





# Sapna Mishra

Space Telescope Science Institute (STScI)

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## Academic Positions

<b>Space Telescope Science Institute</b> Postdoctoral Fellow	Baltimore, USA 2023 - present
<b>Inter-University Centre for Astronomy &amp; Astrophysics</b> Postdoctoral Fellow	Pune, India 2021 - 2023
<b>Aryabhata Research Institute of observational sciencES</b> Post Thesis Submission Fellow (PTSF)	Nainital, India 2020 - 2021

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## Education

<b>Aryabhata Research Institute of observational sciencES</b> Ph. D – Thesis: Probing environment of AGNs based on their feedback processes – Advisor: Prof. Hum Chand – Degree Awarded: July 2021	Nainital, India 2015 - 2020
<b>Aryabhata Research Institute of observational sciencES</b> Pre-Ph. D Course work	Nainital, India 2014 - 2015
<b>Department of Physics &amp; Astrophysics, Delhi University</b> Master of Science, Physics and Astronomy	Delhi, India 2012 - 2014
<b>Miranda House College, Delhi University</b> Bachelor of Science, Physics honors	Delhi, India 2012 - 2014

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## Research Interests

- §5. Exploring the circumgalactic medium (CGM) of the Large Magellanic Cloud (LMC) to understand galaxy evolution within the Local Group ([1 first-author paper](#)).
- §4. Investigating the outskirts of galaxy clusters to study gas inflow and outflow in massive systems across low and high redshifts ([2 first-author papers](#)).
- §3. Examining the CGM of cluster galaxies to understand environmental effects such as ram-pressure stripping, overshooting, and pre-processing ([1 first-author paper](#)).
- §2. Studying the local environments of high-redshift ( $z \sim 2-4$ ) quasars by analyzing spectral variations in associated absorption seen in broad absorption line quasars (BALQSOs) ([1 first-author paper](#)), and identifying a potential blazar-like subclass, termed broad absorption line blazars ([2 first-author papers](#)).

- §1. Investigating the redshift evolution of the number density of intervening absorbers ( $dN/dz$ ) using different background sources, including blazars and gamma-ray bursts (GRBs) ([1 first-author paper](#)).
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## Telescope time and grants as Principle Investigator

- §9. HST/COS, Cycle 32, “Probing the front-side of the Circumgalactic Medium of the Large Magellanic Cloud” (PID: GO-17757): 29 orbits
- §8. ESO/FORS2, Cycle P109, “MgII tomography of cluster outskirts using 11 background quasars” (PID: 109.23G6)
- §7. Devasthal Optical Telescope (DOT), 3.6m international telescope, India, DOT-2022-C1: “NIR spectroscopy of post-starburst galaxies to probe obscured star formation and stellar population”, PID: DOT-2022-C1-P18
- §6. DOT, DOT-2021-C1, “Probing connection between the emission and absorption outflows in IR-bright BAL quasars”, PID: DOT-2021-C1-P32.
- §5. DOT, DOT-2018-C1, “Resolving the narrow emission line region of the quadruply imaged quasar: RXS J113155.4-123155”, PID: P325-2018A.
- §4. DOT, DOT-2017-C1, “Infrared properties of the jet dominated BALQSOs”, PID: P31-2017A.
- §3. Himalayan Chandra Telescope (HCT), 2m national telescope, India, HCT-2021-C2, “Probing the spectral variability of X-Ray bright high ionization Broad absorption line Quasars”, PID: HCT-2021-C2-P56.
- §2. HCT, HCT-2021-C1: “Intranight monitoring of blazar counter parts of BAL quasars, PID: HCT-2021-C1-P52.
- §1. HCT, 3 proposals in various cycles on “Probing environment of emerging Broad absorption line quasars”, PIDs: HCT-2020-C2-P27, HCT-2020-C1-P170, HCT-2019-C3-P117.
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## Service, Mentoring, Teaching

