

MD ABUL “SHAHID”

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SUMMARY

Biotechnologist and cell biology scientist experienced in developing, optimizing, and validating fluorescence- and antibody-based cell and tissue assays that characterize drug mechanism, target engagement, and cellular response. Recently completed a Super-Resolution Imaging internship at Boehringer Ingelheim (Cardiovascular Renal Metabolic), developing and validating dSTORM and DNA-PAINT assays on kidney tissue and delivering a web-based, automated filtration slit density (FSD) analysis workflow verified in an Adriamycin (ADR) nephropathy model. Doctoral research at NC State University (Ph.D. in Fiber & Polymer Science, Minor in Biotechnology, expected 2026) develops multiplexing tools, including spectroscopic DNA-PAINT, to quantify drug-induced chromatin reorganization in cancer cells and connect nanoscale cellular readouts to pharmacodynamic-relevant responses. Proficient in mammalian cell culture, transfection, immunostaining, cloning, and protein overexpression, with quantitative image and data analysis (Picasso, CODI, ImageJ/Fiji, MATLAB), formal protocol and ELN documentation, and peer-reviewed co-authorship. Seeking a scientist role applying cell biology and quantitative assay development to target validation, mechanism-of-action, and biomarker studies.

CORE COMPETENCIES

Cell- & Tissue-Based Assay Development & Validation: Design, optimization, troubleshooting, and validation of fluorescence- and antibody-based assays; antibody titration, antigen-retrieval optimization, and cell-type marker validation; multiplexed target detection; quantitative readout development from sample preparation through analysis; control-driven, reproducible workflows.

Cell & Molecular Biology: Mammalian cell culture, transfection, immunostaining and immunohistochemistry, PCR, cloning and protein overexpression; fixed- and live-cell sample preparation; tissue-based staining and imaging workflows.

Advanced Microscopy & Imaging: Single-molecule localization microscopy (STORM, dSTORM, PALM, SPT-PALM), spectroscopic SMLM, multiplexed spectroscopic DNA-PAINT, FLIM, TIRF, widefield fluorescence, SEM, TEM; hands-on ONI Nanoimager operation, optical alignment, troubleshooting, and preventative maintenance.

Probe, Reagent & Multiplexing Tool Development: Organic synthesis of fluorescent probes and self-labeling dyes (BODIPY, cyanine–Hoechst conjugates); dye–antibody conjugation and purification; DNA origami nanostructures as calibration standards; multiplexed DNA-PAINT method development.

Quantitative Image & Data Analysis: Localization reconstruction, filtering, and quantification (Picasso, CODI, ImageJ/Fiji); single-molecule and single-particle analysis; spectral image processing; statistical analysis (MATLAB, SPSS); Monte Carlo analysis frameworks; dose- and condition-dependent interpretation with hypothesis generation and follow-up experimental design.

Automation & Scientific Software Development: AI-assisted coding; development of web-based, automated image-analysis workflows (filtration slit density quantification tool); analysis pipeline automation and data visualization.

Drug Mechanism & Disease Models: Characterization of chemotherapeutic drug–DNA interactions and drug-induced chromatin reorganization; nanoscale mechanism-of-action and pharmacodynamic-relevant readouts; phenotypic quantification.

Documentation, Communication & Collaboration: SOP and protocol authoring, ELN documentation, cross-functional and matrix teamwork, peer training and mentoring, internal and external scientific presentation, peer-reviewed co-authorship, scientific grant writing, managing multiple parallel projects.

Materials & Analytical Characterization: Electrospinning and nanofiber technology, polymer structure–property analysis, mechanical testing, NMR, mass spectrometry, spectroscopic analysis.

