

Jacob Lord

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Education

Skidmore College, Saratoga Springs, NY
Bachelor of Arts in Physics, Minor in Periclean Honors forum

May 2024

West Virginia University, Morgantown, WV
Graduate Student on PhD Track

Starting: Aug 2024

Professional Experience

Teaching Assistant

Johns Hopkins Center for Talented Youth, Bristol, RI

June 2024-Present

- Worked with fifth and sixth grade students in a project-based class titled “Physics of Engineering”
- Assisted primary instructor with classroom management and project help.
- Developed lessons that made complex physics and engineering topics approachable for ages 10-12 including:
 - Made a lesson to explain a simple differential equation regarding air resistance in multiple levels of complexity to account for the students at all levels of physics and math knowledge
 - Made a demonstration of cosmic ray interactions using a homemade cloud chamber and a lesson on cosmology to accompany the demonstration.

Peer Mentor

Skidmore College First Year Experience Office, Saratoga Springs, NY

Aug. 2023-May 2024

- Support first-year students by offering guidance, academic support, and facilitating discussions in class to help with the transition to college.
- Additionally, I worked to help create a welcoming and inclusive classroom environment, where students can engage in discussions, share experiences, and receive assistance with their academic and personal needs.

Captain of the Physics Peer Academic Coaching Team

Skidmore College, Student Academic Services, Saratoga Springs, NY

Jun. 2023- May 2024

- Promoted to be the Captain of the Peer tutoring program for Physics due to my commitment to my role as a tutor and the success rates of the students I worked with.
 - On average, we receive 10-20 students per night split amongst 3 tutors.
 - This typically equates to about 300-400 visits per semester to PAC by students.
 - In recent semesters the majority of my students have gotten As in their classes, and many have become physics majors and minors after working with me and engaging with the Physics PAC community.
- This role means that I lead our weekly meetings, delegate tasks to team members, and work on promoting our service on Instagram.
- I also act as the liaison between the Peer Academic Coaches and the Full Time Staff who may be professors or the administrators of the program.
 - This part of my role is imperative as it is my responsibility to receive instructions for how we may or may not help students and relay these instructions to the rest of the PAC team.
- This position is crucial to the success of a healthy Physics community at our college due to the following.
 - Out of the 15 PAC groups Physics is by far the most visited with 600-700 attendances per year.

Summer Subject Tutor and Teaching Assistant in Physics

Skidmore College Opportunity program, Saratoga Springs, NY
2023-Aug.2023

Jun.

- Tutored students from low-income households and wide ranges of physics familiarity in a month-long accelerated physics class.
- I also attended every class as a TA working with the professor and students in assisting with group problem work and labs.
- In addition to this, I designed review session programming to help prepare students with class.
- In the context of more general responsibilities in this role, I also lived in the same dorm with the students and was a resource for problems they needed to talk about outside the classroom and offered advice on college life after the summer program.

Student Representative

Skidmore College Physics Department, Saratoga Springs, NY
2024

Jan. 2023-May

- My role in this job is to communicate prior to meetings with fellow students on what they would like discussed in the meeting.
- I then voice ideas and concerns to the faculty during the meetings that students have told me.
 - These included:
 - Modifications to class curriculum in certain physics classes.
 - Adjustments to math prerequisites
 - Suggesting when courses and events should happen from a student's perspective.

Physics Peer Academic Coach

Skidmore College Student Academic Services, Saratoga Springs, NY

Jan. 2022-May 2024

- Support students in introductory and intermediate level physics courses by offering guidance on course material and assignments.
- Organize programs on items such as study skills, academic resource access, and research access at our college.
 - In general, I have found that this both invigorates the Physics community and can help students new to everything college related whether it be applying for internships or deciding what class to take.
- We became the most visited peer tutoring team during the 2022-2023 academic year with almost 700 visits distributed amongst our team of 6 tutors in total.

Thoroughbred Ambassador

Skidmore College Admissions Office, Saratoga Springs, NY

Jan. 2021-August 2023

- I work as a tour guide for my college while at school.
- My duties involve giving information to prospective students and their families.
- From time to time this also entailed working with the office of communication and marketing to create promotional material for the college.

