Niyati Jain

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Education &Training:

- Assistant Professor Ashoka University (April 2026 – Present)
- Assistant Professor (AcSIR), CSIR-IGIB, New Delhi (Jan 2024 – September 2025)
- Ramalingaswami Fellow, CSIR-IGIB, New Delhi (Oct 2019 – September 2025)
- Senior Research Associate, Case Western Reserve University, Ohio (Apr 2016 – May 2018)
- Research Associate, Case Western Reserve University, Ohio (Apr 2013 – Apr 2016)
- Research Scientist, AIIMS, New Delhi (Aug 2012 – Mar 2013)
- Postdoctoral Researcher, The Ohio State University (Jan 2011 – Jun 2012)
- PhD, Molecular & Cell Biology, University of Texas at Dallas (Jul 2005 – Dec 2010)
- MS, Molecular & Cell Biology, University of Texas at Dallas (Jul 2005 – Aug 2008)
- MSc, Microbiology, Kurukshetra University (2003)
- BSc, Zoology, Botany & Chemistry, Meerut University (2001)

Research Interests:

- RNA structure and dynamics using solution-state NMR
- RNA–protein interactions and post-transcriptional gene regulation
- lncRNA and mRNA structural biology (HOTAIR, HIV, HCV RNA)
- Thermodynamics and target specificity of CRISPR-Cas9 systems
- Role of RNA modifications (m6A) in modulating structure and protein recognition

Expertise in Solution-State NMR:

- 10+ years of experience in RNA-focused NMR structural biology.
- Expertise includes: Multi-dimensional NMR (NOESY, TOCSY, HSQC, HMQC, RDC)
- RNA sample prep, isotopic labeling, and conformational studies
- Data acquisition, NMR data analysis and calculation of RNA-3D structure.

Selected Research Highlights:

- Helix-12 of HOTAIR – NMR-based free RNA structure and Biophysical characterization of protein-RNA interface with hnRNPB1.
- HCV 5BSL3.2 RNA–hnRNPA1 complex – NMR-based solution structure of free RNA and complex
- m6A-modified RNAs – Thermodynamic studies and molecular simulation with hnRNPC
- CRISPR-Cas9 – RNA-DNA target recognition specificity and thermodynamics

- HIV-1 RNA – Solution NMR structure of ISS stem-loop and hnRNPA1 interaction
- Uncovered ligand recognition dynamics in purine riboswitches, offering new insights into RNA-based gene regulation.

Detailed Research Work:

Ramalingaswami fellow: CSIR-IGIB, New Delhi (October 2019-September 2025)

Structure and functional studies of lncRNA HOTAIR and its interaction with protein partners that will help to define its molecular mechanism in Cancer

- Investigating the molecular mechanism of Helix-12 of the long non-coding RNA HOTAIR and its specific interaction with the RNA-binding protein hnRNPB1.
- Employing solution-state NMR spectroscopy and biochemical methods to define the RNA-protein interface and functional implications in gene silencing.

Role of hnRNPA1 in Hepatitis C Virus Replication

- Characterizing the interaction between hnRNPA1 and the 5BSL3.2 RNA element of Hepatitis C Virus (HCV).
- Unraveling how hnRNPA1 modulates HCV replication through structural remodeling of viral RNA elements.

Thermodynamic and Structural Characterization of CRISPR-Cas9 Systems

- Studying the thermodynamic parameters and RNA-DNA hybridization specificity in CRISPR-Cas9 systems.
- Investigating how sequence and structural determinants affect Cas9 target recognition and binding fidelity.

Functional Impact of m6A Modifications on RNA Structure and Recognition

- Exploring how N6-methyladenosine (m6A) modifications influence RNA secondary structure and protein-binding affinity.
- Utilizing NMR and biochemical assays to elucidate m6A-mediated structural switches that govern post-transcriptional gene regulation.

mRNA-Based Vaccine Development for Leishmaniasis

- Developing mRNA vaccine candidates targeting Leishmania-specific antigens.
- Using transcriptomic and immunological approaches to identify key parasite antigens for inclusion in mRNA vaccine formulations.

