
CURRICULUM VITAE

Arunima Banerjee

Associate Professor & Associate Chair

Department of Physics
Indian Institute of Science Education & Research, Tirupati
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Editorial Board Member
Journal of Astronomy & Astrophysics,
Indian Academy of Sciences

Chair, Working Group in Gender Equity
Astronomical Society of India

PARTICULARS

BIOGRAPHICAL DETAILS

- Date of Birth: 15th June, 1982
- Nationality: Indian

WORK EXPERIENCE

Assistant Professor Department of Physics Indian Institute of Science Education & Research, Tirupati	Tirupati, India <i>March 2017 - July 2022</i>
DST INSPIRE Faculty Fellow Inter University Centre for Astronomy & Astrophysics	Pune, India <i>October 2014 - March 2017</i>
Postdoctoral Visiting Scientist National Centre for Radio Astrophysics Tata Institute of Fundamental Research	Pune, India <i>April 2013 - October 2014</i>
Postdoctoral Fellow National Centre for Radio Astrophysics Tata Institute of Fundamental Research	Pune, India <i>April 2012 - March 2013</i>
Research Associate Department of Physics Indian Institute of Science	Bangalore, India <i>August 2011 - March 2012</i>

EDUCATION

Department of Physics Indian Institute of Science PhD in Astrophysics	Bangalore, India <i>March 2012</i>
Department of Physics Indian Institute of Science M. S. in Physics (<i>First class</i>)	Bangalore, India <i>June 2007</i>
Department of Physics St.Xaviers' College (University of Calcutta) B. Sc (Honours) in Physics (<i>First class</i>)	Kolkata, India <i>June 2004</i>
Gokhale Memorial Girls' High School Higher Secondary Examination (PCMS) (<i>First Division *</i>)	Kolkata, India <i>2001</i>
Bidya Bharati Girls' School Madhyamik Examination (<i>First Division *</i>)	Kolkata, India <i>1999</i>

RESEARCH INTERESTS

My broad area of research is *Theoretical Astrophysics* focusing on *dynamics of disk galaxies and their dark matter halos* through analytical modeling and numerical simulations, with application to ordinary spirals, dwarf irregulars, low surface brightness superthin galaxies, and most recently, gas-rich lenticulars. Recently I have also been interested in *Alternative Theories of Gravity*, and *Application of Machine Learning in Astronomy & Astrophysics*.

PhD Thesis: Vertical Structure of Disk Galaxies and their Dark Matter Halos
Thesis Supervisor: Chanda J. Jog, Indian Institute of Science, Bangalore

AWARDS & GRANTS

- **INSPIRE Faculty Award**, Department of Science & Technology, Government of India (2014, Session 1)
- Awarded **K. D. Abhyankar Best Thesis Presentation Award**, Annual Meeting of the Astronomical Society of India, Indian Institute of Science Education & Research, Mohali (2014)
- Awarded *DST – ITS²* to attend the conference *Role of Bars in Galaxy Evolution* held in University of Granada, Granada, Spain (April 2013)
- Awarded **Justice Oak Best Thesis Award**, Astronomical Society of India (2012)
- Awarded **Kumari L. A. Meera Memorial Medal for the best Ph.D thesis** (theoretical physics), Indian Institute of Science, Bangalore (2012)
- Awarded *DST – ITS* to attend the conference *Assembling the Puzzle of the Milky Way* held in Observatoire de Besancon, Le Grand-Bornand, France (April 2011)
- Qualified GATE (Graduate Aptitude Test in Engineering) in Physical Sciences (2008) conducted by *MHRD³*
- Awarded *UGC⁴ Research Fellowships in Science for meritorious students* (2007-2008)
- Qualified Joint *CSIR – UGC⁵* Test for Eligibility for Lectureship (NET) in Physical Sciences (2007)
- Qualified Joint Entrance Screening Test (JEST) (2007)
- Qualified Joint Admission Test for MSc (JAM) (2004)
- Qualified Joint Entrance Screening Test (JEST) (2004)
- Awarded National Merit Certificate in Higher Secondary Examination (2001) from *WBCHSE⁶* (2001)
- Awarded National Merit Certificate in Secondary Examination (1999) from *WBBSE⁷* (1999)

