

Numerical Constraints on a Potential Embedded Exomoon in the J1407b Exoring

Student // Felicity Levett

Supervisor // Phil J.Sutton

What is J1407b?

- J1407B IS A PLANET
- 433 LIGHT YEARS FROM EARTH! [2]
- RING SYSTEM APPROXIMATELY 200 TIME LARGER THAN SATURN [4].
- MASS: 20 TO 26 JUPITER MASSES.
- DISCOVERED BY UNIVERSITY OF ROCHESTER'S ERIC MAMAJEK.

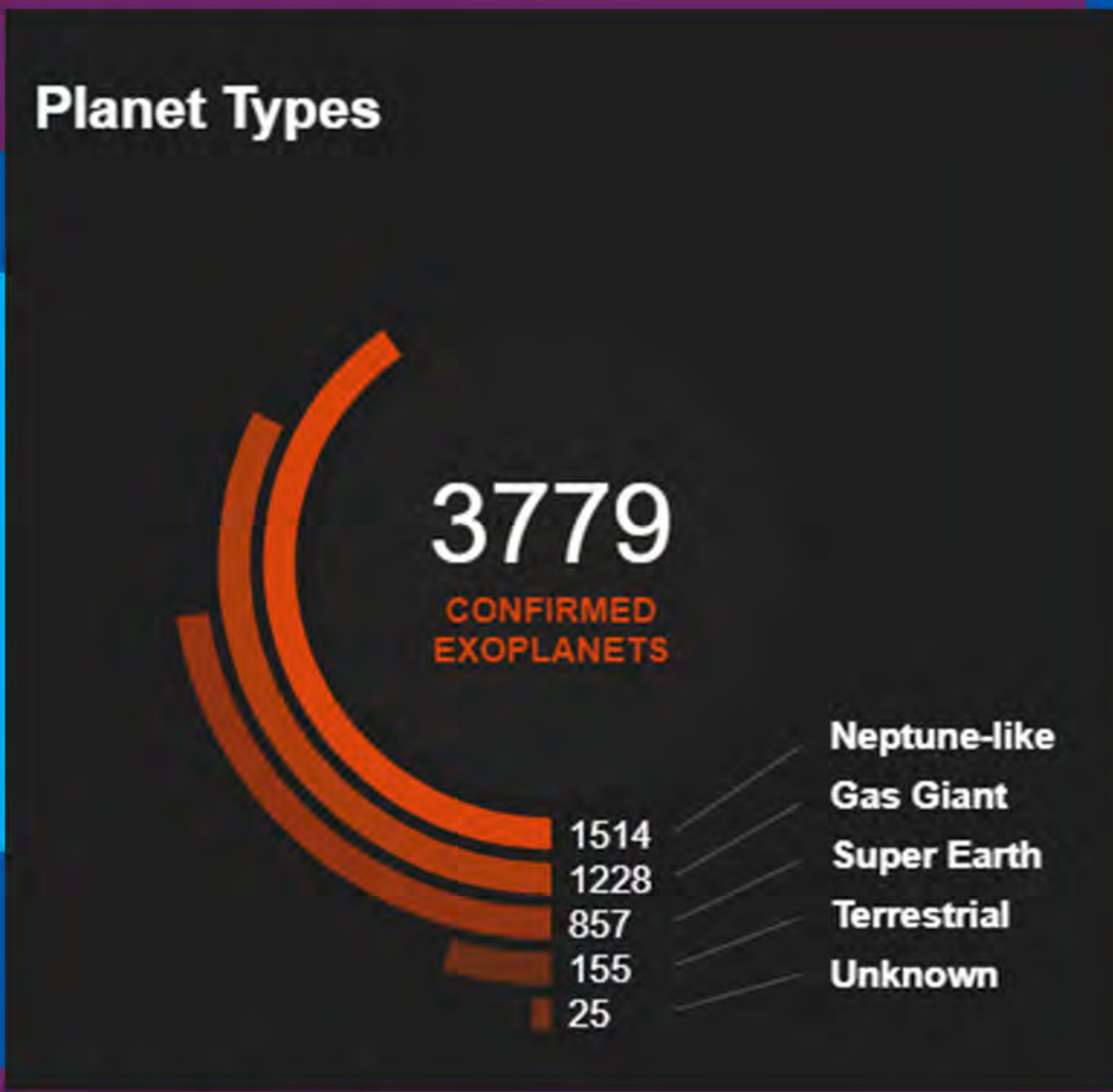
What is an Exoplanet?

An exoplanet is a planet that orbits around another star, outside of our own Solare System.

A c++ program was created for each task. This allowed loops to be created, which make it easier to calculate repetitive sums containing large numbers. To improve, the graphs needed to be made to a more appropriate scale.

The **aim** of the project was to estimate the size of the exomoon and see how it related to the planet J1407b.

