# VEDANT CHANDRA

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## Professional Appointments

**Graduate Student, Center for Astrophysics | Harvard & Smithsonian** 2021–Present
**Visiting Researcher, Max Planck Institute for Astronomy** 2022–Present
**Research Intern, Space Telescope Science Institute** 2020–2021
**Research Assistant, Johns Hopkins University** 2018–2021

## Education

**Harvard University** 2021–Present
- A.M., Ph.D. Astronomy & Astrophysics (intended)

**Johns Hopkins University** 2017–2021
- B.S. Physics & Applied Mathematics, minor in Space Sciences

## Awards & Honors

**James Mills Peirce Fellowship, Harvard University** 2021
**Chambliss Medal, American Astronomical Society** 2021
$\Sigma \Pi \Sigma$ 2020
**Summer Student Fellowship, JHU IDIES** 2020
**Provost's Undergraduate Research Award, JHU** 2019
**Dean's Undergraduate Research Award, JHU** 2019
**Dean's List 7/7 Semesters, JHU** 2017-2021

## Grant Allocations

**STScI JWST Discretionary Fund ($42,740)** 2020
- "The Initial Mass Function of Resolved Stellar Populations in the Local Group"
- PI: Mario Gennaro, Co-I: Vedant Chandra

**Various Undergraduate Research Grants ($13,500)** 2019-2020
- PI: Vedant Chandra, Co-Is: Nadia Zakamska, Hsiang-Chih Hwang, Kevin C. Schlaufman

## Talks and Presentations

**Galaxy Coffee, MPIA Heidelberg** June, 2024
- "The Milky Way's Global Kinematic Response to the LMC".

**The Milky Way Assembly Tale, INAF Bologna** May, 2024
- "The Uncharted Horizons of the Milky Way: From the Heart to the Halo".

**Milky Clouds Above Manhattan, Flatiron Institute** February, 2024
- "Shakes, Wakes, and Streams: The XMC Influence to 100 kpc and Beyond", video.

**ITC Luncheon, CfA | Harvard & Smithsonian** February, 2024
- "The Three-Phase Evolution of the Milky Way" , video.

**Supernova Explosions (SNEx) Meeting** November, 2023

- "Hypervelocity Runaways from Type Ia Supernovae".

**Central Halo Workshop, University of Cambridge** September, 2023

- "Chemodynamically Surveying the Ancient Heart of the Milky Way".

**ITC Luncheon, CfA | Harvard & Smithsonian** September, 2023

- "Discovery of the Magellanic Stellar Stream Out to 100 kpc", video.

**SDSS-V Collaboration Meeting** August, 2023

- "Mapping the Milky Way's Outer Halo with SDSS-V".

**Galaxy Coffee, MPIA** July, 2023

- "Discovery of the Magellanic Stellar Stream Out to 100 kpc".

**Gaia XPloration Workshop, University of Cambridge** May, 2023

- "Mapping the Outer Halo of the Milky Way with XP".

**Wide Field Spectroscopy vs Galaxy Formation Theory** March, 2023

- "The Three-Phase Birth of the Milky Way".

**Disk Formation Workshop, UC Irvine** September, 2022

- "The Poor Old Heart of the Milky Way".

**ITC Luncheon, CfA | Harvard & Smithsonian** September, 2022

- "A Ghost in Boötes: The Least Luminous Disrupted Dwarf Galaxy", video.

**Milky Way Meeting, MPIA** April, 2022

- "To 100 kpc and Beyond: The Outer Halo with RGB Stars".

**Online Meetings on Evolved Stars and Systems** December, 2021

- "Detection of Circumstellar Material and Rotation in a Runaway SNIa Donor", video.

**Institute for Advanced Study, Astrophysics Coffee** October, 2021

- "Circumstellar Material and Surface Rotation in a Runaway SNIa Donor"

**Space Telescope Science Institute, Summer Symposium** July, 2020

- "Fitting the Stellar Birth Function of Resolved Stellar Populations with Approximate Bayesian Computation", 19:30 onwards.

**Space Telescope Science Institute, Summer Symposium** August, 2019

- "White Dwarf Spectroscopy with Machine Learning", 21:00 onwards.

**Maryland Space Grant Consortium, Annual Symposium** July, 2019

- "White Dwarf Astronomy with Machine Learning".

