

2021 Winter Quarter Newsletter

Volume 3, Issue 1

Student Spotlight



Jack Lubin is a 3rd year Physics Ph.D. student studying exoplanets who recently gave a talk at the 237th AAS meeting in January about his research and the upcoming paper. Jack and his team follow up TESS planet candidates with the Keck Telescope in Hawaii to measure the RV's of host stars in an effort to measure the masses of the transiting exoplanets as part of a larger collaboration across all of UC, Caltech, and University of Hawaii (named the TESS-Keck Survey). They have studied the star HD191939 extensively, which has 3 transiting planets identified by TESS data. Jack and his team also found evidence for 2 non-transiting planets in the newly obtained RV data. They extracted tight constraints on the masses for 4 of 5 planets and have described possible compositions of the planets. The paper Jack is leading on this exciting system will be publicly available soon, so keep an eye out!

Read the full spotlight [here](#).

Question of the Quarter

The Blog Team would like to make our department newsletters more interactive. In each newsletter, we will have a fun and short poll for everyone to fill out. The results will then be displayed as a Wordle, or other graphic, in the next newsletter. Please respond to the current poll [here](#).

Disclaimer:

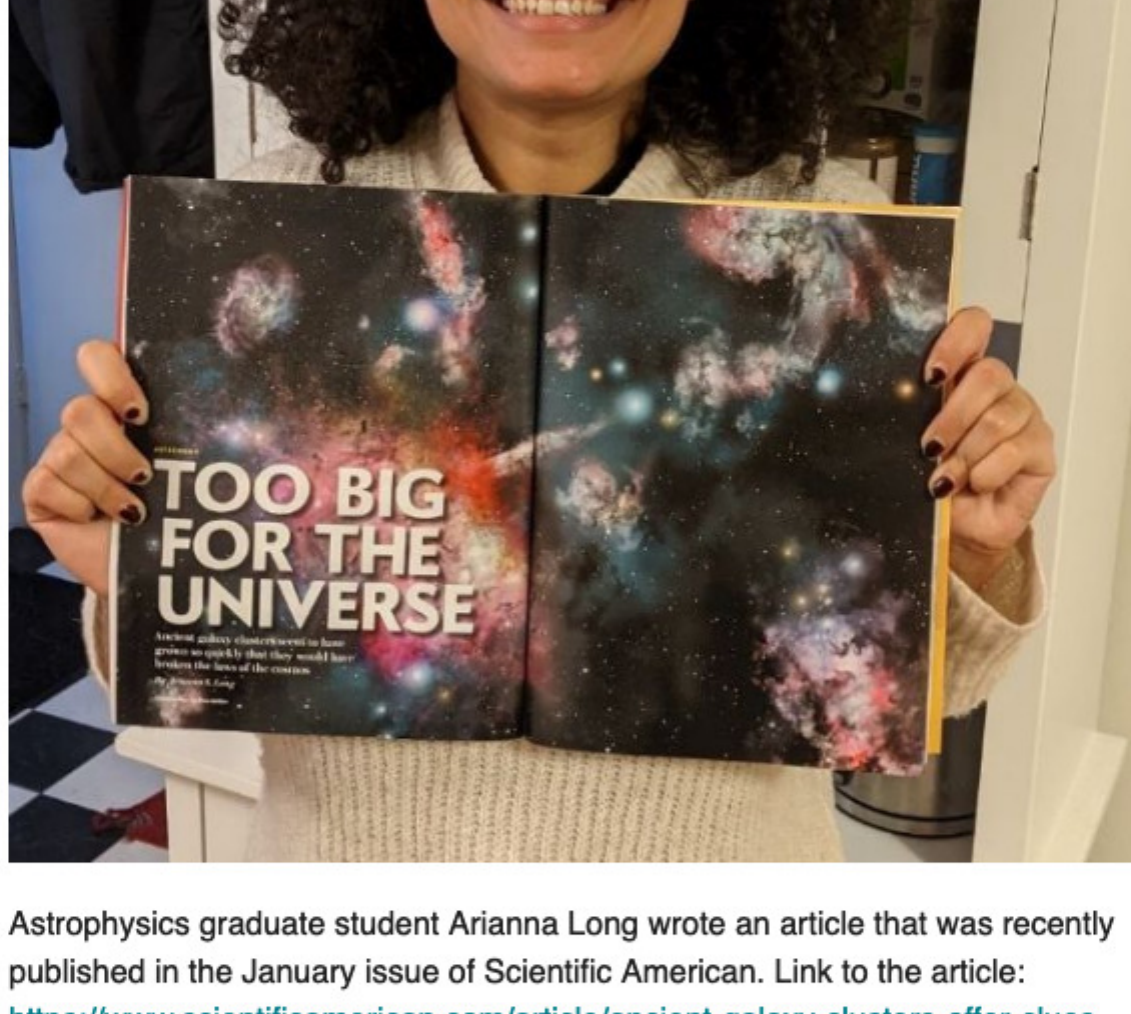
This poll is just for fun and is meant to be completely anonymous. Additionally, we will never display the responses in a way that would cause anyone to be personally identifiable. If you have comments, questions, or concerns please email the Blog Team at physastroblog@uci.edu.

