Digvijay Singh

digvijay.in1@gmail.com | www.digvijay.org | | PubMed.gov | | | | | |

EDUCATION

Last Updated on 12/2025

- **Ph.D. - Johns Hopkins University School of Medicine** 8/2012 - 1/2018
- **Integrated BS-MS - Indian Institute of Technology (IIT), Kharagpur** 7/2007 - 4/2012

PROFESSIONAL EXPERIENCES

Staff Scientist at Singular Genomics 9/2024 – present
- Developing and improving assays and data analysis (including use of deep-learning) to improve the quality, accuracy, & throughput of the G4x, a multi-omics platform combining transcriptomics, proteomics and pathology.

National Institute of Health-K99 fellow at University of California (UC), San Diego 2/2023 – 9/2024
- Solved structure-model of the Nuclear Basket, resulting in a highly cited *Cell* publication, authored an invited review on the Nuclear Pore Complex, & contributed to 3 diverse projects including those involving language models.

Damon Runyon fellow at UC San Diego 2/2019 – 2/2023
- Co-led a team to solve the structure-model of the Nuclear Pore Complex, resulting in another highly cited *Cell* publication, authored an authoritative book chapter on cryo-electron tomography, & elucidated condensate structures, including SARS-CoV-2–related ones, contributing to high-impact publications.

Postdoctoral and Visible Molecular Cell fellow at UC San Diego 2/2018 – 2/2019
- Revitalized a project detailing the steps of in-cell structural biology culminating in a highly cited publication.

PhD researcher at Johns Hopkins University & UIUC 6/2012 – 1/2018
- Led teams & partnered with experts including Nobel laureate Prof. Doudna to uncover molecular mechanisms of CRISPR enzymes and T4 bacteriophage, while simultaneously advancing super-resolution and single-molecule microscopy techniques, culminating in highly cited, top-tier publications.

Research intern at University of Cambridge, UK 6/2012 – 8/2012
- Generated theoretical models of multi-dimensional energy landscapes of protein folding.

Master thesis researcher at IIT, Kharagpur 8/2011 – 3/2012
- Modeled amyloid beta multimers using protein structure prediction (Rosetta). Awarded the highest grade.

Research intern at Massachusetts Institute of Technology (MIT) 5/2011 – 7/2011
- Generated a computational library of amyloid beta using molecular dynamics to study its role in neurodegeneration.

Research intern at Karlsruhe Institute of Technology, Germany 11/2010 – 12/2010
- Synthesized membrane-active peptides for NMR studies on their alignment in membranes and antibacterial action.

Research intern at University of Illinois at Urbana-Champaign 5/2010 – 7/2010
- Expressed & purified protein constructs for imaging their folding inside cells after temperature-induced unfolding.

Research Intern at Unilever 11/2009 – 12/2009
- Investigated the binding affinity of tea polyphenols with milk casein for its impact on popular tea products.

Research Intern at General Electric 4/2009 – 7/2009
- Synthesized radio-labeled antidepressants for analyzing their brain distribution through Positron Emission Tomography.

SKILLS

- **Programming, Data Science & Deep-learning**: Proficient in Python (Pandas, NumPy, SciPy) and C, with expertise in GPU-accelerated Deep Learning (Keras, PyTorch, Transformers, CNNs). Experience with HPC environments, parallel programming, and NVIDIA frameworks (e.g., CUDA, cuDNN, TensorRT).
- **Biophysics & Quantitative Imaging**: Expertise in multi-modal fluorescence imaging, including single-molecule techniques, with special emphasis on imaging for multi-omics (genomics, transcriptomics, proteomics). Skilled in other spectroscopic analysis (e.g., CD, DLS) and developing quantitative image analysis pipelines.
- **Structural Biology**: Expert in GPU-accelerated Cryo-electron Microscopy (Cryo-EM) pipelines (e.g., Relion & cryoSPARC). Proficient in a range of structural biology tools (from AlphaFold to Coot). Experienced in advanced sample preparation (cryo-FIB milling, CLEM, SEM).
- **Cell Biology & Biochemistry**: Cell culture (Bacterial, mammalian & fungal), CRISPR, Cloning, Polymerase Chain Reaction (PCR), Site-directed mutagenesis, Protein purification, Gel-electrophoresis based assays, labeling.

SELECT PRESENTATIONS (Invited or Selected): 3DEM GRC (2023), Biophysical Society Meeting (2023, 2022, 2017, 2015), Southern California cryo-EM symposium (2022), Cryo-EM workshop at Brookhaven National Lab, USA (2022, 2023), National Tomography Workshop (3 lectures & workshops each year), AIIMS, New Delhi (2022, 2023), Friends of Cell Meeting, San Diego Cluster of Institutes (2022), CRISPR Workshop at CSIR-IGIB, New Delhi (2019), Physics of Living Systems Conference (2015), Center for Physics of Living Cells Symposium, UIUC (2015).

