

CURRICULUM VITAE OF KAVITA JAIN

October 17, 2025

Theoretical Sciences Unit

Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR),

Bangalore, India

<https://www.jncasr.ac.in/jain/>

CURRENT RESEARCH INTERESTS

Theoretical Population Genetics

Adaptive dynamics of asexual populations; evolutionary dynamics of complex traits

Nonequilibrium Statistical Physics

Slow quench dynamics of classical and quantum systems; active matter

EMPLOYMENT

since 2019 Professor, Theoretical Sciences Unit, JNCASR, Bangalore

2013-2019 Associate Professor, Theoretical Sciences Unit, JNCASR, Bangalore

2007-2013 Faculty Fellow ¹, Theoretical Sciences Unit, JNCASR, Bangalore

EDUCATION

1992-1995 B.Sc.(Hon) in physics, Miranda House, University of Delhi

1995-1997 M.Sc. in physics, University of Delhi

1997-2003 Ph.D. in theoretical physics, Tata Institute of Fundamental Research (TIFR), Mumbai

2003-2005 Postdoctoral Fellow, University of Köln, Germany

2005-2007 Postdoctoral Fellow, Weizmann Institute of Science, Israel

¹also at Evolutionary and Organismal Biology Unit

OTHER PROFESSIONAL ACTIVITIES

Training and mentoring²

Postdoctoral fellows	1 (1)
Ph.D./Int Ph.D. students	3 (7)
GRIP students	1 (0)
SRFP students	0 (20+)

Academic and community service³

Assoc Editor	Journal of Evolutionary Biology (2023-24) Evolution (2022-24) Genetics (Genetics Society of America) [since 2020]
Co-organizer	Program on polygenic adaptation, ICTS Bangalore (2024) Symposium at the 3rd AsiaEvo conference, NUS Singapore (2023)
Reviewer	Several international physics and biology journals Ph.D. thesis submitted to physics and biology departments in India Tenure and promotion applications
WiS ⁴ activities	Member, “Gender in Physics Working Group”, CMP group (2025-26)

Invited talks³ and lectures[†]

2025	Physics Colloquium “First-passage Problems in Biological Evolution”, IISER Pune “Extremal Statistics in Biology”, ESI Vienna “Modeling and Theory in Population Biology”, NITMB Chicago
2024	“New Ideas in Molecular Evolution”, IISER Trivandrum Edinburgh Statistical Physics and Complexity webinars “6th Bangalore School on Population Genetics and Evolution”, ICTS Bangalore [†]
2023	“Steady State Phenomena in Soft Matter, Active and Biological Systems”, SNBNCBS Kolkata “Aditi Simha Memorial Symposium on Soft Matter Physics”, IIT Madras “Honouring the Past and Embracing the Future: Centenary Celebration”, University of Delhi

²Current (Past)

³Selected list

⁴Women in Science

COMPLETE LIST OF PUBLICATIONS

(* indicates equal contribution)

Preprints

- [1] K. Jain and H. Sumuni. *Dynamics of fixation probability in a population with fluctuating size*. [arXiv:2508.18828](#)
- [2] K. Jain. *Evolutionary dynamics under demographic fluctuations: beyond the effective population size*. [bioRxiv:2025.04.12.648494](#)
- [3] A. Devi and K. Jain. *Polygenic adaptation dynamics in large, finite populations*. [bioRxiv:2023.01.25.525607](#)

