The Sun in a Different Light Activity (Banner)

What's this Activity About?

Objectives:

1) Prepare the visitors for the experience of observing the Sun
2) See how different wavelengths of light reveal the variety of features caused by the Sun's magnetic activity
3) Introduce solar storms

Presenters: A minimum of one person.

Duration: A few minutes, up to a half hour, depending on the number of topics covered.

Visitors: Appropriate for families with older children, the general public, and school groups in fifth grade and up. Any number of visitors can participate.

Materials:

What materials do I need?

- Banner: The PDF for this banner can be found on the webpage below. The file name is "MagSunBanner.pdf". You can have a full-size banner made at a printing company.
    - https://nightsky.jpl.nasa.gov/admin/download-view.cfm?Doc_ID=496

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Copies for educational purposes are encouraged.
Additional astronomy activities can be found here: http://nightsky.jpl.nasa.gov

Activity Script

Leader's Role ***Participants' Role (Anticipated)***

To do:

Have banner hung or placed on a large table for visitors to view.

To say:

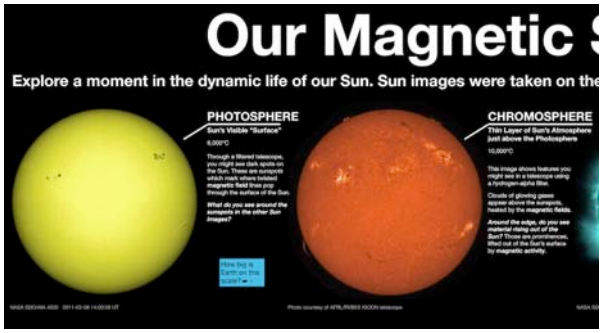
These three images of the Sun were taken on the same day (March 6, 2011) using different kinds of detectors. They allow us to examine more than we can see simply with our eyes.

Who can tell me what they see on these images of the Sun?
How are they the same? What's different?

Various answers

These features are all caused by the dynamic magnetic activity of the Sun. If the Sun did not have changing magnetic activity, it would have a plain, uninteresting face.

To put the size of the Sun in perspective, this little dot in the blue box shows how big the Earth is compared to the Sun at this size – about as big as some of these sunspots that we see in this yellow image on the left. This image is what we would have seen that day in a filtered white light scope.



This middle image is what we would have seen that day in a hydrogen alpha telescope. What do you notice that you don't see in the first image?

White areas, dark streaks, red arcs around the edges

Right – the bright areas are called plage (*pronounced like garage*), like clouds above the sunspots. See how white they are – that means they are hot – generated from material heated by the strong magnetic fields around the sunspots.

Who can find a finger of material rising from the side of the Sun? Those are prominences, material lifted out of the Sun's surface by magnetic activity. How about some darker filaments snaking across the Sun's face? Filaments are just prominences as seen from above, silhouetted against the brighter Sun. They're really the same thing.

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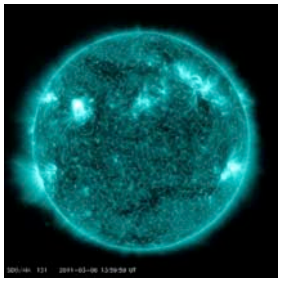
To say:

NASA's Solar Dynamics Observatory – a space-based mission, took this third image. If you had eyes like that spacecraft, you could see features like these that are at much higher temperatures, over a million degrees.



What is around the sunspots here?

Bright loops!

These are called coronal loops. Coronal loops form from material in the Sun's corona, or atmosphere. That material is caught in the magnetic fields around sunspots – following the magnetic field lines – like the ones you see in the image on the right.

This lower image shows the outer atmosphere of the Sun – the Corona – all these particles are streaming away from the Sun all the time.

Sometimes the Sun releases a storm of material. We can see that happen in this video.
This video shows three days (March 5-7, 2011) on the Sun, days that span when these images were taken.

To do:

Show video at:
http://www.astrosociety.org/samplers/DynamicSun4Views.mov
Or scan the QR Code on the bottom left of the banner with a smartphone.
(See Background Information for an explanation of QR codes.)

To say:

Enjoy your views of the Sun through the telescope – see how many of these features you can find.

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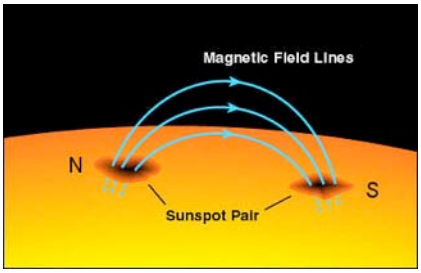
Background Information

During a given sunspot cycle, the leading sunspots in groups in the northern hemisphere of the Sun all tend to have the same polarity, while the same is true of sunspots in the southern hemisphere, except that the common polarity is reversed from that of sunspots in the northern hemisphere.

Sunspots have polarity because they are just the visible manifestation of a magnetic field line emerging above the visible surface of the Sun. A magnetic field line has north-south polarity, even when it is twisted or bent.



Presentation Tips:

- Use the Explore the Sun cards to help answer visitors' questions:
  - https://nightsky.jpl.nasa.gov/download-view.cfm?Doc_ID=498
- Show visitors real-time views of the Sun in different wavelengths:
  - Have your visitors compare what they see in the telescope right now to images acquired from other telescopes.
  - If you have Internet access, use a computer or smartphone to see the most current images of the Sun from the Solar Dynamics Observatory (SDO) (taken within the last hour) and from the National Solar Observatory (NSO).
    - For seeing the current view of the Sun in H-alpha, go to the National Solar Observatory website: http://halpha.nso.edu/
      NOTE: All times are in Universal Time.
    - For viewing other wavelengths on a computer go to the SDO website: http://sdo.gsfc.nasa.gov/
    - For other wavelengths on a smartphone, download the app:
      - iPhone: 3D Sun and Space WX
      - Android: SDO app from ASTRA
    - Then, to see the latest images:
      - Select the "AIA 4500" for a visible light image. It should look very much like what you see in the telescope.
      - Select the "AIA 131" image for the extreme ultraviolet image.
      - Select the "AIA 304" image to see prominences that might also be visible in H-alpha scopes.

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