NASA Resources for Biology classes

<u>For NC Bio. Obj. 1.2.3 -</u> Cell adaptations help cells survive in particular environments

Lesson Plan: **Is it Alive?**
This lesson is designed to be a review of the characteristics of living things.
http://marsed.asu.edu/sites/default/files/stem_resources/Is_it_Alive_HS_Lesson_2_16.pdf

Lesson Plan: Building Blocks of Life
Experiment with Yeast to simulate carbonaceous meteorites.
https://er.jsc.nasa.gov/seh/Exploring_Meteorite_Mysteries.pdf#page=138

Video:

- **Subsurface Astrobiology: Cave Habitats on Earth, Mars and Beyond:** *In our quest to explore other planets, we only have our own planet as an analogue to the environments we may find life. By exploring extreme environments on Earth, we can model conditions that may be present on other celestial bodies and select locations to explore for signatures of life.* https://images.nasa.gov/details-ARC-20160809-AAV2863-SummerSeries-15-PenelopeBoston-Youtube.html
- **Real World: Heart Rate and Blood Pressure:** Learn about the physiological effects reduced gravity environments have on the human body. Use multiplication to calculate cardiac output and find out what effect space travel has on sensory-motor skills, stroke volume and heart rates of the astronauts.
  https://nasaeclips.arc.nasa.gov/video/realworld/real-world-heart-rate-and-blood-pressure

- **Launchpad: Astrobiology:** Are we alone in the universe? Where do we come from? Join NASA in the search for answers to these and many more questions about life in our solar system. Learn how astrobiologists use what we know about Earth to investigate Titan, Europa and other far-off worlds. https://nasaeclips.arc.nasa.gov/video/launchpad/launchpad-astrobiology

Article:

- **Synthetic Biology -** 'Worker Microbes' for Deep Space Missions
  https://www.nasa.gov/content/synthetic-biology

For NC Bio. Obj. 2.1.1 - Analyze the flow of energy and cycling of matter

Lesson Plan: Blossoms Blooming: Analyzing Plant Growth Patterns

Students analyze historic plant growth data (i.e., peak bloom dates) of Washington, D.C.'s famous cherry blossom trees, as well as atmospheric near surface temperatures as evidence for explaining the phenomena of earlier peak blooms in our nation's capital.
https://mynasadata.larc.nasa.gov/lesson-plans/blossoms-blooming-analyzing-plant-growth-patterns

Lesson Plan: The Cycle of Matter

Students trace the path that atoms take as they move throughout the cycle of matter and compare this to the flow of energy.
http://wayback.archive-it.org/5717/20140812005600/http://astroventure.arc.nasa.gov/teachers/pdf/AV-Biolesson-6.pdf

Videos:

- **Recycling**: Recycling on the International Space Station is modeled after the way Earth recycles water and oxygen.
  https://www.nasa.gov/audience/foreducators/diypodcast/recycling-index-diy.html
- **Our World: Plants in Space:** Find out how plants use light to make their own food in a process called photosynthesis. See how NASA uses LED lights to help grow plants in space.
  https://nasaeclips.arc.nasa.gov/video/ourworld/our-world-plants-in-space

Article:

- **Synthetic Biology for Recycling Human Waste into Nutraceuticals and Materials: Closing the Loop for Long-Term Space Travel**
  https://www.nasa.gov/feature/synthetic-biology-for-recycling-human-waste-into-nutraceuticals-and-materials-closing-the

For NC Bio. Obj. 2.2.1 - Human activities may impact the environment

Lesson Plan: Scavenger Hunt

To study evolution by natural selection in this predator population, the class will track the frequency of each appendage type through three generations.
https://pumas.nasa.gov/files/09_17_03_1.pdf

Video:

- **Oceanography Satellite**
  https://images.nasa.gov/details-NHQ_20160122_This%20Week%20at%20NASA_TWAN0122C.html
- **Our World: Honeybees:** Join NASA scientists and beekeepers in a citizen science project to collect important data about climate change. Learn how honeybees pollinate over 130 crops in the United States each year and what NASA is doing to help study the decline in bee populations.
  https://nasaeclips.arc.nasa.gov/video/ourworld/our-world-honeybees

- **Real World: NASA and the Chesapeake Bay:** Learn how NASA uses Earth observing satellites to monitor conditions in the Chesapeake Bay over time. Information about pollution, eutrophication, land cover and watershed runoff helps water managers enact policies to improve the health of the Bay. https://nasaeclips.arc.nasa.gov/video/realworld/real-world-nasa-and-the-chesapeake-bay

Other Resources

Space Life Sciences education website: Here you will find resources on living organisms in the space environment. Visit the topic sections for more information, and return to the website often for news on space life sciences research. https://www.nasa.gov/audience/foreducators/spacelife/home/index.html

The Imagine Mars Project: This project enables students to explore their own community and decide which arts, scientific, and cultural elements will be important on Mars. Then, they develop their concepts relating to a future Mars community from an interdisciplinary perspective of arts, sciences, and technology. https://mars.nasa.gov/imagine/leaders/project_examples/ideas.html

Space Faring: The Radiation Challenge - Even though this guide is marked for middle school students, there is an activity to test knowledge of ionizing versus non-ionizing radiation and the effects on people who are exposed to radiation. https://www.nasa.gov/pdf/284277main_Radiation_MS.pdf