- §7. **Panel Support Scientist (PSS)**: moderated the TAC of HST Cycle, 32.
- §6. **Panel Support Scientist (PSS)**: moderated the TAC of JWST, Cycle, 3.
- §5. **Co-Organize**: HotSci, 2024, colloquium series at STScI.
- §4. Served as a **service observer** at the Devasthal Optical Telescope (3.6m) during the COVID period, conducting observations on behalf of other proposers.
- §3. Given optical data reduction training in ARIES Training School in Observational Astronomy (ATSOA), 2016, 2017, 2018, 2019, ARIES, Nainital, India.
- §2. Given high-resolution UVES spectra data reduction training in TMT workshop on large telescope data handling, Jan 15-27, 2017, IUCAA, Pune, INDIA.
- §1. Guided two master project students on the photometric and spectroscopic data reduction techniques during my Phd.
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## Scientific Talks

- §20. ACP, Aspen, “Holistic picture of CGM”, September 2024.
  - §19. CfA, Harvard, “Multiphase Madness”, August 2024.
  - §18. Space Telescope Science Institute, “Spring Symposium”, April 2024.
  - §17. Flatiron Institute, “Milky Clouds over Manhattan”, February 2024.
  - §16. Space Telescope Science Institute, “Galaxy/AGN Journal Club”, January 2024.
  - §15. Space Telescope Science Institute, “CoolSci”, January 2024.
  - §14. IUCAA, India, “Galactic inflows and outflows on all Scales”, February 2023
  - §13. Università Milano-Bicocca, Milan, “What matter(s) around galaxies”, September 2022
  - §12. IUCAA, India, “Monthly Last Friday Talk series”, January, 2022
  - §11. IISER, Tirupati, India, “Astronomical Society of India”, Poster, March 2020.
  - §10. Department of Physics & Astrophysics, Delhi University, “Departmental Talk”, October 2019.
  - §9. IUCAA, India, “Recent Trends in the study of Compact Objects Theory and Observations (RETCO-IV)”, Poster, April 2019.
  - §8. Institut d’Astrophysique de Paris(IAP), Paris, FR, “massive black holes in evolving galaxies: from quasars to quiescence”, Poster/Flash Talk, May 2018.
  - §7. Département d’Astrophysique, Géophysique, Université de Liège, Liège, Belgium, December 2017.
  - §6. ARIES, India, “ARIES Training School in Observational Astronomy (ATSOA)”, March 2018, March 2017, February 2016.
  - §5. ARIES, India, “Tuesday Seminar series”, February 2017.
  - §4. IUCAA, India, “Thirty Meter Telescope (TMT) Conference”, January 2017.
  - §3. ARIES, India, “Belgo-Indian Network for Astronomy and Astrophysics (BINA)”, Poster/Flash Talk, November 2016.
  - §2. ARIES, India, “Tuesday Seminar series”, May 2016.
  - §1. IUCAA, India, “Cloudy Workshop”, September 2015.
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## Workshops and Schools

- §5. AstroSat data analysis workshop, August 8-11, 2017, ARIES, Nainital, India
  - §4. TMT workshop on large telescope data handling, Jan 15-27, 2017 , IUCAA, Pune, India
  - §3. Extragalactic Relativistic Jets: Cause and Effect, FERMI satellite data reduction school, ICTS Bangalore; October 14-21, 2015
  - §2. Cloudy workshop, Sept 21-26, 2015, IUCAA, Pune, India
  - §1. Workshop on the radio data reduction, Radio Astronomy School-2015 (RAS), August 31, 2015, NCRA, Pune, India
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## Prize fellowships and Awards

2023: [FONDECYT-2023](#) Chilean Prize fellowship.

2022: [MILANO-BICOCCA, 2022](#), Italy, Research Grants type A2.

2014: All India “Graduate Aptitude Test in Engineering” (GATE), India.

2012: All India “Joint Admission Test for Master (JAM)”, India

2012: Selected as top 10% graduate level student in Delhi University.

