Maryland Science Center

OUR HIDDEN UNIVERSE

1. OVERVIEW DESCRIPTION

Our Hidden Universe is a hands-on planetarium show.

Participants are given a kit of materials and encouraged to use these materials to make observations throughout the show.

The show focuses on the various tools that can be used to observe and interpret the planets and stars, and how the continued development of observational tools allows us to expand our knowledge of the planets and stars

2. UNIVERSE OF LEARNING RESOURCES

Hubble Space telescope imagery, radio telescope imagery, Juno imagery, Chandra X-ray Observatory imagery, Gemini Observatory imagery, Fermi Gamma-ray Space Telescope imagery

3. PROGRAM DETAILS

A. Goals: To create an interactive planetarium show

B. Target Audience: Home school students, general public

C. Timeline or Schedule of Events: October 15, 2018- December 29, 2018

4. PROGRAM MODEL

- Staffing: In the best-case scenario, two staff would be involved in running the Our Hidden Universe program. It is helpful to have two staff for passing out and collecting back the material kits, especially as some guests may need to leave the planetarium before the end of the program.
- Graphics or other needed imagery:
    - Image of Galileo + telescope
    - Image of varying sizes of ground telescopes, from at home use to Gemini North
    - Image of Ring Nebula + images of Ring Nebula through different color filters

- Images of EMS and telescopes that can observe the various wavelengths
- Images of Sun as viewed through different wavelengths
- Images of Jupiter as seen through radio telescope, June, Chandra, and Gemini
- Images of the night sky seen through various wavelengths of light (gamma, infrared, microwave)

- Materials

  The interactive material kits included three materials:

  1. Pocket telescopes, up to 8x magnification
     a. NPW Weird Science Mini Telescope (found on Amazon)
  2. Red, Blue, Green filters
     a. Primary Blue, Light Red, Primary Green colored gels (found at stagelightingstore.com)
  3. Diffraction peephole viewers
     a. Rainbow Symphony (found on Amazon)

- Activity outline: Please see below for complete activity outline.

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OUR HIDDEN UNIVERSE: Activity Outline for use in the Davis Planetarium

---Distribute materials as guests enter the planetarium---

Show button labels are highlighted in grey

Presenter notes –Feel free to use your favorite deep space images/videos. Recent add to his page is the WVLNGTH SKIES which is not in the sequence, but up and to the right of the sequence buttons.

Introduction:

- What color seats? - Welcome to Davis Planetarium – basic welcome to theater
    - Coves start only with blue/green light so hiding the fact that the seats are red. Button also adds red and removes it 2x with clicks
- Brief overview of the program
    - Be sure to say: This program is interactive and involves some observational tools that we have provided in the pouches given out as you entered
- What's in the Pouch? - Preview materials before lights are dimmed
    - The three items in your pouch
        - Telescope for up to 8 times magnification like Galileo's first telescope
        - Red/Green/Blue filter
        - Spectraviewer Ring - Circular disk with diffraction grading
    - Share kit with your neighbor
    - IF something is missing from your pouch please raise your hand and we will provide a spare item.
    - I will announce when to use each tool throughout the show, but feel free to explore with any of the tools

Observing with our eyes:

- TSL Opening - Early on [in history] all we knew about the sky was based on what we could observe with our eyes alone
- Allow for guests to make observations with their eyes based on dome projection
    - Display current night sky in Baltimore, then fade away light pollution
    - Objects within our solar system vs deep space Naked Eye View

- Planets Label 6 Planets
- Moon
- Constellations
- Andromeda galaxy

Observing with telescopes:

- Galileo + telescope
    - Telescope helped to change the way we think of ourselves in comparison to the greater universe
    - Cue audience to take out telescope and observe objects on dome
        - Zoom into Jupiter, Mars and Saturn as seen through scope – Mars thru scope, Zoom Saturn pic, Jupiter +Gmoons scope pic
            - First click is small but still telescope view
            - Second click is a slightly more zoomed picture
        - Ask: What do you notice about the object that you didn't notice before?
- Small land scopes vs mega land scopes vs space scopes
    - Starparty, Ground 'small' scopes, Lowell Obs Dome, Gemini North obs
        - Briefly display images of the different types of telescopes
        - Explain that telescopes can not only see further than our eyes, but some can see types of light that are completely hidden to your eyes.

