# Soma Dhakal, Ph.D.

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## EDUCATION

| | | |
|---|---|---|
| Ph.D. | Kent State University, Kent, Ohio<br>*Dissertation: Mechanical stability evaluation of i-motif and G-quadruplex structures under diverse circumstances* | 2013 |
| M. Sc. | Chemistry, Tribhuvan University, Kathmandu, Nepal | 2003 |
| B. Sc. | Chemistry, Tribhuvan University, Kathmandu, Nepal | 2001 |

## PROFESSIONAL POSITIONS

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|---|---|
| Associate Professor, Virginia Commonwealth University | July 2023 – Present |
| Graduate Program Director, Virginia Commonwealth University | Jan 2024 – Present |
| Assistant Professor, Virginia Commonwealth University | Aug 2016 – June 2023 |
| Postdoctoral Fellow, University of Michigan | Feb 2013 – July 2016 |
| LEO Lecturer-I, Department of Chemistry, University of Michigan | Fall 2015 |

## AWARDS/RECOGNITION

IchemE Global Award on the collaborative NSF project in the category "Biochemical Engineering" 2023
Certificate of Recognition for the Keynote Speech, Nanochemistry 2017, GA 2017
Graduate Student Senate (GSS) International Travel Award, Kent State University, OH 2011
University Fellowship Award, Kent State University, OH 2010
Certificate of Appreciation (for excellent teaching), Kathmandu Model College, Nepal 2005

## PEER-REVIEWED PUBLICATIONS

Google Scholar total citations 2211, h-index: 23, i10-index: 31, undergraduate authors are underlined

*VCU (Published)*:

43. Dalton, C.J., **Dhakal, S**. & Lemmon, C.A. (2024) Measuring the biomechanical properties of cell-derived fibronectin fibrils, *Biomech. Model. Mechanobiol*, 10.1007/s10237-024-01918-3
42. Algama, C.H., Basir, J., Wijesinghe, K. M. & **Dhakal, S.** (2024) Fluorescence-based multimodal DNA logic gates, *Nanomaterials*, 14, 1185, doi: 10.3390/nano14141185
41. Sethi, S., Wijesinghe, K.M. & **Dhakal, S**. (2024) Single-molecule FRET-based multiplexed detection, Book Chapter, *Methods in Molecular Biology (MIMB)*, 2744, 183-195, https://link.springer.com/protocol/10.1007/978-1-0716-3581-0_11
40. Edwards, A.N., Iannucci, A.N., VanDenBerg, J., Rice, T., Sethi, S., **Dhakal, S.** & Yangyuoru, P.M. (2024) G-Quadruplex structure in the ATP-binding DNA aptamer strongly modulates ligand binding activity, *ACS Omega*, 12, 14343 -14350, doi: 10.1021/acsomega.3c10386
39. Mahmoud, R., Kalivarathan, J., Castillo, A.J., Wang, S. Fuglestad, B., Kanak, M.A., & **Dhakal, S.** (2023) Aptabinding of tumor necrosis factor-α (TNFα) inhibits its proinflammatory effects and alleviates islet inflammation, *Biotechnology J.*, 29:e2300374. doi: 10.1002/biot.202300374
38. Sabbih, G.O., Wijesinghe, K.M., Algama, C.H., **Dhakal, S.** & Danquah, M.K. (2023) Computational generation and characterization of IsdA-binding aptamers, *Biotechnology J.*, Aug 18;e2300076. doi: 10.1002/biot.202300076

