

DR. LITON MAJUMDAR

CONTACT INFORMATION (Reach me at)

Assistant Professor

National Institute of Science Education and
Research (NISER)

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Visiting Scientist (Office of the Chief Scientist)

NASA Jet Propulsion Laboratory (NASA JPL)
Interstellar and Heliospheric Physics Div. (3263)
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RESEARCH INTERESTS

Star and Planet Formation; Astrochemistry; Origin of Planetary Systems and Astrobiology;
Planetary and Exo-planetary Atmospheres, Exoplanet Observations

EDUCATION

Ph.D., Astronomy & Astrophysics, November 2014, [University of Calcutta](#),
Kolkata, West Bengal, India

Post M.Sc., Astronomy & Astrophysics, 2010, Grade A, [S. N. Bose National
Centre for Basic Sciences](#), Kolkata, West Bengal, India

M.Sc., Physics, 2009, 1st Class, [University of Calcutta](#), Kolkata, India

B.Sc. (Honours), Physics, 2007, 1st Class, [University of North Bengal](#), West
Bengal, India

ACADEMIC APPOINTMENTS

Assistant Professor

24 June 2019 to present

[Star and Planetary Formation Group](#)

School of Earth and Planetary Sciences (SEPS)

National Institute of Science Education and Research (NISER), India

Visiting Scientist — Formal Appointment

24 June 2019 to present

Interstellar and Heliospheric Physics group (3263)

NASA Jet Propulsion Laboratory, USA

California Institute of Technology

NASA Post Doctoral Program Fellow

10 July 2017 to 23 June 2019

Interstellar and Heliospheric Physics group (3263)

NASA Jet Propulsion Laboratory, USA

California Institute of Technology

CNRS Post Doctoral Researcher

Dec 2014 to June 2017

Laboratoire d'astrophysique de Bordeaux

University of Bordeaux, France

HONOURS,
AWARDS AND
FELLOWSHIPS

- Visiting Associate of the [Inter-University Centre for Astronomy and Astrophysics \(IUCAA\)](#), Pune, India, August 2020 to present —
- Regular Member of SKA India Consortium (SKAIC), NCRA-TIFR, Pune, India, August 2020 to present —
- Registered Faculty Member of the [Homi Bhabha National Institute \(HBNI\) in Physical Sciences](#), August 2019 to present —
- Ramanujan Fellowship, Science and Engineering Research Board (SERB), Department of Science and Technology (DST), Government of India in 2019
- [The ALMA Ambassador](#), North American ALMA Science Center (NAASC), National Radio Astronomy Observatory (NRAO), USA in 2019
- International Astronomical Union (IAU) Grant to attend the IAUS 350 in Cambridge, United Kingdom in 2019
- Thirty Meter Telescope (TMT) Early-Career Initiative Researcher in 2018
- [NASA Post Doctoral Program Fellowship](#) in 2017
- Post Doctoral Fellowship (3 yrs), [Niels Bohr Institute, University of Copenhagen](#), Denmark in 2017 (Offer Declined)
- Post Doctoral Fellowship (3 yrs), [Instituto de Ciencia de Materiales de Madrid \(ICMM\), Consejo Superior de Investigaciones Científicas \(CSIC\)](#), Madrid, Spain in 2017 (Offer Declined)
- [CNRS Post Doctoral Fellowship](#) under the European Research Council Grant 3DICE, France in 2014
- The Committee on Space Research (COSPAR) Grant to attend the COSPAR Assembly in Moscow, Russia in 2014
- International Astronomical Union (IAU) Grant to attend the IAU General Assembly XXVIII in Beijing, China in 2012
- Grant Recipient Ph.D. Student, 39th COSPAR Scientific assembly in Mysore, India in 2012
- International Astronomical Union (IAU) Grant to attend the IAU SYMPOSIUM 280 in Toledo, Spain in 2011
- Qualified in GATE Examination
- Qualified in JEST Examination
- Swami Krishnamayananda Award, Ramakrishna Mission Residential College (Autonomous) (Ranked 15 in the list of best colleges in India by NIRF in 2019), Narendrapur, Kolkata, India for best academic performances during all four semesters of M.Sc
- Gold Medal, Ramakrishna Mission Residential College (Autonomous), Narendrapur, Kolkata, India for securing first class first position in M.Sc

GRANTS AWARDED
AS A PRINCIPAL
INVESTIGATOR (PI)

- **NASA ROSES Emerging Worlds Program (EW) Grant 2018 (18-EW18-2-0083):** “Following the multi-isotope trail to understanding the formation and early evolution of our Solar System” —171,928 USD for Year 1; 143,397 USD for Year 2; 190,870 USD for Year 3 (2019-2021) (**Total-3.6 Crores in INR**).
- **NASA SOFIA Cycle 7 Priority 1 Observing Proposal Grant 2018 (07-0070 (US)):** “Where is the Water?” —72,700 USD for one year (**Total- 50 Lakhs in INR**).

- **NSF ALMA Ambassador Program Grant 2019:** The North American ALMA Science Center (NAASC) selected me as an ALMA Ambassador 2019 and a 10,000 USD monetary grant was offered in support of my independent research program as well (**Total-7 Lakhs in INR**).
- **DST/SERB Ramanujan Grant 2019 (SB/S2/RJN-009/2019):** “Tracing the Ingredients for a Habitable Earth from Interstellar Space through Planet formation: Exo-planets, Star and Planet formation” Eligible for a fellowship grant of Rs.1,35,000/- per month (including HRA component), research grant of Rs.7,00,000/- p.a and overheads of Rs.60,000/- p.a. for 5 years (**Total-1.19 Crores in INR**).