PROFESSIONAL EXPERIENCE

Super-Resolution Imaging Intern

06/2026 – 08/2026

Cardiovascular Renal Metabolic (CRM) Group, Boehringer Ingelheim, Ridgefield, USA

- Built and deployed an HTML-based, browser-run analysis tool that automates filtration slit density (FSD) quantification from dSTORM images of kidney tissue, eliminating a dependency on external analysis at a partner site and reducing turnaround from several weeks to days.
- Validated the tool across a 10-animal cohort spanning naive, control, and treated arms in an Adriamycin (ADR) nephropathy model, benchmarking automated FSD output against established injury readouts (%GS, %SRM, UACR); the tool is queued for group-wide adoption and was handed off with documentation to the incoming user.
- Developed, optimized, and validated cell- and tissue-based dSTORM assays on the ONI Nanoimager, expanding the antibody toolbox through titration and antigen-retrieval optimization for podocin, nephrin, synaptopodin, megalin, and WT1 in kidney tissue and TOM20 and H2B in cultured cells.
- Reduced linkage error in dSTORM by implementing an ALFA-tag single-domain nanobody labeling strategy against ALFA-tagged CX3CR1 in transfected cells, improving localization accuracy and the robustness of downstream quantitative measurements over conventional antibody labeling.

- Established two-target multiplexed dSTORM imaging and built a DNA-PAINT toolbox for cell and tissue applications, developing and validating multiplexed assays with standard kit reagents and authoring a transferable protocol for extension to additional cellular and portfolio targets.
- Trained on the Lunaphore COMET platform for sequential immunofluorescence (seqIF) multiplex imaging of FFPE tissue, including antibody panel staining and optimization.
- Delivered three independent projects in a three-month internship; authored formal protocols and ELN documentation for cross-team adoption and presented through weekly technical reviews, a department innovation meeting, and the site poster session.

Ph.D. Researcher, Fiber & Polymer Science

2022 – 2026 (exp.)

Molecular Analytics and Photonics (MAP) Lab, NC State University, USA

- Developed and validated spectroscopic DNA-PAINT enabling simultaneous four-color multiplexed detection in a single acquisition, extending high-content super-resolution assay capability beyond conventional two- to three-target workflows.
- Investigate single-molecule fluorescence spectral heterogeneity (smFLUSH) via spectroscopic SMLM (sSMLM) to improve fundamental dye design for multiplexing
- Co-developed cyanine–Hoechst hybrid conjugates (Hoechst–Cy3, Cy5, Cy7) as direct DNA-binding probes for nanoscale chromatin imaging, eliminating antibody-dependent labeling and its associated linkage error while enabling spectrally resolved multicolor visualization of chromatin organization.
- Develop and validate multiplexed cell-based imaging assays to quantify chromatin organization and nuclear architecture in mammalian cells, with applications in cancer biology and molecular diagnostics.
- Characterize chemotherapeutic drug–DNA interactions and drug-induced chromatin reorganization in cancer cells, generating nanoscale mechanism-of-action and pharmacodynamic-relevant cellular readouts.
- Quantify molecular dynamics by single-particle tracking PALM (SPT-PALM) using photoactivatable BODIPY dyes conjugated to self-labeling protein tags in live and fixed cells.
- Design and apply fluorescent probes, self-labeling dye–protein conjugates, and DNA origami nanostructures as quantitative assay components and calibration standards.
- Cloned and overexpressed ACTN1 to probe cellular structural dynamics by microscopy; designed and tested chemical probes targeting histone deacetylases (HDACs), a validated oncology drug-target class.

Graduate Teaching Assistant

08/2022 – 05/2023

Wilson College of Textiles, North Carolina State University, USA

- Independently led laboratory sessions for Introduction to Fiber Science, owning delivery from setup through instruction and assessment.
- Delivered hands-on microscopy and fiber-characterization training, instructing students in sample preparation, visualization, and fiber identification, with real-time troubleshooting that built independent instrument operation.
- Translated complex technical concepts for a diverse multidisciplinary audience and evaluated student work with constructive written feedback, reinforcing experimental rigor and reproducibility.

M.Sc. Thesis Researcher – Biomaterials & Medical Device Coatings (Erasmus Exchange)

2021 – 2022

Institute of Textile Technology, RWTH Aachen University, Germany

- Developed and validated a quantitative test method to evaluate adhesion strength of electrospun polymer nanofiber coatings on nitinol stents.
- Investigated polymer–metal interface mechanics relevant to implantable medical devices.
- Optimized surface-engineering and coating strategies to enhance performance under mechanical stress.