## Poster Presentations

**Milky Way Surveys Conference, Caltech** October, 2023

- "The Three-Phase Evolution of the Milky Way"

**237th Meeting of the American Astronomical Society** January, 2021

- "Resolved Stellar Populations in the Era of JWST and Roman", iPoster

**IDIES and MINDS Annual Symposium** October, 2020

- "Hunting for Metal-Poor Main-Sequence Stars in SDSS", awarded Best Poster.

**NASA HRP Investigators Workshop** January, 2020

- "Multivariate Analysis of Human Health and Performance in Spaceflight Simulation"

**IDIES Annual Symposium** October, 2019

- "Characterizing White Dwarf Spectra with Neural Networks"

**JHU DREAMS Conference** April, 2019

- "Hunting for Binary White Dwarf Stars with Spectroscopic Analysis"

## Selected Press Coverage

**CfA Press Release** December, 2023

- "Distant Stars Spotted for the First Time in the Vast Magellanic Stream"

**Sky & Telescope Magazine** October, 2023

- "Astronomers find stars cast away from Galactic neighbors"

**New Scientist** July, 2023

- "Stars found hidden in huge cloud wrapped around the Milky Way"

**Quanta Magazine** March, 2023

- "Astronomers Dig Up the Stars That Birthed the Milky Way"

**MPIA Press Release** December, 2022

- "Astronomers identify the ancient heart of the Milky Way galaxy"

**ScienceNews Magazine** November, 2022

- "A protogalaxy in the Milky Way may be our galaxy's original nucleus"

**astrobites** August, 2022

- "The Haunting of Boötes' Backyard"

**ScienceNews Magazine** August, 2020

- "Paradoxically, white dwarf stars shrink as they gain mass"

**JHU Press Release** July, 2020

- "Johns Hopkins astrophysicists observe long-theorized quantum phenomena"

## Observatory Allocations

Principal Investigator:

**MPG/ESO 2.2m, FEROS, 250 hours** 2023-2024

- "The Enrichment History of the Ancient Milky Way", co-PI with Hans-Walter Rix.

**ESO Very Large Telescope, FLAMES/GIRAFFE, 75 hours** 2023

- "A Chemical Survey of the Milky Way's Ancient Heart".

**Magellan Observatory, MagE, 19 nights** 2022-2023

- "Surveying the Uncharted Outer Halo with MagE"
- "Stealth Galaxies in the Southern Outskirts of the Milky Way"

**MMT Observatory, Hectochelle, 4 nights** 2022-2023

- "Stealth Galaxies in the Outskirts of the Milky Way".

**Anglo-Australian Telescope, 2dF+AAOmega, 3 nights** 2022

- "New Structures in the Outskirts of the Milky Way", co-PI with Yuan-Sen Ting.

**Gemini Observatory, GMOS, 30 hours** 2021-2022

- "A Long-period Cataclysmic Variable in NGC 2234"

- "A New Double-lined White Dwarf Binary from SDSS-V"
- "A Long-Period AM CVn Binary with an Unusual Composition"
- "Monitoring a Dynamic Gaseous Debris Disk around a White Dwarf"
- "A Short-period Double White Dwarf Binary from SDSS-V"
- "Double White Dwarf Binaries from SDSS-V"

**Apache Point Observatory, DIS & ARCTIC, 6 nights)** 2020-2021
- "Monitoring Circumstellar Debris around a Runaway SN Ia Donor"
- "Peculiar Hypervelocity Stars from Gaia EDR3"
- "Time-resolved RVs of Massive WDs in Close Binary Systems"

**Neils Gehrels Swift Observatory, UVOT, 1 hour** 2021
- "ToO: A 99-minute WD+WD Binary", Co-PI with Gagik Tovmassian.

Co-Investigator: (advisees are indicated with an asterisk)

**ESO Very Large Telescope, X-Shooter, 8 hours** 2023
- "The Fastest Stars in the Galaxy", PI: Kareem El-Badry.

**CTIO Blanco, DECam, 54 nights** 2023
- "The DECam MAGIC Survey: Mapping the Ancient Galaxy in CaHK", PI: Anirudh Chiti.

