

# JAYA NAGARAJAN-SWENSON

## THEY / THEM / THEIRS

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## EDUCATION

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**University of Virginia**, Charlottesville, VA.  
Doctor of Philosophy, Astronomy (expected May 2027).

*August 2022 – Present*

**Mount Holyoke College**, South Hadley, MA.

*August 2018 – May 2022*

Bachelor of the Arts double major in Astronomy and Biological Sciences, GPA 3.93.

One of eighteen students in 2022 to graduate *summa cum laude* for an exceptional GPA and thesis, titled “Dark Matter in the Darkest Galaxies: Exploring the Structure of Low Surface Brightness Spirals.”

**South Asia Summer Language Institute**, University of Wisconsin, Madison.  
Eight-week (two semester) Tamil Language intensive, GPA 4.00.

*June - August 2020*

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## RESEARCH

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**Merging Galaxies, University of Virginia**

*August 2022 – Present*

*Research Mentors: Dr. Aaron Evans, Dr. George Privon*

- **Research Goal:** Explore the growth and development of Luminous and Ultra-Luminous Infrared Galaxies (LIRGs and ULIRGs, respectively) with instruments covering the entire electromagnetic spectrum as a part of the GOALS Collaboration.
- Studying and classifying the merging galaxy quadruplet IRAS F09111-1007 using optical and X-ray data.

**Faint Spiral Galaxies, Mount Holyoke College**

*January 2020 – Present*

*Research Mentor: Dr. Jason Young*

- **Research Goal:** Study the evolution and formation of Low Surface-Brightness (LSB) spiral galaxies, then use LSB spiral galaxies to explore other galactic mysteries.
- **Project 1:** Determining the dark matter content of various LSB spirals with optical and infrared data. Submitted to Mount Holyoke College as an honors thesis.
  - Collected spectral data from the VIRUS-P IFU on the 2.7m telescope at UT Austin’s McDonald Observatory over four observing runs, then developed and adapted code in Python, Bash, and IRAF to process it.
  - This project presented the dark matter portion of the MUSCEL program, which tests core-cusp transformation by comparing a galaxy’s dark matter structure to its resolved star formation history. We found substantial evidence of dark matter-domination throughout our entire sample, and near solid-body rotation through the entire optical disk of one galaxy. Also, surprisingly, found evidence possibly pointing to a truncated (top-light) initial mass function to explain the paradoxical darkness of LSB spirals. Both results are still being explored.
  - Manuscript(s) in preparation.
- **Project 2:** Determining the impact of hot dust on star formation in Low Surface Brightness galaxies.
  - Repurposed existing pipelines to deconvolute raw data from the Spitzer and GALEX Space Telescopes and apply Independent Component Analysis (ICA) to photometric data of 40 galaxies.
- **Project 3:** Mapping 21 cm atomic galactic hydrogen in LSB spiral UGC 628.
  - Used the Common Astronomy Software Applications package (CASA) to process archival radio data from the Very Large Array (VLA) and was awarded remote time on the VLA to collect additional data on UGC 628 and its environment when the archives were insufficient.

## Field Ecology, Blandy Experimental Farm NSF-REU Program

May - August 2021

Research Mentors: Dr. David Carr and Kelsey Schoenemann

- **Research goal:** Examine and understand factors contributing to hive success and failure in the common eastern bumble bee, *Bombus impatiens*.
- **Abstract title:** It's (on) the bee's knees! The effect of local habitat and time on pollen foraging efficiency of *Bombus impatiens*.
- Assisted ongoing ecological research about the influence of landscape and local habitat on *B. impatiens*.
  - Set up and monitored 27 hives at three field sites in northern Virginia for twelve weeks. (Data from six hives were disregarded after impromptu dissection of the brood clumps by black bears.)
  - Collected pollen from foragers daily and video footage from hives weekly. Data were used to determine goodness of diet and efficiency of foraging for each hive in each habitat.
  - Randomly generated points for floral surveys using GIS software. Navigated to these densely vegetated locations with a compass and GPS, and recorded all floral species within four 8-meter belt transects at each point.
- Led a day-long session for the Blandy Experimental Farm summer day camp with one other REU student. Highlighted the social bumble bee *B. impatiens* and the solitary mason bee *Osmia texana* to teach a 15-student cohort about the diversity of bee genera and their different foraging patterns and habitats with a lecture and an afternoon of hands-on activities.

