Lesson 1: Noticing and Wondering: Observing and Asking Questions about the Sun, Moon, and Stars

CCS Standards

- **RL.1.5:** Know and use various text features (e.g., headings, tables of contents, glossaries, electronic menus, icons) to locate key facts or information in a text.
- **RI.1.1:** Ask and answer questions about key details in a text.
- **W.1.8:** With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.
- **SL.1.2:** Ask and answer questions about key details in a text read aloud or information presented orally or through other media.
- **L.1.1:** Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
- **L.1.1j:** Produce and expand complete simple and compound declarative, interrogative, imperative, and exclamatory sentences in response to prompts.

Daily Learning Targets

- I can describe what I observe in pictures and videos of the sun, moon, and stars. (RI.1.1, SL.1.2)
- I can ask and record questions about what I notice in pictures and videos of the sun, moon, and stars. (RI.1.1, W.1.8, L.1.1j)

Ongoing Assessment

- During the focused read aloud in Work Time B use the Reading Literature checklist to assess students' progress towards RL.1.5 and the Reading Informational Text checklist to assess students' progress towards RI.1.1.

Agenda

1. **Opening**
   A. Reading Aloud: "Elvin, the Boy Who Loved the Sky," Part 5 (10 minutes)
2. **Work Time**
   A. Picture Tea Party: Pattern Photographs (10 minutes)
   B. Focused Read-aloud: *Does the Sun Sleep?: Noticing Sun, Moon, and Star Patterns*, Pages 4–9 (20 minutes)
   C. Engaging the Scientist: "Observe Sunrise and Sunset" (10 minutes)
3. **Closing and Assessment**
   A. Shared Writing: Recording Our Observations and Questions about the Sun, Moon, and Stars (10 minutes)

Teaching Notes

Purpose of lesson and alignment to standards:

- In this unit, students build on their foundational understanding of the sun, moon, and stars as they begin to see that there are patterns in the sky that can be observed and predicted. This first lesson is intended to elicit wonder and curiosity, setting the stage for a more in-depth exploration of the scientific concepts to come throughout the remainder of the unit.
- As in previous units, in almost all lessons, students hear complex texts read aloud. When possible, display the text while reading aloud. And when doing a first read-aloud of a given text, read fluently, with expression, and without interruption. For additional information, refer to the Module Overview.
- In Work Time A, students participate in the Picture Tea Party protocol. Consider how familiar students are with this protocol and reallocate class time spent reviewing it as necessary.
- In Work Time C, students revisit the sun time-lapse video embedded in the website PBS Learning Media, focusing on noticing any patterns.
  - Citation: "Observe Sunrise and Sunset." Video. *Teachers Domain*. PBS Learning Media, Jan. 2016. Web. 1 June 2016. <http://www.pbslearningmedia.org/resource/ess05.sci.ess.eiu.riseset/observe-sunrise-and-sunset/> (For display. Used by permission.)
  - Purpose: Revisit a previously watched video, focusing on noticing and sharing patterns with a partner. Prompt students to use sentence frames to support building on others' ideas and furthering a conversation, a skill they will practice throughout this unit.
- This lesson introduces the use of equity sticks (a stick or card for each student in the class) as a total participation technique for quick response questions. Some other common total participation techniques include cold calling and selecting volunteers.
- This lesson is the first in a series of three that include built-out instruction for the use of Goal 3 Conversation Cues. Conversation Cues are questions teachers can ask students to promote productive and equitable conversation (adapted from Michaels, Sarah and O'Connor, Cathy. *Talk Science Primer*. Cambridge, MA: TERC, 2012. http://inquiryproject.terc.edu/shared/pd/TalkScience_Primer.pdf. Based on Chapin, S., O'Connor, C., and Anderson, N. [2009]. *Classroom Discussions: Using Math Talk to Help Students Learn, Grades K–6*. Second Edition. Sausalito, CA: Math Solutions Publications). Goal 3 Conversation Cues encourage students to deepen their thinking. Continue drawing on Goal 1 and 2 Conversation Cues, introduced in Module 1, and add Goal 3 Conversation Cues to more strategically promote productive and equitable conversation. In Module 3, Goal 4 Conversation Cues are introduced. Refer to the Module 1 Appendix for additional information on Conversation Cues. Consider providing students with a thinking journal or scrap paper. Examples of the Goal 3 Conversation Cues you will see in the next two units are (with expected responses):
  - To encourage students to provide reasoning or evidence:

    "Why do you think that?"

