SESSION 1Q

ADVENTURES IN ASTRONOMY

Session Moderator: Suzanne Hawley, Astronomy
Johnson Hall 022
1:00 PM to 2:30 PM
* Note: Titles in order of presentation.

Activity in Equal-Mass M Dwarf Wide Binaries
Heather Gunning, Senior, Astronomy, Physics
Mentor: Sarah Schmidt, Astronomy
Mentor: James Davenport, Physics & Astronomy, Western Washington University
Mentor: Suzanne Hawley, Astronomy

M dwarf stars, which are smaller, dimmer, and redder than our Sun, are the most common type of star in our galaxy. Like our Sun, these stars exhibit activity due to inherently strong magnetic fields at their surfaces. In M dwarfs, this activity is often classified by the emission line strength of the first transition of the hydrogen Balmer series (H alpha). We examine a sample of five equal-mass M dwarf wide binaries; these "twin" stars should have nearly identical stellar properties and therefore have very similar spectral features. We hypothesize that these stars should exhibit nearly identical properties in H alpha. If our hypothesis proves false, it means there are unexpected dynamics present in the binary system. In initial observations to classify these objects, we found that the M dwarfs in each binary, which were twins in every other way, showed very different levels of H alpha emission. To examine the range of H alpha line strengths we obtained a time series of optical spectra using the Astrophysical Research Consortium's 3.5-meter telescope at Apache Point Observatory in New Mexico. In each binary, the slightly less massive star exhibits stronger mean H alpha, consistent with large survey results. Using data from 70 hours over 14 nights, we determined our stars have a characteristic variability timescale of around 2 hours; indicating our sample is active on shorter timescales than the typical rotational period.

POSTER SESSION 3

Commons East, Easel 64
4:00 PM to 5:30 PM

Searching for Stellar Flares with Kepler Data
Tiffany Lin, Freshman, Pre Engineering
Mentor: Suzanne Hawley, Astronomy
Mentor: James Davenport, Physics & Astronomy, Western Washington University

Stellar flares are the explosive release of energy caused by the reconnection of magnetic fields on stars. Flares release large amounts of UV and X-ray radiation, and may affect the possibility of life on exoplanets, planets orbiting stars other than our own Sun. A star's mass and age greatly affect the frequency, duration, and energy of flares. Therefore, it is important to understand these aspects for a variety of masses and ages. The age of a star is related to the rate of its rotation as well as the rate at which it flares; older stars spin much more slowly and also flare less frequently than younger stars. M dwarfs, stars less than half the mass of the Sun, are commonly used in stellar flare research because they make up the majority of stars in the Milky Way galaxy. To conduct our research, we used two months of data from the NASA Kepler spacecraft to study the light curves of one young and three old M dwarfs. We were able to identify flares in these light curves and measured their durations and energies. We found that the vast majority of flares on all four stars have a short rise time and a long decay time. We also found that flares with long durations have larger total energies, and that older stars have fewer large energy flares compared to younger stars. Through using the light curves, larger, more prominent flares were easily detectable in comparison to smaller flares. Further research would concentrate on more accurate ways toward detecting such small flares.

POSTER SESSION 3

MGH 241, Easel 150
4:00 PM to 5:30 PM

Using Copper to Reduce Microbial Contamination in Drinking Water
Susan Azadi, Junior, Microbiology, Environmental & Occupational Health, North Seattle College
Mentor: Suzanne Schlador, Biology, North Seattle Community College

In developing countries nearly 80% of all diseases are linked to water and sanitation issues; globally, over two million people die annually from water-born diarrheal disease. It has long been known that some metals can exhibit powerful antibacterial properties. Copper has been used for hundreds of years as a means to purify drinking water but only recently have scientists begun to elucidate the mode of action for copper induced microbial death. In 2008 the U.S. Environmental Protection Agency officially registered copper alloys as biocidal agents. Now these alloys need to be studied to determine efficacy at different concentrations and with a variety of disease-causing microbes. This study investigates the powerful bactericidal effects of copper as a low cost accessible method to purify drinking water of pathogenic waterborne microorganisms. More specifically, E. coli was used as a model organism to test the efficacy of solid copper at killing microorganisms in drinking water over variable amounts of time. Efficacy of cell death was assessed with viable plate counts. Results show that $\geq$48cm2 of solid copper in 100 mL of water can kill E. coli (at an average concentration of 3.1x105 CFU/mL) within 24 hours. Further research is needed to determine the optimal copper to water volume ratio as well as the precise timing of cell death. It is also essential that the copper ion concentrations remain below EPA limits of 1.3 mg/L; preliminary findings produced inconsistent values. The results of this research could be beneficial to those living in locations where safe potable water is not readily available, or for those travelling to remote or foreign locations as well as hikers and campers.