



STARFEST celebrates the research stemming from the GBO, builds a collegial community of practice, supports astronomy education and outreach, and encourages the preservation of Great Basin dark skies.

Saturday October 24, 2020

Host Institution: Concordia University, Irvine, CA

Zoom link: <https://cui-edu.zoom.us/j/98241838397>

Conference Organizers: Dr. John Kenney & Aviva O'Neil

Technology Support: Concordia IT- 949-214-3175

Conference Program

9:00-9:15 Welcome

GBO Operations Chair, Dr. John Kenney; Concordia University President, Dr. Michael A. Thomas; Great Basin National Park Superintendent, James Woolsey; Great Basin National Park Foundation Program Manager, Aviva O'Neil

9:15-9:35 Keynote Speaker – Dr. Russell M. Genet

Russ served as the President of the Astronomical Society of the Pacific, and taught astronomy at Cuesta College and California Polytechnic State University. He led the initial development of the Astronomy Research Seminars where student teams conduct astronomical research to make observations with robotic telescopes, reduce their data, and write papers that are published in scientific journals. Over 200 student teams (that included many high school students) with over 700 coauthors have produced published research. The National Science Foundation funded the expansion and evaluation of the Astronomy Research Seminar which is now supported by the Institute for Student Astronomical Research.





9:35-9:55 Presentation 1a - Dr. Aarran Shaw
Postdoctoral Researcher- University of Nevada, Reno
Studying Magnetic Cataclysmic Variables with GBO



9:55-10:15 Presentation 1b- Ruth Larson

Physics/ Mathematics double major, Concordia University

My presentation is on graphical and analytic methods of solving for true double star orbits from the projected orbit which we observe. Accurately solving for an orbit requires many iterative processes and differential corrections which can either converge into a usable orbit or diverge and the researcher must come up with a new estimate. Combining a graphical method with analysis using ephemeris formulae and the Thiele-van den Bos analytic method could lower calculation time by providing a much more accurate original estimation of the observed orbit.



9:55-10:10 Break

10:10-10:30 Keynote Speaker – Dr. Stella Kafka

Executive Director and CEO, American Association of Variable Star Observers

The AAVSO Program: Enabling Citizen Astronomy for all: The AAVSO formed in 1911 as the first group to engage amateur astronomers in data acquisition in support of professional astronomy projects. It has evolved into an International Organization with members and observers from both the professional and non-professional astronomical community, contributing data to its public databases which are frequently used in research projects and help interpret some of the most dynamic phenomena in the universe. The AAVSO successfully engages a diverse community of individuals, backyard astronomers, educators, students and professional astronomers, in astronomical research. Dr. Kafka will present the main aspects of the association as well as introduce the various means that the AAVSO is using to support cutting-edge variable star science, and how individuals can actively participate in the AAVSO's program.





10:30-10:50 Presentation 2a - SUCCESS Academy High School Students

Brenlie Shirts, Alexa Brammer, Taleah Nelson, Zachary Brammer, Kiani Bonilla
Several high school students who have done double star research with Dr. Cameron Pace (Southern Utah University) will present on their projects.

10:50-11:10 Presentation 2b – Noah Herta

University of Nevada Reno
Using the GBO to study Semi-Autonomous Light Curve Analysis of Transient Nova AT2019tlu

11:10-11:20 Break

11:20-11:40 Keynote Speaker – Rachel Freed

Rachel Freed is a co-founder and the President of the Institute for Student Astronomical Research (InStAR), as well as a seminar instructor, with a mission to incorporate true scientific research into secondary and undergraduate education. She is a co-author on over 20 published papers with students and educators from around the United States. Rachel helps to coordinate international conferences around the use of telescopes in education and is currently working on a PhD in astronomy education. She is also a faculty lecturer in the School of Education at Sonoma State University. She is involved in curriculum design and implementation and trains educators in the use of technology and remote telescopes for research. She has been an amateur astronomer for over 20 years and is involved in public outreach. Rachel is a public speaker with a focus on bringing telescopes to students around the globe as well as promoting changes in education that build on a student's intrinsic motivations and interests.