In Journals

- [1] S. Kaushik*, K. Jain* and P. Johri. *Genetic diversity during selective sweeps in non-recombining populations*. [Genetics xxx, iyaf142 \(2025\)](#)
- [2] L. Jindal and K. Jain. *Scaling regimes in slow quenches within a gapped phase*. [Phys. Rev. B 112 \(5\), 014419 \(2025\)](#)
- [3] K. Jain* and S. Chatterjee*. *Run-and-tumble particle with saturating rates*. [Phys. Rev. E 110, 064110 \(2024\)](#)
- [4] T. Chakraborty, P. Pradhan and K. Jain. *Current fluctuations in symmetric zero-range process below and at critical density*. [Phys. Rev. E 110, L052103 \(2024\)](#)
- [5] L. Jindal and K. Jain. *Kibble-Zurek scalings and coarsening laws in slowly quenched classical Ising chains*. [Phys. Rev. E 109 \(5\), 054116 \(2024\)](#)
- [6] K. Jain and S. Kaushik. *Joint effect of changing selection and demography on the site frequency spectrum*. [Theo. Pop. Biol. 146, 46-60 \(2022\)](#)
- [7] S. Kaushik and K. Jain. *Time to fixation in changing environments*. [Genetics 219 \(3\), iyab148 \(2021\)](#)
- [8] Priyanka, S. Chatterjee and K. Jain. *Slow quench dynamics in classical systems: kinetic Ising model and zero-range process*. [J. Stat. Mech. 033208 \(2021\)](#)
- [9] A. Devi and K. Jain. *The impact of dominance on adaptation in changing environments*. [Genetics, 216, 227–240 \(2020\)](#)
- [10] K. Jain and A. Devi. *Evolutionary dynamics and eigenspectrum of confluent Heun equation*. [J. Phys. A: Math. Theor. 53 395602 \(2020\)](#)

- [11] K. Jain. *Interference effects of deleterious and beneficial mutations in large asexual populations*. [Genetics](#), 211, 1357-1369 (2019)
- [12] K. Jain and A. Devi. *Polygenic adaptation in changing environments*. [EPL](#) 123, 48002 (2018)
- [13] K. Jain and W. Stephan. *Modes of rapid polygenic adaptation*. [Mol. Biol. Evol.](#) 34, 3169 (2017)
- [14] K. Jain and W. Stephan. *Rapid adaptation of a polygenic trait after a sudden environmental shift*. [Genetics](#) 206, 389 (2017) [Highlighted Article](#)
- [15] K. Jain and A. James. *Fixation probability of a nonmutator in a large population of asexual mutators*. [J. theor. Biol.](#) 433, 85 (2017)
- [16] Priyanka and K. Jain. *Critical dynamics of classical systems under slow quench*. [EPL](#) 116, 26003 (2016) [EPL Highlights of 2016](#)
- [17] Priyanka and K. Jain. *Critical dynamics of the jamming transition in one-dimensional nonequilibrium models*. [Phys. Rev. E](#) 93, 042104 (2016)
- [18] K. Jain and S. John. *Deterministic evolution of an asexual population under the action of beneficial and deleterious mutations on additive fitness landscapes*. [Theo. Pop. Biol.](#) 112, 117 (2016)
- [19] A. James and K. Jain. *Fixation probability of rare nonmutator and evolution of mutation rates*. [Ecology and Evolution](#) 6, 755 (2016)
- [20] S. Hameed, K. Jain and A. Lakshminarayanan. *Real eigenvalues of non-Gaussian random matrices and their products*. [J. Phys. A: Math. Theor.](#) 48, 385204 (2015)
- [21] K. Jain and W. Stephan. *Response of polygenic traits under stabilizing selection and mutation when loci have unequal effects*. [G3: Genes, Genomes, Genetics](#) 5, 1065 (2015)
- [22] S. John and K. Jain. *Effect of linkage on the equilibrium frequency of deleterious mutations*. [J. theor. Biol.](#) 365, 238 (2015)
- [23] Priyanka, A. Ayer and K. Jain. *Two-point correlation function of an exclusion process with hole-dependent rates*. [Phys. Rev. E](#) 90, 062104 (2014)
- [24] B. Charlesworth and K. Jain. *Purifying selection, drift and reversible mutation with arbitrarily high mutation rates*. [Genetics](#) 198, 1587 (2014)
- [25] S. Seetharaman and K. Jain. *Length of adaptive walk on uncorrelated and correlated fitness landscapes*. [Phys. Rev. E](#) 90, 032703 (2014)
- [26] S. Seetharaman and K. Jain. *Adaptive walks and distribution of beneficial fitness effects*. [Evolution](#) 68, 965 (2014)

