



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)
- <http://jwst.nasa.gov/education/JWSTLifeCyclesBookmark.pdf>

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