²Department of Science & Technology - International Travel Scheme

³Ministry of Human Resource Development, Government of India

⁴University Grants Commission, Government of India

⁵Council of Scientific and Industrial Research-University Grants Commission, Government of India

⁶West Bengal Council of Higher Secondary Education, West Bengal, India

⁷West Bengal Board of Secondary Education, West Bengal, India

COURSES TAUGHT

- Electrodynamics: Monsoon 2022
- Gravitation & Cosmology: Spring 2020, 2021, 2022
- Data Science I: Monsoon 2019,2020, 2021, 2022
- Data Science II: Spring 2021,2022
- Classical Mechanics: Monsoon 2017, 2018
- Statistical Mechanics I: Spring 2018, 2019
- Mathematical Methods in Physics: Monsoon 2019, 2020, 2021
- Mechanics Lab: Monsoon 2017, Spring 2019
- Modern Physics Lab: Spring 2018

LIST OF PUBLICATIONS

IN REFEREED JOURNALS

- Narayanan, G. and **Banerjee, A.** 2022, "Are superthin galaxies low-surface-brightness galaxies seen edge-on? The star formation probe?" Monthly Notices of the Royal Astronomical Society, 514, 5126 arXiv:2104.04216
- Aditya, K., Kamphuis, P., **Banerjee, A.** et al. 2022, "H I 21 cm observation and mass models of the extremely thin galaxy FGC 1440" Monthly Notices of the Royal Astronomical Society,509, 4071 arXiv:2104.04216
- Aditya, K. and **Banerjee, A.** et al. 2021, "How "cold" are the stellar discs of superthin galaxies?" Monthly Notices of the Royal Astronomical Society,502,5049 arXiv:2002.09198
- Komanduri, A., Banerjee, I., **Banerjee, A.** and Sengupta, S. 2020, "Dynamical modelling of disc vertical structure in superthin galaxy 'UGC 7321' in braneworld gravity: an MCMC study" Monthly Notices of the Royal Astronomical Society, 499, 5690 arXiv:2004.05627
- Prakash, P., **Banerjee, A.** and Perepu, P. K. 2020, "Determination of the relative inclination and the viewing angle of an interacting pair of galaxies using Convolutional Neural Networks" Monthly Notices of the Royal Astronomical Society, 497, 3323 arXiv:2002.01238
- Jadhav Y., V & **Banerjee, A.** 2019, The specific angular momenta of superthin galaxies: Cue to its origin? 2019, MNRAS, 488, 547
- Kurapati, S., **Banerjee, A.**, Chengalur, J. N.; Makarov, D., Borisov, S., Afanasiev, A., and Antipova, A. 2018, Mass modelling of a superthin galaxy, FGC 1540: MNRAS, 479, 5686
- Hwang, J-S, Park, C. **Banerjee, A.** and Hwang, H. S. 2018, Evolution of Late-type Galaxies in a Cluster Environment: Effects of High-speed Multiple Encounters with Early-type Galaxies: ApJ, 856, 160

- Garg, P. and **Banerjee, A.**, 2017, Origin of low surface brightness galaxies: A dynamical study, MNRAS, 472, 166
- Mass Modeling of Superthin Galaxies **Banerjee, A.** & Bapat, D. 2017, MNRAS, 466, 3753
- Modeling HI distribution and kinematics in the edge-on dwarf irregular galaxy KK250: Patra, N. N., **Banerjee, A.**, Chengalur, J. N. & Begum, A. 2014, MNRAS, 445, 1424
- The slowly rotating bar in the dwarf irregular galaxy NGC 3741: **Banerjee, A.**, Patra, N. N., Chengalur, J. N. & Begum, A. 2013, MNRAS, 434, 1257
- Why are some galaxy disks extremely thin? **Banerjee, A.** & Jog, C. J. 2013, MNRAS, 431, 582
- Progressively more prolate dark matter halo in the outer Milky Way galaxy: **Banerjee, A.** & Jog, C. J. 2011. ApJ, 732, L8
- Theoretical determination of HI vertical scale heights in the dwarf galaxies: DDO 154, Ho II, IC2574 & NGC 2366: **Banerjee A.**, Jog, C. J., Brinks, E., & Bagetakos, I. 2011, MNRAS, 415, 687
- Dark matter dominance at all radii in the superthin galaxy UGC 7321 from HI data: **Banerjee, A.**, Matthews, L. D., & Jog, C. J. 2010, NewA, 15, 89
- The flattened dark matter halo of M31 from the HI scaleheight distribution: **Banerjee, A.**, & Jog, C. J. 2008, ApJ, 685, 254
- The origin of the steep vertical stellar distribution in the Galactic disk: **Banerjee, A.**, & Jog, C. J. 2007, ApJ, 662, 335