    - "Because _____."

    "What, in the _____ (sentence/text), makes you think so?"

    - "If you look at _____, it says _____, which means _____."
  - To challenge students:

    "What if _____ (that word were removed/the main character had done something different/we didn't write an introduction)? I'll give you time to think and discuss with a partner."

  - "If we did that, then _____."

    "Can you figure out why _____ (the author used this phrase/we used that strategy/ there's an -ly added to that word)? I'll give you time to think and discuss with a partner."

  - "I think it's because _____."

- To encourage students to think about their thinking (metacognition):

  "What strategies/habits helped you succeed? I'll give you time to think and discuss with a partner."

  - "_____ helped me a lot."

    "How does our discussion add to your understanding of _____ (previously discussed topic/text/language)? I'll give you time to think and discuss with a partner."

  - "I used to think that _____, and now I think that _____.

How this lesson builds on previous work:

- In this lesson, students return to what they noticed and observed about the sun, moon, and stars during Unit 1 and build a foundational understanding of the scientific concepts behind observable and predictable patterns in the sky.
- Consider how this lesson builds on instructional routines already introduced to students (e.g., learning targets, discussion protocols, drawing to communicate ideas, transitions, use of materials). Make modifications based on what students have experienced during previous modules and units.

Areas in which students may need additional support:

- During Work Time C, students are encouraged to use sentence frames to build onto others' ideas. This is the first of many opportunities students have throughout this unit to use these sentence frames to support furthering a conversation. Consider posting the sentence frames in a location for all students to view and access.

Down the road:

- During Work Time B, students are introduced to the informational text *Does the Sun Sleep?: Noticing Sun, Moon, and Star Patterns*. During this lesson, students listen to just one section of the text. In subsequent lessons, students will listen to other sections of the text.
- In Lesson 2, students will be introduced to the Unit 2 guiding question: "What patterns can we observe in the sky?"
- In many lessons throughout this unit, students practice building onto others' ideas and furthering a conversation through the use of sentence frames, structured discussions, and the Science Talk protocol. This protocol also serves as the structure for their assessment, in Lesson 12.

In advance:

- Prepare:
  - A set of equity sticks for the class (popsicle sticks with the name of one student on each one).
  - Pattern photographs for Picture Tea Party protocol in Work Time A by copying one or two photographs for each student.
  - Sun, Moon, and Stars Word Wall cards for the words *astronomer* and *horizon*. Write or type the word on a card and create or find a visual to accompany each word.

  - Patterns of the Sun anchor chart by writing the title on chart paper and finding or creating accompanying visuals.
  - Technology necessary to play the "Observe Sunrise and Sunset" video in Work Time C.
- Review the Picture Tea Party and Think-Pair-Share protocols. (Refer to the Classroom Protocols document for the full version of the protocol.)
- Post: Learning targets and applicable anchor charts (see materials list).

Technology & Multimedia

Consider using an interactive white board or document camera to display lesson materials.

- Opening A: "Elvin, the Boy Who Loved the Sky," Part 5 could be an email.
- Opening A: Create a slideshow of the pattern photographs.
- Work Time B: Create the Patterns of the Sun anchor chart in an online format—for example, a Google Doc—to display and for families to access at home to reinforce these skills.

Supporting English Language Learners

Supports guided in part by CA ELD Standards 1.I.A.3, 1.I.B.5, 1.I.B.6, and 1.I.C.10

Important points in the lesson itself

- The basic design of this lesson supports ELLs with opportunities to build background knowledge of the content through watching videos and participating in a read-aloud.
- ELLs may find it challenging to associate the movement of the sun with the definition of the word *pattern*. Spend additional time discussing examples of patterns. Guide students in drawing or arranging images of the sun rising, at midday, and setting. Ask students to predict what comes next in the pattern.

Levels of support

For lighter support:

- During Work Time C, invite student who need lighter support to model using the sentence frames to respond to others' ideas. (Example: "Rihanna, what does Kevin's idea make you? Can you show us how you use this sentence frame?")
- Encourage students to use Conversation Cues with other students to support the use of the sentence frames in Work Time C. (Example: Invite students to clarify their peer's thinking before adding to their own idea: "So, do you mean ____?")