Senior Research Associate, *Case Western Reserve University, Ohio (Apr 2013 – May 2018)*
Mentor: Dr. Blanton Tolbert, Leading RNA NMR Spectroscopist (HHMI Investigator; University of Pennsylvania)

- Led structural and biochemical investigations into protein–RNA interactions regulating HIV-1 gene expression, with a focus on alternative splicing mechanisms.
- Dissected how sequence motifs, spacing, and RNA secondary structure govern the binding specificity and kinetics of hnRNPA1, a key splicing regulator.

- Integrated biochemical assays and protein titration studies to provide mechanistic insight into how structured RNA elements mediate regulated protein-RNA interactions.
- Contributed to a deeper understanding of the cis-acting RNA regulatory elements involved in HIV-1 alternative splicing, with implications for viral replication and therapeutic targeting.

All India Institute of Medical Sciences (AIIMS), New Delhi (Aug 2012 – Mar 2013) **Mentor: Dr. T.P. Singh**

- Contributed to a SERB Fast Track Project proposal titled *"Structure and Functional Studies of Thyroid Peroxidase and Ligand Design"*.
- Awarded SERB Young Scientist Grant *(SERB/LS-647/2012)* under the Department of Science and Technology (DST), Government of India.
- Although the grant was awarded, the project was not availed due to the transition to an international research opportunity.
- Focused on applying structural biology and molecular modeling approaches for the rational design of small-molecule ligands targeting thyroid peroxidase, a key enzyme in thyroid hormone biosynthesis

Postdoctoral Researcher, ***Wexner Medical Center, The Ohio State University, Ohio (Jan 2011 – Jun 2012)*** **Mentor: Dr. Daniel Battle**

- Conducted structural characterization of WD-repeat proteins, including Gemin5 and WDR79, which play critical roles in snRNA recognition and snRNP assembly.
- Investigated protein–RNA interactions involved in the cytoplasmic maturation of spliceosomal small nuclear ribonucleoproteins (snRNPs).
- Employed structural and molecular biology techniques to understand how WD-repeat motifs facilitate RNA-binding specificity and multi-protein complex formation.

Ph.D. Graduate Student, ***University of Texas at Dallas, Texas (Aug 2005 – Dec 2010)*** **Mentor: Dr. Tianbing Xia (now Principal Engineer, Abbott, Illinois, USA)**

- Completed doctoral research in RNA structural biology, focusing on the conformational dynamics and intermolecular interactions of biologically relevant RNA molecules.
- Investigated the heterogeneity and dynamics of ligand recognition in purine-sensing riboswitches, revealing novel insights into RNA-based gene regulation.
- Gained extensive training in ultrafast spectroscopy, RNA synthesis, and RNA–protein interaction studies.
- Developed technical expertise in time-resolved methods to probe structural transitions and folding pathways in regulatory RNAs.

Awards & Honors:

- Ramalingaswami Fellowship (2018–2019) *Department of Biotechnology, Ministry of Science and Technology, Government of India*
- DST Young Scientist Fast Track Grant (2012) *Ministry of Science and Technology, New Delhi, India*
- Graduate Student Scholarship (2006–2010)*University of Texas at Dallas*
- Travel Award – Biocat Advanced SAXS Training Course (Oct 2015)*User at Advanced Photon Source, Argonne National Laboratory, USA*

