

Shyam Harimohan Menon

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Education & Research Experience

- Oct. 2019 – **Doctor of Philosophy, Astronomy & Astrophysics**,
present Research School of Astronomy & Astrophysics, Australian National University,
Canberra, Australia
Thesis title: Impacts of Stellar Feedback on Star Formation
Advisors: A/Prof. Christoph Federrath & Prof. Mark Krumholz
- Aug. 2014 – **Integrated Bachelor and Master of Technology (Hons.), Engineering Physics**,
May 2019 Department of Physics, Indian Institute of Technology (BHU),
Varanasi, India
Thesis title: [HI Fragmentation in the Turbulent Interstellar Medium](#)
Advisor: A/Prof. Prasun Dutta
- May 2018 – **Summer Research Scholar**,
August 2019 University of Tübingen,
Tübingen, Germany
Project title: Impact of ionising radiation on the turbulent ISM
Advisor: Dr. Rolf Kuiper
- May 2017 – **MITACS Globalink Summer Internship**,
August 2017 University of Western Ontario,
London, Canada
Project title: Numerical Magneto-hydrodynamic simulations with the Athena code
Advisor: Prof. Shantanu Basu

Research Projects

- August 2020 – **Impact of Radiation Feedback on Star Cluster Formation**,
– present Primary Collaborators: A/Prof. Christoph Federrath & Prof. Mark Krumholz
- Developed VETTAM¹, a novel radiation-hydrodynamics module with Adaptive-Mesh Refinement in the FLASH code, to study the effects of radiation on star cluster formation. [Publication # 2]
 - Using VETTAM, we tested the role of radiation pressure from dust-reprocessed infrared photons on regulating star formation and driving winds in super-star cluster environments. [Publication # 1]
 - Currently testing the cumulative effects of radiative feedback mechanisms using multi-band RHD simulations, and constraining the conditions in which feedback fails to regulate star formation.

¹Variable Eddington Tensor closed Transport on Adaptive Meshes (VETTAM)

- August 2019 – May 2021 **Impact of ionising radiation feedback on the turbulent interstellar medium (ISM),**
 Primary Collaborators: A/Prof. Christoph Federrath, Dr. Rolf Kuiper, Dr. Pamela Klaassen, Piyush Sharda
- Probed the effects of ionising radiation on driving compressive turbulence and potentially triggering star formation in the ISM using numerical simulations. [Publication # 6]
 - Tested the hypothesis of the above study observationally by quantifying the bulk properties of the turbulence in the Carina nebula. [Publication # 5]
 - Extended the methodology of the previous study to quantify the dynamical effects of physical mechanisms on turbulence in the LMC. [Publication # 3]
 - Currently studying the role of ionising radiation in shaping the magnetic fields in star-forming gas.
- September 2020 – Present **The Spatial Distribution of Star Clusters in External Galaxies,**
 Primary Collaborators: Dr. Kathryn Grasha, Prof. Bruce G. Elmegreen, Prof. Daniela Calzetti, Dr. Angela Adamo
- Investigated the fractal distribution of young star clusters in 12 local galaxies with the LEGUS survey. [Publication # 4]
 - Currently extending work to probe the star cluster distributions in local high-redshift analogue galaxies with the HiPEEC survey, and a larger sample of local galaxies with the PHANGS survey.

Honors & Grants

- Oct 2021 ANU Olin J Eggen Research Award for excellence in research (\$2500 AUD)
 March 2022 RSAA Travel Grant (\$5000 AUD)
 Oct 2019 ANU PhD Scholarship (\$29000 AUD p.a.)
 Oct 2019 ANU RSAA Supplementary Research Scholarship (\$ 2500 AUD p.a.)
 August 2018 Graduate Aptitude Test in Engineering (GATE) Postgraduate Scholarship
 May 2018 Eberhard Karls Universität Tübingen Summer Research Stipend
 May 2017 Mitacs Globalink Research Internship Award
 April 2013 Kishore Vaigyanik Protsahan Yojana (KVPY) Scholarship

Teaching and Mentorship

- Feb 2022 – present **Teaching Assistant, ASTR 1003 – Astronomy & Space,**
Respond to student queries on the course forum and assist in tutorials
- Dec 2021 – Feb 2022 **Mentor: Hank Hua (ANU undergraduate student),**
Project title: Effects of spiral arms on the Two Point Correlation Function
- March 2021 – present **Mentor, McNamara-Saunders Astronomical Teaching Telescopes Project,**
Mentored a grade 10 high school student on a project to measure the period of the I-Carinae Cepheid-variable star. Currently working with a second student on the photometric properties of the moon.
- Aug 2018 – Dec 2018 **Teaching Assistant, PHY 1002 – Introduction to Engineering Electromagnetics,**
Duties involved one tutorial session per week and assistance in preparing tutorials for this undergraduate course
- Jan 2018 – May 2018 **Teaching Assistant, PHY 304 – Computational Physics,**
Duties involved one laboratory session per week, assisting students in implementing numerical methods and recipes taught in theory classes.

March 2022 – **Tutor, Canberra Tutors – High School Mathematics and Physics,**
present *Conduct private tutorial sessions for grade 11 & 12 students for their physics and mathematics coursework..*

Synergistic Activities

Feb 2022 – **Chair, Seminars Committee, RSAA,**
present *Heading the seminars team; responsible for organising, hosting and inviting speakers for colloquia*

July 2021 – **Reviewer, Monthly Notices of the Royal Astronomical Society (MNRAS),**
present *Total Reviewed Papers: 2*

Sept 2020 – **Member of Seminars Committee, RSAA,**
Feb 2022 *Hosted >30 external colloquia and seminars at RSAA*

Jan 2020–present **Member, Astronomical Society of Australia (ASA),**
Active student member of the ASA, and its theoretical astrophysics working group ANITA.