For heavier support:

- During the focused read-aloud in Work Time A, provide students with a series of picture cards depicting the sun at the horizon in the morning, the sun high in the sky, and the sun setting. In partners or triads, invite students to arrange the cards in a pattern according to how the sun appears to move in the sky.

Universal Design for Learning

- **Multiple Means of Representation (MMR):** In Work Time B, students are introduced to *Does the Sun Sleep?: Noticing Sun, Moon, and Star Patterns* in a focused read-aloud. During this read-aloud, students notice facts about the sun and its patterns, then share those to create the Patterns of the Sun anchor chart together with the teacher. This transfer of information into knowledge that students can use requires metacognitive skills and strategies. Some students may need support in summarizing, connecting, and remembering the information presented. Provide scaffolds to students to support diverse abilities in using these strategies, such as manipulatives, to guide students toward new understanding. For example, provide students with images cut from cardstock of the sun, the horizon, and other key features for understanding from the text. Invite students to show the sun's pattern with the manipulatives as described in the text with the manipulatives.
- **Multiple Means of Action & Expression (MMAE):** In Work Time A, students participate in a Picture Tea Party, during which they discuss the pattern photographs. Afterward, share their ideas with the whole group before being introduced to the central theme of the photographs (patterns). Students later make connections with the idea of patterns and the sun, exploring the patterns of the sun each day. Some students need support in confirming their understanding of the word *pattern* and connecting the concept to content other than the photographs. Support this understanding by inviting students to show different patterns with physical manipulatives and their body. For example, students can show a pattern of blinking their eyes, a pattern made from building blocks, or a pattern of movement around the classroom. Providing opportunities for students to use their bodies for these active patterns will support understanding of the sun's patterns throughout the day.
- **Multiple Means of Engagement (MME):** Throughout this lesson, students have multiple opportunities to share ideas and thinking with classmates. Some students may need support for engagement during these activities, so encourage self-regulatory skills by helping them anticipate and manage frustration by modeling what to do if they need help from their partners. For example: "I can remember that if I forget my idea or need help when I'm sharing, I can ask my partner to help me. My partner could help me by giving me prompts that will help me share my thinking." Consider offering sentence frames to strategically selected peer models, such as: "I noticed ___ in the photograph" or "One thing I noticed about the sun in the video was ___." Offering this support promotes a safe learning space for all students.

Vocabulary

Key:

(L): Lesson-Specific Vocabulary

(T): Text-Specific Vocabulary

(W): Vocabulary Used in Writing

New:

- astronomer, pattern (L)
- horizon (T)

Materials

- ☑ "Elvin, the Boy Who Loved the Sky," Part 1 (from Unit 1, Lesson 1; one to display; for teacher read-aloud)
- ☑ Equity sticks (class set; one per student)
- ☑ "Elvin, the Boy Who Loved the Sky," Part 5 (one to display; for teacher read-aloud)
- ☑ Sun, Moon, and Stars Word Wall cards (new; teacher-created; two)
- ☑ Sun, Moon, and Stars Word Wall (begun in Unit 1, Lesson 1; added to during the Opening and Work Time B; see Teaching Notes)
- ☑ Pattern photographs (one per student and two or three to display)
- ☑ Picture Tea Party Protocol anchor chart (begun in Unit 1, Lesson 1)
- ☑ *Does the Sun Sleep?: Noticing Sun, Moon, and Star Patterns* (one to display; for teacher read-aloud)
- ☑ *Summer Sun Risin'* (one to display; from Unit 1)
- ☑ Patterns of the Sun anchor chart (new; co-created with students during Work Time B; see supporting materials)
- ☑ Patterns of the Sun anchor chart (example, for teacher reference)
- ☑ "Observe Sunrise and Sunset"(from Unit 1, Lesson 1; video; play in entirety; see Teaching Notes)
- ☑ Think-Pair-Share Protocol anchor chart (begun in Module 1)
- ☑ Noticing and Wondering anchor chart (begun in Unit 1, Lesson 1; added to during the Closing)