## PROPOSALS AND GRANTS

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Grant	FAMOUS Grant, American Astronomical Society: <b>\$1,000</b>	January 2023
Grant	University of Virginia Graduate School of Arts and Sciences Research and Professional Development Fellowship: <b>\$5,000</b>	March 2022
Co-I	McDonald Observatory, University of Texas at Austin: <b>7 nights</b> . "IFU Spectroscopy of a Post-Burst LSB Spiral" (P.I. Jason Young)	January 2021
Grant	NASA Space Grant, Massachusetts Space Grant Consortium: <b>\$1,500</b>	September 2021

## OBSERVING EXPERIENCE

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McDonald Observatory, 2.7m Harlan J. Smith Telescope, VIRUS-P Instrument. <b>7 nights</b> . Primary targets: LSB Spiral SDSS J010223.55+203334.6 and HSB Spiral 2MFGC731. Also observed UGC3174 and UGC4179.	October 2021
Amherst College Observatory, 11-inch Celestron telescope. <b>2 nights</b> . Primary targets: various open and globular clusters in the Milky Way. Data used for a semester-long independent project for an Amherst College class.	September 2021
McDonald Observatory, 2.7m Harlan J. Smith Telescope, VIRUS-P Instrument. <b>6 nights</b> . Primary target: LSB Spiral UGC 8839	April 2021
McDonald Observatory, 2.7m Harlan J. Smith Telescope, VIRUS-P Instrument. <b>6 nights</b> . Primary targets: LSB Spirals UGC12709, UGC2017, UGC2259, UGC4179, UGC731, LEDA138324, and LEDA33959	December 2020
McDonald Observatory, 2.7m Harlan J. Smith Telescope, VIRUS-P Instrument. <b>9 nights</b> . Primary target: LSB Spiral UGC11820	August 2020

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## POSTERS AND PRESENTATIONS

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Poster	“Dark Matter in the Darkest Galaxies.” American Astronomical Society 240 <sup>th</sup> meeting (Seattle, WA).	January 12, 2023
Talk	“Dark Matter in the Darkest Galaxies.” Mount Holyoke College Senior Symposium Conference (South Hadley, MA).	April 22, 2022
Poster	“Rotation Curves of Low Surface Brightness Spirals.” American Astronomical Society 239 <sup>th</sup> meeting (Salt Lake City, UT).	January 2022*
Poster	“The Environment of a Low Surface Brightness Starburst.” American Astronomical Society 239 <sup>th</sup> meeting (Salt Lake City, UT).	January 2022*
Talk	“It’s (on) the bee’s knees! The effect of local habitat and time on pollen foraging efficiency of <i>Bombus impatiens</i> .” Council on Undergraduate Research 2021 REU Symposium (Remote).	October 25, 2021
Poster	“Hot Dust in Low Surface Brightness Spirals.” Mount Holyoke Physics Summer Research Poster Session (South Hadley, MA).	October 8, 2021
Talk	“It’s (on) the bee’s knees! The effect of local habitat and time on pollen foraging efficiency of <i>Bombus impatiens</i> .” Blandy Experimental Farm Summer Research Symposium (Boyce, VA).	July 28, 2021

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## TEACHING AND MENTORSHIP

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**Graduate Teaching Assistant, University of Virginia Department of Astronomy** *Fall 2022*

***Telescope Observing Lab***

- Ran nearly 1000 introductory students through an observing lab at the McCormick Observatory. The lab consisted of making observations through three historic telescopes, searching for targets with a finder chart, and learning the history of astronomy in the observatory.

***Stars and Galaxies, Professors Aaron Evans and Matthew Pryal***

- Facilitated weekly discussions for 100+ students in each of two introductory astronomy courses.
- Graded exams, labs, and other assignments.

**Lab Consultant, Fimbel Maker and Innovation Lab** *August 2019 – May 2022*

***Lab Consultant, Supervisors Shani Mensing and Kris Camp, Professor Kathy Aidala***

- Mentored students and faculty who used the 8,000-foot Makerspace for independent projects and coursework in fields including architecture, geology, biochemistry, art, and computer science.
- Designed and ran workshops for students and staff.
- Certified to teach the use of Adobe Illustrator for laser cutting and CAD software for 3D design; certified to teach and supervise laser cutting, 3D printing, vinyl cutting, soldering, Arduino, and various woodshop tools.

**Peer-Led Undergraduate Mentoring System Mentor, Mount Holyoke Departments of Biology and Physics**

***Ecology, Professor Martha Hoopes***

*Fall 2021*

- Assisted weekly laboratories teaching data analysis and field ecology methods.
- Created weekly worksheets with other PLUMS to guide students through the problems presented in their weekly problem sets.
- Hosted semiweekly student discussion sessions.

***Calculus-based Physics: Mechanics, Professor Kathy Aidala***

*Fall 2020*

- Created weekly worksheets, hosted semiweekly student discussion and help sessions.
- Assisted modifying curriculum to fit the module system (from the normal semester system), in which students took two classes at a time at double the intensity, for half the semester. This system was adopted for the 2020-2021 academic year only to allow students more flexibility and increase student access to classes during the COVID-19 pandemic.

**Teaching Assistant, Mount Holyoke Departments of Astronomy and Physics**

***Intermediate Astrophysics: Stars and Galaxies, Professor Jason Young***

*Spring 2021*

- Ran weekly discussion sessions to answer student questions.
- Graded student exams and problem sets.

***Solar Systems, Professor Jason Young***

*Spring 2020*

- Ran bi-weekly discussion sessions to answer student questions.
- Graded student quizzes and problem sets.