Research Content

Astrophysics graduate student Kevin Andrade published a paper that has been submitted to the Monthly Notices of the Royal Astronomical Society. Link to the paper: <https://arxiv.org/abs/2012.06611>

Summary: The prevailing theory of the evolution of the universe contemplates the existence of collisionless dark matter, which can't be seen and doesn't collide with anything, but only interacts gravitationally. The theory works pretty well, but there are some puzzles that it can't quite explain. One possible explanation for some of these puzzles is that dark matter sometimes self-interacts, meaning that one dark matter particle occasionally collides with another, which changes the shape of the dark matter cloud (called a "halo") over time. Galaxy clusters are the most massive bound structures in the universe, some having masses of more than 10^{15} times that of the sun, and they are made of mostly dark matter. The enormous mass of such clusters bends the space near them, and turns them into cosmic lenses, magnifying distant galaxies that happen to be behind them. Using the magnification and bending of the galaxy light, we can calculate how much dark matter is in the cluster and determine what its shape must be. If dark matter is indeed self-interacting, the halo's shape will be different than the halo of collisionless dark matter. We examined 8 galaxy clusters and determined that if dark matter is self-interacting, its self-interaction must be very weak, no more than $0.065 \text{ cm}^2/\text{g}$. This is the tightest limit yet reported in this kind of literature.

Particle physics graduate student Jessica Howard published a paper in HEP-Phenomenology titled "Foundations of a Fast, Date-Driven, Machine-Learned Simulator". Link to the paper: <https://arxiv.org/abs/2101.08944>

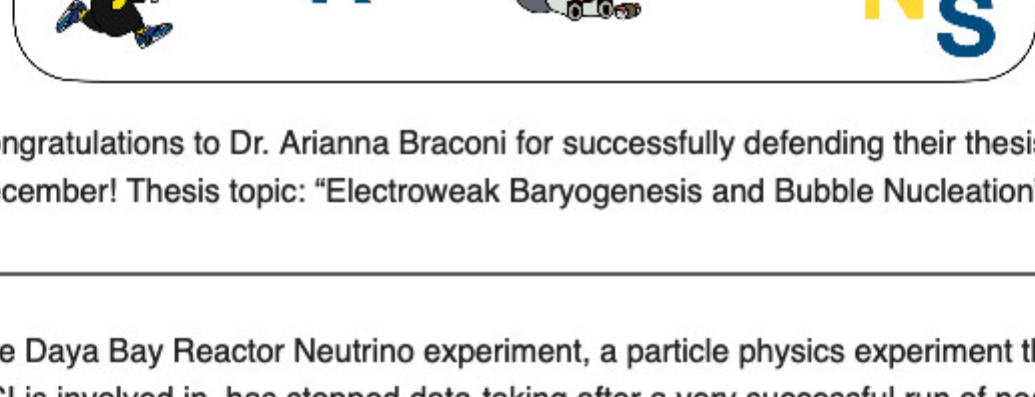


Astrophysics graduate student Arianna Long wrote an article that was recently published in the January issue of Scientific American. Link to the article: <https://www.scientificamerican.com/article/ancient-galaxy-clusters-offer-clues-about-the-early-universe/>

Summary: The article is about the recent discoveries of baby galaxy clusters in the first 2 billion years of the Universe. Some of them are rich with extreme galaxies that are more massive than we expected during this phase of the cosmos. Finding such a high concentration of these massive galaxies so early on presents a real problem for our cosmological models which dictate that they likely shouldn't exist yet.