Lab Assistant

Skidmore College Physics Department, Saratoga Springs, NY

Sep. 2021-May 2022

- Prepared lab equipment for classes to ensure efficient lab sessions.
- Design demonstrations for professors.
- Assist in general tasks needed in and around the Physics department at Skidmore such as:
 - Organizing and labeling electronic components.
 - Assisted in the departments' move into a new building.
 - Testing equipment to ensure functionality.

Research Experience and Skills**Research Assistant in Physics**

Skidmore College Physics Department

Sept. 2021-May 2024

- Worked on research involving cosmic strings and early universe theory with Professor Jeremy Wachter at Skidmore College.
 - I created and edited code that simulates gravitational waves that radiate from cosmic strings.
 - We hope to compare these simulations to recordings of gravitational waves which may help prove the existence of said strings.
- In addition to this project, I have also been a contributor to projects on Active Galactic Nuclei (AGN) with Professor Kendrah Murphy, as well as projects involving large-scale galactic structures with Professor Mary Crone-Odekon at Skidmore College.
 - For my Senior Research, I worked with Professor Crone-Odekon on comparing large-scale environmental characteristics of AGN Galaxies to any randomly selected galaxy

Data Collector

Massachusetts Audubon Society, Belmont, MA

Apr.-Aug. 2019

- Collected data on a volunteer basis for the Massachusetts Audubon Society's project on how climate

- change may be affecting the timing trees native to Massachusetts enter certain phenophases.
- Arranging travel to their Belmont wildlife education reserve and observing the trees they marked for the study and recording what phenophases they were in.

Presentations

Simulating Gravitational Waves Emitted by Cosmic Strings,

Skidmore College, Saratoga Springs, NY

May 2022

- Collaborators: Trayce Reeves, Dr. Jeremy Wachter
- Aim to prove the existence of cosmic strings via the detection of gravitational waves.
- Numerically calculated the stochastic gravitational wave background (SGWB), and then used the SGWB to calculate the spectral index and amplitude A . These quantities are measured by pulsar timing array (PTA) gravitational wave detectors.
- Compare predicted values to measured values and comment on the likelihood of the measurement being a cosmic string SGWB.

Probing the diversity of Cosmic String Populations

Skidmore College, Saratoga Springs, NY

May 2023

- Collaborators: Will Mortell, Dr. Jeremy Wachter
- Continued our investigations into cosmic strings and gravitational waves.
- Investigated the effect of a population of loops with different gravitational wave production efficiencies (represented by γ) on predictions of SGWBs.
- Utilize probability functions to estimate the percentage of likelihood of a wide range of efficiencies throughout a given string population.
- Discovered the difference to be detectable by upcoming telescopes and hope to publish our findings soon.

Modeling Absorption and Reflection of AGN NGC5506

Skidmore College, Saratoga Springs, NY

May 2023

- Collaborators: Dr. Kendrah Murphy, Diego Da Motta, Johanna Meezan, Trayce Reeves
- Aimed to create a model that fits the observed X-ray spectrum from the Chandra satellite of the AGN at the center of Seyfert galaxy NGC5506, which will give insight into the composition and structure of the region surrounding black holes.
- To improve our models, we could add another warm absorber to the line of sight of the MY torus model to simulate the disk wind/narrow line region observed in the PEXRAV model.
- To simulate this narrow line region, we should also start looking for absorption and emission lines in the lower end of the spectrum.
- These new components could hopefully better constrain the model, but they could also lead to issues with degeneracy as adding more parameters would lead to redundancy.
- Employing this model for other sources – or for NGC 5506 spectra obtained by other satellites – would also be beneficial, as it would further reinforce the validity of these computational models.

An (Almost) All-Sky Galaxy Environment Catalog

Skidmore College, Saratoga Springs, NY

Aug. 2023

- Primary Contributors: Jonathan Kasper, Emmy Plage, Dr. Mary Crone-Odekon
- Collaborators: Angel Guinazu, Shakohentehtha Elijah, Trayce Reeves, Jocelyn Elphick
- Our goal was to use the “Almost all sky survey” we had to test hypotheses of how the universe evolved through studying complex galactic structures’ environments.
 - These structures included tendrils with are a cluster of several galaxies and filaments which are larger structures that may include many tendrils to make a structure that includes thousands of galaxies.
- In addition, we wanted to create a database that is available to other researchers and their own external files to research galaxy environments.
- In the end, we found more standard parameters to define tendrils and preliminary results for how galaxy properties depend on a given environment

An (Almost) All-Sky Galaxy Environment Catalog

Siena College, Loudonville, NY

Nov. 2023

- Collaborators: Jonathan Kasper, Cian Schneider, Eric D’Eon, Dr. Mary Crone-Odekon
- We use the Tully 2015 galaxy group catalog based on the Two Micron All-Sky Survey (2MASS) to do

this.

