CV of Rajaram Swaminathan

Name: Dr. Rajaram Swaminathan
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Indian Institute of Technology Guwahati
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Education (degree onwards) & Professional Career

Institution Place	Degree	Year
A. M. Jain College, Chennai, Madras University	Bachelor of Science, Chemistry	1988
Indian Institute of Technology, Bombay	Master of Science, Biotechnology	1990
Tata Institute of Fundamental Research, Mumbai	Ph. D.	1996

Institution Place	Position	Year
University of California, San Francisco, USA	Postdoctoral Fellow	1995-98
National Centre for Ultrafast Processes, Chennai	Project Associate	1998-99
Indian Institute of Technology, Guwahati	Faculty	1999-

List of journal publications **ORCID ID: 0000 0003 1294 8379**

1. **Swaminathan, R**., N. Periasamy, J. B. Udgaonkar and G. Krishnamoorthy (1994). Molten globule-like conformation of barstar: a study by fluorescence dynamics. *J. Phys. Chem.* 98, 9270-9278.
2. **Swaminathan, R**., G. Krishnamoorthy and N. Periasamy (1994). Similarity of fluorescence lifetime distributions in single tryptophan proteins in the random coil state. *Biophys. J.* 67, 2013-2023.
3. **Swaminathan, R.** and N. Periasamy (1996). Analysis of fluorescence decay by the maximum entropy method: influence of noise and analysis parameters on the width of the distribution of lifetimes. *Proc. Indian Acad. Sci. (Chem. Sci.)* 108:39-49.
4. **Swaminathan, R.**, U. Nath, J. B. Udgaonkar, N. Periasamy and G. Krishnamoorthy (1996). Motional dynamics of a buried tryptophan reveals the presence of partially structured forms during denaturation of barstar. *Biochemistry* 35, 9150-9157.
5. **Swaminathan, R.**, S. Bicknese, N. Periasamy and A. S. Verkman (1996). Cytoplasmic viscosity near cell plasma membrane: translational diffusion of a small fluorescent solute measured by total internal reflection-fluorescence photobleaching recovery. *Biophys. J.* 71, 1140-1151.
6. **Swaminathan, R.**, C. P. Hoang and A. S. Verkman (1997). Photobleaching recovery and anisotropy decay of green fluorescent protein GFP-S65T in solution and cells: cytoplasmic viscosity probed by GFP translational and rotational diffusion. *Biophys. J.* 72, 1900-1907.
7. Partikian, A., B. P. Olveczky, **R. Swaminathan,** Y. Li, and A. S. Verkman (1998). Rapid diffusion of green fluorescent protein in the mitochondrial matrix. *J. Cell Biol.* 140, 821-829
8. Homchaudhuri, L. and **Swaminathan, R.** (2001) Novel absorption and fluorescence characteristics of L-lysine *Chem. Lett.* 2001, 844-845.
9. Homchaudhuri, L. and **Swaminathan, R.** (2004) Near ultraviolet absorption arising from lysine residues in close proximity: A probe to monitor protein unfolding and aggregation in lysine-rich proteins. *Bull. Chem. Soc. Japan*, 77, 765-769.