Jan 2020–present **Student Representative, Work, Health & Safety Committee, RSAA,**
Formally representing the student cohort in ensuring a safe and healthy workplace.

Sep 2021 – **Standard Mental Health First Aider (MHFA),**
present *Accredited MHFA by Mental Health First Aid Australia*

Aug 2017 – **Organising Core Team Member, Jigyasa 2017,**
Nov 2017 *Core team member in organising Jigyasa, the annual physics convention held at the Department of Physics, IIT(BHU) Varanasi*

Publications

1. [Infrared Radiation Feedback Does Not Regulate Star Cluster Formation or Drive Winds](#)
Menon, S.H., Federrath, C. & Krumholz, M.R, *MNRAS*, submitted, June 2022
2. [VETAM: A scheme for radiation hydrodynamics with adaptive mesh refinement using the variable Eddington tensor method](#) [2 Citations]
Menon, S.H., Federrath, C., Krumholz, M.R, Kuiper, R., Wibking, B.D, Jung, M., 2022, *MNRAS*, 512, 401
3. [First extragalactic measurement of the turbulence driving parameter: ALMA observations of the star-forming region N159E in the Large Magellanic Cloud](#) [6 Citations]
Sharda, P., **Menon, S.H.**, Federrath, C., Krumholz, M. R., Beattie, J. R., Jameson, K. E., Tokuda, K., Burkhart, B., Crocker, R. M., Law, C. J., Seta, A., Gaetz, T. J., Pingel, N. M., Seitzzahl, I. R., Sano, H., and Fukui, Y., *MNRAS*, 509, 2180
4. [The dependence of the hierarchical distribution of star clusters on galactic environment](#) [3 Citations]
Menon, S.H., Grasha, K., Elmegreen, B.G., Federrath, C., Krumholz, M.R., Calzetti, D., Sánchez, N., Linden, S.T., Adamo, A., Messa, M., Cook, D.O., Dale, D.A., Grebel, E.K., Fumagalli, M., Sabbi, E., Johnson, K.E., Smith, L.J., Kennicutt, R.C., 2021, *MNRAS*, 507, 5542
5. [On the compressive nature of turbulence driven by ionizing feedback in the pillars of the Carina Nebula](#) [11 Citations]
Menon, S.H., Federrath, C., Klaassen, P., Kuiper, R., Reiter, M., 2021, *MNRAS*, 500, 1721
6. [On the turbulence driving mode of expanding H II regions](#) [13 Citations]
Menon, S.H., Federrath, C., Kuiper, R., 2020, *MNRAS*, 493, 4643

Conference Presentations & Colloquia

- July 2022 **Contributed Talk - A Holistic View of Stellar Feedback and Galaxy Evolution, Ascona,**
Title: The role of radiation pressure in dense stellar systems
- July 2022 **Planet and Star Formation (PSF) Seminar - Max-Planck-Institut for Astronomy, Heidelberg,**
Title: Radiation Feedback in Star Cluster Formation
- June 2022 **Seminar - Centre de Recherche Astrophysique de Lyon (CRAL),**
Title: Radiation Feedback in Star Cluster Formation
- June 2022 **Star Formation Seminar - CEA, Saclay,**
Title: Radiation Feedback in Star Cluster Formation
- June 2022 **Poster - From Stars to Galaxies II, Gothenburg,**
Title: The inability of radiation pressure to regulate star formation
- June 2022 **Contributed Talk - NBIA Workshop on Radiation Transfer in Astrophysics, Copenhagen,**
Title: Modelling radiation hydrodynamics with the VET method
- Dec 2021 **Invited Colloquium - Indian Institute of Astrophysics, Bangalore,**
Title: The interplay of stellar feedback and turbulence in the ISM
- Nov 2021 **Contributed Talk, IAU Symposium 362 - The Predictive Power of Computational Astrophysics,**
Title: VETTAM - A novel algorithm for modelling radiation hydrodynamics
- May 2021 **Contributed Talk, ISM 2021, Beirut - Structure, Characteristic Scales, and Star Formation,**
Title: Spatial distribution of star clusters in external galaxies
- February 2021 **Contributed Talk, Australian National Institute for Theoretical Astrophysics science workshop,**
Title: Compressive Turbulence Driven by Ionising Radiation in the ISM
- September 2020 **Contributed Talk, Annual meeting of the Astronomische Gesellschaft, Germany,**
Title: Compressive Turbulence Driven by Ionising Radiation
- March 2020 **Invited Talk, Modelling High-Mass Stellar Feedback Workshop, Tübingen, Germany,**
Title: Turbulence and Triggered Star Formation in Star Clusters
- January 2020 **Australian National Institute for Theoretical Astrophysics science workshop,**
Title: Turbulence Driving Mode of Expanding HII regions
- November 2019 **Mount Stromlo Student Seminars,**
Title: On the turbulence driving mode of expanding HII regions

Relevant Skills

Languages:, English, Malayalam, Tamil, Hindi, Sanskrit

Programming Experience:, C, C++, Fortran, Python, Mathematica, Bash

Codes/Softwares:, FLASH, PLUTO, PETSc, Hypre, Athena, yt, CUDA

Voluntary Training:, Mental Health First Aid, Understanding and Responding to Sexual Violence