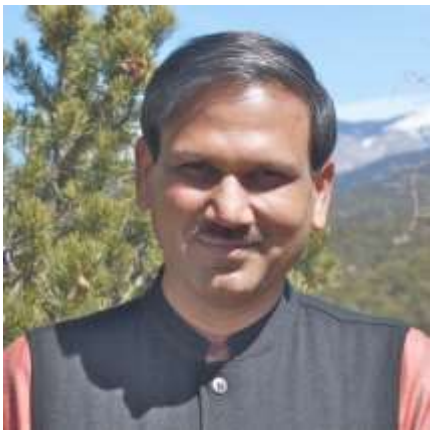
University Faculty Details Page on DU Web-site

Title	Prof.	First Name	Sanjay	Last Name	Jain	Photograph
Designation		Professor				
Department		Department of Physics and Astrophysics				
Address (Campus)		Room No. 153, Multistorey Block, Department of Physics and Astrophysics, University of Delhi, Delhi 110 007				
(Residence)		51 Bharati Artists Colony, Vikas Marg, Delhi 110 092				
Phone No (Campus)		+91-11-2766 7725 (Extn. 1342)				
(Residence)optional		+91-11-2245 6389				
Mobile		+91-98731 20534				
Fax		+91-11-2766 7061				
Email		jain@physics.du.ac.in, jain_physics@yahoo.co.in				
Web-Page		http://people.du.ac.in/~jain/				

Education

Subject	Institution	Year	Details
Ph.D. Theoretical Physics	**Tata Institute of Fundamental Research, Mumbai**	**1987**	Thesis topic: **Conformally invariant field theory in two dimensions and strings in curved spacetime.**
M.Sc.	**Department of Physics and Astrophysics, University of Delhi**	**1981**	Subjects: **Physics**
B.Sc. (Honours)	**St. Stephen's College, University of Delhi**	**1979**	Subjects: **Physics**

Career Profile

Organisation / Institution	Designation	Duration	Role
Physics Department, Brown University	**Research Associate**	**1987 - 1990**	**Research**
Physics Department, Harvard University	**Research Associate**	**1990 - 1992**	**Research**

Centre for Theoretical Studies, Indian Institute of Science	**Assistant Professor Associate Professor**	**1992 - 2000 2000 - 2004**	**Research & Teaching**
Santa Fe Institute	**Visiting Professor (on sabbatical leave from Indian Institute of Science)**	**1999 - 2000**	**Research**
Department of Physics and Astrophysics, University of Delhi	**Professor**	**2002 - present**	**Teaching & Research**
Institute for Advanced Study, Princeton	**Member (on sabbatical leave from University of Delhi)**	**Jan - Aug2016**	**Research**
Institute for Advanced Study, Princeton	**Addie and Harold Member (on sabbatical leave from University of Delhi)**	**Sept - Oct 2016**	**Research**
University of Delhi	**Head, Department of Physics and Astrophysics**	**Nov 2016 - present**	**Administration**

Research Interests / Specialization

- **Theoretical systems biology**
- **Structure and dynamics of complex networks, including chemical, biological, and socio-economic networks**
- **Mathematical modeling of complex adaptive systems, evolutionary mechanisms**
- **Models of non-equilibrium statistical mechanics**
- **Nonlinear dynamics, random matrix models and quantum chaos**
- **Quantum field theory, superstring theory and quantum gravity**

Teaching Experience (Subjects/Courses Taught)

At University of Delhi

- **Complex Systems and Networks**
- **Statistical Mechanics**
- **Classical Mechanics**
- **Quantum Mechanics I, II**
- **Radiation Theory**
- **Waves and Optics Laboratory**

At Indian Institute of Science

- **Classical Mechanics**
- **Electromagnetic Theory**
- **Statistical Mechanics**
- **Quantum Field Theory - For preliminary SERC School in High Energy Physics.**