DID YOU KNOW?
TO THIS DATE, THERE HAS BEEN **3779 CONFIRMED EXOPLANETS DISCOVERED!** [1]

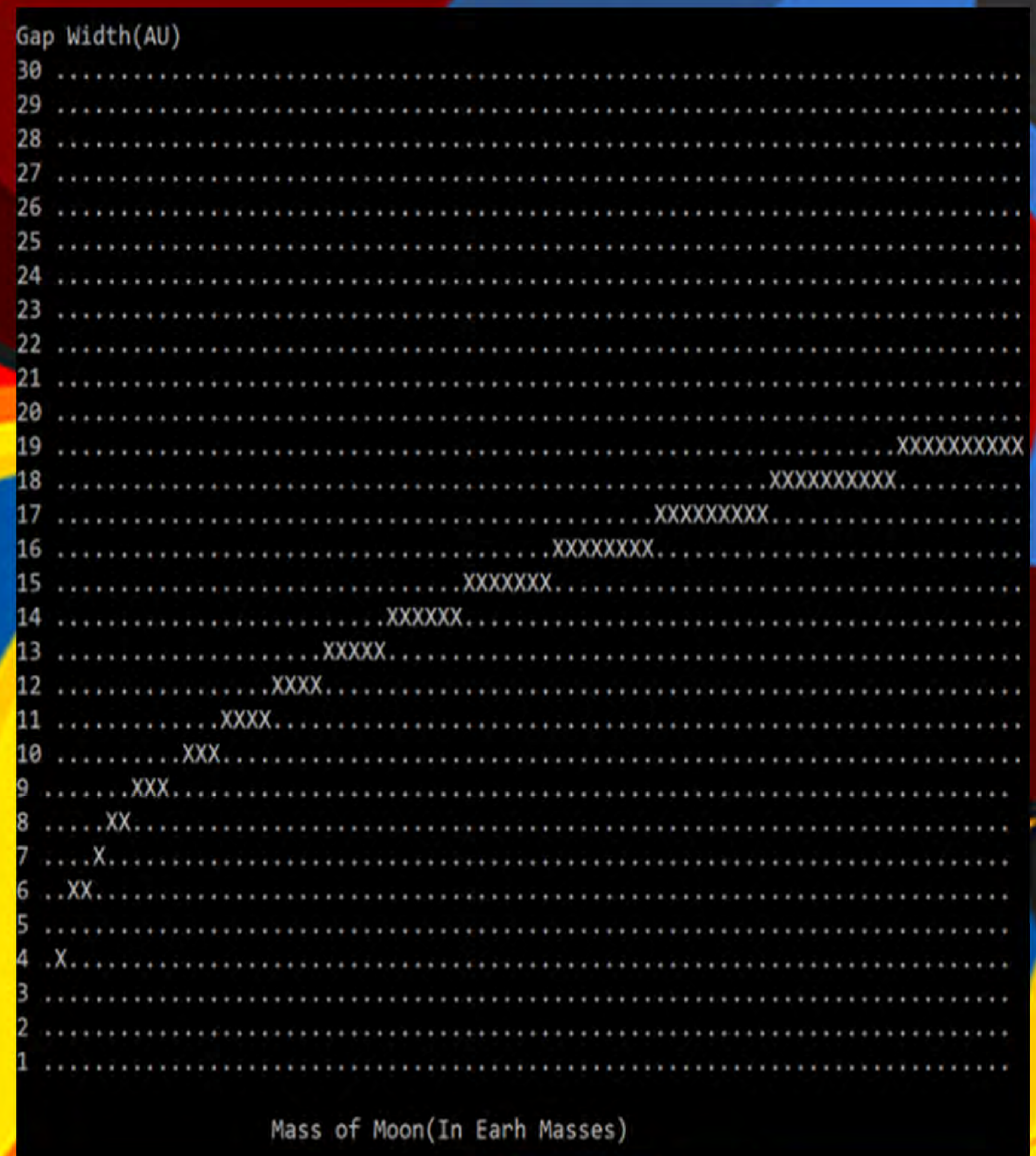


Results

Using a gap width of 0.0267AU, and a planet mass of 23.8Mj (between the range of 20 - 26), the mass of the moon was found to be 1.879×10^{23} kg. This is 6.041×10^{-5} time smaller than our own moon. This is smaller than what is currently theorised; between the mass of earth and mars.

The graph (left) showed that the larger the mass of the moon, the larger the gap width created. The pattern, reflective of logarithmic curve, shows that the larger the mass, the less it effects the gap width.

The final task showed an exponential decrease in mass of the planet against the orbital time of the moon. The minimum orbital period, when using a constant mass of moon of 3.9×10^{23} kg was 0.81 years. The maximum was 8.16 years. The current estimation of 2 years, falls within this range.



P. Brennan, "Exoplanet Exploration," 07 September 2018. [Online]. Available: <https://exoplanets.nasa.gov/>.
S. Hall, "This Super-Saturn Alien Planet might be the new Lrd of the Rings," Space.com, 3 February 2015. [Online]. Available: <https://www.space.com/28435-super-saturn-alien-planet-rings.html>. [Accessed 7 September 2018].
K. Erickson, "What is an Exoplanet," NasaSpacePlace, 10 August 2018. [Online]. Available: <https://spaceplace.nasa.gov/all-about-exoplanets/en/>. [Accessed 7 September 2018].
Astronomy Now, "Exoplanet J1407b possesses ring system 200 times larger than Saturn's," University of Rochester, 26 January 2015. [Online]. Available: <https://astronomynow.com/2015/01/26/exoplanet-j1407b-possesses-ring-system-200-times-larger-than-saturns/>. [Accessed 7 September 2018].