

Live from McDonald Observatory

Teacher Edition for grades 3-5

Introduction

The videoconference will introduce students to McDonald Observatory, telescopes, and the sun. The worksheets are designed to help the student discuss important concepts. Students should be directed to not fill in their sheets until prompted.

Visiting the Otto Struve Telescope

By participating in the videoconference, the students will receive a behind-the-scenes tour of the 2.1-m Otto Struve Telescope. During the videoconference, the facilitator will point out and describe the parts of a telescope and how they work. Note that the Otto Struve Telescope uses several different mirrors to send the focused light to different physical locations where different instruments may be used. Telescopes are housed in buildings, usually domes, which open to the sky to allow the light from astronomical objects into the telescope. The building protects the telescope from weather damage.

In the image of the domes, there are other buildings around as well. These are not domes for housing telescopes, but buildings for use by the people at the observatory. There are always many people at McDonald Observatory, and the telescopes are only a part of the Observatory. There are living quarters for visiting astronomers and support staff, buildings housing the technical support and computers for the telescopes, and many others.

Why is the telescope called "the Otto Struve"? Dr. Otto Struve was the first director of the Observatory; he helped direct the site selected for the telescope and the construction. To show appreciation for his important work, the telescope was named after him.

Why is the Observatory in the remote mountains of west Texas? The farther the telescopes can be from towns and cities, the better. By putting the Observatory in west Texas, astronomers are trying to avoid light pollution that obscures stars and other astronomical objects. The reason the telescopes are on mountaintops is because there is less air on top of the mountains. Have you ever looked at the stars and noticed them twinkling? It may look pretty, but when using a telescope and studying objects in the sky, the twinkling makes it very hard to focus the telescope correctly. Air is one of the greatest nuisances to astronomers because it makes the objects in the sky harder to focus in a telescope. Ground-based telescopes are put on mountaintops to allow as little air as possible between the telescope and space.

What does the telescope collect?

Answer: Light from objects in the sky.

How large is the big mirror in the telescope?

Answer: 2.1 meters or 82 inches

If you could study anything in the universe, what would it be?

Answer: Any astronomical object or phenomena is an appropriate answer. The students may list planets, stars, comets, or more exotic objects they may have heard of like black holes or quasars.

References and Extensions:

For a history of the telescope, visit the NASA website at:

<<http://amazing-space.stsci.edu/resources/explorations/groundup/>>

For more information about the Otto Struve Telescope:

<http://mcdonaldobservatory.org/research/telescopes/telescope.php?t_id=17>


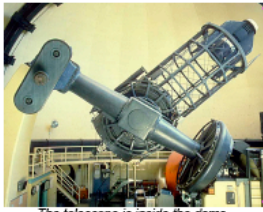
"Live from McDonald Observatory" Videoconference
Activity sheet

Name: _____ Date: _____
Name: _____ Date: _____

The McDonald Observatory is a place where astronomers use telescopes, computers, and special equipment. It is exciting to learn new things about the universe! This activity sheet will help you and your partner learn together.

*****Please wait until you are prompted to begin*****

Section 1: We are visiting the 2.1m Otto Struve Telescope!




The telescope is inside the dome. Here is where the dome is located on Mt. Locke.

What does the telescope collect?

How large is the big mirror in the telescope? _____ meters, or _____ inches.

YOU can be an astronomer too! If you could study anything in the universe, what would it be?


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Live from McDonald Observatory

Teacher Edition for grades 3-5

Our Science Journal: Make a drawing of the sun!

Prior to the videoconference, students should have filled in the pre-assessment sheet. The drawings and words that they use will help you gauge their pre-conceptions as well as prepare them for encountering new information about the sun.

Following the tour of the telescope, the facilitator will provide commentary while showing images of the sun in white light and light that has passed through an H-alpha filter. The facilitator will perform demonstrations to make important links between physical concepts and the sun.

In the box, students should draw the whole sun. Because of the images they will have seen in the videoconference, students should draw things like sunspots on the disk of the sun. It is possible a student could just draw a circle if there are no sunspots that day, although there will be supplemental recordings of the sun with sunspots if that occurs.