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## Multiwavelength Research Experience

### §5. Optical Astronomy:

- **Spectroscopy:**

- Extensive observational experience in absorption line studies of AGNs using national and international telescopes, including the [3.6m Devathal Optical Telescope](#) (DOT, India), [2m Himalayan Chandra Telescope](#) (HCT, India), [2.4m Lijiang Astronomical Observatory](#) (CAS, China), [6m Special Astrophysical Observatory](#) (SAO, Russia), and [8m European Southern Observatory](#) (ESO)/FORS2.
- Proficient in handling archival spectra from facilities: [Sloan Digital Sky Survey](#) (SDSS), ESO (UVES, FORS1/2, X-SHOOTER), and Keck Observatory/LRIS, covering a wide spectral resolution range (900–40,000).
- Skilled in advanced data reduction and analysis using [IRAF](#), [ESOREX](#), [ESO-GASGANO](#), and [LPIPE](#) (IDL).
- Processed large datasets of SDSS quasars (>100,000) for absorption line studies.
- Developed multiple GUI-based automation tools for quasar continuum fitting and identification of doublet absorption lines (MgII, CIV).
- Conducted quasar emission line analysis, particularly in BALQSOs, through simultaneous emission and absorption spectral fitting.

- **Photometry:**

- Conducted AGN variability studies using ground-based [1-4m class national telescopes](#) at ARIES, Nainital, India.
- Performed differential photometry using [IRAF](#) and [DAOPHOT](#) for continuum variability studies.
- Devolved astrometry correction pipeline (in python) for the mock dataset for the 4m international liquid mirror telescope (ILMT), ARIES, Nainital, India.

### §4. Ultraviolet (UV) Astronomy:

- Principal Investigator (PI) for **Hubble Space Telescope / Cosmic Origins Spectrograph (HST/COS) Cycle-32** proposal.
- Handled large HST datasets of quasar spectra from the [Hubble Spectroscopic Legacy Archive](#) (HSLA), developing automated Python tools for spectral addition, continuum fitting, and line identification.

- Conducted photoionization modeling using **Cloudy** and absorption line modeling using **vpfit** to analyze diffuse gas in cluster outskirts and the circumgalactic medium (CGM).
  - Experienced in **AstroSat-UVIT** satellite data reduction and **LAXPC** data analysis (trained in a dedicated data reduction workshop, ARIES, Nainital, 2017).
- §3. **X-ray Astronomy:** Expertise in Chandra and XMM-Newton satellite data reduction and spectral modeling using **Xspec** (submitted proposals), focusing on shielding gas in X-ray bright BAL quasars (trained through a dedicated data reduction workshop).
- §2. **Radio Astronomy:** **GMRT** data reduction using **AIPS** and **CASA** (trained in a dedicated data reduction workshop, RAS, NCRA, Pune, 2015).
- §1.  **$\gamma$ -ray Astronomy:** FERMI satellite data reduction using **FREMI-LAT** and high-energy astrophysical analysis (trained in a dedicated data reduction workshop, ICTS, 2015).
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## List of publications