GRANTS AWARDED
AS A CO
INVESTIGATOR
(CO-I)

- **NASA SOFIA Cycle 7 Priority 1 Observing Proposal Grant 2018 (07-0028 (US)):** “Probing Feedback and the ISM Structure in the Carina Nebula Complex?” —112,600 USD for one year (**Total- 83.3 Lakhs in INR**).
- **NASA ROSES Astrophysics Data Analysis Program (ADAP) Grant 2019 (18-2ADAP18-0072):** “Reduction and Data Distribution of SOFIA [OI] Observations, [OI] Kinematics, and Oxygen Abundance ” —172,711 USD for Year 1; 213,536 USD for Year 2 (2020-2021) (**Total-2.85 Crores in INR**).

RESEARCH INDEX **Citations:** 540, **h-index:**15, **i10-index:**20 [Link for Google Scholar](#)
No. of Publications in peer-reviewed journals: 33, 10 first-authored; 8 second-authored; 15 co-authored

PUBLICATIONS IN
REFERRED
JOURNALS

1. P. A. Strøm, D. Bodewits, M. M. Knight, F. Kiefer, G. H. Jones, Q. Kral, L. Matrà, E. Bodman, M. T. Capria, I. Cleeves, A. Fitzsimmons, N. Haghhighipour, J. H. D. Harrison, D. Iglesias, M. Kama, H. Linnartz, **L. Majumdar**, E. J. W. de Mooij, S. N. Milam, C. Opitom, I. Rebollido, L. K. Rogers, C. Snodgrass, C. Sousa-Silva, S. Xu, Z. Lin, and S. Zieba, [Exocomets from a Solar System Perspective](#), 2020, **Publications of the Astronomical Society of the Pacific (PASP)**, 132, 101001
2. C. N. Shingledecker, G. Molpeceres, V. M. Rivilla, **L. Majumdar**, J. Kastner, [Isomers in Interstellar Environments. I. : The Case of Z- and E-Cynaomethanimine](#), 2020, **The Astrophysical Journal (ApJ)**, 897, 158
3. K. Taniguchi, A. Guzman, **L. Majumdar**, M. Saito, K. Tokuda, [Chemical composition in the IRAS 16562–3959 high-mass star-forming regions](#), 2020, **The Astrophysical Journal (ApJ)**, 898, 54
4. N. T. Phuong, A. Dutrey, E. Di Folco, S. Guilloteau, A. Pierens, J. Bary, T. L. Beck, E. Chapillon, O. Denis-Alpizar, P.N. Diep, **L. Majumdar**, V. Pietu, Y. -W. Tang, [Planet-induced spirals in the circumbinary disk of GG Tauri A](#), 2020, **Astronomy & Astrophysics Letter (A& A)**, 635, L9.

5. V. Wakelam, E. Chapillon, A. Dutrey, S. Guilloteau, W. Iqbal, A. Coutens, **L. Majumdar**, [Protoplanetary disks: Sensitivity of the chemical composition to various model parameters](#), 2019, **Monthly Notices of the Royal Astronomical Society (MNRAS)**, 484, 1563.
6. Y. Seo, **L. Majumdar**, P. F. Goldsmith, Y. L. Shirley, K. Willacy, D. Ward-Thompson, R. Friesen et al., [An Ammonia Spectral Map of the L1495-B218 Filaments in the Taurus Molecular Cloud: II CCS & HC₇N Chemistry and Three Modes of Star Formation in the Filaments](#), 2019, **The Astrophysical Journal (ApJ)**, 871, 134.
7. **L. Majumdar**, P. Gratier, V. Wakelam, E. Caux, K. Willacy, M. E. Ressler, [Detection of HOCO⁺ in the protostar IRAS 16293-2422](#), 2018, **Monthly Notices of the Royal Astronomical Society (MNRAS)**, 477, 525.
8. **L. Majumdar**, J. C. Loison, M. Ruaud, P. Gratier, V. Wakelam, A. Coutens, [Methyl isocyanate CH₃NCO: An important missing organic in current astrochemical networks](#), 2018, **Monthly Notices of the Royal Astronomical Society Letters (MNRAS)**, 473, L59.
9. I. Andron, P. Gratier, **L. Majumdar**, T. Vidal, A. Coutens, J. C. Loison, V. Wakelam, [Methyl cyanide \(CH₃CN\) and propyne \(CH₃CCH\) in the low-mass protostar IRAS 16293-2422](#), 2018, **Monthly Notices of the Royal Astronomical Society (MNRAS)**, 481, 5651.
10. K. Taniguchi, M. Saito, **L. Majumdar**, T. Shimoikura, K. Dobashi, H. Ozeki, F. Nakamura, T. Hirota, T. Minamidani, Y. Miyamoto, H. Kaneko, [Chemical Diversity in Three Massive Young Stellar Objects Associated with 6.7 GHz CH₃OH Masers](#), 2018, **The Astrophysical Journal (ApJ)**, 866, 150.
11. N. T. Phuong, E. Chapillon, **L. Majumdar**, S. Guilloteau, V. Pietu, V. Wakelam, P. N. Diep, T. Beck, J. Barry, [The first detection of H₂S in protoplanetary disk: The dense GG Tau A ring](#), 2018, **Astronomy & Astrophysics Letter (A&A)**, 616, L5.
12. T. Suzuki, **L. Majumdar**, M. Ohishi, M. Saito, T. Hirota, V. Wakelam, [An expanded gas-grain model for interstellar glycine](#), 2018, **The Astrophysical Journal (ApJ)**, 863, 51.
13. T. Suzuki, M. Ohishi, M. Saito, T. Hirota, **L. Majumdar**, V. Wakelam, [The difference in abundance between N-bearing and O-bearing species in high-mass star forming regions](#), 2018, **The Astrophysical Journal Supplementary Series (ApJS)**, 237, 42.
14. **L. Majumdar**, P. Gratier, M. Ruaud, V. Wakelam, C. Vastel, O. Sipilä, F. Hersant, A. Dutrey, S. Guilloteau, [Chemistry of TMC-1 with multiply deuterated species and spin chemistry of H₂, H₂⁺, H₃⁺ and their isotopologues](#), 2017, **Monthly Notices of the Royal Astronomical Society (MNRAS)**, 466, 4470.

