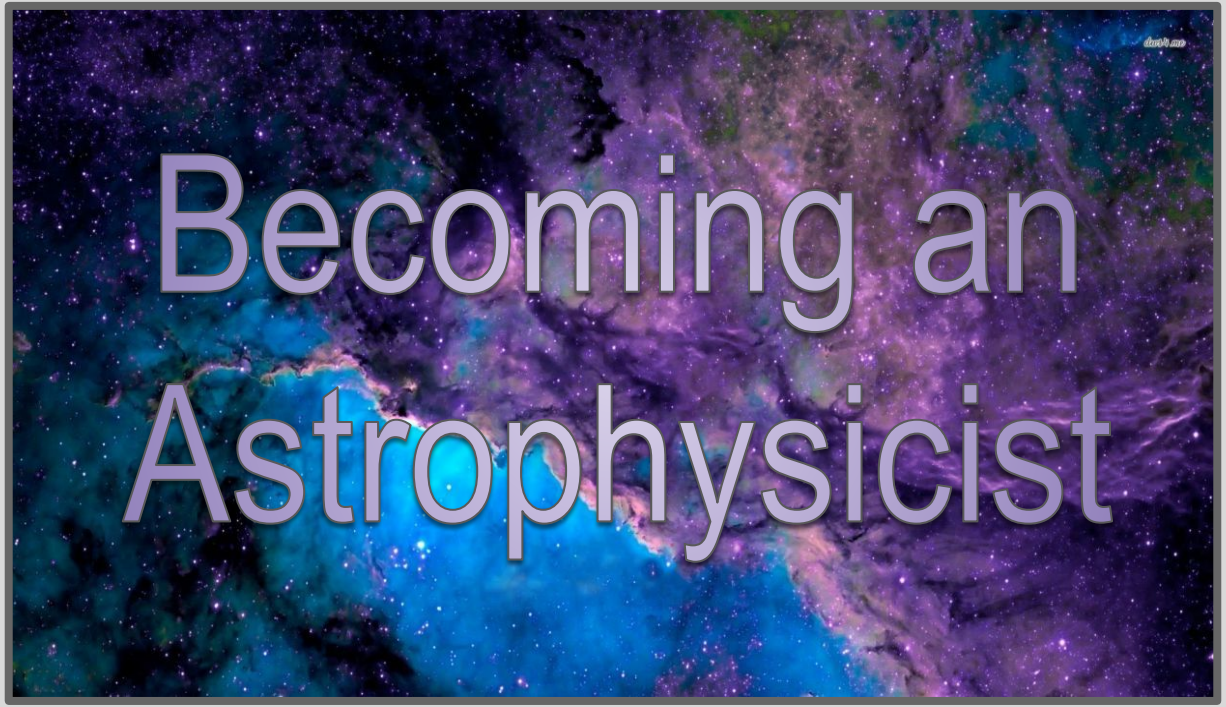


VEX IQ STEM Career Readiness Online Challenge

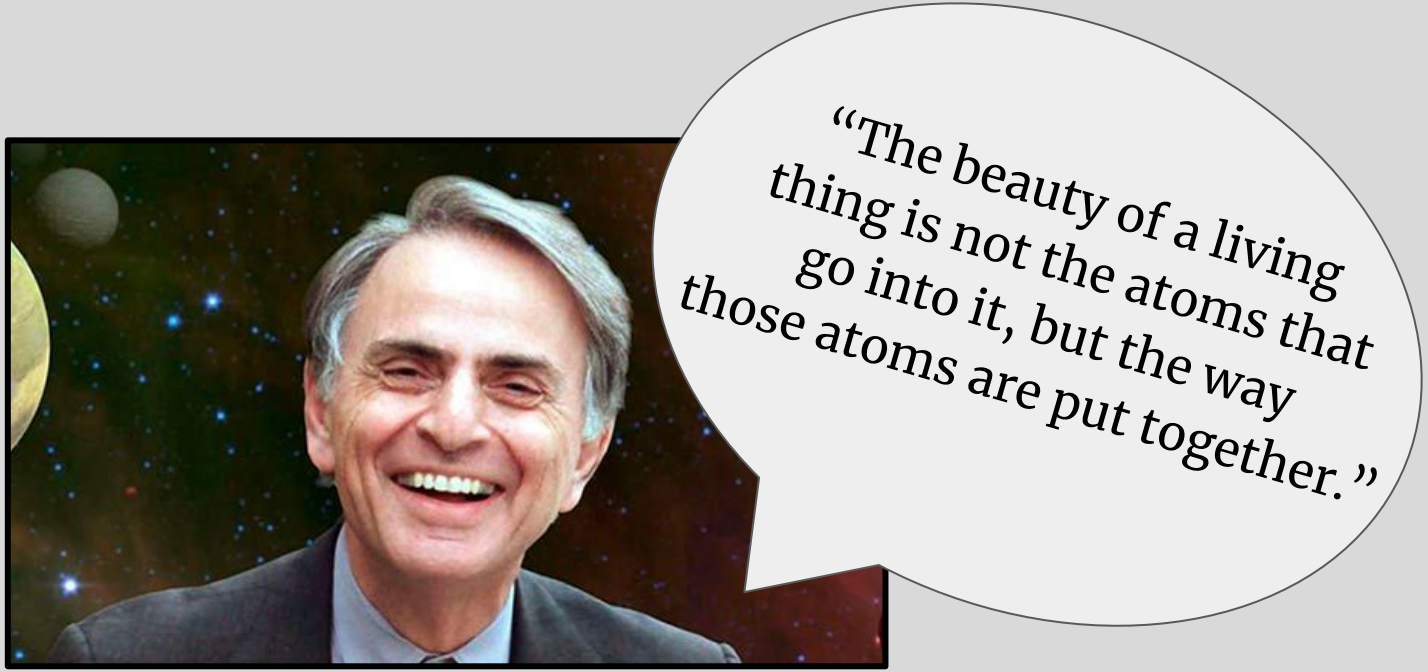
Team 14366A - Generation Artemis

We are Generation Artemis!

We have a deep passion and interest in space. We love reading the updates on NASA's website and seeing all the amazing things that scientists do in their labs.

We will be exploring the career of an Astrophysicist.

People love to explore and understand how things work. That is why we have space exploration and astrophysicists. The famous astrophysicist Carl Sagan said,



The ultimate purpose of Astrophysicists is to bring understanding to the many discoveries that are being made.

Astrophysicists...

- Work in labs, observatories and universities
- Conduct research and make observations
- Interpret data to draw conclusions about our known universe

M87 black hole

Palomar Observatory