10. Homchaudhuri, L., Kumar, S. and **R. Swaminathan** (2006). Slow aggregation of lysozyme in alkaline pH monitored in real time employing the fluorescence anisotropy of covalently labelled dansyl probe., *FEBS Lett.*, 580, 2097-2101.
11. Homchaudhuri, L., Sarma, N. and **R. Swaminathan** (2006). Effect of crowding by dextrans and Ficolls on the rate of alkaline phosphatase-catalysed hydrolysis: A size dependent investigation, *Biopolymers*, 83, 477-486.
12. Kumar, S. and **R. Swaminathan** (2007) Employing the fluorescence anisotropy and quenching kinetics of tryptophan to hunt for residual structures in denatured proteins. *J. Chem. Sci.*, 119, 141-145.
13. Agrawal, M., S. B. Santra, Rajat Anand and **R. Swaminathan** (2008) Effect of macromolecular crowding on the rate of diffusion-limited enzymatic reaction, *Pramana-J. Phys.* 71, 359-368.
14. Kumar, S., Atul K. Singh, G. Krishnamoorthy and **R. Swaminathan** (2008) Thioflavin T displays enhanced fluorescence selectively inside anionic micelles and mammalian cells, *J. Fluoresc.* 18, 1199-1205.
15. Kumar, S., Vijay K. Ravi and **R. Swaminathan** (2008) How do surfactants and DTT affect the size, dynamics, activity and growth of soluble lysozyme aggregates? *Biochem. J.* 415, 275-288.
16. Dash, N., F. A. S. Chipem, **R. Swaminathan,** and G. Krishnamoorthy (2008) Hydrogen bond induced twisted intramolecular charge transfer in 2-(4'-N,N-dimethylaminophenyl)imidazo [4,5-b]pyridine, Chem. Phys. Lett. 460, 119-124.
17. Kumar, S., Vijay K. Ravi and **R. Swaminathan** (2009) Suppression of lysozyme aggregation at alkaline pH by tri-N-acetylchitotriose. *Biochim. Biophys. Acta* 1794, 913-920.
18. Kumar, M. V. S. and **R. Swaminathan** (2010) A novel approach to segregate and identify functional loop regions in protein structures using their Ramachandran maps. *Proteins* 78, 900-916.
19. **Swaminathan, R.**, V. K. Ravi, S. Kumar, M. V. S. Kumar and N. Chandra (2011) Lysozyme: A model protein for amyloid research. *In Adv. Protein Chem. Struct. Biol.* Vol. 84 R. M. Donev (editor), Academic Press, 2011, pp. 63-111. ISBN: 978-0-12-386483-3
20. Prasad, S. and **R. Swaminathan** (2013) Measuring the diffusion of fluorescent dye or protein inside living cells. *Curr. Sci.* 105, 1549-1561.
21. Ravi, V. K., T. Swain, N. Chandra and **R. Swaminathan** (2014) On the characterization of intermediates in the isodesmic aggregation pathway of hen lysozyme at alkaline pH. *PLoS ONE* 9(1): e87256 doi 10.1371/journal.pone.0087256
22. Ravi, V. K., M. Goel, H. C. Kotamarthi, S. R. K. Ainavarapu and **R. Swaminathan** (2014) Preventing Disulfide Bond Formation Weakens Non-covalent Forces Among Lysozyme Aggregates. *PLoS One* 9(2): e87012 doi 10.1371/journal.pone.0087012
23. Iyer, A., A. Chandra and **R. Swaminathan** (2014) Hydrolytic enzymes conjugated to quantum dots mostly retain whole catalytic activity. *Biochim. Biophys. Acta* 1840, 2935–2943
24. Thokchom, A. K., **R. Swaminathan** and A. Singh (2014) Fluid Flow and Particle Dynamics Inside an Evaporating Droplet Containing Live Bacteria Displaying Chemotaxis. *Langmuir* 30,12144-12153
25. Somaiah C, A. Kumar, D. Mawrie, A. Sharma, S. D. Patil, J. Bhattacharyya, **R. Swaminathan**, B. G. Jaganathan (2015) Collagen Promotes Higher Adhesion, Survival and Proliferation of Mesenchymal Stem Cells. PLoS ONE 10(12): e0145068. doi:10.1371/journal.pone.0145068
26. Chhabra G, N. Chandra, **R. Swaminathan** (2017) Osmolytes: Key players in regulating protein aggregation in *Cellular Osmolytes: From Chaperoning Protein Folding to Clinical Perspectives*, L. Rajendrakumar Singh and T. A. Das (eds.), pp97—119 Springer Singapore 2017. eBook ISBN 978-981-10-3707-8**;** Hardcover ISBN 978-981-10-3706-1
27. Prasad, S., I. Mandal, S. Singh, A. Paul, B. Mandal, R. Venkatramani, **R. Swaminathan** (2017) Near UV-Visible electronic absorption originating from charged amino acids in a monomeric protein. Chem. Sci., 8, 5416—5433
28. Ansari, Mohd. Z., A. Kumar, D. Ahari, A. Priyadarshi, L. Padmavathi, R. Bhandari, **R. Swaminathan** (2018) Protein charge transfer absorption spectra: An intrinsic probe to monitor structural and oligomeric transitions in proteins. Faraday Discuss., 207, 91—113. DOI: 10.1039/C7FD00194K
29. R. Anand, M. Agrawal, V. K. S. Mattaparthi, R. **Swaminathan**, S. B. Santra (2019) Consequences of heterogeneous crowding on an enzymatic reaction: A residence time Monte Carlo approach. ACS Omega, 4, 727-736. doi: 10.1021/acsomega.8b02863