Introduce concept of the Electromagnetic Spectrum:

- EMS only cyl – Display graphic of electromagnetic spectrum
    - Cue guest to take out circle viewer, hold to eye, look at projector near exit sign
        - You will notice rainbows, white light is actually made of all the colors of the rainbow and this tool helps us make that observation
        - Everything we can see is what we call visible light (use arrow to show on dome graphic)
    - Visible light is just on very small portion of all the different types of light that exist in the universe

Capturing images with telescopes:

- Let's take a look at an object through some of these different types of light and see if we can guess what it is.

- DON'T GIVE AWAY WHAT THIS OBJECT IS UNTIL LAST BUTTON IN SEQUENCE – Display "guessing game" -- viewed through various wavelengths of light – first click loads scope, second loads mystery object
    - Radio telescopes
    - UVS Juno – ultra violet
    - Xray Chandra
    - Vis IR Gemini telescope – infrared
    - Vis Telescope – visible – has ten second delay from small with moons to bigger view of Jupiter

- Ring Nebula M57 - shows in summer triangle small telescope view - Image of color layering to develop whole picture
    - Ring Nebula RGYBC – each click adds new black and white view of nebular under certain color filters – Color - colorizes the b/w images then color combines them
    - M57 AllSky Ring Neb – all sky view - encourage to look at with color filters
- Space Scopes cyl – show without any of the previous scope images
    - First click shows spectrum and telescopes
    - Second click adds labels for scopes
    - Each is different in design depending on what kind of light in the spectrum it is collecting.
- EMS only cyl – Showing just the electromagnetic spectrum
    - Sun EMS – sun at the same time through the different wavelengths
    - DON'T GIVE AWAY WHAT THIS OBJECT IS UNTIL LAST BUTTON IN SEQUENCE – Display "guessing game" -- viewed through various wavelengths of light – first click loads scope, second loads mystery object
        - Radio telescopes
        - UVS Juno – ultra violet
        - Xray Chandra
        - Vis IR Gemini telescope – infrared
        - Vis Telescope – visible – has ten second delay from small with moons to bigger view of Jupiter
- What we've learned from exiting Earth's atmosphere
    - Project images of deep field, crab nebula, etc.
- Filters
    - Invite guests to pull out the r/b/g filters and observe various images
        - Discuss which parts of the image are most apparent when viewed through each filter—why this is important/what this means
        - Discuss the purpose of filters

        - Spectraviewer ring – can be used on any of these items or just looking at projectors light if they can see it.
    - Show other deep space imagery – see each with filters provided
        - A for Andromeda - M31 Andro gal t-scope – two buttons that help point out and show galaxy and scope view
        - Circle Pleiades - Pleiades – M45 Tscope - two buttons that point out Pleiades and scope view, they can use their scopes on the first one compare naked eye to scope then show zoomed view
        - M1 Earth – crab nebula in Taurus
            - M1 AllSky Crab Nebula – natural color view
            - M1 Crab Neb Layers – colors represent different wavelengths, each click shows what the color layers are - presenter notes in DS with details
    - Sky in different wavelengths WVLNGTH SKIES
        - It starts with loading then goes through wavelengths with clicks, has slight diurnal motion to it and stops motion after the last click. Each click goes to visible between each of wavelengths.
            - Gamma Ray
            - Infrared – thermal radiation
            - Microwave – WMAP microwave background

Wrap up:

- Sunrise
- Instruct guests to drop bags of materials off at the door