cards.
3. Find another classmate and repeat.

FIND THE CARD:

1. Divide into small groups. Each group will need a set of vocabulary cards. Spread the cards in front of you so that everyone in your group can see the pictures.
2. Listen as your teacher says a word aloud from one of the cards.
3. Work with your group to find and hold up the correct card.

VOCABULARY SLAP

1. Select one student to serve as the “caller” for this game. That student should make a list of the Iñupiaq vocabulary words on a separate sheet of paper. The words can be found on the back of the cards.
2. Place the cards in a circle, picture-side-up, in the middle of the playing area.
3. The caller should call out a word from their list. Everyone else should quickly place their hand on the picture that they believe represents that word.
4. Turn over the card or cards that students selected to see who chose correctly. Each student who placed his or her hand on the correct card earns a point.
5. Put the card(s) back in the circle and play again.
6. Play for a designated period of time. At the end of the time, the person with the most points wins.

TEAMWORK

1. Divide your group into two teams. Each team will need a pencil and paper.
2. Shuffle the vocabulary cards and place them picture-side up in the middle of the table.
3. Work with your team to write down the Iñupiaq and English words for the picture on the card.
4. After both teams have written answers, turn the card over to check. Teams get 1 point for the correct Iñupiaq word and 1 point for the correct English word.
5. Repeat until all cards are gone. The team with the most points wins.

ACT IT OUT

1. Shuffle the vocabulary cards and deal them out to each player. Keep your cards a secret!
2. Take turns acting out your cards using motions and sound effects, but no words.
3. Whoever guesses the Iñupiaq word first takes the card as a point.
4. The game is over after all cards have been acted out.
5. Optional: Add a timer to the mix! See if you can get your classmates to guess the word in 30 or 60 seconds.

Iñupiaq Northern Lights Vocabulary

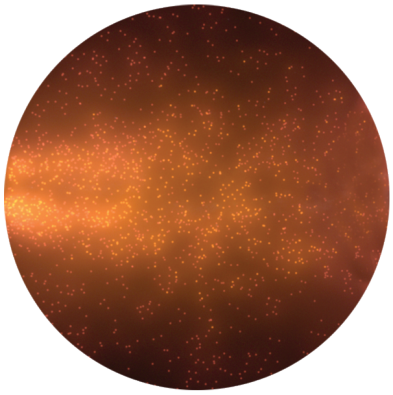
Name: _____

Write the Iñupiaq word or phrase for each image:

northern lights

_____

solar wind



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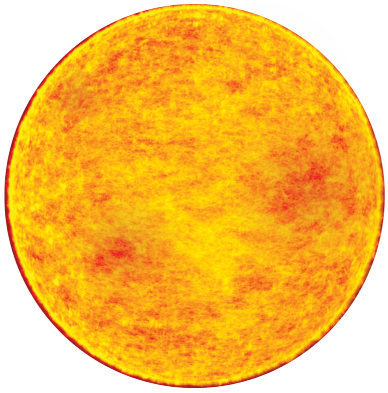
sun



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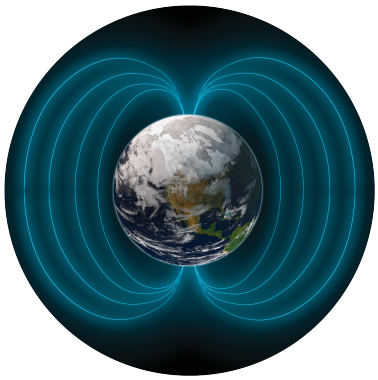
Earth's magnetic field



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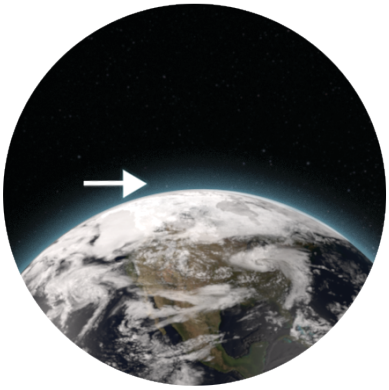
Earth

_____

atmosphere



_____

Modeling the sun/Earth System[NS]

Name: _____

Follow the steps below to create a scale model of objects in our solar system. This will help you to understand the vast distance between the sun and Earth.

	Actual Diameter (NASA data)	**Model Diameter** (Scale: 2 billion to 1)
Sun (siqiñiq)	1,391,016 km	69.5 cm
Earth (Nunaqpak)	12,756 km	0.6 cm

Predict:

How far apart do you think you will have to place the model sun and Earth to create a scale model?

_____

Make your model:

1. Earth is 149,600,000 km from the sun. Divide this distance by 2 billion to calculate how far apart to place the model sun and Earth to create a scale model.

   149,600,000 km ÷ 2,000,000,000 = _____ km

2. There are 1000 meters in a kilometer. Multiply your answer by 1000 m/km to find out how far apart, in meters, to place your sun and Earth models.

   _____ km x 1000 m/km = _____ m

3. Take the sun and Earth models outside. Use a measuring tape and work with your classmates to place the sun and Earth models the correct distance apart.

Reflect: How accurate was your prediction?

_____

Extend: Use what you have learned and the data below to determine the scale distance from the sun to each planet in our solar system. Add the remaining inner planets (Mercury, Venus, Mars) to your scale model. (Scale: 2 billion to 1)

Planet	**Approximate distance from sun** (in kilometers)	**Scale distance from sun** (in kilometers)	**Scale distance from sun** (in meters)
Mercury	58,000,000		
Venus	108,000,000		
Earth	149,600,000		
Mars	228,000,000		
Jupiter	778,000,000		
Saturn	1,400,000,000		
Uranus	2,900,000,000		
Neptune	4,500,000,000		
Pluto	5,900,000,000		

Modeling the sun/Earth System[NP]

Name: _____

Follow the steps below to create a scale model of objects in our solar system. This will help you to understand the vast distance between the sun and Earth.

	Actual Diameter (NASA data)	**Model Diameter** (Scale: 2 billion to 1)
Sun (mazaq)	1,391,016 km	69.5 cm
Earth (Nunaqpak)	12,756 km	0.6 cm

Predict:

How far apart do you think you will have to place the model sun and Earth to create a scale model?

_____

Make your model:

1. Earth is 149,600,000 km from the sun. Divide this distance by 2 billion to calculate how far apart to place the model sun and Earth to create a scale model.

   149,600,000 km ÷ 2,000,000,000 = _____ km

2. There are 1000 meters in a kilometer. Multiply your answer by 1000 m/km to find out how far apart, in meters, to place your sun and Earth models.

   _____ km x 1000 m/km = _____ m

3. Take the sun and Earth models outside. Use a measuring tape and work with your classmates to place the sun and Earth models the correct distance apart.

Reflect: How accurate was your prediction?

_____

Extend: Use what you have learned and the data below to determine the scale distance from the sun to each planet in our solar system. Add the remaining inner planets (Mercury, Venus, Mars) to your scale model. (Scale: 2 billion to 1)

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Jupiter	778,000,000		
Saturn	1,400,000,000		
Uranus	2,900,000,000		
Neptune	4,500,000,000		
Pluto	5,900,000,000		

Build a Sunspot Viewer

WARNING! Do not look directly at the sun. The sun's rays can damage your eyes. Look through a solar viewing slide or use instruments to project an image of the sun onto a piece of paper.

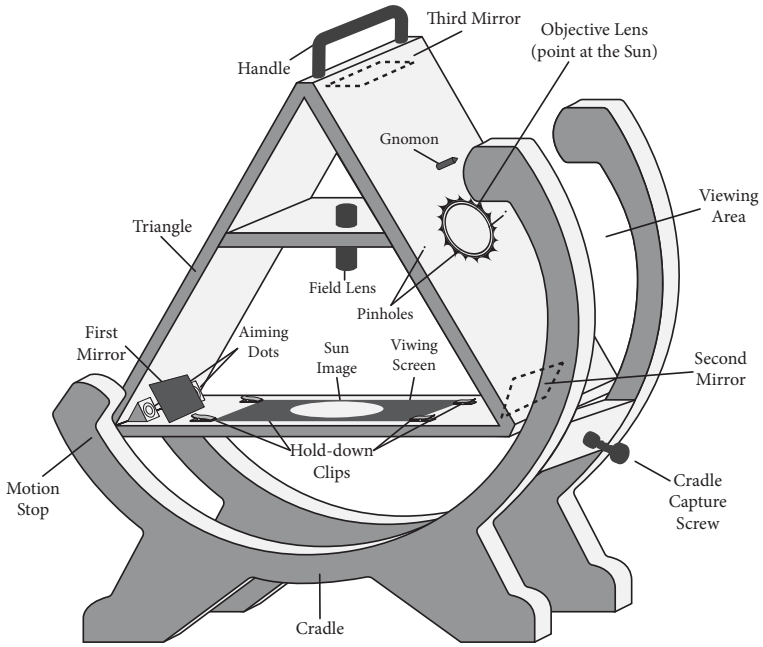
Make it!

Set up your district Sunspotter or make your own sunspot viewer using the steps below.

Use it!

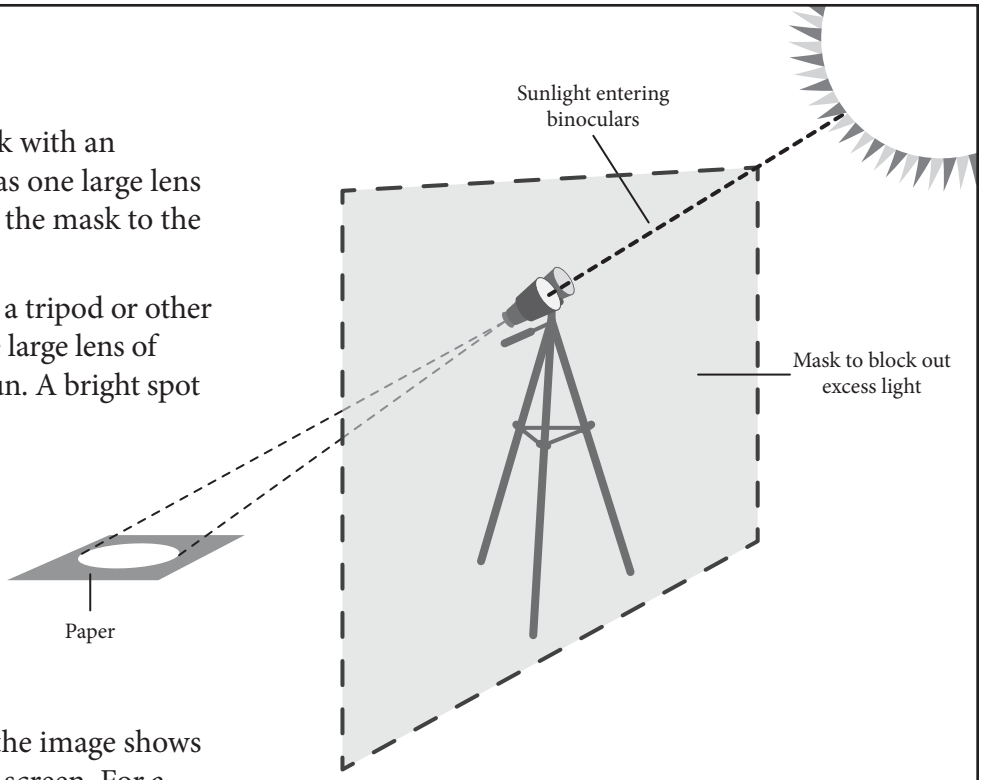
Work with classmates to carefully trace the sun image that appears on the viewing screen. Be sure to include any dark areas that are inside of the circle. These are sunspots!

Sunspotter



Sunspot Viewer Setup

1. Make a cardboard mask with an opening the same size as one large lens of the binoculars. Tape the mask to the binoculars.
2. Place the binoculars on a tripod or other stable surface. Point the large lens of the instrument at the sun. A bright spot should form on the wall or floor.
3. Place a piece of paper where the image of the sun appears. This is your viewing screen. Adjust your instrument until the image shows sharply on the viewing screen. For a clearer image, darken the room, or place the instrument under a draped table.



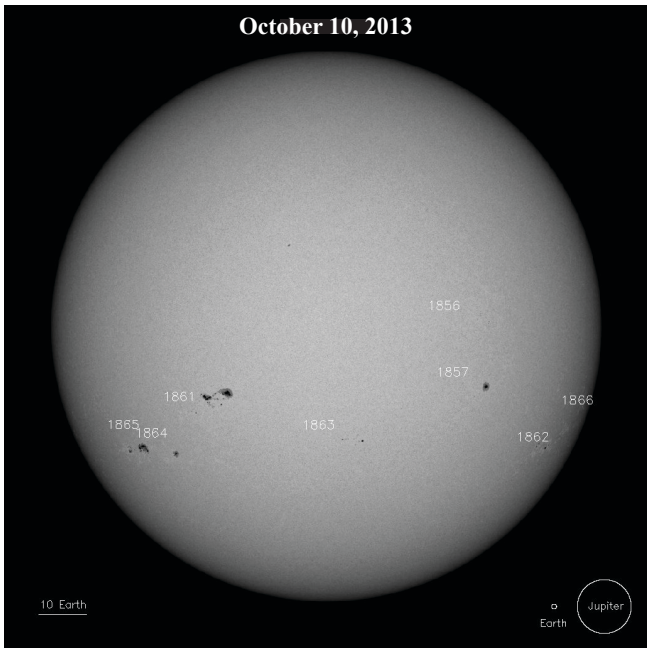
Sunspot Viewer (1 of 2)

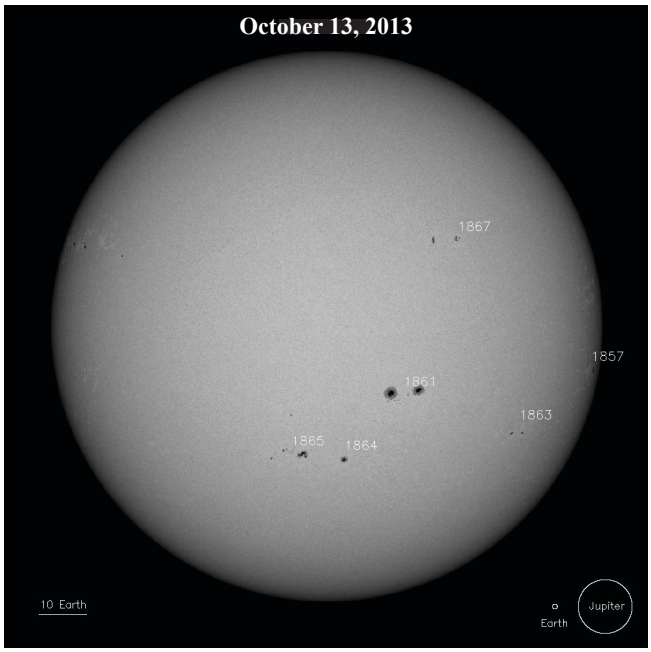
Name: _____

1. Use a sunspot viewer or the solar viewing slide to observe the sun. **Sketch** what you see. **Label** the sun in your drawing in English and Iñupiaq. **Include the date** that the image represents. **Draw arrows** pointing at the sunspots.

Date of observation: _____

2. Study the sun images below from NASA's Solar and Heliospheric Observatory. Compare the images. **Draw an arrow** below the images to show which way the sun is rotating.





3. How do you know which way the sun is rotating?

_____

_____

Sunspot Viewer (2 of 2)

Name: _____

4. Each sun image is a scale model of the sun. The scale can be used to estimate the diameter of the sunspots.

   The sun's actual diameter is about 1,391,000 kilometers (864,000 miles).

   Use a ruler to measure one of the sun images above in centimeters.

   The diameter of the model sun is _____ cm.

5. Find out how many kilometers are represented by each centimeter in your model:

   1,391,000 km ÷ _____ cm = _____ km/cm scale

6. Use a ruler to measure the largest sunspot on the sun image above.

   The diameter of the largest sunspot on the model sun is _____ cm.

7. Estimate the diameter of the sunspot using your scale.

   I estimate the diameter of the largest sunspot I observed is about _____ km.

8. The diameter of Earth is about 12,700 kilometers (8,000 miles). How does the diameter of the sunspot you observed compare to that of Earth?

   _____

   _____

Connect it!

9. How do sunspots relate to the northern lights? Use what you have learned from the student guide and the sun multimedia to help you answer.

   _____

   _____

   _____

   _____

10. What is the Iñupiaq name for the northern lights? _____

Invisible Magnetic Fields (1 of 4)

Name: _____ Date: _____

Discover the magnetic field around a bar magnet.

Materials:

- Magnetic field observation window
- Iron filings
- Bar Magnets
- Paper clips or staples (use closed staples for safety)
- Experiment Recording Sheet
- Pencil
- Sheet of white paper

Hypothesis:

Use what you know about magnets to make a hypothesis. What shape is the magnetic field around a bar magnet? **Sketch the shape** that you predict around the bar magnet below, and **explain your hypothesis** in the space provided. Where is the magnetic field strongest? Where is it weakest?

_____

_____

_____

_____

Invisible Magnetic Fields (2 of 4)

Name: _____

Experiment:

Work with a partner to test your hypothesis. Here are two ways to find the magnetic field around a bar magnet using the materials provided. **Put a check** next to the method you use.

☐ Method 1: Use a magnetic field observation window to view the magnetic field around a bar magnet. The observation window is full of iron filings and mineral oil. Iron is attracted to magnets.

1. Tip the iron filings to the bottom of the window.
2. Hold a magnet against the window.
3. Flip the window so that the iron filings move toward the magnet.
4. Sketch your observations.
5. Repeat the trial at least three times, recording your observations each time.

☐ Method 2: Use iron filings, staples or paper clips to reveal the magnetic field around a bar magnet.

1. Place a bar magnet flat on a desk or table, on top of or underneath a sheet of white paper.
2. Sprinkle iron filings, paper clips or closed staples around the magnet. Watch as the objects are pulled toward the magnet before they actually touch it.
3. Sketch your observations.
4. Repeat the trial at least three times, recording your observations each time.

TRIAL 1

Sketch your observations.

Describe your observations. Where was the field strongest? Where was it weakest?

_____

_____

Invisible Magnetic Fields (3 of 4)

Name: _____

TRIAL 2

Sketch your observations.

Describe your observations. Where was the field strongest? Where was it weakest?

_____

_____

TRIAL 3

Sketch your observations.

Describe your observations. Where was the field strongest? Where was it weakest?

_____

_____

Invisible Magnetic Fields (4 of 4)

Name: _____

Conclusion:

What did you find out? **Draw and describe** the magnetic field around a bar magnet. What shape is it? Where is the field strongest? Where is it weakest?

_____

_____

_____

What evidence supports this conclusion?

_____

_____

_____

Think about what you learned about Earth's magnetic field. How is the magnetic field around a bar magnet similar to the magnetic field around Earth? How is it different?

_____

_____

_____

Evaluate your experiment: How well did it test your hypothesis? How could you improve the experiment?

_____

_____

Which statement is correct? Circle one.

a. Magnetic fields extend into the space around the magnet.
b. Magnetic fields do not extend beyond the surface of the magnet.

Aurora Ovals

Name: _____

Visit culturalconnections.gi.alaska.edu to learn about why the aurora forms an oval over Earth's geomagnetic north pole. Use what you learn to answer the questions below.

1. The aurora forms an oval around Earth's _____ magnetic field lines.

2. Draw and label the open magnetic field lines, the closed magnetic field lines and aurora ovals in their correct locations on the Earth image below:

3. Where does the energy that produces the aurora come from?

   a. The sun b. Earth c. A power plant

4. What is an Iñupiaq word for Earth? _____

5. Why do people living near Earth's north and south poles have more opportunity to see the aurora than people living near Earth's equator?

_____

_____

_____

Be an Aurora Forecaster (1 of 2)

Name: _____

The National Aeronautics and Space Administration (NASA) tracks space weather, including solar wind and the storms on the sun that cause the northern lights. Scientists use the data that NASA collects to help predict when the northern lights are likely to occur over Earth.

Read each quote below.

U**se the graph** on the following page to predict when the storm will reach Earth and potentially cause northern lights displays. **Find the speed** of the CME on the graph to find how long it will take to reach Earth.

Add the number of hours to the time that the CME occurred to estimate when the CME will reach Earth.

1. *"On January 13, 2013 at 2:24 AM Eastern Standard Time, the sun erupted with an Earth-directed coronal mass ejection or CME. The CME left the sun at speeds of 330 miles (531 kilometers) per second..."* (Karen C. Fox, NASA Goddard Space Flight Center)

When do you predict that the CME will reach Earth and likely cause northern lights displays?

_____

2. "*On Jan. 23, 2013, at 9:55 a.m. EST, the sun erupted with an Earth-directed coronal mass ejection, or CME...[T]he CME left the sun at speeds of around 375 miles (603 kilometers) per second, which is a fairly typical speed for CMEs.*" (Karen C. Fox, NASA Goddard Space Flight Center)

When do you predict that the CME will reach Earth and likely cause northern lights displays?

_____

3. "*At 5:24 a.m. EDT on May 17, 2013, the sun erupted with an Earth-directed coronal mass ejection... Experimental NASA research models, based on observations from NASA's Solar Terrestrial Relations Observatory, show that the CME left the sun at speeds of around 745 miles (1199 kilometers) per second.*" (NASA/SDO/Goddard, ESA&NASA SOHO)

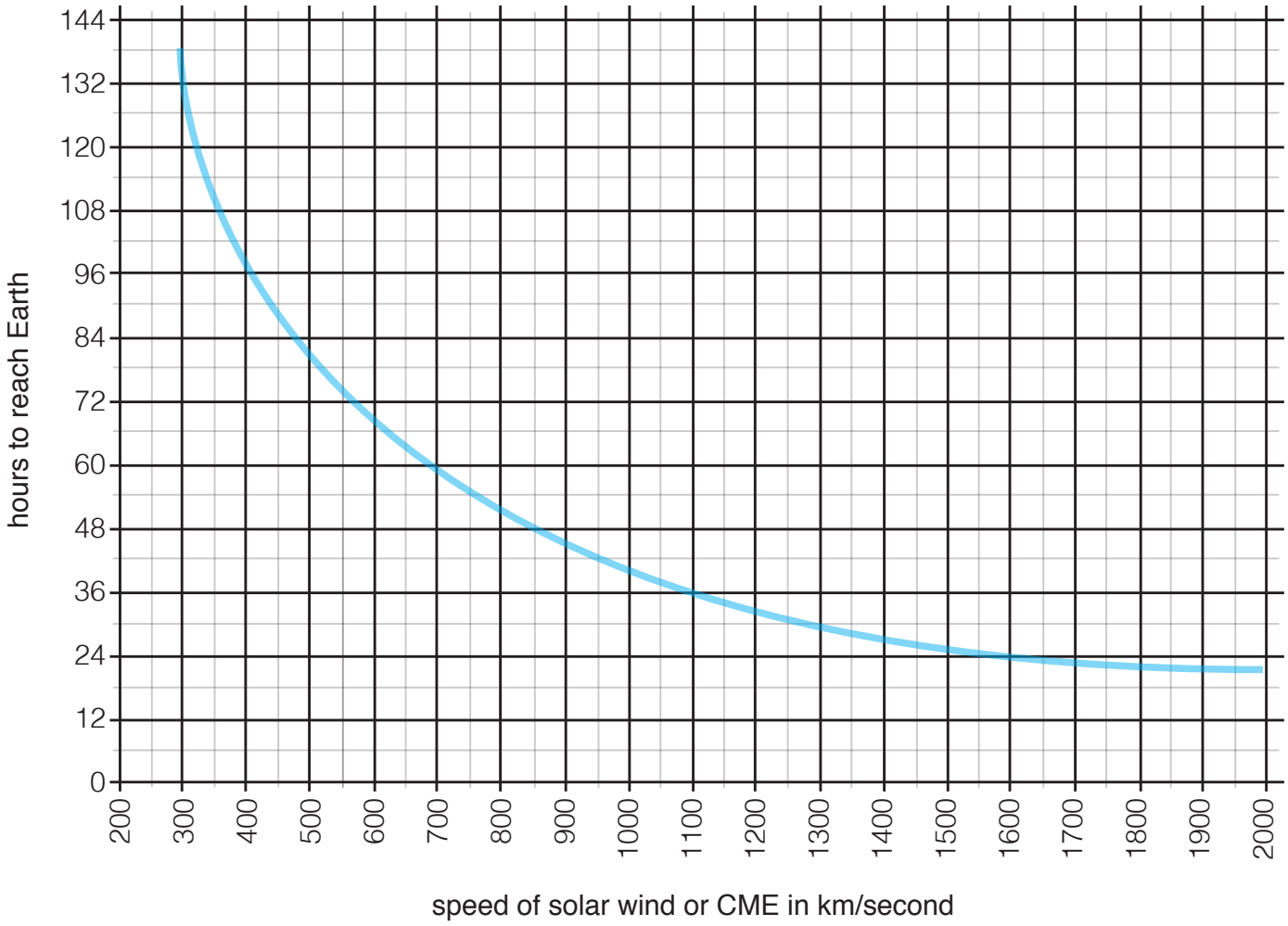
When do you predict that the CME will reach Earth and likely cause northern lights displays?

_____

Be an Aurora Forecaster (2 of 2)

Name: _____

Predicting the Northern Lights



Use complete sentences to answer the questions below:

Who in your community might like to have an aurora forecast? Why?

_____

_____

What cause and effect relationship makes it possible to forecast the northern lights?

_____

_____

Traditional Knowledge and Stories (1 of 2)

Name: _____

Read Elijah Kakinya's northern lights story. **Watch and Listen** to at least three of the following people share traditional knowledge and stories about the northern lights:

Helen Allen
Kotzebue

Mary Ahkivgak
Barrow

Ronald Brower Sr.
Barrow

Annie Conger
Brevig Mission

Elmer Goodwin
Kotzebue

Diana Martin
Barrow

What do the stories have in common?

_____

_____

How are the stories different?

_____

_____

What do these stories tell you about traditional Iñupiat spiritual understandings of the northern lights?

_____

_____

How can travelers make use of the northern lights when they appear during travel?

_____

_____

What can the northern lights often indicate about the weather?

a) it is warm b) it is cold c) it is cloudy

Share one Iñupiaq word or phrase that you learned during this activity.

Iñupiaq: _____ English translation: _____

Traditional Knowledge and Stories (2 of 2)

Name: _____

Use the space below to **illustrate the story** or video you liked best.

Try it:

Go outside and observe the sky, weather and environment around you. **Describe your observations** and experience. Include time of day, what you saw in the sky (clouds, sun, stars, moon, northern lights, etc). Describe the weather (snowing, windy, cold, cloudy, clear etc.).

_____

_____

_____

_____

_____

_____

Pass it on:

Work with a partner or a small group of classmates to **choose one** of the following ways to pass on one of these stories:

- Learn to retell the story.
- Develop a song about the story in a traditional Iñupiat style.
- Develop an Iñupiat dance about the story.

Present your story, song or dance to an audience. Be sure to introduce yourself and share where you learned the story.

The Northern Lights by Elijah Kakinya (1 of 2)

Now I shall tell Qasuniq's story about the northern lights up there, a story made about one of the people living here a long time ago, a story about them.

A long time ago there were people living in a big village, probably here at the head of the Killiq River. They used to remove the children's teeth when a tooth became loose. A child's teeth would become loose when the child was five years old. Then they used to remove the child's teeth. Or when they were four years old, the children's teeth would become loose, their milk teeth. They used to remove the teeth when they become loose.