Examples of Astrophysical Research:

- Research habitable planets
- Study weather patterns on different planets
- Look to see if planets have storms or geysers
- Find which direction galaxies spin and how black holes work

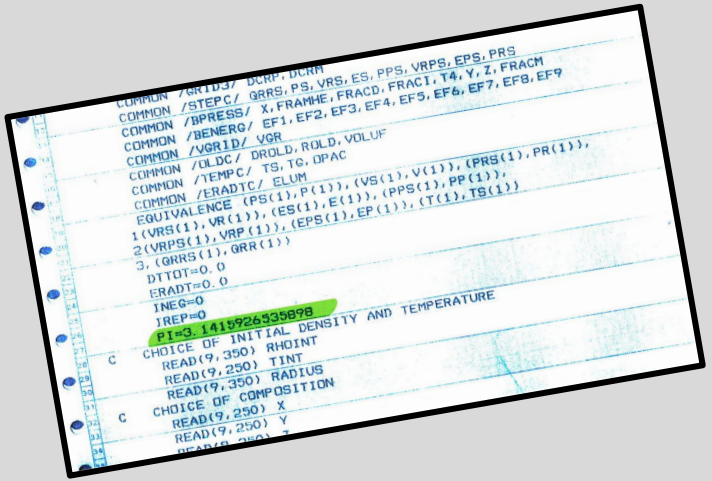
Dr. Becky

Becky Smethurst is an astrophysicist at Oxford University, London England. She studies the differences between star formations in spiral galaxies and blob galaxies. She predicts galaxies that rotate will have more hydrogen gas. She working on proving her theory.

She is also our favorite YouTube vlogger. Known as Dr. Becky, she has posted useful vlog. A day the life of an Astrophysicist. Her video shows that she researches most of her day, attends scientific lectures, has a journal club that shares the results of their research, and writes proposals summarizing her research to earn time at observatories.