**James Webb Space Telescope, NIRCAM, 48 hours** 2023
- "A Pristine IMF Probe of the Star-Forming Conditions in the Early Universe", PI: Mario Gennaro
- "Does the Stellar Initial Mass Function Depend on Metallicity?", PI: Roger Cohen

**Gemini Observatory, GMOS, 7 hours** 2023
- "The Fastest Stars in the Galaxy", PI: Kareem El-Badry
- "Discovery of a rare massive double-lined WD binary", PI: Gautham Pallathadka*
- "Probing the Mass-Radius Relation of White Dwarfs With Wide Binaries", PI: Stefan Arseneau*

**Magellan Observatory, MagE, 7 nights** 2022
- "Bringing the Gaia Revolution to the Brink of our Galaxy", PI: Rohan Naidu
- "The progenitors of extremely low-mass white dwarfs", PI: Kareem El-Badry

**Apache Point Observatory, DIS, 3 nights** 2022
- "Astrophysics of Stellar Binaries", PI: Nadia Zakamska
- "Following up Double White Dwarf Binaries found in SDSS-V", PI: Nadia Zakamska

## Research Mentorship

**Nicole Crumpler** (JHU PhD, WD EoS with SDSS-V) 2022-Present

**Gautham A. Pallathadka** (JHU PhD, WD binaries in SDSS-V) 2022-Present

Stefan Arseneau (JHU UG, gravitational redshift of binary WDs) 2022-Present

## Teaching

**Teaching Fellow, ASTRON 202a: Galaxies and Cosmology, Harvard** Spring, 2024

**Teaching Fellow, ASTRON 120: Stellar Physics, Harvard** Spring, 2023

**Teaching Assistant, 360.133: Great Books at Hopkins, JHU** Fall, 2018

**Teaching Assistant, 171.101: General Physics I, JHU** Summer, 2018

## Professional Service

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| **Deputy Project Scientist, Via Project** | 2022-Present |
| **Journal Referee (MNRAS, ApJs, A&A)** | 2022-Present |
| **Faculty Search Committee, Harvard Astronomy** | 2023-2024 |
| **Lead Organizer, Harvard Astronomy Student-Faculty Forum** | 2023-2024 |
| **Representative, Harvard Astronomy Student-Faculty Council** | 2021-2023 |

## Outreach

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|---|---|
| **Representative, Astronomy Graduate Student Congress** | 2023-Present |
| **Executive Committee, CfA Social & Recreational Club** | 2021-Present |
| **Head of Logistics, JHU MedHacks Hackathon** | 2018-2019 |
| **Volunteer, JHU Physics Spring Fair** | 2018-2019 |
| **Contributing Writer, space.stackexchange.com** | 2014-2018 |

## References

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|---|---|
| **Charlie Conroy, Professor, Harvard University** | PhD Advisor, cconroy@cfa.harvard.edu |
| **Hans-Walter Rix, Director, Max Planck Institute for Astronomy** | Advisor, rix@mpia.de |
| **Nadia L. Zakamska, Professor, Johns Hopkins University** | Advisor, zakamska@jhu.edu |
| **Daniel J. Eisenstein, Professor, Harvard University** | TAC Chair, deisenstein@cfa.harvard.edu |
| **Charles R. Alcock, Professor, Harvard University** | Teaching Reference, calcock@cfa.harvard.edu |

33 refereed publications, 10 as lead-author, 2 as supervising author
*h*-index: 15, advisees are highlighted with an asterisk.

## Lead-Author Publications

10. **Vedant Chandra**, Vedant Chandra, Rohan P. Naidu, Charlie Conroy, Nicolas Garavito-Camargo, Chervin Laporte, Ana Bonaca, Phillip A. Cargile, Emily Cunningham, Jiwon Jesse Han, Benjamin D. Johnson, Hans-Walter Rix, Yuan-Sen Ting, Turner Woody, Dennis Zaritsky (2024)
"All-Sky Kinematics of the Distant Halo: The Reflex Response to the LMC"
*The Astrophysical Journal, submitted*

9. **Vedant Chandra**, Vadim A. Semenov, Hans-Walter Rix, Charlie Conroy, Ana Bonaca, Rohan P. Naidu, Rene Andrae, Jiadong Li, Lars Hernquist (2024)
"The Three-Phase Evolution of the Milky Way"
*The Astrophysical Journal, submitted*

8. **Vedant Chandra**, Rohan P. Naidu, Charlie Conroy, Ana Bonaca, Dennis Zaritsky, Phillip A. Cargile, Nelson Caldwell, Benjamin D. Johnson, Jiwon Jesse Han, Yuan-Sen Ting (2023)
"Discovery of the Magellanic Stellar Stream Out to 100 Kiloparsecs"
*The Astrophysical Journal, 956, 110*

7. **Vedant Chandra**, Rohan Naidu, Charlie Conroy, Alexander P. Ji, Hans-Walter Rix, Ana Bonaca, Phillip A. Cargile, Jiwon Jesse Han, Benjamin D. Johnson, Yuan-Sen Ting, Turner Woody, Dennis Zaritsky (2023)
"Distant Echoes of the Milky Way's Last Major Merger"
*The Astrophysical Journal, 951, 26*