- [27] K. Jain and A. Nagar. *Fixation of mutators in asexual populations: the role of genetic drift and epistasis*. [Evolution 67, 1143 \(2013\)](#)
- [28] K. Jain. *Number of adaptive steps to a local fitness peak*. [EPL 96, 58006 \(2011\)](#)
- [29] K. Jain and S. Seetharaman. *Multiple adaptive substitutions during evolution in novel environments*. [Genetics 189, 1029 \(2011\)](#)
- [30] K. Jain and S. Seetharaman. *Nonlinear deterministic equations in biological evolution*. [J. Nonlin. Math. Phys. 18, 321 \(2011\)](#)
- [31] K. Jain. *Extreme value distributions for weakly correlated fitnesses in block model*. [J. Stat. Mech. P04020 \(2011\)](#)
- [32] K. Jain, J. Krug and S.-C. Park. *Evolutionary advantage of small populations on complex fitness landscapes*. [Evolution 65, 1945 \(2011\)](#)
- [33] S. Seetharaman and K. Jain. *Evolutionary dynamics on strongly correlated fitness landscapes*. [Phys. Rev. E 82, 031109 \(2010\)](#)
- [34] K. Jain. *Time to fixation in the presence of recombination*. [Theo. Pop. Biol. 77, 23 \(2010\)](#)
- [35] K. Jain, A. Dasgupta and G. Das. *Exact and limit distributions of the largest fitness on correlated fitness landscapes*. [J. Stat. Mech. L10001 \(2009\)](#)
- [36] A. Nagar and K. Jain. *Exact phase diagram of quasispecies model with mutation rate modifier*. [Phys. Rev. Lett. 102, 038101 \(2009\)](#)
- [37] R. Marathe, K. Jain and A. Dhar. *Particle current in symmetric exclusion process with time-dependent hopping rates*. [J. Stat. Mech. P11014 \(2008\)](#)
- [38] K. Jain. *Loss of least-loaded class in asexual populations due to drift and epistasis*. [Genetics 179, 2125 \(2008\)](#)
- [39] K. Jain, F. Bouchet and D. Mukamel. *Relaxation times for unstable states in long-ranged systems*. [J. Stat. Mech. P11008 \(2007\)](#)
- [40] K. Jain. *Evolutionary dynamics of the most populated genotype on rugged fitness landscapes*. [Phys. Rev. E 76, 031922 \(2007\)](#)
- [41] K. Jain, R. Marathe, A. Chaudhuri and A. Dhar. *Driving particle current through narrow channels using classical pump*. [Phys. Rev. Lett. 99, 190601 \(2007\)](#)
- [42] K. Jain and J. Krug. *Deterministic and stochastic regimes of asexual evolution on rugged fitness landscapes*. [Genetics 175, 1275 \(2007\)](#)
- [43] K. Jain. *Simple sandpile model of active-absorbing state transitions*. [Phys. Rev. E 72, 017105 \(2005\)](#)

- [44] [K. Jain](#). *Nonuniversal exponents in sandpiles with stochastic particle number transfer*. [Europhys. Lett.](#) **71**, 8 (2005)
- [45] [K. Jain](#) and J. Krug. *Evolutionary trajectories in rugged fitness landscapes*. [J. Stat. Mech.](#) P04008 (2005)
- [46] [K. Jain](#) and M. Barma. *Dynamics of a disordered, driven zero range process in one dimension*. [Phys. Rev. Lett.](#) **91**,135701 (2003)
- [47] R. D. Willmann, G. M. Schütz and [K. Jain](#). *Diffusion in a generalized Rubinstein-Duke model of electrophoresis with kinematic disorder*. [Phys. Rev. E](#) **67**, 061806 (2003)
- [48] M. Barma and [K. Jain](#). *Locating the minimum: Approach to equilibrium in a disordered, symmetric zero range process*. [Pramana-J. Phys.](#) **58**, 409 (2002)
- [49] [K. Jain](#) and M. Barma. *Phases of a conserved mass model of aggregation with fragmentation at fixed sites*. [Phys. Rev. E](#) **64**, 016107 (2001)

In Proceedings

- [1] [K. Jain](#). *Adaptation dynamics of the quasispecies model*. [Pramana](#) **71**, 275 (2008)
- [2] J. Krug and [K. Jain](#). *Breaking records in the evolutionary race*. [Physica A](#) **358**, 1 (2005)

In Books

- [1] [K. Jain](#) and J. Krug. *Adaptation in simple and complex fitness landscapes*. Structural approaches to sequence evolution: Molecules, networks and populations, ed. by U. Bastolla, M. Porto, H.E. Roman and M. Vendruscolo (Springer Berlin, 2007)