Honors & Awards

- **Addie & Harold Broitman Member, Simons Center for Systems Biology, Institute for Advanced Study, Princeton, USA (Sept – October 2016).**
- **Fellow, Indian Academy of Sciences, Bangalore, India.**
- **Member of the External Faculty, Santa Fe Institute, Santa Fe, NM, USA (2000-2006, 2007-present).**
- **Senior Associate of the International Centre for Theoretical Sciences - TIFR, Bangalore (since 2013)**
- **Honorary Faculty Member, Condensed Matter Theory Unit, Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore, India (1995-2014).**
- **Associate Member of the Abdus Salam International Centre for Theoretical Physics, Trieste (1996-2003)**
- **Recipient of National Science Talent Scholarship, 1976**

Publications (LAST FIVE YEARS)

In Indexed/ Peer Reviewed Journals

Year of Publication	Title	Journal	Co-Author
2012	The origin of large molecules in primordial autocatalytic reaction networks	*PLoS One* 7(1): e29546. DOI:10.1371/journal. pone.0029546	Varun Giri
2013	Flux-based classification of reactions reveals a functional bow-tie organization of complex metabolic networks	*Phys. Rev.* E 87, 052708 (2013).	S.Singh, A.Samal, V. Giri, S. Krishna and N.Raghuram
2013	Bistability in a model of early B cell receptor activation and its role in tonic signaling and system tunability	*Mol. BioSyst.*,9, 2498-2511, (2013). DOI:10.1039/ C3MB70099B	Srikanth R. and K.V. Rao
2013	A genome-wide association study reveals ARL15, a novel non-HLA susceptibility gene for Rheumatoid arthritis in north Indians	*Arthritis & Rheumatism*, 2013, DOI:10.1002/art. 38110	S. Negi et al
2014	Genome-wide association scan in north Indians reveals three novel HLA-independent risk loci for ulcerative colitis	*Gut,* doi:10.1136/. gutjnl-2013-306625	G. Juyal et al
2014	Genome-wide analysis of methotrexate pharmacogenomics in rheumatoid arthritis shows multiple novel risk variants and leads for TYMS regulation	P*harmacogenetics. and Genomics* 24, 211-219 (2014)	S. Senapati et al
2016	Analytic derivation of bacterial growth laws from simple intracellular chemical dynamics	TheorBiosci, pp1-10, DOI:10.1007/ s12064-016-0227-9	P.P Pandey
2018	Modelling the cost and benefit of proteome regulation In a growing bacterial cell	Phys Biology (2018) DOI: 10.1088/1478-3975/aabe43	P.Sharma and P.P Pandey
2018	Feedbacks from the metabolic network to the genetic. Reveal regulatory modules in E.Coli and B. Subtilis	PLoS ONE 13(10): DOI:10.1371/journal .pone.0203311	S.Kumar and S.Mahajan

Articles

Book Chapters

1. **Can we recognize an innovation?: Perspective from an evolving network model**
   S. Jain and S. Krishna, in *Econophysics and Sociophysics: Trends and Perspectives*, edited by B. K. Chakrabarti et al (Wiley-VCH, Weinheim, 2006), p. 561-592. Reprinted in *Principles of Evolution* edited by H. Meyer-Ortmanns and S. Thurner (Springer-Verlag, Berlin Heidelberg 2011), p. 145-173.

