Aaron Burke

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Education

Stony Brook University **Fall 2023 – Present**
Master of Arts in Physics *Stony Brook, NY*

Stony Brook University **Spring 2020 – Spring 2023**
Bachelor of Science in Physics, minor in Astronomy and Mathematics *Stony Brook, NY*

Rochester Institute of Technology **Fall 2019**
Rochester, NY

Research

Kinematic Weak Lensing on Galaxy Clusters **Jan. 2023 - Present**

- **Summary** — *Kinematic Weak Lensing* is a powerful technique that can distinguish between the intrinsic shape of a galaxy and the lensing effect of cosmic shear using a combination of photometry and spectroscopy.
- **Key Skills** — Experience with data reduction for Keck DEIMOS using the Python `PypeIt` data reduction pipeline. Galaxy Redshift determination using the `IDL` `SpecPro` spectra analysis program.
- **Supervisor** — Professor Anja von der Linden

Writing an Automated Redshift Determination Program **Jan. 2024 - Present**

- **Summary** — My program in `Python` can fit a redshift to DEIMOS spectra by detecting the 3726-3729 Å [OII] doublet, or by using template cross-correlation fitting using `SDSS` templates, interpolated using a flux conserving algorithm.
- **Key Skills** — `PypeIt` & `SpecPro`. Taking advantage of powerful programming frameworks for astronomy in `Python`, like `pandas`, `Astropy`, `SciPy`, `SpecUtils`. Solving complex problems that arise when designing your own pipeline.
- **Supervisor** — Professor Anja von der Linden

Projects

Intelligently Rendering the Entire Gaia Source Catalog on a Personal Laptop **Fall 2023**

- **Summary** — I have rendered 8K resolution visualizations of the 700 GB Gaia source catalog comparable to those by the Gaia Collaboration. Using `Dask`, this can be run on a consumer laptop in minutes. No cloud computing required.
- **Key Skills** — Parallel computing using `Dask` and big data rendering using `Datashader`. Interactive `Jupyter` notebooks. Familiar with the largest star catalog to date.
- **Supervisor** — Professor Michael Zingale

Period Determination and Analysis of Variable Star DY Pegasi **Fall 2022**

- **Summary** — Took optical observations of DY Pegasi using the university telescope and CCD Camera. I concatenated a light curve and determined period and other attributes. My obtained period agreed with the literature within 1 second.
- **Key Skills** — In addition to previously mentioned `Python` tools, gained experience with `DS9` and telescope guidance tools like Cartes du Ciel, CCDSoft, and SiTech. Refined journal writing skills in AASTeX format.

Assorted Experimental Design

- **Cloud chamber cooled via Peltier devices** — I built a cloud chamber from off-the-shelf components that can reach −40°C temperatures using thermoelectric (Peltier) coolers. No dry ice required, only electricity.
- **Pick and Place (PNP) Machine** — I continued development of a PNP machine that will build PCBs from an input schematic. Designed, built, and integrated end-stop sensors into the PNP.

Graduate Coursework

- General Relativity
- Cosmology
- Dark Universe (DM/DE)
- Galaxies
- Gravitational Lensing
- Obs. Astronomy Lab
- Stars
- Interstellar Medium
- Computational Methods
- Research Instruments
- Graduate Seminars

Technical Skills

Spectroscopic Data Reduction: `SpecPro`, `PypeIt`, `SpecUtils`
Photometric Data Reduction: `DS9`, `Astropy`, `SciPy`, `Source Extractor`
Scientific Python/Data Analysis: `NumPy`, `SciPy`, `SymPy`, `Astropy`, `matplotlib`, `pandas`, `Dask`, `HoloViews`, `Bokeh`
Languages: Python, C++, Fortran, Java, C, C#, MATLab, G-Code
Familiar with: Generative AI (begrugingly), Git, Github, Slack, SIMBAD, VizieR, Microsoft Office

Work Experiences

Science Fiction Forum **2021 – 2022**

Treasurer *Stony Brook University*

- **Summary** — The Science Fiction Forum is the largest free-lending library on the eastern seaboard and are among the oldest continuously running organizations at SBU. We host many outreach events for the student general body.
- **Responsibilities**— Managed a $12,000 budget and handled budget applications, which requires in-person presentation in front of a budget committee. Planned events, improved the library, and maintained alumni relations.

Teaching Assistant **2018 – 2019**

MEGA Academy *Flushing, NY*

- **Summary** — Worked at an afterschool tutoring center for students grades 3-12.
- **Responsibilities**— Graded ELA and math homework. Tutored students who were struggling and helped them understand key concepts. Helped students find joy in using math for real life applications.