- Infrared light with a wavelength of two microns can penetrate through the obscuring dust of the Milky Way, making it a reliable choice for this purpose.
- We then compare these results to previous work like data from Odekon et. al. 2018 because this data observes the same area of the sky differently, we can compare that to our current data.
- We use the third nearest-neighbor density to compare the effects of large-scale structures with those of local density.
- For each galaxy in the main sample, we find the distance r across the sky to the third nearest neighboring galaxy in the environment set that is within $cz \pm 500$ km/s, with c being the speed of light and z being the redshift.
- The nearest-neighbor density is the number of galaxies per area, $3/(\pi r^2)$.
- We define large filamentary structures using a minimum spanning tree to connect large groups of galaxies.
- In addition to large filamentary structures, galaxies are arranged in smaller filamentary structures sometimes called tendrils.
- We define tendrils using a minimum spanning tree to connect individual galaxies (rather than entire groups, as we do to define filaments)

The Large-Scale Environments of AGN Galaxies

Skidmore College, Saratoga Springs, NY

May 2024

- Collaborators: Jonathan Kasper, Dr. Mary Crone-Odekon
- Goal was to check the hypothesis that Active Galactic Nuclei (AGN) appear in different large-scale environments than other galaxies found in the Tully 2015 galaxy group catalog.
- By defining a maximum redshift value 0.033 we ran previously made galactic structure defining code for the Tully 2015 catalog and the Secrest et al. 2015 AGN catalog to make our datasets.
- Using Kolmogorov Smirnov (KS) tests we looked to see if there was potential for environmental similarity between AGN and any random galaxy.
- Our KS tests on Nearest Neighbour Density, Distance to filament, Distance to Tendril, and Distance to group resulted in extremely low p-values
- These tests yielding such a low p-value means that AGN environments may differ greatly from the expected environments of any randomly selected galaxy in the range $z < 0.033$.
- In the future, we will want to investigate the spike in the AGN sample that occurs in the measures of distance to filament, tendril, and group. We will also statistically compare our results with other papers such as Padilla et. al.

Co-Curricular Activities

Treasurer

Skidmore College Hillel, Saratoga Springs, NY

Sep. 2021-May 2023

- Managed everything budget-related to keep the second highest funded club on campus functioning.
- Liaised between my peers, planning events that required caterers, book event spaces, and purchased items used at events.
- Part of my role was being the reliable problem solver as the role of the treasurer at the club is to make plans come to fruition.

Peer Health Educator

Office of Health Promotion, Skidmore College, Saratoga Springs, NY

Jan. 2021-May 2024

- I attended meetings and create programs focusing on health and wellness for the college community in a variety of aspects.
- In this role, I was able to coordinate with non-profit organizations to secure thousands of dollars w

Scholarships, Awards, and Honors

Porter Wachenheim Scholarship for Achievement in Mathematics and Science

Skidmore College, Saratoga Springs, NY

Feb. 2020

- This Scholarship is awarded to roughly 50 students each admissions cycle based on their achievements in Science and Mathematics
- The year I was awarded this scholarship, I was one of the 50 students chosen out of a pool of about 1,700 applicants to receive the award.

Periclean Honors

Skidmore College, Saratoga Springs, NY

May 2024

Departmental Honors in Physics

Skidmore College, Saratoga Springs, NY

May 2024

- Received Honors in Physics upon graduation based on my GPA in my Major

Notable Skills

Proficiencies in Python, Wolfram Mathematica, IDL, Excel, and Topcat.

Implementing efficient new techniques in teaching students in beginner-level Physics courses.

Designing labs to use for physics classes.

Mild linguistic proficiency in Yiddish, Spanish, and German.