***Physics: Mechanics, Professor Kerstin Nordstrom and Casey Lee-Trimble***

*Fall 2020*

- Assisted creating, setting up, and running laboratories to teach the fundamentals of mechanics in a course aimed at non-physics students.

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**LEADERSHIP**

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**Panel Speaker, NCAA Inclusion Forum.**

*April 20–23, 2023*

Invited to represent the student-athlete perspective and design a session for the 2023 NCAA Inclusion Forum in Indianapolis, Indiana. This collaboration resulted in a facilitated conversation titled “QTBIPOC: At the Intersection of Race, Sexual Orientation, and Gender Identity in College Athletics.”

**Varsity Coxswain, Mount Holyoke Rowing and Berkeley High Crew.**

*September 2014 – May 2022*

First varsity coxswain and primary mentor of novice athletes and coxswains since August 2019, competing rower and coxswain since September 2014. Recently competed (and earned an automatic qualifier for 2022) at the Head of the Charles and New England Rowing Championship Regattas.

**Chair and Co-founder, Mount Holyoke Athlete Empowerment Coalition.**

*February 2020 – May 2022*

Chair and co-founder of an official student organization for first generation student-athletes and student-athletes of color at Mount Holyoke College.

**Student Liaison, Mount Holyoke Astronomy Department.**

*August 2021 – May 2022*

Point person for connecting with and supporting incoming and prospective students in astronomy. Works with the Society for Physics Students (SPS) to organize and facilitate open houses at the Williston Observatory at Mount Holyoke College. Trained to use the historic eight-inch Alvan Clark equatorial refractor telescope.

**Diversity and Inclusion Chair, Student-Athlete Advisory Committee.**

*January 2019 – January 2022*

Diversity and Inclusion Chair for SAAC and the student representative for Mount Holyoke Athletics in the 2020 and 2021 calendar years. Representative of the rowing team since 2019. Interviewed for NBC News features on bills surrounding transgender student-athletes in June 2021 and January 2022. [\[Video\]](#)

**Founding Member, Sunrise Movement South Hadley.**

*October 2019 – May 2022*

Founding member of a new hub with the national 10,000-member Sunrise Movement, building an “army of young people to stop climate change and create millions of new jobs in the process.”

**Panel Host, *A Most Beautiful Thing* panel**

*April 6, 2021*

Hosted a virtual 100+ person panel. Interviewed award-winning filmmaker and Olympic rower Mary Mazzio, as well as Arshay Cooper, author of *A Most Beautiful Thing*.

**Communications Committee, Pioneer Valley Mini Maker Faire.** *November 2019 – April 2020\**  
 Member of the communications and outreach committee to organize the 2020 Pioneer Valley Mini Maker Faire hosted by Mount Holyoke College in April 2020.

**Keynote Speaker, Stanford University** *July 17, 2018*  
 Selected as keynote speaker for the Stanford University Hollyhock Fellowship’s conference about equity in education and my own experiences as a student activist.

## HONORS AND AWARDS

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**Chambliss Award Honorable Mention** from the American Astronomical Society. *January 2023*

**Excellence in Teaching Award** from the Mount Holyoke Department of Biological Sciences. *May 2022*

**Mount Holyoke Scholar Athlete** for seniors who have excelled academically and athletically. *May 2022*

**H. Elizabeth Braun Catalyst for Change Award** to recognize leaders who have done extraordinary work creating a diverse and inclusive community at Mount Holyoke College. *April 2022*

**Best Undergraduate Research Presentation** at the UVA Blandy Summer Research Symposium. *July 2021*

**Bennett Prize** for undergraduate excellence in physics by the Mount Holyoke Physics Department. *May 2020*

**NEWMAC Academic All-Conference Team (x3)** *May 2020, 2021, 2022*

**NEWMAC All-Conference Sportsmanship Team** for one person per sport. *April 2019*

**Tuition Exchange Award and Mary Lyon Scholarship:** Awarded two annual merit-based scholarships from Mount Holyoke College. \$41,000 annually for four years. *2018 – 2022*

**Selected Arangetram Soloist:** Selected for an Arangetram (solo classical South Indian dance performance) after 10 years of training and performance with “Kalanjali: Dances of India.” *July 2018*

**Kalpna Mistry Award** for academic achievement and activist work in Berkeley *June 2018*

## COMPETENCIES

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**Relevant Coursework:** Observational Techniques · Cosmology · Galactic Astrophysics · Stellar Astrophysics · Astrophysics I: Stars and Galaxies · Planetary Science · Icy Worlds · Solar Systems · Electromagnetism · Math Methods in Physics · Multivariable Calculus

**Computer-based:** Python · R · IRAF · Bash shell scripting · CASA · LaTeX · MathStudio · Fusion 360 · Linux · MacOS · Windows · Microsoft Office Suite · Adobe Creative Cloud Suite

**Language:** English, native · Tamil, intermediate written and read, intermediate beginner spoken · French, intermediate · Spanish, beginner

*\*Cancelled due to the COVID-19 pandemic.*