Dr.Becky's BIGGEST piece of advice is…

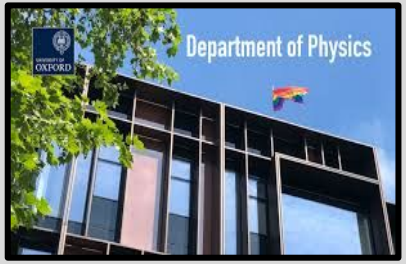
LEARN TO CODE!



Dr. Becky says if you use coding to help you, you will have time to make more discoveries and not have to do huge tasks. You will be able to let the computer do most of the research just by writing a script.

How to become an astrophysicist

With a bachelor's degree in astrophysics or astronomy, you could work as a research assistant or an assistant at an observatory. You could teach middle or high school science. Most astrophysicists have PhDs. With a PhD, you could teach at the university level, become a consultant or conduct research in your field of interest.

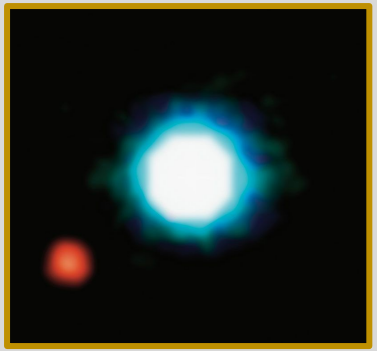


A bachelor's degree in either physics or astronomy is considered good preparation for becoming an astrophysicist. After one or more postdoctoral appointments, where you will learn under the supervision of an experienced astrophysicist, you will be able to lead a team of researchers on your own.

NASA Fellowships

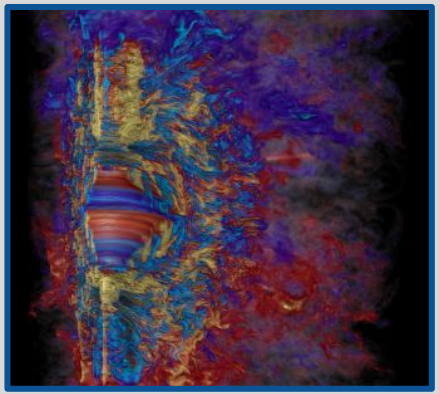
A fellowship is typically a merit-based scholarship for advanced study of an academic subject. Currently Nasa has three well known fellowships. These fellowships are available to students who have finished their PhD and are researching astronomy and astrophysics.

The **Sagan fellowship** is given out to people who are interested in exoplanetary exploration.



Exoplanet 2M1207b

Supercomputer visualization of a magnetic field in collapsed star



The **Einstein fellowship** aims to expand our knowledge of the origin, evolution and fate of the universe.

The **Hubble fellowship** conducts research related to the mission of NASA's Cosmic Origins program, which examines the origins of galaxies, stars and planetary systems, and the evolution of these structures with cosmic time.

Andromeda galaxy

How much money astrophysicists earn per year/month:

The average astrophysicist salary is $88,5600.

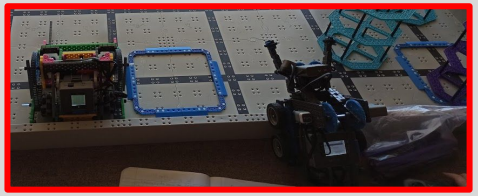
The salary range typically falls between

$75,149 and $104,042.

How Competitive Robotics prepares us for the STEM field

Skills

- Data collection
- Note taking
- Goal setting and task completion
- Communication

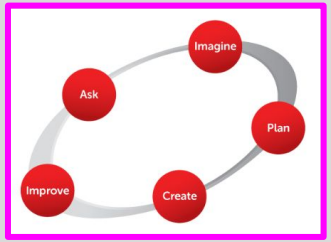


Emotional Skills

- How to deal with trial and error
- Dealing with failures
- Collaboration
- Becoming more innovative

Academics

- Math: measurements, ratios, weight,
- Science: physics, torque, speed, leverage, force, motion
- Coding
- Engineering design process