- Travel Grant – CRNA Workshop *"Introduction to X-ray Crystallography"Ann Arbor, Michigan, March 26–27, 2014*
- Chair, Session II, Rustbelt RNA Meeting (2015) *Sawmill Creek Resort and Conference Center, Huron, OH. http://rustbeltrna.org/2015/agenda.php*
- Judge, Poster Session, Rustbelt RNA Meeting (2014) *Pittsburgh, PA*
- *Guest Editor for JOVE Method Collection: RNA-Protein interaction.*
- Peer Reviewer for the following journals:
  Journal of Molecular Biology (JMB)
  IJBIOMAC
  BBA – Proteins and Proteomics
  HIV/AIDS – Research and Palliative Care
  In Silico Research in Biomedicine
  BMS – MicroRNA
  Journal of Pharmacovigilance

Publications:

- ***Jain Niyati#***, Zhao Liang#, Liu J.D and Xia Tianbing. ***Biochemistry*** 49, 3703-3714 **(2010)**.*" Heterogeneity and Dynamics of the Ligand Recognition Mode in Purine-Sensing Riboswitches". **Impact factor 3.0***

- Alvarado LJ, LeBlanc RM, Longhini AP, Keane SC, ***Jain N***, Yildiz ZF, Tolbert BS, D'Souza VM, Summers MF, Kreutz C, Dayie TK. ***Chembiochem*** 15,1529–1686 ***(*2014)** *"Regio-selective chemical-enzymatic synthesis of pyrimidine nucleotides facilitates RNA structure and dynamics studies".* **Featured on the Back Cover of Journal Chembiochem. *Impact factor 2.8***

- ***Jain Niyati#,*** Morgan C.E, Rife B.D, Salemi M, Tolbert B.S ***Journal of Biological Chemistry*** 291(5), 2331-2344 **(2015).** "*Solution Structure of the HIV-1 Intron Splicing Silencer and its Interactions with the UP1 Domain of hnRNP A1". **Impact factor 3.9***

- ***Niyati Jain#***, Hsuan-Chun Lin#, Christopher E. Morgan, Michael Harris and Blanton S. Tolbert ***PNAS*** 114(9):2206-2211 **(2017)** "*Rules of RNA specificity of hnRNPA1 revealed by global and quantitative analysis of its affinity distribution*". ***Impact factor 9.1***

- Abhijit Basu, ***Niyati jain***, Blanton S. Tolbert, Anton A. Komar and Barsanjit Mazumder ***Nucleic Acids Research*** *45(22):12987-13003* ***(2017)***. "*Conserved structures formed by heterogeneous RNA sequences drive silencing of an inflammation responsive post-transcriptional operon*". ***Impact factor 13.1***

- Yifab Dai*, Liang-Yuan Chiu*, Yongkun Sui, Quanbin Dai, Srinivas Penumutchu, ***Niyati Jain***, Liming Dai,Christian A. Zorman, Blanton S.Tolbert, R. Mohan Sankaran,Chung Chiun Liu. ***Talanta*** *Vol 95 46-54* ***(2019).*** "*Nanoparticles based simple electrochemical biosensor platform for profiling of protein-nucleic acid interactions". **Impact factor 6.1***

- *Love Panchariya*, *Wajahat Ali Khan*, *Shobhan Kuila*, *Kirtishila Sonkar, Sibasis Sahoo*, *Archita Ghoshal*, *Ankit Kumar*, *Dileep Kumar Verma*, *Abdul Hasan, Mohd Azeem Khan*, ***Niyati Jain***, *Amit Kumar Mohapatra*, *Shubhashis Das*, *Jitendra K Thakur*, *Souvik Maiti*, *Ranjan Kumar Nanda*, *Rajkumar Halder*, *Sujatha Sunil*, *Arulandu Arockiasamy.* ***Chem Commun (Camb).*** **2021** Sep 30;57(78):10083-10086 Zinc^{2+} ion inhibits SARS-CoV-2 main protease and viral replication *in vitro.* ***Impact factor 4.2***