6. **Vedant Chandra**, Charlie Conroy, Nelson Caldwell, Ana Bonaca, Rohan P. Naidu, Dennis Zaritsky, Phillip A. Cargile, Jiwon Jesse Han, Benjamin D. Johnson, Joshua S. Speagle, Yuan-Sen Ting, Turner Woody (2022)
"A Ghost in Boötes: The Least Luminous Disrupted Dwarf Galaxy"
*The Astrophysical Journal, 940, 127*

5. **Vedant Chandra**, Hsiang-Chih Hwang, Nadia L. Zakamska, Simon Blouin, Andrew Swan, Thomas R. Marsh, Ken J. Shen, Boris T. Gänsicke, J.J. Hermes, Odelia Putterman, Evan B. Bauer, Evan Petrosky, Vikram S. Dhillon, Stuart P. Littlefair, Richard P. Ashley (2022)
"The SN Ia Runaway LP 398-9: Detection of Circumstellar Material and Surface Rotation"
*Monthly Notices of the Royal Astronomical Society, 512, 6122*

4. **Vedant Chandra**, Hsiang-Chih Hwang, Nadia L. Zakamska, Boris T. Gänsicke, J.J. Hermes, Axel Schwope, Carles Badenes, Gagik Tovmassian, Evan B. Bauer, Dan Maoz, Matthias R. Schreiber, Odette F. Toloza, Keith P. Inight, Hans-Walter Rix, Warren R. Brown (2021)
"A 99-minute Double-lined White Dwarf Binary from SDSS-V"
*The Astrophysical Journal, 921, 160*

3. **Vedant Chandra** & Kevin C. Schlaufman (2021)
"Searching for Low-mass Population III Stars Disguised as White Dwarfs"
*The Astronomical Journal, 161, 197*

2. **Vedant Chandra**, Hsiang-Chih Hwang, Nadia L. Zakamska, Sihao Cheng (2020)
"A Gravitational Redshift Measurement of the White Dwarf Mass–Radius Relation"
*The Astrophysical Journal, 899, 146*

1. **Vedant Chandra**, Hsiang-Chih Hwang, Nadia L. Zakamska, Tamás Budavári (2020)
"Computational Tools for the Spectroscopic Analysis of White Dwarfs"
*Monthly Notices of the Royal Astronomical Society, 497, 2688*

## Publications with Major Contributions

9. Hans-Walter Rix, **Vedant Chandra**, Gail Zasowski, et al (2024)
"The Extremely Metal Rich Knot of Stars at the Heart of the Galaxy "
*The Astrophysical Journal, submitted*

8. Stefan Arseneau*, **Vedant Chandra**, Hsiang-Chih Hwang, et al (2024)
"Measuring The Mass-Radius Relation of White Dwarfs Using Wide Binaries "
*The Astrophysical Journal, submitted*

7. Gautham A. Pallathadka*, **Vedant Chandra**, Nadia L. Zakamska, et al (2024)
"Discovery of a proto-white dwarf with a massive unseen companion"
*The Astrophysical Journal, submitted*

6. Vadim A. Semenov, Charlie Conroy, **Vedant Chandra**, et al (2023)
"Formation of Galactic Disks II: the Physical Drivers of Disk Spin-up"
*The Astrophysical Journal, submitted*

5. Vadim A. Semenov, Charlie Conroy, **Vedant Chandra**, et al (2023)
"Formation of Galactic Disks I: Why did the Milky Way's Disk Form Unusually Early?"
*The Astrophysical Journal, 962, 18*

4. Kareem El-Badry, Ken J. Shen, **Vedant Chandra**, et al (2023)
"The fastest stars in the Galaxy"
*The Open Journal of Astrophysics, 6 (July)*

3. René Andrae, Hans-Walter Rix and **Vedant Chandra** (2023)
"Robust Data-driven Metallicities for 175 Million Stars from Gaia XP Spectra"
*The Astrophysical Journal Supplement, 267, 8*

2. Hans-Walter Rix, **Vedant Chandra**, René Andrae, et al (2022)
"The Poor Old Heart of the Milky Way"
*The Astrophysical Journal, 941, 45*

1. Evan B. Bauer, **Vedant Chandra**, Ken J. Shen, J.J. Hermes (2022)
"Masses of White Dwarf Binary Companions to Type Ia Supernovae Measured from Runaway Velocities"
*The Astrophysical Journal Letters, 923, L24*