In labeling the parts, students may write "Sun" just outside the disk that they draw. The image they will be looking at to draw this sun will be showing them the photosphere, so the whole disk could be labeled as "Photosphere" as well. If students draw individual sunspots, they should label those as well.

Extended science details: "H-alpha" refers to a certain wavelength of light that comes from the release of a photon within a hydrogen atom. About 92% of the atoms in the sun are hydrogen. Hydrogen is the simplest atom possible with one electron that orbits around one neutron in the nucleus. If an atom gains energy (from deeper in the sun), the electron jumps to a higher orbit. When it spontaneously jumps downward to a lower energy level, it emits a photon. Electrons jumping from the third to the second orbit emit the H-alpha photon. The wavelength of this photon is 656.3 nanometers.

References and Extensions:

There are many references to sunspots and solar phenomena
< <http://helios.gsfc.nasa.gov/scycle.html> >

To check out daily photos of the Sun and track sunspots through SOHO:
< <http://sohowww.nascom.nasa.gov/sunspots/> >

"Live from McDonald Observatory" Videoconference
Activity sheet

Name: _____ Date: _____

Name: _____ Date: _____


Section 2: Our Science Journal. Make a drawing of the sun!

You should NEVER look up at the Sun with your eyes or with a telescope. Our star, the Sun, is very hot, and very bright! Astronomers use special equipment to learn about the Sun. Today, we will study the sun safely.

Remember, every good scientist makes careful investigations. Draw the entire sun as you see it.

Can you label its parts? Use the words below and label your drawing.

Sunspot Photosphere Sun



McDONALD OBSERVATORY
Fort Davis, Texas

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Our Science Journal: Make a CLOSE-UP drawing of the sun!

In the box, students should draw a feature that they can see on the sun. Their drawing should be like a zoom-in of a part of the sun, i.e. there should not be a full disk. (In the pre-assessment, it is likely that they drew a full disk image.)

In the zoom-in view that students draw, they should include a feature of the sun, such as a prominence or spicule layer and should label it accordingly. The image the students will be looking at for this drawing will be showing the chromosphere instead of the photosphere as seen previously, so students can label the whole drawing as "Chromosphere."

Choose one answer. Sunspots are:
Correct Answer: Cooler than the photosphere.

The facilitator will have done a demonstration of sunspots' coolness using an overhead projector and a light bulb. Remind students of the darkness of the filament, if they answer incorrectly. The filament was cooler, thus darker, than the surrounding area in the same way that sunspots are cooler than the surrounding photosphere.

More science details: The sun consists of several layers. Energy is produced by fusion in the core. It radiates outward, eventually traveling through the convective layer. The upper layers are: the photosphere, the chromosphere (a thin transitional layer only 8000 km thick, with some spicules going a bit higher sometimes), and the corona. When you consider that the diameter of the sun is 1.4 million km, you'll understand how thin the chromosphere really is!

References and Extensions:

For general pictures and information about observing the Sun, visit the Solar & Heliospheric Observatory (SOHO) website at:
<<http://sohowww.nascom.nasa.gov/>>

To extend your study of the sun, see Project FIRST (Fostering Reading through Science and Technology): Eye on the Sky for grades K-5 teachers. This site lists many grade appropriate books on the sun as well as activities for the classroom.

< <http://www.eyeonthesky.org/ourstarsun.html>>

"Live from McDonald Observatory" Videoconference
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Name: _____ Date: _____

Name: _____ Date: _____

Section 3: Our Science Journal. Make a CLOSE-UP drawing of the sun!

You should NEVER look up at the Sun with your eyes or with a telescope. Our star, the Sun, is very hot, and very bright! Astronomers use special equipment to learn about the Sun. Today, we will study the sun safely.

Remember, every good scientist makes careful investigations. Draw the feature as you see it.

Can you label its parts? Use the words below and label your drawing.


Prominence Spicule layer Chromosphere

Choose one answer. Sunspots are:

Hotter than the photosphere.

The same temperature as the photosphere.

Cooler than the photosphere.



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