Opening

A. Reading Aloud: "Elvin, the Boy Who Loved the Sky," Part 5 (5 minutes)

- Gather students whole group.
- Remind them that in the last unit, they were introduced to Elvin, who shared his questions and observations about the sun, moon, and stars with them.
- Tell students that to help them remember all the things Elvin wondered about, you are going to briefly reread part of the story.
- Display **"Elvin, the Boy Who Loved the Sky," Part 1** and read it aloud slowly, fluently, with expression, and without interruption.
- Explain to students that you are going to begin using **equity sticks** as a way of calling on them to share their ideas with the group. Each of their names is on a different popsicle stick, and you will pull one at random. When you do, that student will share his or her ideas with the class.
- Invite students to turn and talk with an elbow partner, and use equity sticks to select students to share their responses with the whole group:

"What are some things that Elvin wondered about?" (if the sun and moon had stories; if the sun and moon danced and had songs)

"What are some things that Elvin shared with us because he wondered about the sun, moon, and stars?" (photographs, songs, movement routines, books)

- Tell students that today is an exciting day because you have a new story about Elvin to read to them and that you think there are more things Elvin wonders about.
- Display "**Elvin, the Boy Who Loved the Sky," Part 5** and read the first three sentences aloud fluently, with expression, and without interruption.
- Focus students' attention on the word *astronomer*.
- Invite students to turn and talk with an elbow partner:

"What word does the word* astronomer *remind you of?" (astronaut, astronomy)

- Using equity sticks, cold call students to share out.
- If productive, use a Goal 3 Conversation Cue to encourage students to provide reasoning:

"Why does the word* astronomer *remind you of that?" (Responses will vary; e.g., they sound the same.)

- Point out that all of these words—*astronomer*, *astronaut*, and *astronomy*—have a similar beginning, *astro*.
- Tell students that *astro* means having to do with outer space, objects in the sky, and the sun, moon, and stars.
- Show students the Sun, Moon, and Stars Word Wall card for *astronomer*.
- Tell students that an astronomer is a scientist who studies the sky, universe, and beyond.
- Invite students to repeat the word with you and to clap its syllables as they say it.
- Place the Word Wall card and picture for *astronomer* on the **Sun, Moon, and Stars Word Wall**.
- Draw students' attention back to the text and read the remainder of Part 5.
- With excitement, reveal and then display two or three of the **pattern photographs**.
- Using a total participation technique, invite responses from the group:

"What is Elvin wondering about now?" (He wonders if there are facts about the sun, moon, and stars.)

Meeting Students' Needs

- When preparing students for the read-aloud, provide options for physical action and sensory input by differentiating seating. Some students might benefit from sitting on a gym ball, a move-and-sit cushion, or a chair with a resistive elastic band wrapped around the legs. (MMAE)
- For ELLs: For heavier support, invite students to act out the roles of Elvin and the astronomer during the read-aloud.

Work Time

A. Picture Tea Party: Pattern Photographs (10 minutes)

- Tell students that now they are going to get a chance to closely examine the pattern photographs that Elvin shared with them.
- Explain that they are going to use the Picture Tea Party protocol to view and discuss the pattern photographs. Remind students that they used this protocol in Unit 1, and review as necessary using the **Picture Tea Party Protocol anchor chart**. (Refer to the Classroom Protocols document for the full version of the protocol.)
- Guide students through the protocol.
- After 5–6 minutes, refocus whole group and collect the pattern photographs.
- Using a total participation technique, invite responses from the group:

  "What did you notice in your pictures?" (Responses will vary, but may include: things repeating, the sunlight creating a pattern on the ground, the moon in different shapes over and over again, and groups of stars creating a pattern in the sky.)

- Inform students that the photographs they looked at show patterns.
- Using a total participation technique, invite responses from the group:

  "What does the word* pattern *mean?" (an arrangement of shapes, lines, letters, numbers, or colors that can be repeated or used again and again)

- Remind students that when Elvin wondered if the sun, moon, and stars had facts, an astronomer gave him these photographs.
- If productive, use a Goal 3 Conversation Cue to encourage students to provide reasoning.
- Using a total participation technique, invite responses from the group:

  "Why do you think the astronomer gave Elvin photographs of patterns when Elvin was wondering if there were facts about the sun, moon, and stars?" (Student responses may vary; if necessary, guide them toward: the sun, moon, and stars follow patterns or there are patterns that have to do with the sun, moon, and stars.)