Conference Presentations

1. **International Conference on Mathematical and Theoretical Biology, at VITS Hotel Pune, January 23-27, 2012, organized by IISER Pune and The Society for Mathematical Biology.**
   Invited talk: The large scale genetic regulatory network of E. Coli: Implication for system level robustness
2. **Workshop on Social Networks, February 20-24, 2012, at IMSc Chennai.**
   Invited talk: Complex systems and social networks: Modeling Innovation and economic growth through evolving networks
3. **16th Popli Memorial Lectures, at St. Stephen's College, Complex systems and Networks, February 29-March 2, 2012.**
4. **International Conference on Networks in Biology, Social Sciences and Engineering, July 12-14, 2012, at IISc Bangalore.**
   Invited talk: : Nested autocatalytic networks: A mechanism for the primordial origin of large molecules
5. **Summer School on "DNA Dynamics and Life Strategies", August 12-18, 2012, at Humlebaek, Denmark.**
   Invited talk: Structure and dynamics of feedback in the large scale genetic regulatory network of E. Coli
6. **Winter School on Quantitative Systems Biology, November 26 – December 7, 2012, at International Centre for Theoretical Physics, Trieste, Italy.**
   Invited talk: Structure and dynamics of feedback in the large scale genetic regulatory network of E. Coli
7. **Symposium on Complex Systems from Physics to Biology, October 15-16, 2013, at Jawaharlal Nehru University, New Delhi.**
   Invited talk: Feedback and modularity in intracellular biochemical networks
8. **Instructional School on Mathematical and Computational Biology, May 15-29, 2014, at IISER Mohali**
   Invited lecture series: Introduction to Networks
9. **Workshop on the Economy of a Cell: Resource Allocation, Trade-Offs and Efficiency in Living Systems, 23-27 June 2014, at International Centre for Theoretical Physics, Trieste, Italy**
   Invited talk: Balanced growth in toy mathematical models of growing-dividing cells
10. **International Conference on Mathematical and Computational Biology, February 28 – March 2, 2015, at IIT Kanpur**
    Invited talk: Self-organization in models of cell growth and division
11. **Interdisciplinary Conference on the Science and Applications of Networks, March 20-22, 2015, Shiv Nader University**
    Invited talk: Self-organization in intracellular biochemical networks of growing-dividing cells
12. **Workshop and Summer School on Models of Life, August 2-8, at Humlebaek, Denmark**
    Invited talk: Growth-division dynamics and global regulation in bacteria
13. **String Theory: Past and Present, Jan 11-13 2017, ICTS, Bangalore**
    Invited talk: Growth dynamics and size fluctuations of bacterial cells
14. **Discussion Meeting on Emergence and Evolution of Biological Complexity, Feb 4-6 2017, National Centre for Biological Sciences, Bangalore**
    Invited talk: Emergence of complexity in pre-biotic chemical evolution: Some mathematical models
15. **National Conference on Mathematical and Theoretical Biology, March 16, 2017, Jadavpur University**
    Invited talk: Deterministic and stochastic attractors of cell growth dynamics
16. **Symposium on Applied Mathematics March 21 -22, St.Stephen's College, University of Delhi**
    Invited talk: Mathematical biology: Dynamics of cell growth and division
17. **Lectures on fluid mechanics, statistical physics and nonlinear dynamics, March 28,2017, Harish Chandra Institute (HRI), Allahabad**
    Invited talk: Deterministic and stochastic dynamics of growing-dividing cells
18. **5th DST Inspire Internship Camp, April 26-30 2017, Punjab University, Chandigarh**
    Invited talk: The origin of life problem: Some mathematical insights
19. **One Day Symposium on Network Biology, Oct 28 2017, IIIT, Delhi**
    Invited talk: Hierarchy, feedback and modularity in bacterial genetic-metabolic regulatory network
20. **Complexity Science Hub Workshop on Adaptive and Co-evolving Networks and Catastrophes, Nov 2-3,2017, Vienna**
    Invited talk: Network anatomy of innovation and catastrophe in an evolutionary model
21. **International Workshop on Economy as a Complex Systems IV: Can Economics be a Physical Science? Nov 13-14,2017, Institute of Mathematical Sciences, Chennai**
    Invited talk: Network anatomy of innovation: Growth and creative destruction in an evolutionary model
22. **Joint Conference Econophysics-2017 and Asia Pacific Econophysics Conference-2017, Nov 15-18 2017, Jawaharlal Nehru University, Delhi**
    Invited talk: Network anatomy of innovation: Growth and creative destruction in an evolutionary model
23. **National Conference on Cross-disciplinary Applications of Complex Networks, March 22-24 2018, Shiv Nadar University, Uttar Pradesh**
    Invited talk: Interactions between two intracellular networks reveal functional modules in the cell
24. **Conference on Nonlinear Systems and Dynamics, Oct 11-14 2018, Jawaharlal Nehru University, Delhi**
    Invited talk: System level dynamics of growing and dividing cells through coarse grained models