Graduate Research Assistant (M.Sc.)

2020 – 2022

Cukurova University, Adana, Türkiye

- Conducted structured method development, mechanical testing, and structure–property analysis of engineered polymeric, sustainable and composite materials.
- Conducted research on sustainable polymeric materials and their functional applications.

Industry Experience (Internships & Traineeships)

2017 – 2019

Northern Tosrifa Group; Modern Poly Industries Ltd.; Matin Spinning Mills Ltd., Bangladesh

- Rotated through production, quality control, and process troubleshooting in capital-intensive manufacturing; performed routine quality testing and equipment maintenance and coordinated across operations and supply-chain teams.

Undergraduate Researcher – Materials & Fiber Science

2015 – 2017

Bangladesh University of Textiles, Dhaka, Bangladesh

- Investigated structure–property relationships of bio-based polymer fibers for medical applications; gained early training in characterization, experimental design, and data analysis.

EDUCATION

Ph.D. Candidate, Fiber and Polymer Science (Minor in Biotechnology)

2022 – 2026 (exp.)

North Carolina State University, USA

TECHNICAL SKILLS

Cell & Molecular Biology: Mammalian cell culture, transfection, immunostaining, immunohistochemistry, tissue sample preparation, PCR, cloning, protein overexpression, western blotting, antibody titration, antigen retrieval, dye-antibody conjugation and purification, NanoDrop quantification.

Microscopy & Imaging: SMLM, dSTORM, PALM, SPT-PALM, spectroscopic SMLM (sSMLM), DNA-PAINT and spectroscopic DNA-PAINT, FLIM, TIRF, confocal, widefield and multicolor fluorescence microscopy, DNA origami imaging, SEM, TEM; ONI Nanoimager, Lunaphore COMET (seqIF multiplex immunofluorescence).

Chemistry & Characterization: Organic synthesis of fluorescent probes and self-labeling dyes, purification, chromatography, NMR, mass spectrometry, spectroscopic analysis, electrospinning and nanofiber technology, surface treatment

Software & Data Analysis: MATLAB, Python, AI-assisted coding, Picasso, CODI, ImageJ/Fiji, TrackMate, GraphPad Prism, ChemDraw, BioRender, SPSS, Inkscape, MS Office Suite; spectral image processing, statistical analysis, data visualization

PUBLICATIONS & PRESENTATIONS ~ 7 publications and ~ 5 presentations focused on SMLM

SELECTED PUBLICATIONS

- *Spectroscopic DNA-PAINT for simultaneous multiplexed super-resolution microscopy.* **M.A. Shahid**, S.C. Das, K. Patel, X. Gong, H. Mao, D.A. Miller, Y. Zhang. *Nano Letters*, 26(32), 10651–10659, 2026.
- *Molecular engineering of cyanine–Hoechst hybrid materials for nanoscale DNA and chromatin imaging.* A.K. Singh, **M.A. Shahid**, Y. Zheng, A. Tomassini, X. Gong, S.C. Das, et al. *Journal of Physics: Materials*, 9(3), 035009, 2026.
- *Photoactivatable BODIPY dyes conjugated to self-labeling protein tags.* A.K. Singh, A. Tomassini, **M.A. Shahid**, P. Rathee, S.N. Moorkkannur, et al. *ACS Applied Bio Materials*, 2026.
- *Functional super-resolution microscopy of fibers and polymers: convergence of artificial and biological systems at the nanoscale.* S.J. Rao, X. Gong, **M.A. Shahid**, Y. Liu, H. Mao, Y. Zhang. *Nanoscale Horizons*, 11(3), 616–629, 2026.
- *Accurate and robust measurement of single-molecule fluorescence spectral heterogeneity.* X. Gong, A. Singh, H. Mao, A.K. Singh, **M.A. Shahid**, F.M. Raymo, Y. Zhang. (Under review)
- *Framework for accurate single-molecule spectroscopic imaging analyses using Monte Carlo simulation and deep learning.* H. Mao, Y. Liu, O. Kanchanadevi Venkataraman, **M.A. Shahid**, C. Laplante, et al. *Analytical Chemistry*, 97(30), 16250, 2025.
- *Photoactivation of BODIPY fluorescence with green light.* A. Tomassini, Y. Liu, Y. Zheng, **M.A. Shahid**, A. Singh, A.K. Singh, W.M. Piedra, et al. *The Journal of Organic Chemistry*, 90(24), 8214, 2025.
- *Switchable and functional fluorophores for multidimensional single-molecule localization microscopy.* Y. Liu, **M.A. Shahid**, H. Mao, J. Chen, M. Waddington, K.H. Song, Y. Zhang. *Chemical & Biomedical Imaging*, 1(5), 403–413, 2023.