Meeting Students' Needs

- To activate background knowledge, provide one or two familiar examples of what a pattern looks and sounds like. Example: Display a visual of building cubes arranged in a pattern or invite students to listen to a clapping pattern (e.g., clap hands twice, tap thighs once, repeat). (MMR)
- For ELLs: Invite a small group of volunteers to briefly fish bowl or model the Picture Tea Party protocol for the group. As they model, cold call students to repeat or add to what the volunteers have said, using the sentence frames. This will provide an opportunity to check for comprehension while giving some students practice using the sentence frames before the protocol begins.
- For ELLs: It may take longer for some students to process language and follow the conversation during the Picture Tea Party protocol. Encourage students to speak up when they would like to hear something repeated. Empower them with questions they can ask to regulate the pace of the conversation. (Examples: "Can you please repeat what you said?" "Can you please speak more slowly?")

Work Time

B. Focused Read-aloud: *Does the Sun Sleep?: Noticing Sun, Moon, and Star Patterns*, Pages 4–9 (20 minutes)

- Tell students that today is exciting because you have a new text to share with them!
- Display ***Does the Sun Sleep?: Noticing Sun, Moon, and Star Patterns*** and read the title aloud.
- Display *Summer Sun Risin'* next to *Does the Sun Sleep: Noticing Sun, Moon, and Star Patterns*.
- Tell students that *Summer Sun Risin'* is a narrative text that tells a story, while the new text *Does the Sun Sleep: Noticing Sun, Moon, and Star Patterns* is an informational text that teaches the reader information.
- Using a total participation technique, invite responses from the group:

  "How are these two texts different?" (Summer Sun Risin' tells a story. Does the Sun Sleep teaches the reader)
- Explain to students that in this unit they will be reading informational texts, like *Does the Sun Sleep* to learn more information about the patterns of the sun, moon and stars.
- Read pages 4–7 slowly, fluently, with expression, and without interruption.
- Direct students' attention to the **Patterns of the Sun anchor chart** and read the title aloud. Tell students that as they read this section of the text about the sun they will capture ideas and facts about the sun and its patterns on the chart.
- Reread page 7 and invite students to turn and talk with an elbow partner:

  "What is a pattern that the sun follows?" (It shines during the day. We cannot see the sun at night.)
- Use equity sticks to call on one or two students to share out.
- If productive, use a Goal 3 Conversation Cue to encourage students to provide evidence:

  "What, in the text, makes you think so?" (Responses will vary.)
- As students share out, clarify and capture their ideas on the Patterns of the Sun anchor chart, writing down the language they use as accurately as possible. Refer to **Patterns of the Sun anchor chart (example, for teacher reference)** as necessary.
- Draw students' attention back to the text and read page 8 fluently and without interruption.
- Focus students' attention on the word horizon.
- Reread the last two lines on page 8 and, using equity sticks, select a student to come to the front of the whole group area and respond:

  "Where is the horizon line in the illustration on page 8?"
- Display the Sun, Moon, and Stars Word Wall card for *horizon* and review the definition for it (the line where the sky and the land seem to meet).
- Invite students to repeat the word with you and place the card on the Sun, Moon, and Stars Word Wall.
- Draw students' attention back to the text and read page 9 fluently and without interruption.
- Direct students' attention to the three pictures on pages 8–9. Using a total participation technique, invite responses from the group:

  "What do you notice about where the sun is in the sky in these three pictures?" (near the horizon, high in the sky, and then near the horizon again)

"What other patterns does the sun follow?" (it moves across the sky; it is near the horizon early in the morning and in the evening; it rises in the east and sets in the west)

- As students share out, clarify and capture their ideas on the Patterns of the Sun anchor chart, writing down the language they use as accurately as possible. Refer to Patterns of the Sun anchor chart (example, for teacher reference) as necessary.
- Review the information that has been recorded on the Patterns of the Sun anchor chart.
- Invite students to turn and talk with an elbow partner:

"What is one new piece of information you learned about a pattern that the sun follows?"

- Refocus students whole group and offer them specific, positive feedback on their work during the focused read-aloud. (Example: "This section of the text contained a lot of important information about the sun and patterns that it follows, and I noticed you all paid close attention to the text and illustrations to make sure you understood the information.")
- Tell students that now they will watch the time-lapse video of the sun from Unit 1 again, this time paying attention to any patterns that the sun follows.