15. **L. Majumdar**, P. Gratier, I. Andron, V. Wakelam, E. Caux, [A study of singly deuterated cyclopropenylidene c-C₃HD in protostar IRAS 16293-2422](#), 2017, **Monthly Notices of the Royal Astronomical Society (MNRAS)**, 467, 3525.
16. P. Gorai, A. Das, **L. Majumdar**, B. Sivaraman, S. K. Chakrabarti, E. Herbst, [The Possibility of Forming Propargyl Alcohol in the Interstellar Medium](#), 2017, **Molecular Astrophysics (MA)**, 6, 36.
17. **L. Majumdar**, P. Gratier, T. Vidal, V. Wakelam, J. C. Loison, K. M. Hickson, E. Caux, [Detection of CH₃SH in protostar IRAS 16293-2422](#), 2016, **Monthly Notices of the Royal Astronomical Society (MNRAS)**, 458, 1859.
18. P. Gratier, **L. Majumdar**, M. Ohishi, E. Roueff, J. C. Loison, K. M. Hickson, V. Wakelam, [A new reference chemical composition for TMC-1](#), 2016, **The Astrophysical Journal Supplementary Series (ApJS)**, 225, 25.
19. T. Suzuki, M. Ohishi, T. Hirota, M. Saito, **L. Majumdar**, V. Wakelam, [Survey observation of a possible Glycine Precursor Methanimine CH₂NH](#), 2016, **The Astrophysical Journal (ApJ)**, 825, 79.
20. V. Wakelam, M. Ruaud, F. Hersant, A. Dutrey, D. Semenov, **L. Majumdar**, S. Guolloteau, [Importance of the H₂ abundance in protoplanetary disk ices for the molecular layer chemical composition](#), 2016, **Astronomy & Astrophysics (A&A)**, 594, A35.
21. A. Das, D. Sahu, **L. Majumdar**, S. K. Chakrabarti, [Deuterium enrichment of the interstellar grain mantle](#), 2015, **Monthly Notices of the Royal Astronomical Society (MNRAS)**, 455, 540.
22. **L. Majumdar**, P. Gorai, A. Das, S. K. Chakrabarti, [Potential formation of three pyrimidine bases in interstellar regions](#), 2015, **Astrophysics and Space Science (ApSS)**, 360, 64.
23. A. Das, **L. Majumdar**, D. Sahu, P. Gorai, B. Sivaraman, S. K. Chakrabarti, [Methyl Acetate and its singly deuterated isotopomers in the interstellar medium](#), 2015, **The Astrophysical Journal (ApJ)**, 808, 21.
24. S. K. Chakrabarti, **L. Majumdar**, A. Das, S. Chakrabarti, [Search for interstellar Adenine](#), 2015, **Astrophysics and Space Science (ApSS)**, 357, 90.
25. D. Sahu, A. Das, **L. Majumdar**, S. K. Chakrabarti, [Monte Carlo simulation for the formation of molecular hydrogen and its deuterated forms](#), 2015, **New Astronomy (New A)**, 38, 23.
26. B. Sivaraman, N. Radhika, A. Das, G. Goopakumar, **L. Majumdar**, S. K. Chakrabarti, K. P. Subramanian, M. Hada, [Infrared Spectra and Chemical Abundance of Methyl Propionate in Icy Astrochemical Conditions](#), 2015, **Monthly Notices of the Royal Astronomical Society (MNRAS)**, 448, 1372.
27. A. Das, **L. Majumdar**, S. K. Chakrabarti, D. Sahu, [Deuterium enrichment of the interstellar medium](#), 2015, **New Astronomy (New A)**, 35, 53.

28. **L. Majumdar**, A. Das, S. K. Chakrabarti, Formation of different isotopomers of Chloronium in the interstellar medium, 2014, **The Astrophysical Journal (ApJ)**, 782, 73.
29. **L. Majumdar**, A. Das, S. K. Chakrabarti, Spectroscopic characteristics of the cyanomethyl anion and its deuterated derivatives, 2014, **Astronomy & Astrophysics (A&A)**, 562, 56.
30. A. Das, **L. Majumdar**, S. K. Chakrabarti, R. Saha, S. Chakrabarti, Formation of cyanoformaldehyde in interstellar space, 2013, **Monthly Notices of the Royal Astronomical Society (MNRAS)**, 433, 3152.
31. A. Das, **L. Majumdar**, S. K. Chakrabarti, S. Chakrabarti, Chemical evolution during the process of proto-star formation by considering a two dimensional hydrodynamic model, 2013, **New Astronomy (New A)**, 23, 118.
32. **L. Majumdar**, A. Das, S. K. Chakrabarti, S. Chakrabarti, Study the chemical evolution and spectral signatures of some interstellar precursor molecules of adenine, glycine and alanine, 2013, **New Astronomy (New A)**, 20, 15.
33. **L. Majumdar**, A. Das, S. K. Chakrabarti, S. Chakrabarti, Hydro-chemical study of the evolution of interstellar pre-biotic molecules during the collapse of molecular clouds, 2012, **Research in Astronomy and Astrophysics (RAA)**, 12, 1613.

