# CALIFORNIA STATE SCIENCE FAIR
# 2015 PROJECT SUMMARY

**Name(s)**

**Shashank Dholakia; Shishir Dholakia**

**Project Number**

35793

**Project Title**

## A Search for Exoplanets in Open Star Clusters Using a Novel Photometric Algorithm for the "Crippled" Kepler Mission

**Abstract**

**Objectives/Goals**

To date, over 5000 exoplanet candidates have been discovered orbiting around isolated stars. All of these stars once existed in open star clusters, yet the existence of exoplanets in open clusters has not been studied. In this project, we search for exoplanets in two open clusters, Messier 35 and Koposov 62. We hypothesized that we would not find exoplanets in clusters because gravitational interactions between stars would eject forming exoplanets.

**Methods/Materials**

The Kepler Space Telescope was instrumental in the search for exoplanets, but it failed in 2013. The salvage mission, dubbed K2, allowed limited observations to continue. We used images of the clusters, as well as a control group of isolated stars taken by the K2 mission every 30 minutes for 85 days. We wrote a novel, K2-optimized photometric pipeline in Python to search for exoplanets using the transit method.

**Results**

We discovered 4 exoplanets in a sample of 620 clustered stars. In an equal sample of isolated stars, no exoplanets were found. Three of the exoplanets found were hot-Jupiters, and one was a super-Earth. All four exoplanets orbit within 0.1 AU from their host star.

**Conclusions/Discussion**

We conclude that exoplanets do exist in open clusters. Furthermore, their prevalence may even be higher in open clusters than in other stars. A possible explanation for our results is the gravitational recapture of ejected exoplanets in open clusters. We are looking to analyze 4 more clusters as K2 images them. Because all stars form clustered, our findings may further the understanding of planetary formation in all stars.

**Summary Statement**

In our project, we wrote a novel photometric pipeline for the "crippled" Kepler Mission and used it to search for exoplanets in open star clusters.

**Help Received**

Parents and physics teacher helped and refined the project board and presentation