Meeting Students' Needs

- Before reading, provide white boards and dry-erase markers as an option for students to record (in drawing or writing) their ideas. This will also help scaffold active listening for key details. (MMR, MMAE)
- For ELLs: Pair students with a partner who has more advanced or native language proficiency. The partner with greater language proficiency in the pair can serve as a model during the read-aloud, initiating discussions and providing implicit sentence frames.
- For ELLs: During the read-aloud, provide sentence frames for Think-Pair-Shares. (Example: "One thing I learned about a pattern is ...")
- For ELLs: During the read-aloud, display the text on a document camera or an enlarged copy of the text to help direct students to the appropriate sentences on each page.

Work Time

B. Engaging the Scientist: "Observe Sunrise and Sunset" (10 minutes)

- Remind students that during Unit 1 they watched a short video of the sun rising and setting. Tell students that they are going to view the video again and then have the opportunity to discuss what they notice and wonder with a partner.
- Play the **"Observe Sunrise and Sunset" time-lapse video**.
- Tell students they will use the Think-Pair-Share protocol to discuss what they noticed and observed about the sun in the video. Remind them that they've used this protocol before. Review as necessary using the **Think-Pair-Share Protocol anchor chart**. (Refer to the Classroom Protocols document for the full version of the protocol.)
- Invite students to Think-Pair-Share with an elbow partner:

"What do you notice about the sun in this video? What patterns do you notice the sun following in this video?" (Responses will vary, but may include: The sun is near the horizon

in the morning and evening, the sun seems to move across the sky, and the sun is visible during the day.)

- As students talk, circulate and listen in. Take note of the ideas they are sharing and target a few students to share out with the whole group.
- Refocus students whole group and invite a few students to share out.
- Prompt students to add on or to build onto others' ideas by using several focusing questions—for example:

  "Does anyone have anything to add to what Vernon said?"

  "What does what Janice said make you think?"
- As students respond to these questions, prompt them to use a sentence frame:
  - "I'd like to add _____."
  - "That makes me think _____ because _____."
- Tell students that now they will revisit their notices and wonderings from Unit 1 and add their new thinking and new questions.

Meeting Students' Needs

- During the Think-Pair-Share (before refocusing students whole group), increase mastery-oriented feedback by providing feedback that is frequent, timely, and specific to individual pairs of students. (Example: "Great noticing! I heard you mention specifically that you saw that the sun looked like it was moving across the sky during the day. That sounds like part of the pattern each day, because you said that you saw that happen each day.") (MME)
- For ELLs: Watch the "Sun Time Lapse" video twice. Students will be able to absorb and process more information during their second viewing after they understand the general idea during the first viewing. Consider introducing and displaying the question "What patterns do you notice the sun following in this video?" before watching it.
- For ELLs: Introduce and model using the sentence frames to respond to others' ideas. Display the sentence frames in speech bubbles. Example: "I have something more to say about Brianna's idea, so I am going to say, 'I'd like to add to Brianna's idea.'"

Closing and Assessment

A. Shared Writing: Recording Our Observations and Questions about the Sun, Moon, and Stars (10 minutes)

- Direct students' attention to the **Noticing and Wondering anchor chart**.
- Review what students had noticed and wondered about the sun, moon, and stars during Unit 1 by reading the chart aloud.
- Invite students to turn to an elbow partner and talk after providing 30 seconds of wait time for each of the following questions:

  "What are some new things you notice about the sun?" (Student responses will vary.)

  "What are new questions or wonders you have about the sun?" (Student responses will vary.)

- Refocus whole group and call students to share out.
- As students share out, clarify and capture their ideas on the Noticing and Wondering anchor chart, writing down the language they use as accurately as possible. If possible, model referring to the Sun, Moon, and Stars Word Wall as a tool to help when spelling content-related words.
- Share with students that in the next lesson they will continue learning about patterns in the sky that can be observed.

Meeting Students' Needs

- Before inviting students to turn and talk, provide scaffolds to support organization and working memory. Example: Offer an index card divided in two. Include (1) a picture of the sun on one half and (2) a question mark on the other half. Invite students to use this card as a guide for sharing (1) notices about the sun and (2) questions they have about the sun. (MMAE, MMR)