11:40-12:00 Presentation 3a- Sarah Colangelo

2020 graduate Physics, University of Nevada Reno
Monitoring Optical Decay of a Black Hole X-ray Binary using the GBO
Low mass X-ray binary (LMXB) systems are composed of a stellar mass black hole and a companion star that powers the black hole by accretion. These types of systems spend a majority of the time accreting at slow rates in a state of quiescence but have been observed to enter an outburst cycle. The LMXB binary system MAXI J1820+070 was observed as it was going through an outburst cycle beginning in the hard state





and transitioning into the soft state before entering quiescence again. Observations in the optical light spectrum began towards the end of the outburst cycle in October of 2018 with the use of the Great Basin Observatory. The brightness of the system was monitored regularly to determine how the optical light emitted during the outburst changes over time which resulted in a decay timescale of 43 days. This result was compared to that of the X-ray light emitted from the same source in order to better understand the complex structure of the black hole system.

12:00-12:20 Presentation 3b- Jaxton Maez

Pure Mathematics Major, Junior, Southern Utah University

Double star astronomy considers pairs of stars that appear close to each other when viewed with an optical telescope from Earth. The intention is to characterize the interaction, if any, between the stars. Southern Utah University (SUU) is utilizing the GBO and double star investigation to introduce students new to astronomy to the basics of astronomy research. A primary objective for this project is to learn how to characterize the orbit of interacting double star systems.

12:20- 1:30 Lunch

1:30-1:50 Cole Niebuhr

Director of Research at Global Science Directive and Adjunct Professor, Concordia University Irvine

Speckle interferometry uses a combination of mathematics to extract data from otherwise unreadable images in order to produce high-resolution images of double star systems where the star orbit proximities are too close to be distinguished using traditional photometry. Cole, who has been integral in setting up the speckle software at the GBO, will talk about recent and upcoming software upgrades and as the planned installation of the new meteorite tracking camera at the GBO.



1:50-2:10 Presentation 4a- Alexis Tudor

Master Student Computer Science and Engineering, University of Nevada Reno

User-Guided Development of a Photometric Pipeline for the GBO Robotic Telescope: As more and more data are collected from the night sky, it becomes more important to be able to analyze the data as precisely as possible in as little time as is necessary with the use of computer programs. The spotlight has thus begun to shine on data science and software development as



key new fields of astrophysics. Given the importance of data analysis pipelines for telescopes of all kinds, we have developed a photometric pipeline, Photometry+, for the GBO. To prevent Photometry+ from being a black box, we focus on the human-computer interaction (HCI) components of the program. The definition of HCI is hotly debated by those interested in the field, however put simply HCI puts forth the principles of using a multi-disciplinary approach to making interactions between humans and the software we depend on easier, more fulfilling, and more accessible. The HCI goal of the proposed pipeline is to create a user interface for it that is easy to use, gives astronomers control over the program, increases confidence in the results of the program and can be used to teach students the process of differential photometry. The development of this user interface has been guided and validated by HCI user studies, and we present examples of the application of Photometry+ for monitoring transient sources. This publicly available and open source code has been designed for the GBO telescope, but it is flexible enough to be used and adapted at any observatory.



2:10-2:20 Great Basin Observatory Scholarship Award

2:20-2:40 Presentation 4b- Harrison Torgerson & Carson Blickenstaff

Southern Utah University

The primary objective of the research performed was to analyze the physical relationship within the double star system of WDS 00382+0305. Analyzing the physicality of a double star system is important in helping to determine the mass of the stars. In order to determine the physicality of this system measurements were taken using the GBO and then compared to 10 previous historical measurements of the system. This system was analyzed using nine different images taken with the V filter with an exposure time of 180 seconds. These images were then imported into AstrolmageJ, plate solved, calibrated, and analyzed to determine the separation (ρ) and angle (θ). Our measurements were then compared to proper motion and parallax data from the Gaia database.



2:40-2:45 Conference Close- Dr. John Kenney