PUBLICATIONS IN
PROCEEDINGS

1. N. Dzyurkevich, W. Lyra, **L. Majumdar**, Tracing the early planet formation with molecular lines: chemistry of vortex in the protoplanetary disks, 2018, *Origins: From the Protosun to the First Steps of Life. Proceedings of the International Astronomical Union*, 345, 285
2. **L. Majumdar**, V. Wakelam, P. Gratier, E. Caux, J.-C. Loison, K Willacy, Possibility of protostellar inheritance of organics to Jupiter-family comet 67P/C-G, 2018, **cosp**, 42, 2130.
3. **L. Majumdar**, V. Wakelam, P. Gratier, E. Caux, K. Willacy, M. Ruaud, C. Vastel, A. Dutrey, S. Guilloteau, An extended public deuterium fractionation model for the astrochemical community, 2018, **cosp**, 42, 2131.
4. **L. Majumdar**, V. Wakelam, P. Gratier, E. Caux, J.-C. Loison, K Willacy, The chemical link between comet 67P/C-G and low mass protostar IRAS 16293-2422: Integrative Studies in Observational Astronomy and Chemical-Dynamical Modeling, 2018, **cosp**, 42, 2132.
5. **L. Majumdar**, V. Wakelam, P. Gratier, E. Caux, K. Willacy, M. E. Ressler, Chemistry in Protostellar regions: New implications for JWST MIRI/NIRSpec, 2018, **cosp**, 42, 2133.
6. T. Suzuki, M. Ohishi, **L. Majumdar**, V. Wakelam, M. Saito, T. Hirota, An Expanded Gas-Grain Model for Interstellar Glycine, 2018, **cosp**, 42, 3309.

7. P. Gorai, S. K. Chakrabarti, A. Das, **L. Majumdar**, E. Herbst, B. Sivaraman, Serach for Propargyl Alcohol in the Interstellar Medium, 2018, **cosp**, 42, 1253.
8. A. Das, D. Sahu, **L. Majumdar**, S. K. Chakrabarti, Deuterium enrichment of interstellar dusts, 2016, **cosp**, 41, 401.
9. P. Gorai, S. K. Chakrabarti, A. Das, **L. Majumdar**, D. Sahu, B. Sivaraman, Search for Deuterated methyl acetate in the ISM, 2016, **cosp**, 41, 731.
10. **L. Majumdar**, S. K. Chakrabarti, A. Das, On the detection of different chlorine bearing molecules in ISM through Herschel/HIFI, 2014, **cosp**, 40, 1949.
11. **L. Majumdar**, S. K. Chakrabarti, A. Das, S. Chakrabati, Existence of some pre-biotic molecules in and around the Interstellar Medium, 2014, **cosp**, 40, 1948.
12. **L. Majumdar**, S. K. Chakrabarti, A. Das, Physics and Chemistry on interstellar dust, 2014, **cosp**, 40, 1947.
13. **L. Majumdar**, S. K. Chakrabarti, A. Das, S. Chakrabati, Chemical evolution of life making molecules in extreme environments, 2014, **cosp**, 40, 1946.
14. **L. Majumdar**, S. K. Chakrabarti, A. Das, Structure, spectroscopy and chemistry on interstellar dust, 2014, **cosp**, 40, 1945.
15. A. Das, S. K. Chakrabarti, **L. Majumdar**, D. Sahu, Chemical composition of interstellar dust, 2014, **cosp**, 40, 625.
16. A. Das, S. K. Chakrabarti, **L. Majumdar**, D. Sahu, Co-relation of the degree of Ionization of a molecular cloud with the depletion of the neutral species on the interstellar dust, 2014, **cosp**, 40, 624.
17. D. Sahu, S. K. Chakrabarti, A. Das, **L. Majumdar**, Explaining the deuterium fractionation of Water: Modeling and observations, 2014, **cosp**, 40, 2842.
18. D. Sahu, S. K. Chakrabarti, A. Das, **L. Majumdar**, Effective formation of simple molecules like H₂, D₂, HD on grain surfaces and various consequences, 2014, **cosp**, 40, 2841.
19. **L. Majumdar**, A. Das, S. K. Chakrabarti, S. Chakrabarti, Chemical evolution and spectroscopy of some complex molecules which could be treated as the precursor of some bio-molecules in the interstellar medium, 2013, **IAUS**, 292, 250.
20. **L. Majumdar**, A. Das, S. K. Chakrabarti, S. Chakrabarti, A 2D hydrodynamic simulation coupled to chemical evolution around star forming region: A time dependent study, 2013, **AIP Conf. Proc.**, 1543, 242.
21. **L. Majumdar**, A. Das, S. K. Chakrabarti, S. Chakrabarti, Quantum Chemical approach to study the spectral properties of some important precursor of bio-molecules, 2013, **AIP Conf. Proc.**, 1543, 266.

22. R. Saha, **L. Majumdar**, A. Das, S. K. Chakrabarti, S. Chakrabarti, Formation of the nucleobases around the Star forming region, 2013, **AIP Conf. Proc.**, **1543**, 251.
23. D. Sahu, A. Das, **L. Majumdar**, S. K. Chakrabarti, Role of Ambipolar Diffusion towards the chemical evolution of molecular cloud, 2013, **AIP Conf. Proc.**, 1543, 236.
24. **L. Majumdar**, S. K. Chakrabarti, A. Das, S. Chakrabarti, A quantum chemical approach to set a guideline for the observation of different pre-biotic molecules in the interstellar space, 2012, **cosp**, 39, 1154.
25. **L. Majumdar**, S. K. Chakrabarti, A. Das, S. Chakrabarti, Formation of some of the bases of DNA in the interstellar space during the molecular cloud collapse, 2012, **cosp**, 39,1153.
26. **L. Majumdar**, S. K. Chakrabarti, A. Das, S. Chakrabarti, Spectral signature and chemical evolution of some complex molecules which could be treated as the precursor of some bio-molecules in the ISM, 2012, **cosp**, 39, 1152.
27. S. K. Chakrabarti, A. Das, **L. Majumdar**, S. Chakrabarti, A 2D hydrodynamic simulation coupled with the chemical evolution to study the physics and Chemistry of the ISM, 2012, **cosp**, 39, 288.
28. S. K. Chakrabarti, A. Das, **L. Majumdar**, S. Chakrabarti, Synthesis of prebiotic molecules and origin of life, 2012, **cosp**, 39, 289.
29. R. Saha, S. K. Chakrabarti, A. Das, **L. Majumdar**, S. Chakrabarti, Effect of photo-dissociation on the composition of the grain mantle, 2012, **cosp**, 39, 1647.
30. **L. Majumdar**, A. Das, S.K Chakrabarti, S. Chakrabarti, Chemical Evolution around star forming region: A time dependent study, 2011, **IAUS**, 280, 400.