Total Publication Profile optional
In Indexed/ Peer Reviewed Journals **40 publication in Journals**
Articles **4 book chapters** **3 conference proceedings**
Conference Presentations
Public Service / University Service / Consulting Activity
• **Member of Governing body of several colleges** • **Member of selection committees for appointment/promotion of college principals and teachers** • **Vice-Chancellor's nominee in DRC of Department of Geology and BRS of Faculty of Inter-disciplinary sciences** • **Member of several committees of University including Academic Council, Standing Committee for Academic Affairs & other committees.**
Professional Societies Memberships
Projects (Major Grants / Collaborations)
• **Co-investigator, project titled "Pre-evolutionary processes in autocatalytic RNA networks", funded by CEFIPRA (Indo French Centre for Promotion of Advanced Research).** • **Co-investigator, DBT COE project titled "Whole Genome Association Analyses in Complex Diseases: An Indian Initiative", 2008 – present** • **Delhi Node Coordinator, National Network in Mathematical and Computational Biology, funded by Science and Engineering Research Board, GOI, 2013 -- present**
Other Details

Membership of Editorial Boards of Journals:

- **Member of the Editorial Board of *Theory in Biosciences* (Elsevier).**
- **Member of the Editorial Board of *Artificial Life* (MIT Press).**

Ph.D. students supervised:

- **Sandeep Krishna (presently Associate Professor at the National Centre for Biological Sciences, Bangalore)**
- **AreejitSamal (presently Reader at the Institute of Mathematical Sciences, Chennai)**
- **Shalini Singh (presently Education Officer, University Grants Commission, New Delhi)**
- **Varun Giri (presently Postdoctoral Researcher at University of Saarland, Saarbrucken, Germany)**
- **Srikanth Ravichandran (presently Research Associate at University of Luxembourg, Luxembourg)**
- **ParthPratim Pandey (presently Post-Doctoral Fellow at University of Illinois at Urbana-Champaign, USA)**
- **Santhust Kumar (presently Post-Doctoral Fellow at Jacobs University, Bremen, Germany)**
- **Pooja Sharma (presently Guest Lecturer at Shaheed Rajguru College of Applied Sciences for Women)**

Organization of conferences:

- **Member - Scientific Advisory Committee: Winter School on Quantitative Systems Biology, 2016-18, ICTP, Trieste & ICTS, Bangalore.**
- **Member – Organizing Committee: Winter School on Quantitative Systems Biology, December 7-20, 2015, International Centre for Theoretical Sciences, Bangalore.**
- **Member – Scientific Committee: Winter School on Quantitative Systems Biology, December 1-12, 2014, International Centre for Theoretical Physics, Trieste, Italy.**
- **Member – Organizing Committee: Winter School on Quantitative Systems Biology, December 8-20, 2013, International Centre for Theoretical Sciences, Bangalore.**
- **Member – Organizing Committee: School and International Conference on Networks in Biology, Social Science and Engineering, July 2-14, 2012, Indian Institute of Science, Bangalore.**
- **Member - Programme Committee: European Conference in Complex Systems 2007 (ECCS'07), 1-5 October, 2007 at Dresden, Germany.**
- **Member - Programme Committee: European Conference in Complex Systems 2006 (ECCS'06), 25-29 September, 2006 at Oxford University, UK.**
- **Convener: Millennium Meeting on String Theory, 3-7 January, 2000 at Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Indian Institute of Science Campus, Bangalore**