### First-author publications

- §8. **Mishra, Sapna**; Fox, Andrew; Smoker, J; Lucchini, Scott; D’Onghia, Elena; 2025, ApJ (under revision), “*The Distance to the Magellanic Stream: Constraints from Optical Absorption along Stellar Sightlines*”.
- §7. **Mishra, Sapna**; Fox, Andrew; Krishnarao, Dhanesh; Lucchini, Scott; D’Onghia, Elena; Cashman, Frances; Barger, Kathleen; Lehner, Nicolas; Tumlinson, Jason, 2024, ApJ Letters, 976, L28, “*The Truncated Circumgalactic Medium of the Large Magellanic Cloud*”
- §6. **Mishra, Sapna**, Muzahid Sowgat, Dutta Sayak, Srianand, Raghunathan, Charlton, Jane, 2024, MNRAS, 527, 3858, “*Characterizing cool, neutral gas, and ionized metals in the outskirts of low-z galaxy clusters*”.
- §5. **Mishra, Sapna**, & Muzahid Sowgat, 2022, ApJ, 933, 229, “*Discovery of a Cool, Metal-rich Gas Reservoir in the Outskirts of  $z \approx 0.5$  Clusters*”.
- §4. **Mishra, Sapna**, Gopal-Krishna, Chand H., Chand K., Kumar A., Negi V., 2021, MNRAS Letters, 2021, 507, 46, “*A search for blazar activity in broad-absorption-line quasars*”.
- §3. **Mishra, Sapna**, Vivek M., Chand H., Joshi R, 2021, MNRAS, 504, 3187, “*Appearance versus disappearance of broad absorption line troughs in quasars*”.
- §2. **Mishra, Sapna**, Krishna G, Chand H, Chand K, Ojha V, 2019, MNRAS Letters, 489, L42, “*Are there broad absorption line blazars?*”.
- §1. **Mishra Sapna**, Chand H, Krishna G, Joshi R., Shchekinov Y. A., Fatkhullin T. A., 2018, MNRAS, 473, 5154, “*On the incidence of MgII absorbers along the blazar sightlines*”.

### Co-author publications <sup>†</sup>

- §5. Dutta, Sayak; Muzahid, Sowgat; Schaye, Joop; **Mishra, Sapna**; Chen, Hsiao-Wen; Johnson, Sean; Wisotzki, Lutz; Cantalupo, Sebastiano, 2024, MNRAS, 528, 3745, “*MUSEQuBES: mapping the distribution of neutral hydrogen around low-redshift galaxies*”.
- §4. Gopal-Krishna, Chand K., Chand H., Negi V., **Mishra, Sapna**, Britzen S., Bisht S., 2023, MNRAS, 518, 13, “*Intranight optical variability of low-mass active galactic nuclei: a pointer to blazar-like activity*”.
- §3. Kumar B., Negi V., Ailawadhi B., **Mishra, Sapna**, Pradhan B., Misra K., Hickson P., Surdej J., 2022, JAA, 43, 10, “*Upcoming 4m ILMT facility and data reduction pipeline testing*”.
- §2. Chand K., Gopal-Krishna, Omar A., Chand H., **Mishra, Sapna**, Bisht S., Britzen S, 2022, MNRAS, 511, 13, “*Intranight variability of ultraviolet emission from powerful blazars*”.
- §1. Ojha V., Chand H., Gopal-Krishna, **Mishra, Sapna**, Chand, K, MNRAS, 2020, 493, 3642, “*Comparative intra-night optical variability of X-ray and  $\gamma$ -ray detected narrow-line Seyfert 1 galaxies*”.

## Conference Proceedings & GCN Circular

- §4. Kumar, Amit; Gupta, Rahul; Dastidar, Raya; Dimple; Ghosh, Ankur; **Mishra, Sapna**; et al. 2020GCN.29030....1K, “*GRB 201203A: 1.3m DFOT, optical upper limits*”.
  - §3. Kumar A., Aryan, A., Pandey S.B., **Mishra, Sapna**; et al. 2020GCN.27564....1K, “*GRB 200412B: Optical afterglow detection with 1.3m DFOT*”.
  - §2. **Sapna Mishra**, H. Chand, et al. 2018, Bulletin de la Société Royale des Sciences de Liège, 87, 325, “*Revisiting the incidence of Mg II absorbers along the blazar sightlines*”.
  - §1. Hum Chand, Suwendu Rakshit, Priyanka Jalan, Vineet Ojha, Raghunathan Sri-anand, Mariappan Vivek, **Sapna Mishra** et al. 2018, Bulletin de la Société Royale des Sciences de Liège, 87, 291, “*Probing the central engine and environment of AGN using ARIES 1.3-m and 3.6-m telescopes*”.
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