Book Chapter

- *Luminescent Labels for Fluorescence Microscopy and Nanoscopy of DNA and Chromatin.* **M.A. Shahid**, S. Hossain, S. Rao, S.C. Das, Y. Zhang. In *Nanotechnology at Biointerfaces: In Honor of the 85th Birthday of Prof. Roger M. Leblanc* (Accepted).

Conference & Symposium

Gordon Research Conference: Single molecule approaches to biology (2024, 2026), Biophysical Society (2026), SERMACS (2024), Chromatin and Epigenetics (Virtually Present), EMBL Conference (2025), Graduate School Research Symposium (2026)

AWARDS, GRANTS & CERTIFICATIONS

- 1st Place, Poster Presentation, NCSU Graduate Research Symposium, 2026
- Travel Award, NC State Graduate School Association, 2026
- Thriving in Interdisciplinary Teams, Shelton Leadership Center, 2025
- Leadership Certificate, The Graduate School, NC State University, 2025
- Young Scholar Award, Comparative Medicine Institute (CMI), NC State University
- Research Grant, Comparative Medicine Institute (CMI): Tracking DNA-Targeting Chemotherapeutics in Cancer Cells Using Single-Molecule Imaging
- Make-a-thon 2023 (3rd Place, Textile Category), NC State University
- Dolphin Tank 2023 (Best Presentation), Biotechnology innovation pitch, NC State University
- Graduate Fellowship (2022) & Summer Graduate Fellowships (2023, 2025), The Graduate School, NC State University
- Erasmus Exchange Scholarship, M.Sc. thesis research at RWTH Aachen University, Germany, 2021
- Turkish Burslari (YTB) Scholarship, 2019, Fully funded M.Sc., Cukurova University, Türkiye

- Soft Skill Development, Textile Today Training, 2018

LEADERSHIP & PROFESSIONAL ACTIVITIES

Beyond research, I have held leadership roles across student government, advisory committees, and international organizations on three continents. Representing graduate students as an NCSU Senator, overseeing campus services as Assistant Director, and leading communications and community events, including a research symposium and a researchers mixer as Communication Secretary and event coordinator have sharpened my ability to coordinate stakeholders, adapt across cultures, and explain complex ideas to non-specialist audiences, the relationship-building skills central to customer-facing scientific work.

Leadership & Governance

Assistant Secretary, BUTEX Alumni Association USA (2025 – present); Senator, NCSU Student Body Government, 104th Session (2024 – 2025); Advisory Committee Member, ISAC & Pack Essentials, NCSU (2024 – present); Assistant Director, FIT Student Campus Service, NCSU (2024 – 2025); Communication Secretary, Bangladesh Student Association, NCSU (2023 – 2024).

Event & Community Engagement

Event Coordinator, TAGS, NCSU (2025 – 2026); Orientation Team Member, Office of International Services, NCSU (2024 – 2025); Mentor & Judge, Make-a-thon (2025); Volunteering: ISSERV, Kizilay, IHH, IMSU, Bridge International NCSU, Fiber Society, IGMG, NC Science Olympiad, TAGS, IAR.

International & Student Organizations

Executive Member, MUSAB, RWTH Aachen University (2022); General Secretary, Mini BD Bangladesh, Adana, Türkiye (2021); Founder & Secretary, BUTEX Spinners Club, Bangladesh (2017).

**References available upon request.*

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Date: