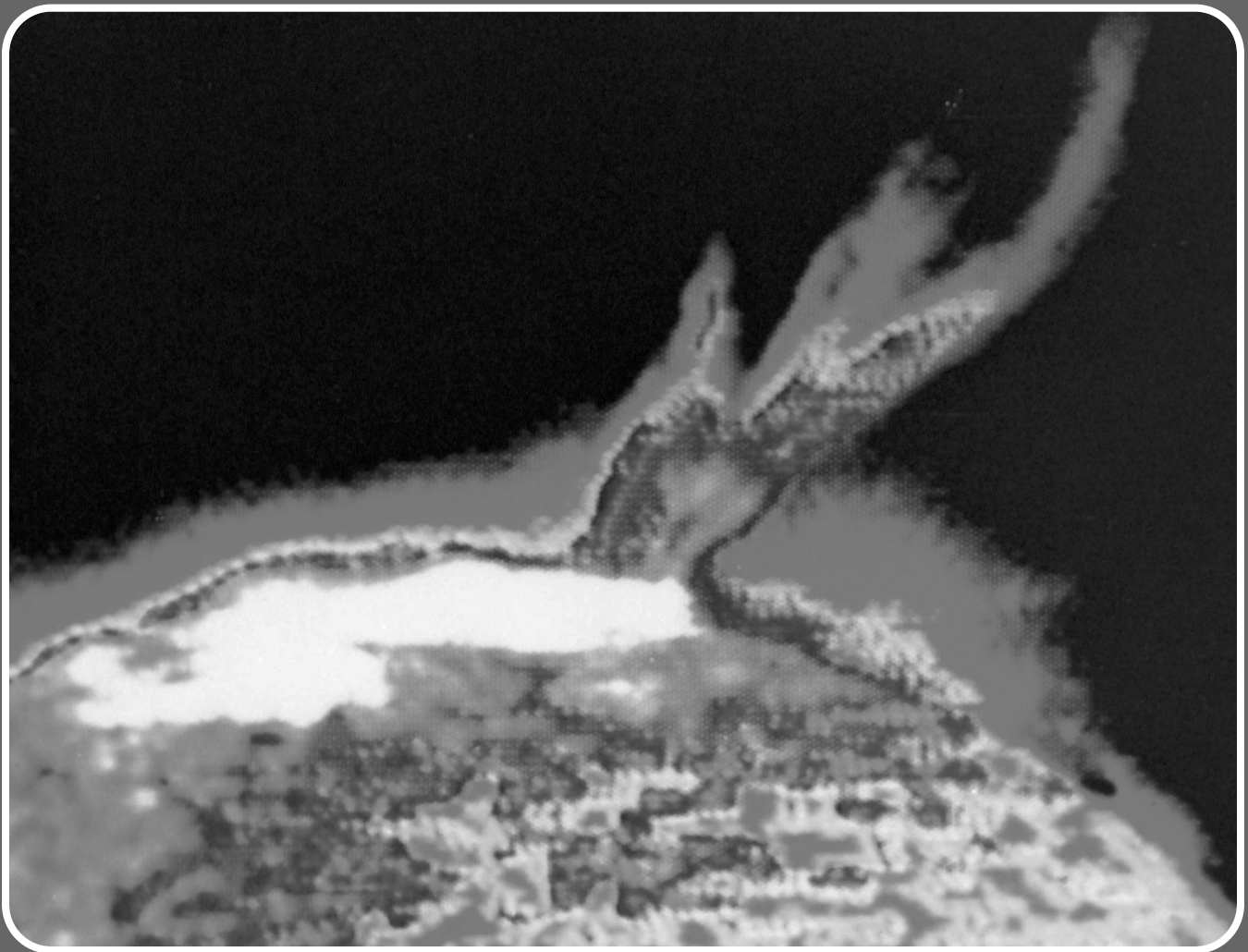


# SUN & OTHER STARS



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## **Museum Classroom Programs**

*Pre- and Postvisit Activities*

**Grades 6–8**

## We're Glad You're Coming!

Thank you for selecting this Museum Classroom Programs class at the Denver Museum of Nature & Science for your field trip. In order to make the most of your visit, we recommend the following:

- Include your students and chaperones in the planning process.
- Discuss and distribute an agenda that explains what the students can expect to do and see during their field trip. In the agenda, include time for students to visit the gift shop, take breaks, and eat lunch.
- These classes are most effective when students have adult guidance. Please invite parents and other adults to help the students get the most out of the Museum class. The adults will enjoy the experience of exploring the stations with the students, and the class will be more productive for the students.
- Bring cameras! Photographs are a great way for kids to document their visit.

**IMPORTANT:** Use the enclosed pre- and postvisit activities to extend and enhance your scheduled program(s) at the Denver Museum of Nature & Science.

Included in this packet you will find pre- and postvisit activities especially designed to extend and deepen the educational value of your Museum class. Research shows that students who engage in related activities before and after a field trip obtain and retain more knowledge and understanding from their visit than unprepared peers retain. Therefore, we strongly recommend that you use the enclosed activities before and after your visit.

### **“The Sun and Other Stars” Class Overview**

Students learn about the formation and stages of development of stars, with a focus on our Sun. They engage in a variety of activities to learn about stellar evolution. Students build a model of the stages of star development, investigate some of the tools used to observe the Sun, and learn about various cultural interpretations of the stars in the night sky.

### **While You Are in the Museum:**

- Visit the *Space Odyssey* exhibition
- Attend a Planetarium show

Please review the enclosed materials prior to your visit. If you have questions, please call 303-322-7009 or visit [www.dmns.org](http://www.dmns.org).

### Preparation

- Estimated Preparation Time: None
- Estimated Activity Time: Two 45-minute periods and 20 minutes once a week for several weeks

### Materials for Teachers

- Poster paper
- Overhead projector
- Overhead pens
- Blank transparencies

### Materials for Students

- Drawing paper
- Pencils



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### CDE Standards

- Science: 1,4.4a,4.4b,4.4d 6
- Reading and Writing: 2
- Visual Arts: 1

### Learning Goals

Students will

- Make and record observations
- Interpret observations
- Observe that the position and time of sunset changes daily

### What Students Do in This Activity

Students keep a sunset journal. Students make observations of the Sun at sunset from a location in their neighborhood. They draw a view of the horizon and the position of the Sun at sunset for each observation. They label the time and date of each observation. After a predetermined number of weeks or observations, students interpret the results of their work.

### Advance Preparations

1. Read and review the lesson plan.
2. It is recommended that the teacher keep a sunset journal for several weeks as practice for teaching the lesson.
3. Introduce the concept of “horizon” to students during one science period.



### Teacher Tip

Students would benefit from a brief “field trip” on the school campus to explain the term “horizon” and to practice drawing the distant horizon with landmarks.

**Classroom Activity**

**Introducing the Activity**

1. After introducing the concept of “horizon,” explain to students that over the next several weeks, they will be responsible for observing the Sun at sunset.
2. Explain to students that in order to better understand their predictions and observations, they will keep a pictorial journal of the Sun at sunset.
3. Explain that students are expected to draw the horizon including important or obvious landmarks and record the position of the Sun at sunset, the time, and the date of the observation.
4. Explain that students will keep a draft journal and at the end of the series of observations make a final copy.



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**Teacher Tip**

Some students may want to keep their journal using other recording methods such as a camera or video recorder. Encourage them to do this but suggest that they keep a draft drawing as well if there is any potential for the equipment to fail.

5. Using an overhead projector, show students examples of what you consider a draft drawing of the horizon with the position of the Sun at sunset labeled with the date and time of the observation.
- figure 1: Example of draft sunset journal

6. Ask students to explain where the directions north, south, east, and west would appear in your example.



**Teacher Tip**

East would not appear in the drawing, as it would be to the back of the viewer. North is to the right, west in the center, and south on the left side of the page.

**Facilitating the Activity**

**Making Predictions**

1. Ask students to predict what they will observe about the Sun at sunset; allow them to brainstorm various ideas. Example student responses include
  - Sunset will occur at the same time and place every day
  - Sunset will occur later (earlier) but will occur in the same place
  - It depends on what time of year it is
2. Record these ideas on the drawing of the Sun at sunset using various colors of ink. Draw and label the time and position of sunset as students describe their predictions.
3. Using this drawing, ask students to predict where the Sun will set on future days relative to the example

you have provided.

To prompt discussion, you might ask students questions such as:

- If I were to look for the Sun at sunset on another (a future) day, what would I see?
- If I were to look for the Sun at sunset on another (a future) day, would there be any differences? If so, what would be different?



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Note: Do not give students answers to these questions. Use this time to discuss the various predictions and to explain that through their observations, students will eventually answer these and other questions.



### Teacher Tip

Students may want to define sunset in terms of the amount of Sun visible. This is a useful discussion, as the time of sunset will depend upon how much of the Sun is above or below the horizon. Sunset is defined as the time when the upper edge of the Sun is on the horizon. For this and other definitions, see the Web site [http://aa.usno.navy.mil/faq/docs/RST\\_defs.html#top](http://aa.usno.navy.mil/faq/docs/RST_defs.html#top).

### Defining Project Expectations

1. Set a time limit for the project and define the minimum number of observations you'd like the students to record. For example, you might require students to make 10 observations of the Sun at sunset over five or more weeks.
2. Assign students to make at least one observation in the next five school days.
3. Explain that you will expect them to arrive at school with their sunset journal once a week for the next several weeks.

### Weekly Journal Review

Once observations have begun, review student sunset journals weekly. Require students to share their draft drawings with you and/or their peers.

### Facilitating Journal Reviews

There are several important observations to make when reviewing student journals. Check for the following and use any variations among journals as points for discussion during class:

1. How detailed are the drawings?
2. Do students correctly mark south, north, and west on their drafts?
3. Do students use the same position for the Sun to define sunset? If not, how does that cause variation in the time and position of sunset?
4. Once students have two or more observations, how do the position of the Sun and the time of sunset change? Do all students find the same changes?
5. What were students' original predictions about the location and time of sunset, and how do those predictions compare to their findings?

There are many methods for reviewing student journals. Some recommended methods:

- A. Have student pairs discuss their journals. One student explains his or her work while the other listens. They switch roles after a specific amount of time.
- B. Make overhead copies of several student journals and discuss the exemplary aspects of each.

### Final Drafts and Assessment

1. Remind students of the due date and the minimum number of observations.

2. Explain your expectations for the layout of the journal.
3. Explain your expectations for any written response that accompanies their pictorial data.
4. Develop (with or without students) the assessment rubric. Explain and provide students with an example of the rubric.



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### Recommended Final Draft Requirements

- Due date
- Heading: name, class period, date in upper right hand corner of journal
- Neat and accurate drawing of the western horizon with cardinal directions labeled as well as several landmarks such as trees, buildings, or other objects
- Ten observations of the Sun at sunset labeled with time of observations, day, month, and year (observations should be separated by at least three days)
- Large paper 16" x 22"
- Color, effort, neatness (additional requirements)

### Summarizing and Reflecting

Once students have completed the pictorial sunset journal, they should use their work to answer the following questions. You may structure this as a discussion, oral presentation, or writing assignment.



#### Teacher Tip

Hold a brief class discussion that allows students to summarize their findings. Review the questions with the class and review the answers. Point out any patterns or explain what the majority of students observed.

Q: What changes did you observe in the position of the Sun at sunset during this time period? Use examples from your journal to support your answer to this question.

A: Depending on the dates of observation, there are two general observations. If students observe the Sun at sunset from June 21 through December 21 then the position of sunset with respect to the horizon changes from north of west to south of west. The reverse is true for observations made from the winter solstice through the summer solstice.

Q: What changes did you observe in the time of sunset during this time period? Use examples from your journal to support your answer to this question.

A: Again, the time of sunset changes depending on the time of year that the observations are made. For observations made from summer to winter, the time of sunset becomes earlier. After the winter solstice, the time of becomes later.

Q: Based on your observations, what do you predict will happen to the position of the Sun at sunset in the next month? Use examples from your journal to support your answer to this question.

A: Answers will vary depending on the dates when the data is collected.

Q: Based on your observations, what do you predict will happen to the time of sunset in the next month? Use examples from your journal to support your answer to this question.

A: Answers will vary depending on the dates when the data is collected.

### Background Content



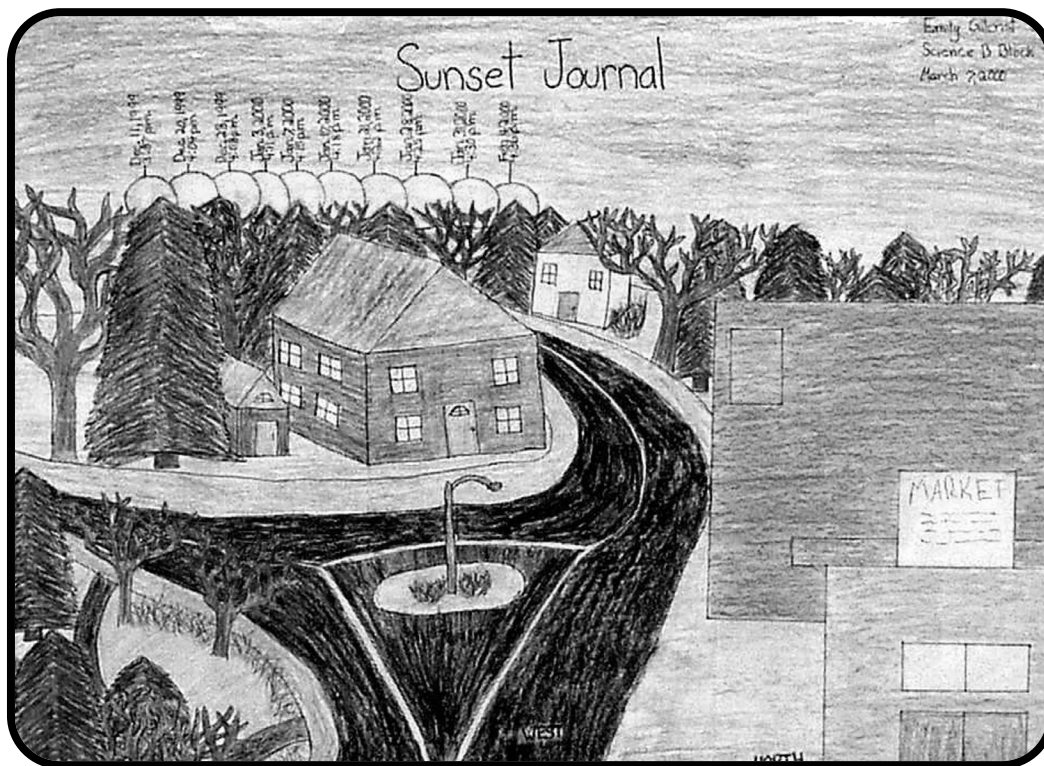
This activity is designed to engage students in observing and keeping records of the Sun and interpreting data. It would be to the teacher’s advantage to keep his or her own journal prior to introducing the activity to the class.

The position of the Sun at sunset changes daily. The following information assumes that the viewer is in the Northern Hemisphere.

From the summer solstice through the winter solstice, the position of the Sun at sunset moves from north of due west to south of due west. Following the winter solstice, the position of sunset migrates from its southern most point back.



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*figure 2*  
The sunset journal shown here provides an excellent example of sixth grade student work. Notice the detailed drawing, the change in the position of the Sun with respect to fixed objects on the horizon, and the precise labels. Artwork provided courtesy of Emily Rachel Gillcrest.

Likewise, the time of sunset changes daily. The time of sunset is latest on the summer solstice and decreases daily until the winter solstice. The reverse occurs from the winter solstice through the start of summer. Thus, students who observe sunset will note that the time of the event either increases or decreases. They can calculate an average rate of change by finding the total number of minutes of change and dividing that by the number of days over which the observations were made.



**Teacher Tip**

To older or advanced students, assign the project over at period of time that spans the winter (or summer) solstice. Students will observe the time of sunset to decrease and then increase (or vice versa). In addition, if they make very careful observations they will also notice that the location of the Sun at sunset appears to reverse direction.

**Resources**

Sunset Time and Dates: [http://aa.usno.navy.mil/data/docs/RS\\_OneYear.html](http://aa.usno.navy.mil/data/docs/RS_OneYear.html)