EXPERT SERVICES, TEACHING & MENTORSHIP

- **Reviewer for:** *Nature Structural and Molecular Biology, Proceedings of the National Academy of Science, Nature Communications, Journal of Biological Chemistry, Chemical Science, Biochemistry, ACS Omega, Scientific Reports, Cellular and Molecular Life Sciences, Frontiers in Molecular Neuroscience, Frontiers in Neuroscience, Journal of Visualized Experiments.*
- **Instructor** at *Center for the Physics of Living Cells summer schools* (2013 - 2015) and **Teaching assistant** at University of Illinois (2013 - 2015).
- **Mentor for** 3 students (UC San Diego), 3 students (Johns Hopkins University)

PUBLICATIONS [20 so far; 9 first/co-first] [Citations > 2500]

Selected:

19. **D. Singh**[*], N. Soni[*], J. Hutchings[*], ..., M. Rout, A. Sali, E. Villa. The Molecular Architecture of the Nuclear Basket. *Cell* (2024). Pre-print [*]Equal Contribution
16. C. Akey[*], **D. Singh**[*], C. Ouch[*], I. Echeverria[*], ..., J. F. Martinez, S. J. Ludtke, E. Villa, M. Rout. Comprehensive structure and functional adaptations of the yeast nuclear pore complex. *Cell* (2022). Pre-print. Media-Release [*]Equal contribution
4. **D. Singh**, ..., J. A. Doudna, T. Ha. Real-time observation of DNA recognition and rejection by the RNA-guided endonuclease Cas9. *Nature Communications* (2016). Pre-print.
8. **D. Singh**, ..., T. Ha. Real-time observation of DNA target interrogation and product release by RNA-guided endonuclease CRISPR-Cpf1. *PNAS* (2018). Pre-print.
7. **D. Singh**, ..., T. Ha. Mechanism of improved specificity of engineered Cas9s revealed by single molecule analysis. *Nature Structural and Molecular Biology.* (2018). Pre-print.
15. L. Dai[*], **D. Singh**[*], ..., Y. R. Chemla, T. Ha, V. B. Rao. A viral genome packaging ring-ATPase is a flexibly coordinated pentamer. *Nature Communications* (2021). Pre-print. [*]Co-first
9. I. Okafor[*], **D. Singh**[*], Y. Wang[*], ..., T. Ha. Single molecule analysis of effects of non-canonical guide RNAs and specificity-enhancing mutations on Cas9-induced DNA unwinding. *Nucleic Acids Research* (2019). Pre-print. [*]Co-first.
18. **D. Singh**, E. Villa. Cryo-Focused Ion Beam Milling of Cells. *Springer book on Cryo-Electron Tomography* (2023).
6. **D. Singh**, T. Ha. Understanding the molecular mechanism of CRISPR toolbox using single-molecule approaches. *ACS Chemical Biology* (2018).
3. J. Fei, **D. Singh**,... , T. Ha. Single-molecule analysis of the target search kinetics of a bacterial sRNA. *Science* (2015).

Remaining:

13. H. Yu, S. Lu[†], K. Gasior[†], **D. Singh**, ..., and D. W. Cleveland. TDP-43 and HSP70 phase separate into anisotropic, intranuclear liquid spherical annuli. *Science* (2020). Pre-print.[†]Equal Contribution
12. S. Lu[*], Q. Ye[*], **D. Singh**, ..., K. D. Corbett. The SARS-CoV-2 Nucleocapsid phosphoprotein forms mutually exclusive condensates with RNA and the membrane-associated M protein. *Nature Communications* (2020). Pre-print. [*]Co-first
20. R. Hosseini[*], Y. Liang[*], **D. Singh**, ..., P. Xie. RobPicker: A Meta Learning Framework for Robust Identification of Macromolecules in Cryo-Electron Tomograms. *Biorxiv* (2025). Pre-print. [*]Co-first
11. Y. Wang, J. Mallon, H. Wang, **D. Singh**, ..., T. Ha. Real-time observation of Cas9 postcatalytic domain motions. *PNAS* (2020).
10. F. R. Wagner[*], R. Watanabe[*], R. Schampers, **D. Singh**, ..., E. Villa. Preparing samples from whole cells using focused-ion-beam milling for cryo-electron tomography. *Nature Protocols* (2020).[*]Co-first.
1. A. Dhar, K. Girdhar, **D. Singh**, ..., M. Gruebele. Different protein stability and folding kinetics in the nucleus, endoplasmic reticulum, and cytoplasm of living cells. *Biophysical Journal* (2011).
2. B. Hua, K. Y. Han, R. Zhou, H. Kim, X. Shi, S. C. Abeysirigunawarden, A. Jain, **D. Singh**, ..., T. Ha. An improved surface passivation method for single-molecule Studies. *Nature Methods* (2014).
17. B. Raveh, R. Eliasian, S. Rashkovits, D. Russel, R. Hayama, S. Sparks, **D. Singh**, ..., M. Rout, D. Cowburn, A. Sali. Integrative spatiotemporal map of nucleocytoplasmic transport. *PNAS* (2025).
5. B. Hua, Y. Wang, K. Y. Han, S. Park, **D. Singh**, ..., T. Ha. Single-molecule centroid localization algorithm improves the accuracy of fluorescence binding assays. *Biochemistry* (2018).
14. A. Poddar, M. S. Azam, T. Kayikcioglu, M. Bobrovskyy, J. Zhang, X. Ma, P. Labhsetwar, J. Fei, **D. Singh**, ..., C. K. Vanderpool, T. Ha. Effects of individual base-pairs on in vivo target search and destruction kinetics of small RNA. *Nature Communications* (2021). Pre-print.

...: Please refer to the link for complete author list.

AWARDS & FUNDING

- NIH K99-R00 Pathway to Independence Award, National Institute of Health. 2023 - 2028
- Damon Runyon Fellowship, Damon Runyon Cancer Foundation 2019 - 2023
- Virtual Molecular Cell Consortium (VMCC) Fellow, UC San Diego. 2018 - 2019
- Finalist of Damon Runyon-Dale F. Frey Award for Breakthrough Scientists 2022
- Biophysical Society Education Travel Award 2017
- Finalist of International Howard Hughes Medical Institute fellowship 2015
- Johns Hopkins Biophysics department nominee for international Weintraub Award 2018
- INSPIRE fellowship by Government of India 2008 - 2012