30. Ansari, Mohd. Z., **R. Swaminathan** (2020) Structure and dynamics at N- and C-terminal regions of intrinsically disordered human c-Myc PEST degron reveal a pH-induced transition. *Proteins* 88, 889-909. doi:10.1002/prot.25880
31. Kumar, Amrendra, D. Ahari, A. Priyadarshi, Mohd. Z. Ansari and **R. Swaminathan** (2020) Weak Intrinsic Luminescence in Monomeric Proteins Arising from Charge Recombination. J. Phys. Chem. B 124, 2731-2746. Doi: 10.1021/acs.jpcb.9b10071
32. Ansari, Mohd. Z., Shah Ekramul Alom, **R. Swaminathan** (2021) Ordered Structure Induced in Human c-Myc PEST region upon forming a Disulphide bonded Dimer. *J. Chem. Sci*. 133(26). DOI: 10.1007/s12039-021-01889-3
33. Singh, Anuma, G. Bhatt, N. Gujre, S. Mitra, **R. Swaminathan**, A. M. Limaye, L. Rangan (2021) Karanjin. Phytochemistry. 183:112641. doi: 10.1016/j.phytochem.2020.112641.
34. Singh, Anuma, M. Z. Ansari, S. Senthilkumar, L. Rangan, **R. Swaminathan**, (2021) Enhanced solubility, electronic absorption and fluorescence observed for Karanjin in aqueous SDS micelles compared to water. J. Photochem. Photobiol. A: Chemistry, 414:113289. doi: 10.1016/j.jphotochem.2021.113289
35. Kumar, Amrendra, Shah E. Alom, D. Ahari, A. Priyadarshi, Mohd. Z. Ansari and **R. Swaminathan** (2022) Role of Charged Amino Acids in Sullying the Fluorescence of Tryptophan or Conjugated Dansyl probe in Monomeric Proteins. Biochemistry 61, 339-353. DOI 10.1021/acs.biochem.1c00753
36. Rakesh Ruchel Khanikar, Parismita Kalita, Monika Narzary, Deepjyoti Basumatarya, Ashim Jyoti Bharati, Anurag Priyadarshi, **R. Swaminathan**, Heremba Bailunga and Kamatchi Sankaranarayanan (2022). Cold atmospheric plasma driven self-assembly in serum proteins: insights into the protein aggregation to biomaterials. RSC Adv., 12, 26211-26219. DOI: 10.1039/D2RA04318A
37. Chalapathi, D.; Kumar, A.; Behera, P.; Sathi, S.N.; **Swaminathan, R.**; Narayana, C (2022). Insights on Aggregation of Hen Egg-White Lysozyme from Raman Spectroscopy and MD Simulations. Molecules 27, 7122. DOI: 10.3390/molecules27207122
38. Priyadarshi, Anurag, Himanshi Maniram Devi and **R. Swaminathan** (2023), Disruption of Spatial Proximities among Charged Groups in Equilibrium-Denatured States of Proteins Tracked Using Protein Charge Transfer Spectra. Biochemistry https://pubs.acs.org/doi/full/10.1021/acs.biochem.3c00006
39. Alom, Shah Ekramul and **R. Swaminathan** (2023). Protein Charge Transfer Spectra in a Monomeric Protein with No Lysine (2023). Phys. Chem. Chem. Phys. https://doi.org/10.1039/D2CP05836G

Patents

Title: COST EFFECTIVE, PORTABLE OPTOELECTRONIC INSTRUMENT TO MEASURE STEADY STATE FLUORESCENCE AND ITS SET UP METHOD
Inventors: Kulkarni Alark Shripad, Harshal B. Nemade and Rajaram Swaminathan
Patent Application No.1136/KOL/2015
Patent Number: 310875, The Patent Office, Government of India.

