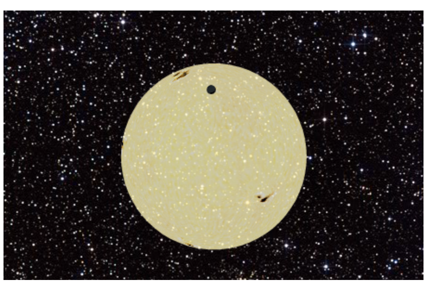
HAT-P-32b

<u>Introduction</u>

• Until recently, there was no proof that there were any planets outside of our solar system. It was only in 1995 that an *exoplanet* was first discovered. Now, there are so many potential exoplanets that there aren't enough scientists to go through all the data in order to prove their existence. In order to help make up for some of this much-needed research, scientists have opened up all their data to the public. We took it upon ourselves to research the potential exoplanet HAT-P-32b using MicroObservatory, an online student research tool, and images taken with the Whipple Observatory.

<u>Brightness Curve</u>

•The brightness curve for HAT-P-32b shows a much lower light level at its beginning than it does at the end. Without making any assumptions, this doesn't appear to imply the transit of a planet. However, since we knew what the pattern would look like if there was indeed a transit, we were able to figure out that the seemingly meaningless data would make sense if it only applied for the second half of the transit-that is to say, if we only had data for the second half of the transit. From this and our prior knowledge, which dictated that the brightness curve of a planet's transit should be reflective over the axis of brightness, we were able to extrapolate the data from the second half of the transit and apply it to the first half. We took the data from hours 0-3 and reflected it for the 3 hours prior to the predicted transit.

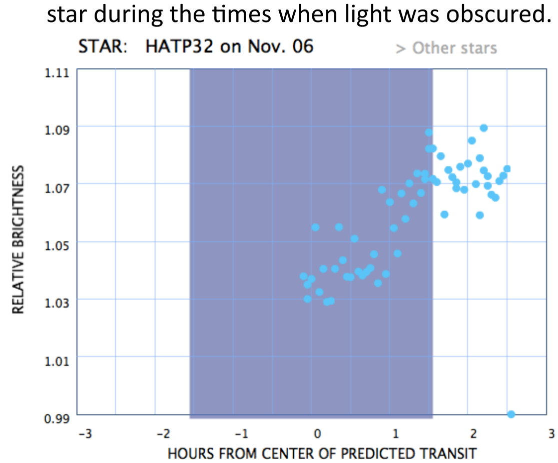


Our planet 3% of the size of its star. It's orbit is tilted so that it grazes the star, this is why it is shown at the top of the star.

<u>Methodology</u>

• Because exoplanets are faint in comparison to the stars they orbit, it is near impossible to directly observe them. Alternative methods of finding exoplanets in stars' orbit have been developed, the most common of which is the transit method. This involves measuring the light coming from a planet and determining whether at any point it is fainter- a fainter light would indicate that something, like an exoplanet, is passing in front of the star and obscuring some of its light.

• This is the method that we used in the detection of the exoplanet whose data we mined using MicroObservatory. Using the images we requested for our exoplanet (HAT-P-32b), we calculated the brightness of our target star, two comparison stars,and two patches of background sky. We did this for an approximate total of 50 images of HAT-P-32b, and, true to our expectations, found that there was a dip in the light coming from the star. Based on our knowledge of exoplanets and the transit method, this implied that there was a planet passing in front of the star during the times when light was obscured.



<u>Description</u>

•The area of our planet's disk is 0.0327 (3%) of the area of its host star's disk. The relative size of the planet, compared to the host star is 0.181. We can compare the size of HAT-P-32b with some planets in our own solar system: Jupiter is .1 times the Sun's diameter, whereas our planet is .181 times its host star's diameter. Therefore we can say that our planet's relative size is .181 (nearly double Jupiter's relative size). The duration of our planet's assumed transit is 6 hours, making our planet about the same distance from our star as Venus is from the sun, or about 70 million miles from its host star. Our planet's distance from Earth 4.65E15 miles, or 775 light-years.

•We noticed that our data did not relay all the information needed in order to tell if there was, in fact, a transit. However, based onour prior knowledge, which dictated that the brightness curve of a planet's transit should be reflective over the axis of brightness, we were able to extrapolate the data from the second half of the transit and apply it to the first half. We took the data from hours 0-3 and reflected it for the 3 hours prior to the predicted transit.