Among the people living in that big village, there was a girl. Her teeth-she was four years old and one tooth had become loose, but her parents didn't pay attention to that tooth, a canine tooth, so the didn't remove it! Although all the people watched their children and removed their teeth, the parents of that girl didn't watch their daughter and that one tooth of hers, her canine tooth. Then it wasn't loose any more. Then they were unable to do anything to it, for there were no white men around, no forceps, so when it tightened, they left it there.

That woman grew up, and her canine tooth came out through her upper lip. When she got married and became able to work, she used it to twist thread on, tying sinews to her canine tooth. When she made lengths of sewing thread, she always tied them on and used her tooth to twist them on.

Those people used to hunt and trap, setting snares for caribou, and hunting in kayaks, and with corrals; they made a living in every possible way. And that woman set out with her child on her back. While she was busy putting the snares in order, having left her husband behind- that was how they lived- she went to the ptarmigan snares. As she was taking her snares and what she had caught, as she was removing the snare from the tenth ptarmigan, suddenly a hot, feverish feeling came over her! She suddenly felt hot, just as when we get a fever. The fever came over her as she was taking the tenth ptarmigan. She made holes in their wings with a little awl of marrowbone, and she had a thing for them. Stabbing them between the wings, in the bones, she packed them under the child on her back.

When the fever suddenly came over her, she thought, "What's happening to me?" Just as she was about to pack up her ptarmigan, the northern lights got her. The northern lights got her and rose with her! The northern lights had many people who played football. They played football with a human head that smiled whenever they kicked it! They were many and used to play football and have a good time, many of them. Then the people of the northern lights scooped her up from here; they took that woman to be one of them. When her relatives followed her tracks to the snare, having become worried about her, at one of her snares, the tenth one, her tracks ended.

The Northern Lights by Elijah Kakinya (2 of 2)

Some time afterward, a very long time afterward, a man was checking his snares, one of those people, a man. Taking the ptarmigan he had caught, he pierced them in the same way in the wing and packed them, using a little awl of marrowbone. While he was doing this, a hot feeling all of a sudden cam over him too! As he was getting the fever, he thought, "How strange! What's happening to me?" and looked upward. Look! The northern lights were just about to seize him! Then he suddenly recognized that women with her pack of ten ptarmigan, with the sinew-twisting tooth! "Oh, there's that woman, right there!" He gave a start at that, recognizing the one with the tooth like a little horn to twist on. "Too bad that both of us, I and my kinswoman with the twisted tooth, should be taken up there in the sky! If they take me, our people will have no one to tell about us," he thought with apprehension. Becoming anxious, he got into the dirt gathered by the wind, falling on his belly into a little hollow in the wind-gathered dirt. When the football players had come upon him unawares, and he realized it and recognized the woman with the sinew-twisting tooth, he abruptly crouched down into that dirt. They felt regret right away: "Alas, we didn't get that one! We let him get stuck in the dirt," they said. That woman burst out, "Alas, you didn't hold onto the only one I'd be happy with!" So the woman said, but he thought, "If both of us are taken, my kinswoman and I, our people won't know what has become of us, so for me, let me not be taken. I'll tell about that kinswoman of mine to her relatives, to her siblings and her husband, telling them that I have seen her."

And the woman, shouting, "Alas!" was becoming inaudible. "Alas, you didn't hold onto the only one I'd be happy with!" she shouted, but that man too wanted to be safe and to report back. He wanted to return to his relatives in order to tell the real story of the one with the sinew-twisting tooth.

When the northern lights were gone, he looked for her, after the northern light had disappeared; then he started homeward with his ptarmigan packed on his back. Then he arrived with something to tell: "I've seen that kinswoman of mine. The northern lights took her, and they also have a human head, and it smiles whenever they kick it. That's how they have fun. The northern lights took that kinswoman of mine away, they took possession of her. I was on the point of being taken too, but I really wanted to tell the story about her. To avoid being taken, I hid in the dirt gathered by the wind."

That's the end of the story.

This story was originally printed in: Nunamiut Unipkaaŋich: Nunamiut Stories, Told by Elijah Kakinya and Simon Paneak, Collected by Helge Ingstad, Edited and Translated by Knut Bergsland, Illustrated by Ronald W. Senungetuk