Science MATTERS! ... IN CONNECTICUT

NIE ACTIVITY

Science Matters! is a series presented in collaboration with the **Connecticut Academy of Science and Engineering.** For more information, visit www.ctcase.org or call 860.571.7143.

Proxima b in the Habitable Zone

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Like a wish come true, scientists at the European Southern Observatory (which has telescopes in various locations around the world) discovered a habitable, roughly Earth-sized planet orbiting Proxima Centauri, our closest stellar neighbor at only 4.2 **lightyears** away. This **exoplanet**, named Proxima b, circles around its host star every 11.2 days at a distance 20x closer than the Earth to the Sun. This places Proxima b right in its host star's **habitable zone**.

Though in the habitable zone, Proxima b still might be a rough place to live because the host star is very active and will emit more high-energy radiation that can potentially damage life. Additionally, Proxima b also might be tidally locked with one side of the planet always facing the star, resulting in extreme hot and cold temperatures on its surface. Additionally, it is unclear how much water the planet retains.

Scientists are working to find the answer to whether Proxima b hosts life. Important to this goal is characterizing the different chemicals present in its atmosphere, which can be accomplished through **spectroscopy**. An atmosphere spectrum can be acquired when a planet passes between its host star and us, or through direct imaging, where special instruments are used to take a careful picture of the planet. We can then search these spectra for **biosignatures**, which have the potential of finally revealing the presence of life.

The James Webb Space Telescope is slated for launch in October of 2018 for orbit around the sun and will be potentially capable of imaging Proxima b. Others are working on additional projects to study Proxima b, including one group endeavoring to use lasers to push small space-sailboats with light sails to reach Proxima b in around 20 years.

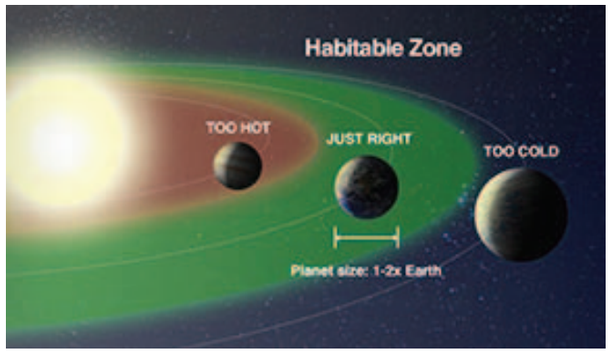
In the meantime, if we call organisms from Mars, Martians, think about what we might call organisms from Proxima b!

MEET THE SCIENTIST

I grew to be passionate about science because I really enjoyed being right. A special satisfaction comes from scientifically working through a problem to reach an answer based upon rigorous evidence and calculations. In middle school and high school, I was eager to participate in Mathcounts and volunteer at my local science museum. In my spare time, I also enjoy participating in triathlons, planning scavenger hunts, and caring for houseplants.

SKILLS AND KNOWLEDGE

I am a graduate student in astronomy with a focus on astrobiology. The most exciting aspect of astrobiology is how many different areas of expertise it incorporates. Skills ranging from chemistry to biology help determine what signs of life to look for, and skills in physics and engineering help construct the ways to find them. To join this interdisciplinary field, focus on math and science courses, pick your favorite one, and keep an open mind.



Lightyear – A unit of length, described by the distance light travels in a year; approximately 6 trillion miles

Exoplanet – A planet that orbits a star other than our own Sun

Habitable zone – The distance from its host star that a planet needs to be in order to maintain liquid water on its surface, which is thought to be essential for life

Spectroscopy – The study of how different types of matter interact with light

Biosignature – Evidence of a chemical, process, or phenomenon that is produced only by the presence of life

Hyperlinks:

View and learn about the stars closest to us at: http://stars.chromeexperiments.com/
A comparison of Proxima b to Earth: https://medium.com/starts-with-a-bang/ten-ways-proxima-b-is-different-than-earth-9110a441baca#.532cewm1n
For more information and updates: http://www.ice.cat/personal/iribas/Proxima_b/index.html
James Web Space Telescope: https://jwst.nasa.gov/orbit.html
European Southern Observatory: http://www.eso.org/public/
Project Blue: http://www.projectblue.org/
Breakthrough Initiatives, Starshot: https://breakthroughinitiatives.org/Initiative/3

For Students and Teachers Making Curriculum Connections, see the following:

Next Generation Science Standards: Scientific and Engineering Practices

- Asking questions and defining problems
- Developing and using models
- Planning and carrying out investigations
- Analyzing and interpreting data
- Using Mathematics and computational thinking
- Constructing explanations and designing solutions
- Engaging in argument from evidence
- Obtaining, evaluating, and communicating information

Connecticut State Department of Education (CSDE) Common Core State Standards (CCSS): Mathematics

- CCSS.Math.Practice.MP1 Make sense of problems and persevere in solving them
- CCSS.Math.Practice.MP3 Construct viable arguments and critique the reasoning of others
- CCSS.Math.Practice.MP5 Use appropriate tools strategically

NIE NEWS IN EDUCATION

- Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena
- Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation
- Scientific inquiry requires the sharing of findings and ideas for critical review by colleagues and other scientists