PUBLICATIONS IN BOOKS

1. **L. Majumdar**, *The Interstellar Molecular Complexity.*, 2018, In: B. Mukhopadhyay, S. Sasmal (eds), *Exploring the Universe: From Near Space to Extra-Galactic. Astrophysics and Space Science Proceedings*, vol 53, pp 439-452, Springer.

PUBLICATIONS IN WHITE PAPERS

1. M. Gudipati, S. Milam, A. R. Hendrix, B. Henderson, H. Linnartz, **L. Majumdar**, M. Nuevo, D. M. Paardekooper, E. M. Sciamma-O'Brien, R. Smith, N. Turner, K. Willacy, *From Interstellar Ice Grains to Evolved Planetary Systems: The Role of Laboratory Studies*, *Astro2020: Decadal Survey on Astronomy and Astrophysics*, science white papers, no. 518; *Bulletin of the American Astronomical Society*, Vol. 51, Issue 3, id. 518 (2019).

PUBLICATIONS
(ARXIV)

1. T. Suzuki, **L. Majumdar**, K. Tokuda, H. Minamoto, M. Ohishi, M. Saito, T. Hirota, 2019, [Survey Observation of CH₃NH₂ using ALMA and its formation process](#), 2019, **The Astrophysical Journal**, arxiv:1909.00528, under review.
2. T. Suzuki, Y. Shinnaka, T. Shibata, Y. Shilbaike, **L. Majumdar**, H. Nomura, H. Minamoto, [Possibility of condensation of glycine near the surface of comet 67P/C-G](#), 2019, **The Astrophysical Journal**, arxiv: 1901.05170, under review.

RESEARCH
HIGHLIGHTS

1. Research highlighted in [nature India](#) with a headline “Glimpse of planets around a multiple star system ” which discusses first discovery of a circumbinary planetary system (i.e., planets are orbiting around multiple star systems) and will lead us to understand how such planetary systems (different than our Solar-system) can form and survive. (DOI:10.1038/nindia.2020.95)
2. **Discovery of a Circumbinary Planetary System using ALMA**, Press release from CNRS -French National Center for Scientific Research which is the French state research organization and is the largest fundamental science agency in Europe.
3. Post-doctoral research paper (first authored & work carried out in the France) highlighted in [Physics Today](#) which is a publication of the American Institute of Physics with a headline “[How an organic molecule forms in space.](#)” (DOI:10.1063/PT.6.1.20171109b)
4. Post-doctoral research at NASA Jet Propulsion Laboratory (first authored & work carried out in the USA) highlighted in NASA Postdoctoral Program Quarterly Newsletter- Volume 1, Issue 4 - January 2018.
5. Post-doctoral research paper (1st authored & work carried out in the USA) produced one of 12 approved scientific studies to receive the ngVLA Second Round Award (as a PI) with the proposal entitled [HOCO⁺ emission as a diagnostic of planet-forming regions of disks: Bridging ngVLA and the James Webb Space Telescope \(JWST\)](#), which shows how NASA’s JWST mission and ngVLA could be linked together to address key scientific questions. The ngVLA Community Studies Program was launched by the National Radio Astronomy Observatory (NRAO) to allow contributions from members of the scientific and engineering communities in process of building a final concept for the ngVLA.
6. Ph.D. research paper (first authored & work carried out in India) highlighted in [nature India](#) with a headline “[Space Recipe for Life Making Molecules.](#)” (DOI:10.1038/nindia.2013.28)
7. Ph.D. research paper (second authored & work carried out in India) highlighted in [nature India](#) with a headline “[Heavier Hydrogen Unveils Secrets of Protostars.](#)” (DOI:10.1038/nindia.2014.155)

8. Study of the chemical evolution and spectral signatures of some interstellar precursor molecules of adenine, glycine & alanine, published in 2013 in the New Astronomy Journal is **one of the 5 most highly cited papers during 2014, 2015 and up until June 2016.**
9. Chemical evolution during the process of proto-star formation by considering a two dimensional hydrodynamic model, published in 2013 in the New Astronomy Journal is **one of the 5 most highly cited papers during 2014, 2015 and up until June 2016.**

PROFESSIONAL SERVICE

Referee for publications in peer-review journals:

- Nature Astronomy
- The Astrophysical Journal
- The Astrophysical Journal Letters
- Astronomy and Astrophysics
- Planetary and Space Science
- Astrobiology
- ACS Earth and Space Chemistry
- Indian Journal of Physics

Reviewing fellowship applications:

- Reviewer of NASA Fellowship Applications
- Reviewer of NASA Post Doctoral Program Applications
- Reviewer of NASA Future Investigators in Earth and Space Science and Technology (FINESST) Astrophysics Program Applications

Reviewing grant applications and panelist:

- Reviewer of NASA Astrophysics Research and Analysis Program (APRA)
- Reviewer of NASA ROSES Exoplanet Research Program (XRP)
- Reviewer of National Science Foundation (NSF), USA in Galactic Astronomy, including Structure of the Milky Way, the Interstellar Medium, Galactic Clusters and Star Formation Panel
- Invited Panel Member of NASA Exoplanet Research Program (XRP)
- Invited Panel Member of NASA Emerging World Program (EW)
- Invited Panel Member of NASA Astrophysics Research and Analysis Program (APRA)
- Invited Panel Member of NASA Astrophysics Data Analysis Program (ADAP)
- Invited Technical Secretary of ALMA Proposal Review Committee (APRC) in 2019
- Invited Virtual Panel Member of 2019 NASA Postdoctoral Program (NPP)
- Invited Member of ALMA Proposals Review Committee (APRC) of 2020

Membership of Professional Organizations:

- Life Member of the Astronomical Society of India (L2281)
- Member of the ACS Astrochemistry Subdivision
- COSPAR Associate
- [International Astronomical Union \(IAU\)](#)

- American Geophysical Union (AGU)

In organizing Conferences and Workshops:

- Primary Convener of the AGU Session [Down the icy road: The journey of ices from interstellar clouds to planetary systems](#), American Geophysical Union (AGU) Fall Meeting 2020, San Francisco, 7 to 11 December, 2020
- Chairperson of the Organizing Committee for [ALMA Community Day Event —2019](#) at NASA Jet Propulsion Laboratory, Pasadena, USA on 27 March 2019.
- Member of the Local Organizing Committee for [KIDA 2015](#) at CNES headquarters, Paris, France from 5-7 May 2015. [Link](#)
- Member of the Local Organizing Committee for [Chemical Evolution of Star Forming Region and Origin of Life —ASTROCHEM 2012](#) at S.N. Bose National Centre for Basic Sciences, Kolkata, India from 10-13 July 2012.

Service for the Institute (NISER):

- Core Examiner of Integrated 5-year M.Sc & Integrated MSc-PhD Thesis on Astronomy and Astrophysics of the School of Physical Sciences (SPS) at NISER, 2019 to present —
- External Member of the Post-doctoral Selection Committee on Astronomy and Astrophysics of the School of Physical Sciences (SPS) at NISER, 2019 to present —
- Member of the Post-doctoral Screening Committee of the School of Earth and Planetary Sciences (SEPS) at NISER, 2019 to present —
- Member of the Faculty Screening Committee of the School of Earth and Planetary Sciences (SEPS) at NISER, 2019 to present —
- Member of the Course Development Committee of the School of Earth and Planetary Sciences at NISER, 2019 to present —

INVOLVEMENT IN INTERNATIONAL SCIENTIFIC NETWORKS

- Co-investigator of the [Guaranteed Time Observation \(GTO\) Program —1236](#) of NASA’s next flagship astrophysics mission James Webb Space Telescope (JWST) to study physics and chemistry of protostellar binaries in Perseus.
- Member of the **“The Chemistry in Disks (CID)”** Project which is an international consortium among the Max Planck Institute for Astronomy (Heidelberg, Germany), Laboratoire d’astrophysique de Bordeaux (Bordeaux, France), Institut de Radio astronomie Millimetrique (Grenoble, France), SETI Institute (Mountain View, USA), Institute of Astronomy and Astrophysics (Taiwan, China), Jena Observatory (Jena, Germany), University of Virginia (Charlottesville, USA), and Konkoly Observatory (Budapest, Hungary).
- Member of the **“From Qualitative to Quantitative: Exploring the Early Solar System by Connecting Comet Composition and Protoplanetary Disk Models”**, Project of International Space Science Institute (ISSI), Bern between University of Bern (Switzerland); American University, University of Missouri at Saint Louis, Catholic University of America, NASA Jet Propulsion Laboratory

& NASA Goddard Center for Astrobiology (USA); Institute de Planetologie et d'Astrophysique de Grenoble, Universite d'Orleans (France); Leiden University, University of Groningen (Netherlands); Queen's University, Belfast (UK).

- Member of the “**Square Kilometre Array (SKA) Cradle of Life**” International Science Working Group (SWG) which provide input to the Square Kilometre Array Organisation (SKAO) on issues relating to the design, commissioning, and future operations of the SKA to address many fundamental science questions using SKA in the future such as (i) What accounts for the diversity in planetary systems? (ii) Are terrestrial planets common in the habitable zone? (iii) Do gas giant planets form in the inner disk or do they migrate there? (iv) What are the implications for Earth-like planets?

MAJOR
OBSERVING
PROPOSAL
AWARDS AS
PRINCIPAL
INVESTIGATOR

- **IRAM 30-meter:** Summer Cycle (2015) —Looking for the Sulfur reservoir in IRAS 16293-2422
- **ALMA Cycle 3:** —Searching for H_2D^+ in the circumbinary disk surrounding GG Tau A
- **IRAM 30-meter:** Winter Cycle (2016) —Ortho-to-Para ratio of H_2CO as a thermometer for disk chemistry
- **NOEMA:** Winter Cycle (2016) —Looking for the cold organic reservoir in disks
- **ARO 12-meter:** Semester 2017B —Chemical diversity of starless and protostellar cores
- **NRO 45-meter:** Semester 2017 —Survey of a direct amino acid (chiral + non-chiral) precursor NH_2OH around two low-mass stars
- **NRO 45-meter:** Semester 2018 —Phosphorus-bearing molecules in solar-type protostars
- **NRO 45-meter:** Semester 2018 —Survey of the interstellar aromatic molecule Benzonitrile (cyclic- $\text{C}_6\text{H}_5\text{CN}$) in dark clouds
- **ARO12-meter:** Spring 2018A semester —Phosphorus-bearing Molecules in Solar-type Protostars: Bridging ARO with JWST and ROSETTA
- **ALMA Cycle 6:** —Searching for Nitrogen bearing organic Formamide: Bridging the Disk composition with Comet 67P/Churyumov-Gerasimenko
- **SOFIA Cycle 7:** —Where is the Water
- **ALMA Cycle 7:** —Searching for H_2D^+ in the circumbinary disk surrounding GGTau A
- **ALMA Cycle 7:** —Searching for Nitrogen bearing organic Formamide in HD 163296