Department News

Congratulations to those who have successfully defended their thesis:



Congratulations to Dr. Arianna Braconi for successfully defending their thesis in December! Thesis topic: "Electroweak Baryogenesis and Bubble Nucleation"

The Daya Bay Reactor Neutrino experiment, a particle physics experiment that UCI is involved in, has stopped data-taking after a very successful run of nearly 9 years. Daya Bay measured an important property of neutrinos about 8 years ago, which ushered in a new series of experiments and discoveries related to these elusive particles. The people from UCI involved in Daya Bay were Prof. Juan Pedro Ochoa-Ricoux, postdoc Bedrich Roskovec, graduate students Olivia Dalager, Roberto Mandujano, Kaleb Hatfield, and Jay Mosley, and undergraduate student Yansong Huang. A virtual completion ceremony was held that was attended by many funding agency representatives and members of the press. Press release: <https://www.interactions.org/press-release/scientists-say-farewell-daya-bay-site-proceed-final-data>

Prof. Toshiki Tajima and his team co-organized the "Uspekhi Forum on Climate Change and Global Energy Issues" on Jan. 19. The forum took place over Zoom and was followed by the collection of review articles that will be published in Physics-Uspekhi. Video of the forum can be found here: <https://uspekhiforum2021.org/#rec260783045>

Lee Nano-optics Lab

Research Associate



Dr. Oleksiy Anopchenko

PhD



Jingyi Yang



Sudip Gurung

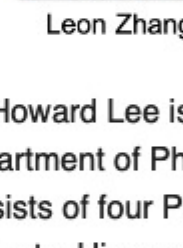


Andrew Palmer

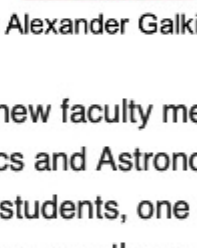


Chris Gonzalez

Undergraduate

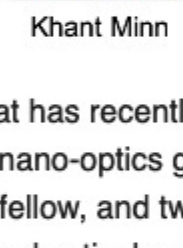


Leon Zhang

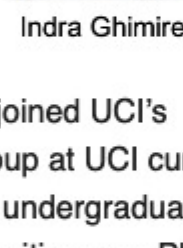


Alexander Galkin

Visiting/non-UCI PhD



Khant Minn



Indra Ghimire

Dr. Howard Lee is a new faculty member that has recently joined UCI's Department of Physics and Astronomy. His nano-optics group at UCI currently consists of four PhD students, one postdoc fellow, and two undergraduate students. His group is currently expanding and actively recruiting new PhD students, undergraduate researchers, and visiting scientists to perform multidisciplinary research projects that focus on nano-optics, nano-physics, material sciences, bio-photonics and nano-optical device applications. They are also interested in working with local industry partners to develop novel optical applications and technologies based on the fascinating ultrathin and multifunctional nano-optical structures/materials. If interested in learning more information, please contact Dr. Lee at howardhw.lee@uci.edu! His website can be found here: <https://sites.google.com/site/caltechhowardlee/>

Events

Grad Slam 2021 will have a virtual event for the UCI Finals on March 4, 2021! Stay updated at <https://grad.uci.edu/gradslam/index.php> and for the date & format for the systemwide Grad Slam Finals.

WiPA is hosting the Magnifying Voices in Physics (MVP) speaker series in response to the longstanding underrepresentation of womxn, transgender, and non-binary folks of color in physics and astronomy. We hope to provide a platform to support and highlight these folks and shift people's perspective of what a physicist looks like. We hosted our first MVP, Isabel Rodriguez, on February 18th. Isabel spoke about their untraditional path to a Masters degree, their plans to transition into industry, and their research on neutron star mergers. If you missed this talk, don't worry! MVP will be held once each quarter, so keep a look out for information about our second MVP next quarter! You can find more information about this series on our [website](#).

Resources

As we approach the one-year mark since this pandemic started, it's important to remember to take care of your wellness through these times. UCI Be Well offers a tool here at this website (<https://bewell.uci.edu/>) for searching UCI wellness programs and initiatives for students, faculty, and staff.

Heads up! The Graduate & Postdoctoral Scholar Resource Center (GPSRC) offers certificate programs for developing professional skills like mentoring and science communication. [Check out the certificate program lineup for Spring 2021 here.](#)