IN CONFERENCE PROCEEDINGS

- “Footprints of the dark matter halo: from pattern speed to disk vertical structure”: **Banerjee, A.**, Patra, N. N., Chengalur, J. N., Jog, C. J., Begum, A. 2014, , ASI Conference Series: Edited by J. N. Chengalur Y. Gupta , 13, 307
- Dark matter halo properties deduced from HI vertical scale heights: **Banerjee, A.**, Jog, C. J., & Matthews, L.D. 2009, ASPC, 407, 99

STUDENT SUPERVISION

Postdoctoral Fellows

1. Dr. Suman Sarkar (2021 - Present)
2. Dr. Pavan K Perepu (2020)

Graduate Students

3. Mr. Biju Saha (2022 - Present)
4. Ms.Nilanjana Nandi (2021 - Present)
5. Ms.Anagha A. G. (2021 - Present)
6. Mr. Ganesh N. (2018 - Present)
7. Mr. K. Aditya (2017 - 2022)

Project Students

8. Mr. Gogulakrishna (Monsoon 2022)
9. Mr. Anirudh Nemmani (Monsoon 2022)
10. Mr. Akashdeep Karan (Summer 2017, Monsoon 2022)
11. Mr. Arnab Lahiry (Spring 2022)
12. Mr.R. Anirudh (Spring 2022)
13. Ms. Yukta Ajay (Spring 2021, Summer 2021, Monsoon 2021)
14. Mr. Sanket M (Monsoon 2021)
15. Ms. Nikita Balodhi (Spring 2021)
16. Mr. P S Vishnuprasad (Spring 2021)
17. Mr. Sahyadri Krishna (Spring 2021)
18. Ms.Jayamol P (Monsoon 2017, Summer 2018)
19. Mr. Jisvin Sam (Spring 2020)
20. Mr. Ambareesh Srivastav (Spring 2019)
21. Mr.Arka Bhattacharya (Spring 2018)
22. Mr.Chaitanya Chawak (Summer 2021)
23. Ms.P Gayathri Vinod (Summer 2021)
24. Mr.Sandipani Ghosh (Summer 2021)
25. Mr. Akashdeep Karan (Summer 2021)

26. Mr. Lalit M (Summer 2021)
27. Mr. Deepjyoti Satpathy (Summer 2020)
28. Mr. Suyambulingam S.(Summer 2019, 2020)
29. Mr. Deepjyoti Satpathy(Summer 2019, 2020)
30. Mr. Akshay Kannan Sairam (Summer 2018)
31. Mr. Vikas Jadhav Y ((Summer 2017, 2018))
32. Mr. Ganesh N (DST Inspire Faculty Fellowship funded, Monsoon 2017)
33. Mr. Nikhil Hubballi (IISER Intramural Fellowship funded, Summer 2017)
34. Mr. Prem Prakash (DST Inspire Faculty Fellowship funded, 2019 - 2020)
35. Mr. Prerak Garg (Summer 2016)
36. Ms. Disha Bapat (MS Thesis, 2015 - 2016)
37. Ms. Shalmalee Kapse (2014-2015)

TELESCOPE TIME ALLOCATED

- HI 21cm observation of superthin galaxies: **Banerjee, A.**, Chengalur, J. N. & Patra, N. N. 2013 (Allocated 48 hours of observation time on Giant Meterwave Radio Telescope, Narayangaon, India)
- HI 21cm mapping of the edge-on spiral galaxy ESO270-*g*G017: Benaglia, P., Saponara, J., Koribalski, B. S. & **Banerjee, A.** (Allocated 25 hours of observation time on Giant Meterwave Radio Telescope, Cycle 28, Narayangaon, India)
- Fueling and feedback in the vicinity of black holes: **Banerjee, A.**, Barway, S., Combes, F. & Kembhavi, A. 2015, (Allocated 7.5 hours of observation time on South African Large Telescope, South Africa)
- HI 21cm observations of Gas-Rich Lenticulars: **Banerjee, A.** 2016 (Allocated 16 hours of observation time on Giant Meterwave Radio Telescope, Narayangaon, Cycle 30, India)
- HI 21cm observation of superthin galaxies: K. Aditya & **Banerjee, A.** 2019 (Allocated 20 hours of observation time on Giant Meterwave Radio Telescope, Cycle 36, Narayangaon, India)

ACADEMIC & ADMINISTRATIVE SERVICES RENDERED

Institute Level

- Member: Senate, IISER Tirupati [2022 -]
- Member: Human Ethics Committee [2018 -]
- Member: Academic Ethics Committee [2017 - 2019]
- Member: Internal Complaints Committee [2017 - Present]
- Member: Women's Cell [2019 - 2022]
- Member: Academic Committee [2022 - Present]
- Member: Committee of Students' Affairs [2022 - Present]
- Member: Curriculum Committee [2017 - Present]
- Faculty Co-ordinator (jointly with Dr. S. Sunil Kumar): Ph.D, Integrated Ph.D and Postdoctoral Programme (Physics) [2017 - 2019]

External

- Editorial Board Member, Journal of Astronomy & Astrophysics, Indian Academy of Sciences (2022 - Present)
- Chair, Working Group in Gender Equity, Astronomical Society of India (2022 - Present)
- Member: Selection Committee: Justice Oak Best Thesis Award given by Astronomical Society of India (2021)
- Member: Organizing Committee: JEST 2019

Peer review rendered for journals/book reviews/journal editorial work

- Referee for Astronomy & Astrophysics
- Referee for Monthly Notices of the Royal Astronomical Society
- Referee for Astronomische Nachrichten
- Referee for observing proposals to the Giant Meterwave Radio Telescope
- Referee for observing proposals ASTROSAT

TALKS/POSTERS

TALKS

Morphological Classification of galaxies using Machine Learning

- Refresher course in Physics, Inter University Centre for Astronomy Astrophysics (IUCAA), June 2022

Dynamical Modelling of Interacting Galaxies using Machine Learning

- Department of Physics, Indian Institute of Science, May 2021
- Division of Physical Sciences, Indian Association for the Cultivation of Science (IACS), August 2020
- Inter University Centre for Astronomy Astrophysics (IUCAA), July 2020

Elements of Galactic Dynamics

- IUCAA-TLC Workshop for Teachers, Providence College for Women, Calicut University, Kerala (*Invited*)
- Department of Physics, Central University of Tamil Nadu (February 2019) (*Invited*)

How "cold" are superthin galaxies?

- IACS, Kolkata (July 2019)
- European Week of Astronomy & Space Science (EWASS 2019), Lyon, France. Session: Formation & Evolution of Bulgeless Galaxies (*Invited*)
- Department of Physics & Astrophysics, University of Delhi (February 2019)

The origin of low surface brightness galaxies: A dynamical study

- IACS, Kolkata (December 2018)
- IMSc, Chennai (September 2018)
- GEDS conference, IUCAA, Pune (January 2018)
- Meeting of the Astronomical Society of India, Osmania University, Hyderabad (February 2018)

Footprints of the Dark Matter Halo

- Indian Institute of Science Education & Research, Mohali, India (September 2014)
- Department of Physics & Astrophysics, Delhi University, India (September 2014)

- Special Astrophysical Observatory, Russian Academy of Sciences (SAO-RAS), Russia (September 2014)
- Department of Astronomy, Seoul National University, Seoul, South Korea (August 2014)
- Korea Astronomy & Space Science Institute, Daejeon, South Korea (August 2014)
- Astrophysics & Cosmology Division, School of Physics, Korea Institute of Advanced Study, Seoul, South Korea (August 2014)
- Department of Astronomy, Yonsei University, Seoul, South Korea (August 2014)

Dark Matter Halos of Spiral Galaxies

- JESCOL, Department of Physics, St.Xavier's College, Kolkata (February 2015) (*Invited*)
- The 6th KIAS Conference on Cosmology & Structure Formation, Seoul, South Korea (November 2014) (*Invited*)
- Workshop on Galaxies & Cosmology, NCRA-TIFR, Pune (July 2014) (*Invited*)
- Department of Physics, St.Xavier's College, Kolkata (October 2013)

Footprints of the Dark Matter halo: From pattern speed to disk vertical structure

- Astronomisches Rechen-Institut, University of Heidelberg, Heidelberg, Germany (June 2013)
- Astronomisches Institut der Ruhr-Universität Bochum, Bochum, Germany (June 2013)
- Max Planck Institute for Extraterrestrial Physics, Garching, Germany (June 2013)

Why are some galaxy disks extremely thin?

- Centres of Spiral Galaxies Workshop, IUCAA, Pune (January 2015)
- Max Planck Institute for Astronomy, Heidelberg, Germany (June 2013)
- Observatory of Geneva, Geneva, Switzerland (May 2013)
- Max Planck Institute for Astrophysics, Garching, Germany (May 2013)

Tremaine-Weinberg Method on HI disk

- The Role of Bars in Galaxy Evolution, University of Granada, Granada, Spain (May 2013)

The shapes of dark matter halos from HI thickness data: Signatures of non-universality?

- The 13th Nottingham-Birmingham Extragalactic Workshop: Dark Matter in Clusters, Groups & Galaxies, University of Nottingham, UK (September 2011)

Vertical Structure of Disk Galaxies and their Dark Matter Halos

- Indian Statistical Institute, Kolkata (December 2016)
- Indian Institute of Science Education & Research, Mohali (March 2014)
- Max Planck Institute for Astronomy, Heidelberg, Germany (June 2013)
- Tata Institute of Fundamental Research, Mumbai, India (October 2011)
- Inter University Centre for Astronomy & Astrophysics, Pune, India (October 2011)
- National Centre for Radio Astronomy, Pune, India (October 2011)
- Centre for Astrophysics Research, University of Hertfordshire, UK (September 2011)
- Jeremiah Horrocks Institute, University of Central Lancashire, UK (September 2011)
- Department of Physics & Astronomy, University of Leicester, UK (September 2011)
- Indian Institute of Astrophysics, Bangalore, India (August 2011)
- Raman Research Institute, Bangalore, India (August 2011)

Tracking the galactic dark matter halo by modeling the vertical HI scale height

- University Observatory Munich, Germany (May 2009)

The origin of the steep vertical stellar distribution in the Galactic disc

- Observatoire de Paris, Meudon, France (May 2009)

Dark Matter Halo properties of galaxies as deduced from observed HI scaleheights

- The Low Frequency Radio Universe(LFRU), NCRA, Pune, India (December 2008)
- A National Workshop Cosmology with the HI 21-cm Line, RRI, Bangalore, India (June 2015)

POSTERS

The specific angular momenta of superthin galaxies: Cue to their origin?: BonnGravity, Argelander Institute for Astronomy, Bonn, Germany (September 2019)

How "cold" are superthin galaxies?: The Metrewavelength Sky II, NCRA-TIFR, Pune, India (March 2019)

Footprints of the Dark Matter halo: From pattern speed to disk vertical structure

- The Metrewavelength Sky, NCRA-TIFR, Pune, India (December 2013)

Why are some galaxy disks extremely thin?

- The Physical Link between Galaxies and their Halos, MPA/MPE/ESO/Excellence Cluster Universe conference (June 2013)

Progressively More Prolate Dark Matter Halo in the Outer Galaxy as Traced by Flaring H I Gas

- Accepted for presentation in "Assembling the Puzzle of the Milky Way" held in Observatoire de Besancon, Le Grand-Bornand, France (April 2011)

Constraining the dark matter halo profile of the superthin galaxy UGC 7321: Implications of high gas velocity dispersion

- 27th meeting of ASI (Astronomical Society of India) at IIA, Bangalore, India (February 2009)

WORKSHOPS/CONFERENCES ATTENDED

- The functioning of galaxies: Challenges for Newtonian and Milgromian Dynamics, Bonn, Germany [September 2019]
- GEDS Workshop, IUCAA, Pune (January 2018)
- The 10th PHISCC Workshop, NCRA-Pune (February 2017)
- A National Workshop Cosmology with the HI 21-cm Line, RRI, Bangalore, India (June 2015)
- The 33rd ASI (Astronomical Society of India) meeting held in NCRA-TIFR, Pune, India (March 2015)
- Centres of Spiral Galaxies Workshop, IUCAA, Pune (January 2015)

- The 6th KIAS Conference on Cosmology & Structure Formation, Seoul, South Korea (November 2014)
- The 32nd ASI (Astronomical Society of India) meeting held in Indian Institute of Science Education & Research, Mohali, India (March 2014)
- The Metrewavelength Sky, NCRA-TIFR, Pune, India (December 2013)
- The Physical Link between Galaxies and their Halos, MPA/MPE/ESO/Excellence Cluster Universe conference (June 2013)
- The Role of Bars in Galaxy Evolution, University of Granada, Granada, Spain (May 2013)
- IIA Theoretical Astrophysics Group Mini Workshop on Cosmology and Galaxies (November 2011)
- The 13th Nottingham-Birmingham Extragalactic Workshop: Dark Matter in Clusters, Groups & Galaxies: University of Nottingham, UK (September 2011)
- Recent Observations in Star Formation: Observations & Theory: IIA, Bangalore, India (June 2011)
- The Chandrasekhar Centenary Conference: IIA, Bangalore, India (December 2010)
- The 27th ASI (Astronomical Society of India) meeting held in IIA, Bangalore, India (February 2009)
- The Low Frequency Radio Universe (LFRU) held in NCRA, Pune, India (December 2008)
- The 2nd IIA-Pennstate Astrostatistics School held in Vainu Bappu Observatory, Kavalur, India (August 2008)

RESEARCH VISITS

- Department of Physical Sciences, Indian Association for the Cultivation of Science (June 2019)
Host: Soumitra Sengupta
- Special Astrophysical Observatory, Russian Academy of Sciences (SAO RAS) (10th - 18th September 2014)
Hosts: Igor Karachentsev & Simon Pustilnik
- Astrophysics & Cosmology Division, School of Physics, Korea Institute of Advanced Study, Seoul, South Korea (2nd - 22nd August 2014)
Host: Changbom Park

- Excellence Cluster Universe, Garching, Munich, Germany (19th May - 29th June 2013)
Host: Andreas Burkert
- National Centre for Radio Astrophysics, Pune, India (11th - 15th October 2011)
Host: Jayaram Chengalur
- Jeremiah Horrocks Institute, University of Central Lancashire (20th - 23rd September 2011)
Host: Victor Debattista
- Munich University Observatory, Munich, Germany (30th April- 25th May 2009)
Host: Andreas Burkert

MEETINGS ORGANIZED

- 38th Meeting of the Astronomical Society of India (ASI), IISER Tirupati [February 2020] (Point of Contact, LOC)
- Data Analysis & Machine Learning (DAML) Workshop, IISER Tirupati [May 2019] (jointly with Prof. G. Ambika & Prof. R. Misra [IUCAA, Pune])

MEMBERSHIPS

- Member of the Astronomical Society of India (L2169)
- Visiting Associate, Inter University Centre for Astronomy & Astrophysics (IUCAA), Pune, India