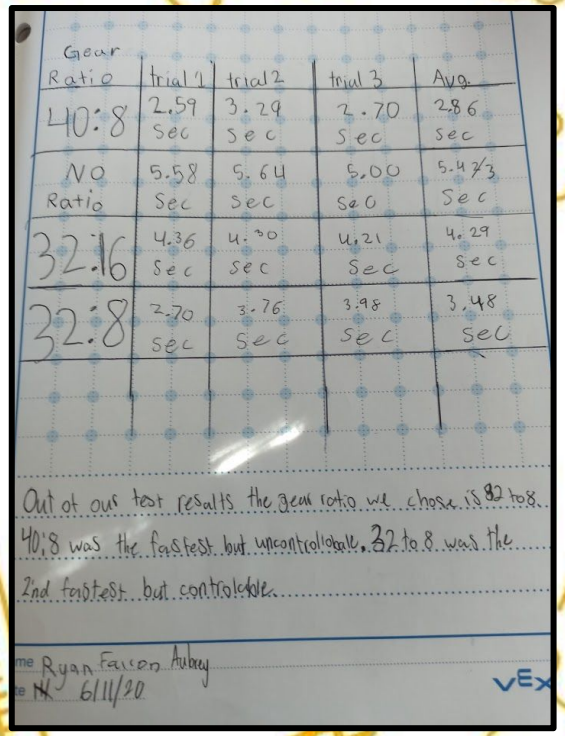
$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$\text{Speed} = \frac{d}{t}$$

MATH in STEM

Math is part of an astrophysicists' everyday life by including calculations of speed, mass, gravitational pull, and many other things.

In VEX we constantly use math to make an efficient and more competitive robot. This year we needed to make our robot faster so we had to calculate an optimal gear ratio. Using math in VEX makes us better mathematicians.



Gear Ratio	trial 1	trial 2	trial 3	Avg.
40:8	2.59 sec	3.29 sec	3.70 sec	2.86 sec
NO Ratio	5.58 sec	5.64 sec	5.00 sec	5.4⅓ sec
32:16	4.36 sec	4.30 sec	4.21 sec	4.29 sec
32:8	2.70 sec	3.76 sec	3.98 sec	3.48 sec

Out of our test results the gear ratio we chose is 32 to 8. 40:8 was the fastest but uncontrollable. 32 to 8 was the 2nd fastest but controlable.

me Ryan Faison Aubrey
e 6/11/20

VEX

Here are our calculations of gear ratios for Rise Above

What do Robotics and Astrophysics have in common?

Physics is a branch of science that studies matter, force and motion, and energy.

In VEX robotics you learn about physics by learning about torque, leverage and other things. For example, teams need to calculate torque on their robots to lift things. The laws of physics that we get to learn about and apply in VEX robotics are universal and are used by astrophysicists.

Here we are trying to figure out the mechanics of the double reverse 4 bar arm lift.

Here are astrophysicists trying to figure out if this galaxy is affected by its environment.

How Technology moves astrophysics forward

NASA has an entire department for Astrophysics. NASA's goal in Astrophysics is to "Discover how the universe works, explore how it began and evolved, and search for life on planets around other stars." A big part of this mission includes the Kepler Mission.

Here is a picture that Kepler took so scientists can analyze it

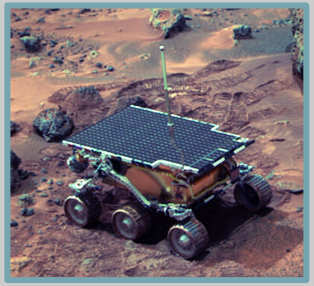
It is amazing that we have this powerful technology, the Kepler Telescope launching into space is an example of how engineering can help Astrophysicists research farther and gather data that they didn't think was possible.

Kepler Mission Goal

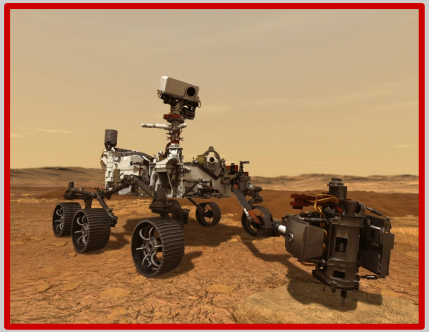
To research exoplanets; these are planets that are outside of our solar system

How will this career evolve over the next decade

1. Better mechanics, rovers, and robotic telescopes means we can go farther in our research.
2. Better computer programs will create more autonomous machines.
3. More sturdy rovers and space crafts means more accurate data collection.



Sojourner 1996



Perseverance 2019

Aubrey wants to be an astrophysicist when she grows up and Fallon wants to be an engineer. Akash likes programming and Ryan also loves space and robots. All these interests go well together. We all love robotics and feel like robotics will help us in our future careers. We all hope that we can take part in the STEM field in the next decade.

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