## Co-Authored Publications

14. Neige Frankel, Rene Andrae, Hans-Walter Rix, et al (2024)
"What Does the Large Magellanic Cloud Look Like? It Depends on [M/H] and Age"
*The Astrophysical Journal, submitted*

13. Logan Sizemore, Diego Llanes, Marina Kounkel, et al (2023)
"A self-consistent data-driven model for determining stellar parameters from optical and near-IR spectra"
*The Astrophysical Journal, submitted*

12. Alexander P. Ji, Sanjana Curtis, Nicholas Storm, et al (2023)
"Spectacular nucleosynthesis from early massive stars"
*The Astrophysical Journal Letters, 961, 25*

11. Jiadong Li, Kaze W.K. Wong, David W. Hogg, et al (2023)
"AspGap: Augmented Stellar Parameters and Abundances for 23 million RGB stars from Gaia XP low-resolution spectra"
*The Astrophysical Journal Supplement, submitted*

10. Guilherme Limberg, Alexander P. Ji, Rohan P. Naidu, et al (2023)
"Extending the Chemical Reach of the H3 Survey: Detailed Abundances of the Dwarf-galaxy Stellar Stream Wukong/LMS-1"
*Monthly Notices of the Royal Astronomical Society, submitted*

9. Keith Inight, Boris T. Gänsicke, Axel Schwope, et al (2023)
"Cataclysmic Variables from Sloan Digital Sky Survey V – the search for period bouncers continues"
*Monthly Notices of the Royal Astronomical Society, 525, 3597*

8. The SDSS-V Collaboration (2023)
"The Eighteenth Data Release of the Sloan Digital Sky Surveys: Targeting and First Spectra from SDSS-V"
*The Astronomical Journal, 267, 44*

7. Jiwon Jesse Han, Charlie Conroy, Benjamin D. Johnson, et al (2022)
"The Stellar Halo of the Galaxy is Tilted & Doubly Broken"
*The Astronomical Journal, 164, 249*

6. Rohan P. Naidu, Charlie Conroy, Ana Bonaca, et al (2022)
"Live Fast, Die $\alpha$-Enhanced: The Mass-Metallicity-$\alpha$ Relation of the Milky Way's Disrupted Dwarf Galaxies"
*The Astrophysical Journal, submitted*

5. Charlie Conroy, David H. Weinberg, Rohan P. Naidu, et al (2022)
"Birth of the Galactic Disk Revealed by the H3 Survey"
*The Astrophysical Journal, submitted*

4. Rohan P. Naidu, Alexander P. Ji, Charlie Conroy, et al (2022)
"Evidence from Disrupted Halo Dwarfs that r-process Enrichment via Neutron Star Mergers is Delayed by $\gtrsim$ 500 Myrs"
*The Astrophysical Journal Letters, 926, L36*

3. Jiwon Jesse Han, Rohan P. Naidu, Charlie Conroy, et al (2022)
"A Tilt in the Dark Matter Halo of the Galaxy"
*The Astrophysical Journal, 934, 14*

2. Hsiang-Chih Hwang, Yuan-Sen Ting, Charlie Conroy, et al (2022)
"Wide binaries from the H3 survey: the thick disk and halo have similar wide binary fractions"
*Monthly Notices of the Royal Astronomical Society, 513, 754*

1. Evan Petrosky, Hsiang-Chih Hwang, Nadia L. Zakamska, et al (2021)
"Variability, periodicity and contact binaries in WISE"
*Monthly Notices of the Royal Astronomical Society, 503, 3975*

## Other Writing

4. Arjun Dey, Joan Najita, Carrie Fillion, et al (2023)
"RomAndromeda: The Roman Survey of the Andromeda Halo"
*NASA Roman Core Community Survey White Paper*

3. Jiwon Jesse Han, Arjun Dey, Adrian M. Price-Whelan, et al (2022)
"NANCY: Next-generation All-sky Near-infrared Community surveY"
*NASA Roman Core Community Survey White Paper*

2. Charlie Conroy, Dan Fabricant, Nelson Caldwell, **Vedant Chandra**, et al (2022)
"A Fast All-Sky Spectroscopic Survey to Discover the Nature of Dark Matter, Find the Edge of Galaxy Formation, and Map the Cold Gas Feeding the Milky Way"
*CfA Science & Technology White Paper*

1. **Vedant Chandra** (2020)
"Measuring the White Dwarf Mass-Radius Relation using Thousands of Stars"
*astrobites*