Birthday Star
ACTIVITY INSTRUCTIONS

Objective
- Discuss how looking into space means looking back in time because of light's travel time.
- Discover that a "birthday star" is one whose starlight left the star around the time you were born.

Suggested Age Range
Ages 6 and up

Activity Duration
5-10 minutes, depending on discussion time

Materials
- List of stars at different distances
- Birthday star certificates
- Pencils
- Optional: calculator, image of James Webb Space Telescope

Setting
Indoors or outdoors

Credit
Adapted from **https://www.pbs.org/seeinginthedark/explore-the-sky/birthday-stars.html** and from an activity from Cape Fear Museum of History and Science.

Procedure
1. Invite participants to the table with a question like, "Do you want to find out if you have a birthday star?"
2. Explain that first we'll consider how distance is measured in space. Most things in space are so far from Earth that it doesn't make sense to talk about their distance in terms of miles or kilometers. Instead, astronomers use units like light-years. That might sound like a unit of time, but it's really a unit of distance. A light-year is the distance light travels in a year. Does light travel slowly or quickly? (Fastest thing in the universe!) Light travels 186,000 miles per *second*. One light-year is nearly 6 trillion miles (more than 9 trillion kilometers). That's 6 with twelve zeroes behind it—a very long distance!
3. Explain that we see stars and other objects in space as they looked back when the light left them. *When you look into space, you look back in time!* For example, Sirius is 9 light-years away. It takes 9 years for its starlight to reach Earth, so we always see that star as it looked 9 years ago. If you're 9 years old right now, then Sirius is your current "birthday star." When you see Sirius, you see starlight as old as you are; its light left the star around the time you were born. (Note: Be careful not to imply that the star itself is only 9 years old. Stars live for millions to billions of years.)
4. Direct your participant to the birthday star list. See if they can find their age. Encourage them to round their age up or down as needed to find a corresponding star. (Note: Estimates for star distances can vary. We relied mostly on the PBS Seeing in the Dark webpage, **https://www.pbs.org/seeinginthedark/explore-the-sky/birthday-stars.html**, but also considered other sources.)
5. Answer any questions as participants study the birthday star list. For example, they may wonder why there aren't stars listed for some of the youngest ages. That's because when we look farther away, we're sampling larger and larger volumes of space and have more stars to choose from. The birthday star list focuses on brighter-appearing stars visible from North Carolina with the unaided eye (when possible), but seeing some of the stars on the list requires a telescope or traveling farther south. Note that a given birthday star is accurate only for a person's current age. As you age, you get to pick a different star.

CONTINUED ON BACK

Procedure (continued)

6. Help your participant fill out a birthday star certificate to take home. Optional: Provide a calculator to help with the multiplication.
7. Follow up when participants finish their certificates. Ask, what's your birthday star? If you see that star in the sky, the starlight you see left that star around the time you were born and is only now entering your eyes!
8. To connect this activity with current science, mention that in December 2021, NASA launched the James Webb Space Telescope. It's a powerful time machine that can see much farther into space than our eyes can. The Webb telescope can peer back over 13.5 billion years to see the first stars and galaxies forming. The telescope's discoveries will help us better understand the origins of our universe and our place in it. Learn more about this telescope at **https://jwst.nasa.gov/**

A NOTE ON STAR NAMES

Stars can have several names, such as a proper name for the brightest stars, with mostly Arabic, Greek, or Latin etymologies (e.g., Vega), or various catalog numbers (HR 7001 is another name for Vega). Stars used to be named in order of brightness within a given constellation, with Alpha as the brightest, Beta the second-brightest, etc. In this system, the constellation name is given with the Latin genitive case, e.g., the brightest star in the constellation Lyra is Alpha Lyrae (yet another name for Vega). Early estimates of which star is brightest were sometimes flawed, but the naming system is still widely used. Several companies offer to "name" stars—for a price. These registries are not official. The International Astronomical Union is the internationally recognized authority for naming celestial bodies; names are not sold, but are assigned according to internationally accepted rules. Learn more at **https://www.iau.org/public/themes/buying_star_names/**

A NOTE ON CONSTELLATIONS

To astronomers, a constellation is not a connect-the-stars outline or picture, but an entire area of the sky with defined boundaries. It's a bit like how the U.S. is divided into areas called states. Objects in a given constellation can lie at many different distances, and are not necessarily related in any way other than lying in the same general direction from Earth's point of view. That is, constellations are arbitrary human inventions—not natural groupings of stars. The International Astronomical Union has divided the sky into 88 constellations, which are recognized by the international scientific community, though different cultures have divided and organized the stars in different ways over time. Learn more about the origin of the constellations and find a pronunciation guide at **https://www.iau.org/public/themes/constellations/**

NORTH CAROLINA SPACE GRANT

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