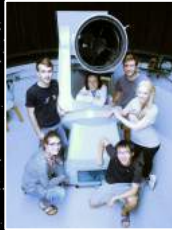


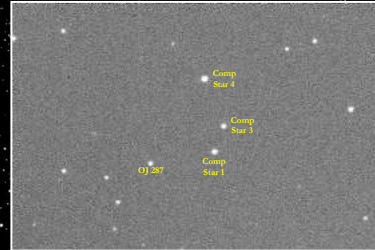


Summer 2017  
Astronomy  
Research  
Students at the  
Foggy Bottom  
Observatory



# The 2015-2016 Optical Outburst and Historic Light Curve of the Blazar OJ 287

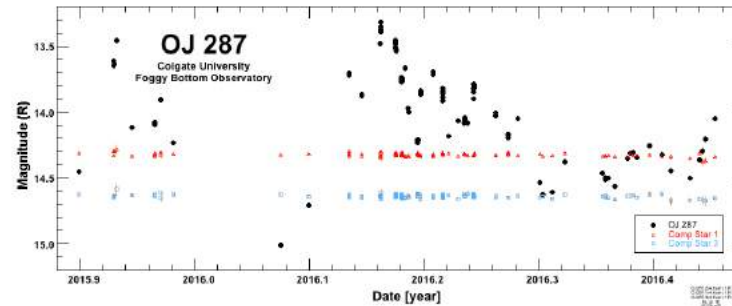
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Advisor: Thomas J. Balonek, Physics and Astronomy, Colgate University



Two minute R filter images of the blazar OJ 287 taken at FBO. The field of view is 5 x 8 arcmin. The left image shows the quasar at a dim period, taken January 28<sup>th</sup>, 2016. The right image shows the quasar during a flare, taken February 29<sup>th</sup>, 2016.

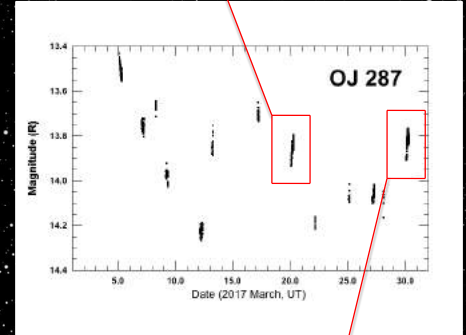
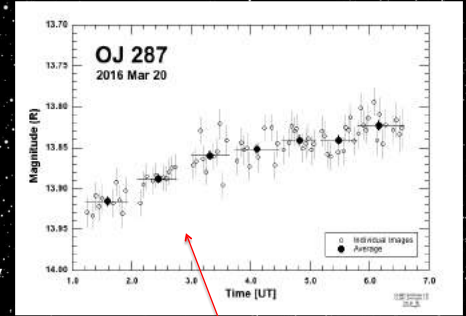
## BACKGROUND

This past summer at the Foggy Bottom Observatory, we observed quasars, a phenomenon of distant galactic nuclei caused by hot gas and plasma falling into a supermassive black hole at the centers of galaxies. As the material falls in, jets of electromagnetic radiation are ejected perpendicular to the plane of the accretion disk, and we can study how these change over time. When these jets are oriented towards Earth, it is considered a "blazar." OJ 287 is a blazar that is theorized to be a smaller black hole orbiting another. There are various timescales on which quasars can be studied. Below is an example of observations of OJ 287 over thirty years. The image to the right shows the 2016 winter flare over the course of about a month. As shown to the far right, the magnitude is able to fluctuate during a single night as well. These timescales help us study the mechanics of these objects and understand how galaxy evolution takes place.



## THE 2015-2016 WINTER OUTBURST

During the winter of 2015-2016, OJ 287 flared in optical wavelengths. Pictured above is FBO's data from that observing season of the quasar and comparison stars' brightness, showing a flare from 15.0 to 13.3 in less than a month. We can see that the variability of OJ 287 is real because the comparison stars experience almost no variability during the entire observing season.



## INTRA-NIGHT VARIABILITY

OJ 287 has been seen to vary within a single night of observations. Two of these nights are shown above and are indicated in context on the plot below.