- *Liang-Yuan Chiu*, *Ann Emery*, ***Niyati Jain***, *Andrew Sugarman*, *Nashea Kendrick*, *Le Luo*, *William Ford*, *Ronald Swanstrom*, *Blanton S Tolbert.* ***J Mol Biol***. **2022** Sep 30;434(18):167728 Encoded Conformational Dynamics of the HIV Splice Site A3 Regulatory Locus: Implications for Differential Binding of hnRNP Splicing Auxiliary Factors. ***Impact factor 4.5***

- *Ajit kumar, Purba Daripa, Souvik Maiti,* ***Niyati jain****.* ***Biochemistry*** **2023** 62 (13), 2041-2054 Interaction of hnRNPB1 with Helix-12 of *hHOTAIR* Reveals the Distinctive Mode of RNA Recognition That Enables the Structural Rearrangement by LCD. ***Impact factor 3.0***
Selected among best papers for 2023 by ACS and also asked to nominate the first Author for Gordon Hannes Scholar*.*

- *Nidhi Katyal, Shantanu Khatri, Ajit Kumar, Akanksha Arun, Purba Daripa, Saman Fatihi, Suresh Kumar,* ***Niyati Jain****, Lipi Thukral* ***Autophagy***, **2023** (12):3201-3220 AI-based AlphaFold2 significantly expands the structural space of the autophagy pathway. ***Impact factor 10.28***

- *Ajit Kumar, Purba Daripa, Kaiser Rasool, Debojyoti Chakraborty,* ***Niyati jain****, and Souvik Maiti** Deciphering the Thermodynamic Landscape of CRISPR/Cas9: Insights into Enhancing Gene Editing Precision and Efficiency ***J. Phys. Chem. B*** **2024**, 128, 35, 8409–8422. ***Impact factor 2.8***

- *Isha Rakheja, Vishal Bharti, S Sahana, Prosad Kumar Das, Gyan Ranjan, Ajit Kumar,* ***Niyati Jain****, Souvik Maiti.* **Biochemistry 2024** 64 (1), 250–265 Development of an In Silico Platform (TRIPinRNA) for the Identification of Novel RNA Intramolecular Triple Helices and Their Validation Using Biophysical Techniques. ***Impact factor 3.0***

- *Ajit Kumar[#], Purba Daripa[#], Srinivas Penumutchu, Souvik Maiti and* ***Niyati jain****.* **IJBIOMAC** Volume 312, June 2025, 144210 "Thermodynamic Insights into N6 Methyladenosine-Modified Ribonucleic Acids and Their Interactions with the RNA Recognition Motif of Heterogeneous Nuclear Ribonucleoprotein C". ***Impact factor 8.5***

- *Shalini Mishra[#], Ajit Kumar[#], Priyanka Kumari, Kaiser Rasool, Souvik Maiti and* ***Niyati jain****.* ***Biochemistry 64*** *(16), 3535-3548 2025/7/30*. "Thermodynamics and Binding Mechanism of Insulin-like Growth Factor Binding Protein 1 (IGF2BP1) and Y3 RNA Interaction: Exploring the Mode and Mechanism of Their Interaction." ***Impact factor 3.0***

- *Ajit Kumar, Srinivasa Penumutchu, Love Panchariya, Priyanka Kumari, Shubham Thakur, Purba Daripa, Vandana Singh, Arockiasamy Arulandu, Souvik Maiti, Mandar V Deshmukh,* ***Niyati jain****."

Loop of fate: structural and mechanistic insights into hnRNPA1 binding to the hepatitis C virus RNA." ***2026/2/1 RNA 32 (2), 215-236. Impact factor 5***

- *Deepanshi Gahlot, Jesu Castin, Shruti Mathur, Debajyoti Das, Ajit Kumar, Akanksha Arun, Chandrima Gain, Mridul Sharma, Ravi Kant Pal,* ***Niyati Jain****, Bichitra K Biswal, Rajat Singh, Lipi Thukral* "A novel lipid-triggered allosteric site modulates LC3-LIR receptor binding activity" ***Nature communication accepted Aug 5 Impact factor 18.1***

- *Ajit Kumar, Shubham thakur, Priyanka kumari, Shalini Mishra, Souvik Maiti, and* ***Niyati jain**.*** Engineered FnCas9 and their affinity and specificity to different PAM targets. ***Biochemistry ACS Aug 5 published Impact factor 3.0***

***corresponding author**

Patent filed

Engineered LC3 protein mutants with altered receptor binding properties during the autophagy pathway.