TECHNICAL
SKILLS

Astronomy & Astrophysics

- GILDAS for reduction and analysis of single dish telescope & interferometric data both for continuum and spectral lines (IRAM-30m, NRO-45m, ARO-12m, GBT and NOEMA)
- CASA for ALMA data analysis both for continuum and spectral lines
- DiskFit for line modeling of protoplanetary disks
- LIME, Radex and RadLite for LTE/non-LTE radiative transfer modeling of thermal dust and spectral line emissions

- CASSIS and XCLASS for line analysis
- Thermo-chemical codes to model the physical and chemical environment of dark clouds, protostars and protoplanetary disks
- Infrared data analysis (Keck/NIRSPEC, Spitzer/IRS, Herschel/PACS) and spectro-astrometric observations and high dynamic range data reduction

Cosmochemistry & Astrobiology

- Developer of isotope chemical network to study the origin and evolution of our solar system. [See here the first public Isotope \(D, H\) KIDA Chemical Network in the community.](#)
- Developer of theoretically spectroscopic catalogs for pre-biotic species (not available either in JPL or CDMS databases) using SPFIT/SPCAT Codes detectable using NASA observatories including JWST, and SOFIA, together with ground-based facilities including ALMA, IRAM-30m, NOEMA and GBT.
- Developer of chemical-kinetic models to study formation and evolution of amino acids such as glycine, alanine, serine, bases of DNA and RNA in various star and planet-forming environments to address key science objectives of astrobiology such as “When does the process of life emergence start?” and “Is the process universal or localized?”

Planetary and Exoplanetary Science

- Chemical kinetics for planetary and exoplanetary atmospheres (on going)
- Inverse retrieval code for exoplanetary atmospheres (on going)
- Sub-mm astronomy to study Solar-system objects such as asteroids, comets (on going)

Programming

- Fortran (Expert), Python (Expert), IDL (Expert), Shell, LATEX, Xmgrace, Gnuplot.

INVITED TALKS

- [Are we alone in this Universe?](#), September 5, 2020, Barasat College, West Bengal State University, Kolkata, India.
- [Tracing the origin of planetary systems with multi-wavelength astronomy](#), May 31, 2019, Centro de Astrobiologia, CSIC, Madrid, Spain.
- [Chemical composition and physical properties of gases and volatiles in protostellar envelopes and planet-forming disks: a new era of JWST](#), May 6, 2019, Max Planck Institute for Extraterrestrial Physics, Garching, Germany.
- [Multi-wavelength astronomy and the origin of planetary systems](#), March 5, 2019, Institute of Astronomy and Astrophysics, ASIAA, Taipei, Taiwan.
- [Astrochemistry and the origin of the planetary systems](#), February 9, 2019, NRAO and University of Virginia Joint Colloquium, Charlottesville, USA.
- [Building stars, planets and the ingredients for life in space](#), November 30, 2018, California State University, Los Angeles, USA.

- [Possibility of protostellar inheritance of organics to Jupiter-family comet 67P/C-G](#), 2018, COSPAR 2018 42nd Assembly, Pasadena, USA.
- [Chemistry from clouds to disks and chemical composition of comets](#), August 2017, NASA Jet Propulsion Laboratory, Pasadena, USA.
- [Deuterium enrichment of the interstellar medium](#), March 21, 2017, University of Cergy Pontoise, Cergy Pontoise, France.
- [Deuterium fractionation from clouds to protoplanetary disks: modeling and observation](#), March 22, 2017, Observatoire de Paris, Université Pierre et Marie Curie, France.
- [The kinetic database for astrochemistry: present and future](#), November 26, 2015, Max Planck Institute for Extraterrestrial Physics (MPE), Garching, Germany.
- [Chemical evolution of interstellar medium: modeling and observation](#), May 12, 2015, Institut de Recherche en Astrophysique et Planetologie (IRAP), Toulouse, France.

CONTRIBUTED
TAILKS

- [The physical and chemical origins of planetary systems such as our own](#), September 9-11, 2020, Australasian Astrobiology Meeting, Virtual International Conference.
- [The chemical link between comet 67P/C-G and low mass protostar IRAS 16293-2422](#), July, 2018, COSPAR 42nd Assembly, Pasadena, USA.
- [Deuterium fractionation in the ISM: modeling and observation](#), July, 2018, COSPAR 42nd Assembly, Pasadena, USA.
- [Chemistry in protostellar regions: new implications for JWST MIRI/NIRSpec](#), July, 2018, COSPAR 42nd Assembly, Pasadena, USA.
- [Deuterium fractionation from molecular clouds to protoplanetary disks: modeling and observation](#), March 18-22, 2018, ACS Astrochemistry Meeting, New Orleans, USA.
- [Protonated Carbon Dioxide Emission as a Diagnostic of Planet-Forming Regions of Disks](#), June 26-29, 2018, Astrophysical Frontiers in the Next Decade and Beyond, Portland, USA.
- [The chemical link between comet 67P/C-G and low mass protostar IRAS 16293-2422](#), Nov 29-Dec 1, 2017, The origin of galaxies, stars, and planets in the era of ALMA, Caltech, Pasadena, USA.
- [Deuterated spin chemistry from cloud to protoplanetary disk: modeling and](#)

