**Activity: Life Cycle of a Massive Star**

**Objective:** The NASA/James Webb Space Telescope Life Cycle bookmark will model the life cycle of a massive star using beads to represent a star’s development.

**The James Webb Space Telescope and Star Formation:** The James Webb Space Telescope (Webb) will launch in 2021 and will see light in the infrared part of the spectrum. Spanning the size of a tennis court and standing three stories tall, Webb will be the largest observatory ever sent into space. From its orbit some one and a half million kilometers away from Earth—about four times the Earth-Moon distance—Webb will be used to study many things, including the life cycles of stars. Within this activity, students will make a visual representation of the life cycle of a massive star by associating different colored pony beads to different stages of stellar life.

**Materials:**
- Pony Beads: green, blue, white, yellow, orange, red, black, & green
- Cord or yarn
- Tape
- Scissors
- [Webb Life Cycle bookmark](http://jwst.nasa.gov/education/JWSTLifeCyclesBookmark.pdf) (If available, use heavy-card-stock paper for bookmark)

**Procedure:**
1) Ask student to describe a life cycle that is familiar to them. Help facilitate this conversation by using a guided approach. Then discuss that a star also goes through a life cycle.

2) Discuss that a star’s life cycle depends on its mass. Review that Webb will help us study the life cycle of stars (See resource below).

3) To begin activity, cut six to eight inches of yarn and tie it to the end of the stellar Life Cycle bookmark.
4) Tape the end of the cord/yarn for easy threading of the beads. Have students model the correct order of beads by color by referring to their bookmark. Check for correct order before tying a final knot.

**Life Cycle of a Massive Star:**

Step 1 - Green - A cloud of gas and dust collapses due to gravity, creating a protostar.

Step 2 - Blue - Gravitational energy powers the young star until...

Step 3 - Yellow - …nuclear fusion occurs. The main sequence star may live millions or even billions of years.

Step 4 - Red - The star expands into a red giant when the star's hydrogen level drops.

Step 5 - Orange - Different fusion processes occur. The star expands, cools, and loses mass each time.

Step 6 - White - Fusion stops and a supernova explosion occurs. Most of the star is blown away.

Step 7 - Black - Depending on the original star’s mass, either a black hole or neutron star remains.

Step 8 - Green - The material shed during the star's life joins new gas clouds, and new stars are formed.

**Resources:**

★NASA: James Webb Space Telescope
http://jwst.nasa.gov

★NASA: Imagine the Universe – The Life Cycles of Stars
https://imagine.gsfc.nasa.gov/educators/lessons/xray_spectra/background-lifecycles.html