Teaching Experience:

Teaching Assistant, *University of Texas at Dallas* (Fall 2006 – Spring 2010)
- Anatomy & Physiology I & II – Summer 2006 to Spring 2008, Fall 2008
- Microbiology Laboratory – Summer 2008, Summer 2009, Spring 2010
- Protein and Structural Biology – Fall 2009

Guest Lecturer (Biochemistry) *Department of Chemistry, Case Western Reserve University*
- Chem 328/428 (Introductory Biochemistry) Fall 2013, Fall 2014, Fall 2015, Fall 2017

Instructor – Lecture Series *CSIR-IGIB*
- Chemistry for Biologists
  - Sep – Dec 2022: 8 lectures
  - Feb – May 2024: 5 lectures
  - Feb – May 2025: 8 lectures

Training and Mentorship | IGIB

PhD students, Postdoctoral Fellows, Project Associates, and Master's Thesis Trainees

PhD Student (Co-guided with Dr. Souvik Maiti):
- Ajit Kumar – SRF (Feb 2022 – Dec 2024); *PhD defended, Dec 2024*

Postdoctoral Fellow:
- Tania Ray – Postdoc (July 2021 – Jan 2022)

Project Associates / JRFs / Master 's-level Researchers:

- Tarun Kumar – Project Associate (Sep 2020 – Feb 2021)
- Purba Daripa – Project Associate (June 2022 – June 2024); *Pursuing PhD in Germany*
- Kaiser Rasool – Project Associate (Sep 2023 – Sep 2024);*Pursuing PhD from USA*
- Shalini Mishra – Project Associate (Sep 2023 – Feb 2025); *Pursuing PhD Austria*
- Sachin Mural – JRF (Jan 2024 – Oct 2024)
- Shwetha Jash – Project Associate (Dec 2024 – June 2025)
- Priyanka Kumari – Project Associate (Sep 2024 – Present)
- Shubham Thakur -Project Associate (July 2025-March 2026)

Master's Thesis / Summer Trainees:

- Nandini Mukherjee – BITS Pilani (May 30 – Aug 5, 2023)
- Gyana Ranjan Putel – Central University of South Bihar (Jan 15 – May 5, 2024)
- Basab Bijayee Bera – University of Kalyani (Mar 30 – July 31, 2024)
- Sakshi Kansa – DCRUST, Murthal (Aug – Sep 2024)
- Shweta Jash – BHU (Aug – Nov 2024)
- Ankita Dash – Siksha 'O' Anusandhan, Bhubaneswar (Jan 1 – June 2, 2025)
- Shubham Thakur – Jamia Hamdard University (Jan 1 – June 30, 2025)
- Om Vilas Mutyalwar – SGBAU, Amravati (June 6 – Aug 6, 2025)

<u>Conferences & Presentations</u>:

- Invited talk webinar guest speaker in one of the Yearly webinar series of Nannotemper (3rd October 2025). Integrated Biophysical Approaches to Investigate Biomolecular Interactions: From Structural Insights to Functional Mechanism.
- Invited talk in Cell & Molecular Biology workshop shop 18th-23rd August 2025 (August 19th 2025) IGIB Integrated Biophysical Approaches to Investigate Biomolecular Interactions: From Structural Insights to Functional Mechanism.
- Symposium on "Droplets and Condensates in Biological Systems" at CSIR-IGIB on 11th December 2023.
- Frontiers in Genome Engineering 2023" being organized in Goa from November 14-16, 2023". Unraveling the effect of temperature and osmolytes on the thermodynamic interactions of Cas9 RNA/DNA complexes.
- Invited talk DBT NIBMG-CSIR IGIB conclave July 7-8 2023 "Insights into the Molecular Mechanism of interactions between Helix-12 of lncRNA HOTAIR and hnRNPB1".
- Invited talk at ICGEB New Delhi Student seminar series May 2023 "Insights into the Molecular Mechanism of interactions between Helix-12 of lncRNA HOTAIR and hnRNPB1".
- IBRO regulatory RNAs and the Brain: development to disease" Jan 20th to 25th, 2021. To understand the spicing mechanism of HIV.
- Structural biology Related to HIV/AIDS NIH Bethesda Maryland (2017).
- Structural biology Related to HIV/AIDS NIH Bethesda Maryland (2016). RNA specificity of HIV splicing factor revealed by global analysis of its binding landscape. (Abstract & Poster)
- Structural biology Related to HIV/AIDS NIH Bethesda Maryland (2015). Solution Structure of the HIV Intronic Splicing Silencer (ISS). (Abstract & Poster)
- Great Lakes Regional NMR symposium (2015). Solution Structure of the HIV Intronic Splicing Silencer (ISS). (Abstract & Poster)

- CRNA NMR Workshop held in Ann Arbor, Michigan, April 13-14, 2015.
- Rustbelt RNA meeting Pittsburgh, PA (2014). Phylogenetic, Structural and thermodynamic insight HIV-1 Intronic splicing silencer (ISS). (Oral Presentation)
- Center for HIV RNA studies (CRNA) trainees seminar (July/2014). Solving NMR structure of RNA
  Intronic Splicing Silencer (ISS) from sequence.
- Structural biology Related to HIV/AIDS NIH Bethesda Maryland (2014). Structural characterization of the Intronic Splicing Silencer (ISS) of HIV-1 using NMR. (Abstract & Poster)
- Finger Lakes RNA Conference New york (2013). Structural characterization of the Intronic Splicing Silencer (ISS) of HIV-1 using NMR. (Abstract & Poster)
- Rustbelt RNA meeting Cleveland, Ohio (2013). Structural characterization of the Intronic Splicing Silencer (ISS) of HIV-1 using NMR. (Abstract & Poster)
- CRNA meeting Ann Arbor Michigan (2013).
- Rustbelt RNA meeting Dayton, Ohio (2011).
- Annual Chemistry-Biology symposium, University of Texas at Dallas (2008-2009). *The Heterogeneity and Dynamics of Ligand Recognition Mode in Purine-Sensing Riboswitches*. (Abstract & poster)
- 12th annual RNA society meeting, Madison, Wisconsin (2007). Probing conformational dynamics of GNRA tetraloop- receptor complex with femtosecond dynamics. (Abstract & poster)
- Annual Chemistry-Biology symposium, University of Texas at Dallas (2007). Analyzing the Tertiary Interactions between GAAA tetraloop and receptor with femtosecond dynamics. (Abstract & poster)

Academic & Scientific Engagements:

Conferences and Talks Organized:

- Organized invited talks by leading scientists including:
- Played key roles in organizing major scientific meetings:
  - IGIB–ACTREC Tata Memorial Centre Conference (May 23–24, 2023)
  - CSIR-IGIB "One Week One Lab" (OWOL) Program (Sept 18–23, 2023)
  - IGIB–NIBMG Conclave (April 19–20, 2024)

Lab Management & Mentoring:

- Oversaw day-to-day lab operations and procurement (2013–2018)
- Established an RNA fluorescence facility in collaboration with the PI
- Mentored and trained students from various programs:
  - ACS SEED Summer Program (2014, 2015, 2017)
  - Welch Summer Scholars (2009)
  - Graduate, undergraduate, and high school students on lab projects and techniques