Title: TRANSFORMING PROTEIN INTO A PRIME NUMBER SEQUENCE: ASSIGNING UNIQUE PRIME INTEGER TO EACH AMINO ACID
Inventors: Saumya Prasad and Rajaram Swaminathan
Patent Application No.: 201831038890
Patent Number: 396261, The Patent Office, Government of India.

Current Research Interests:

Protein Charge Transfer Spectroscopy and its application to investigate protein structure and function; Influence of Macromolecular Crowding on enzymatic reaction rates & equilibria; Intrinsically Disordered Proteins; Big Data analysis of the Proteomes;

Professional Activities

Member, Biophysical Society, USA
Member of the Royal Society of Chemistry, UK
Life Member, Indian Biophysical Society
Reviewer: *Journal of Fluorescence, Biotechnology Progress, Biochemistry (USA), Biopolymers, Biochimica et Biophysica Acta, Analytical Chemistry*

List of sponsored projects completed/ongoing

1) **Title:** Effect of macromolecular obstacles on the kinetics of a chemiluminescent reaction.
Funding source: Department of Science and Technology, New Delhi.
Amount: INR 5 lakhs
Start: July 2000
Status: Completed

2) **Title:** Protein Folding: Looking for residual structures in denatured proteins
Funding source: Ministry of Human Resources and Development under the Research and Development scheme
Start Date: 1 May 2003 Duration: 3.5 years
Amount; INR 14,00,000
REF: F 26.—4/2002 TS V
Status: Completed

3) **Title:** Tracking the growth of soluble protein aggregates in real time using fluorescence and subsequent manoeuvres to inhibit their growth.
Funding source: Council for Scientific and Industrial Research, New Delhi.
Start Date: 29 May 2006
Amount: INR 10,00,000
Ref: 37(1247)/06/EMR II
Status: Completed

4) **Title:** Conjugating luminescent quantum dots to proteins: Consequences on protein function and development of sensitive assays.
Funding source: Council for Scientific and Industrial Research, New Delhi.
Start date: 8 Dec 2009 **Duration:** 3 years
Ref: 37/1373/09 EMR II
Amount: INR 13,68,752
Status: Completed

5) **Title:** Protein aggregation: Early molecular events, mechanisms and inhibition
Funding source: Department of Science and Technology, New Delhi.
Start date: 1 Dec 2010 **Duration:** 3 years
Amount: INR 53,00,000
REF: SR/SO/BB-48/2009
Status: Completed

6) **Title:** Single molecule fluorescence investigations on the mechanism of lysozyme aggregation and RNA helicase activity
Funding source: Department of Biotechnology, New Delhi.
Status: Completed
Start Date: March 2011 Duration: 3 years
Amount: INR 94,75,000
REF: BT/53/NE/TBP/2010

7) **Title:** Investigating the role of protein dynamics on the function of few disordered proteins
Funding source: Department of Biotechnology, New Delhi.
Start date: 7 August 2014 **Duration: 3 years**
Amount: INR 98,20,000
REF: BT/409/NE/U-Excel/2013
Status: Completed

8) **Title:** Investigating enzymatic reactions in crowded physiological spaces AND structural changes in SARS-CoV-2-S protein in response to drug
Funding source: National Supercomputing Mission, IISc Bengaluru.
Start date: 6 April 2021 **Duration: 2 years**
Amount: INR 15,00,000
REF: DST/NSM/R&D_HPC_Applications/2021/03.27
Status: Ongoing