- [future observation](#), July 8, 2016, EWASS Meeting (Session S8), Athens, Greece.
- [A new comprehensive astrochemical model including deuteration and nuclear spin state processes](#), May 13, 2016, LAB Bordeaux, France.
 - [Deuteration and Spin Chemistry in Protoplanetary Disks](#), May 24, 2015, CID Meeting, Bordeaux, France.
 - [Chemistry of star forming regions including deuteration: modelling and observations](#), May 5-7, 2015, Kinetic Database for Astrochemistry (KIDA) workshop Paris, France.
 - [Physics and Chemistry on interstellar dust](#), August 2-10, 2014, COSPAR B 0.5 (Session: Dust and Rings (in the Solar System and Beyond)), Moscow, Russia.
 - [Existence of some pre-biotic molecules in and around the interstellar medium](#), August 2-10, 2014, COSPAR B0.6 (Session: Astrobiology: Life Signs Detections within Planetary Exploration), Moscow, Russia.
 - [On the detection of different chlorine bearing molecules in ISM through Herschel/HIFI](#), August 2-10, 2014, COSPAR E1.8 (Session: The Herschel (Far-IR) Heritage: High-z Universe, Star Formation, ISM, Stars, ...), Moscow, Russia.
 - [Role of interstellar dusts towards the chemical enrichment of the ISM](#), Nov 19-20, 2013, Light Scattering Techniques and Application to Astronomy and other Areas, S. N. Bose National Centre for Basic Sciences, Kolkata, India.
 - [Study the interstellar processes leading to the deuterium enrichment](#), 2013, ISRO Respond Meeting, PRL, Ahmedabad, India.
 - [Guidelines for astronomical detections of new complex molecules in the interstellar medium](#), 2013, Chemical Evolution and Origin of life, IIT Roorkee, India.
 - [Formation of some of the bases of DNA in the interstellar space during the molecular cloud collapse](#), July 15-16, 2012, COSPAR F3.5 (Session: Chemical Evolution of star forming Regions: Observations, Experiment and theory), Mysore, India.
 - [A quantum chemical approach to set a guideline for the observation of different pre-biotic molecules in the ISM](#), July 17-18, 2012, COSPAR F3.2 (Session: Prebiotic Chemistry and the Origin of Life), Mysore, India.
 - [Spectral signature and chemical evolution of some complex molecules which could be treated as the precursor of some bio-molecules in the ISM](#), July 15-16, 2012, COSPAR F3.5 (Session: Chemical Evolution of star forming Regions: Observations, Experiment and theory), Mysore, India.
 - [Quantum chemical approach to study the spectral properties of some important](#)

[precursor of bio-molecules](#), July 10-13, 2012, ASTROCHEM 2012 Conference, S.N.Bose National Centre for Basic Sciences, Kolkata, India.

- [Formulation of three dimensional total variation diminishing scheme to solve hyperbolic system of equations](#), Dec 1, 2010, S. N. Bose National Centre for Basic Sciences, Kolkata, India.

ACADEMIC VISITS

- [Prof. Eric Herbst](#), Commonwealth Professor, Department of Physics, Chemistry and Astronomy, **University of Virginia**, Charlottesville, USA in February 2019.
- [Prof. Paola Caselli](#), Director, The Center for Astrochemical Studies, **Max Planck Institute for Extraterrestrial Physics**, Garching, Germany in May 2019.
- [Dr. Izaskun Jimenez-Serra](#), Scientist, Departamento de Astrofísica, **CSIC**, Spain in June 2019.
- [Dr. Chin-Fei Lee](#), Deputy Director, **Academia Sinica Institute of Astronomy and Astrophysics (ASIAA)**, Taipei, Taiwan in January 2019.
- [Prof. Masatoshi Ohishi](#), Senior Professor, **National Astronomical Observatory of Japan**, Mitaka, Japan in December 2017.
- [Dr. Charlotte Vastel](#), Scientist, **Institut pour la Recherche en Astrophysique et Planetologie (IRAP)**, Toulouse, France in May 2015.

TEACHING & OUTREACH

- Gave course and tutorials on Mathematical Methods to Physics undergraduate students at the prestigious Ramakrishna Mission Residential College, Narendrapur, Kolkata, India.
- Science demonstrations in 18th West Bengal Science Congress (2011), Kolkata, India.
- Science demonstrations in 100th Indian Science Congress (2013), Kolkata, India.
- Assistant in the Annual Laboratoire d'astrophysique de Bordeaux, France JPO Science Festival.
- Research highlighted in Indian Best National News Paper "**The Hindu**" with a headline "**Life from the stuff between the stars**".
- Research highlighted in Indian Best National News Paper "**The Telegraph**" with a headline "**Seed of Life**".
- Co-Chair in organizing the **NISER Chandrayaan-2** Outreach Program on September 7, 2019.
- Outreach Talk "Are we alone in the Universe" at **NISER Chandrayaan-2** Outreach Program on September 7, 2019.
- Popular Astronomy and Planetary Science Talk "**Current Challenges and Progresses in Astronomy and Planetary Science**" at Centurion University of Technology and Management (CUTM), Odisha on Nov 2, 2019.

REFERENCES

Available on request

MENTORING			
Current/Past Students			
MS Students	Affiliation	Year	Project
1. Jayden Buttler	California State University, USA	2018	Star Formation
2. Suyas Fokane	National Institute of Science Education and Research (NISER), India	2019	Planet Formation
3. Rutuja Attal	National Institute of Science Education and Research (NISER), Bhubaneswar, India	2019	Planet Formation
4. Nishil Mehta	Indian Institute of Science Education and Research (IISER), Thiruvananthapuram, India	2019-	Planet Formation
5. Spandan Dash	University of Leiden, Netherlands	2019-	Exoplanets
6. A. Priyadarshi	National Institute of Science Education and Research (NISER), Bhubaneswar, India	2020-	Exoplanets
7. Rohith Konda	Indian Institute of Technology (IIT), Dhanbad, India	2020-	Planet Formation