37. Wijesinghe, K.M., Sabbih, G., Algama, C.H., Syed, R., Danquah, M.K., & **Dhakal, S.** (2023) FRET-based single-molecule detection of pathogen-protein IsdA using computationally selected aptamers, *Anal. Chem.*, 2023, 95, 26, 9839–9846
36. †Kaur, A., †Mahmoud, R., Megalathan, A., Pettit, S. & **Dhakal, S.** (2023) Multiplexed smFRET Nucleic Acid Sensing Using DNA Nanotweezers, *Biosensors*, 13 (1), 119 † Equal Contribution
35. Mahmoud, R. & **Dhakal, S.** (2022) Single-Molecule Analysis of DNA Branch Migration under Biomimetic Environments, *J. Phys. Chem. B*, 126 (38), 7252-7261
34. Ghimire, M. L., Gibbs, D. R., Mahmoud, R., **Dhakal, S**. & Reiner, J.E. (2022) Nanopore analysis as a tool for studying rapid Holliday junction dynamics and analyte binding, *Analytical Chemistry*, 94, 28, 10027–10034
33. Wijesinghe, K.M., Kanak, M.A., Harrell, J.C. & **Dhakal, S.** (2022) Single-molecule sensor for high-confidence detection of miRNA, *ACS Sensors*, 7, 4, 1086–1094
32. Kaur, A., Mischa, E. & **Dhakal, S.** (2021) MASH FRET: A simplified approach for single-molecule multiplexing using FRET, *Analytical Chemistry*, 93, 25, 8856-8863
31. Gibbs, D.R., Mahmoud, R., Kaur, A. & **Dhakal, S.** (2021) Direct unfolding of RuvA-HJ complex at the single-molecule level, *Biophysical Journal*, 120, 10, 1894-1902
30. Megalathan, A., Wijesinghe, K. M., & **Dhakal, S.** (2021) A single-molecule FRET-based dynamic DNA sensor, *ACS Sensors*, 6, 3, 1367-1374
29. Megalathan, A., Wijesinghe, K. M., Ranson, L. & **Dhakal, S.** (2021) Single-molecule analysis of nanocircle-embedded i-motif under crowding, *J. Phys. Chem. B*, 2021, 125, 9, 2193-2201
28. Sapkota, K. & **Dhakal, S.** (2020) FRET-based aptasensor for the selective and sensitive detection of lysozyme, *Sensors*, 20, 914
27. Kaur, A. & **Dhakal S.** (2020) Recent applications of FRET-based multiplexed techniques, *Trends Anal. Chem.*, 123, 115777
26. Gibbs, D.R. & **Dhakal, S.** (2019) Homologous Recombination under the Single Molecule Fluorescence Microscope, *Int. J. Mol. Sci.*, 2019, 20, 6102
25. Sapkota, K., Kaur, A., Megalathan, A. Donkoh-Moore, C. & **Dhakal, S.** (2019) Single-step FRET-based detection of femtomoles DNA. *Sensors*, 19, 34952
24. Megalathan, A., Cox, B.D., Wilkerson, P.D., Kaur, A., Sapkota K., Reiner, J.E., and **Dhakal, S.** (2019) Single molecule analysis of i-motif within self-assembled DNA duplexes and nanocircles, *Nucleic Acids Research*, 47, 7199-7212
23. Kaur, A., Sapkota, K. and **Dhakal, S.** (2019) Multiplexed nucleic acid sensing with single-molecule FRET. *ACS Sensors,* 4, 623-633
22. Gibbs, D.R., Kaur, A., Megalathan, A., Sapkota, K. and **Dhakal, S.** (2018) Build your own microscope: Step-by-step guide for building a prism-based TIRF microscope. *Methods & Protocols,* 1, 40
21. Gibbs, D.R. & **Dhakal, S.** (2018) Single-molecule imaging reveals conformational manipulation of Holliday junction DNA by the junction processing protein RuvA. *Biochemistry,* 57, 3616-3624

*Prior to VCU:*

20. Valero, J., Pal, N., **Dhakal, S.**, Walter, N.G. & Famulok, M. (2018) A bio-hybrid DNA rotor/stator nanoengine that moves along pre-defined tracks. *Nature Nanotechnology*, 13, 496-503.
19. Fu, J., Yang, YR. **Dhakal, S.** Zhao, Z., Zhang, T., Liu, M., Walter N.G. & Yan, H. (2016) DNA Nanostructure-Scaffolded Assembly of Multienzyme Complexes. *Nature Protocol*, 11; 2243-2273.
18. **Dhakal, S.** Adendorff, M., Liu, M., Yan, H., Bathe, M. & Walter N.G. (2016) Rational design of DNA-actuated enzyme nanoreactors guided by single molecule analysis. *Nanoscale*, 8**,** 3125-3137.

17. Zhao, Z., Fu, J., **Dhakal, S.**, Johnson-Buck, A., Liu, M., Zhang, T., Woodbury, N., Liu, Y., Walter, N.G. & Yan, H. (2016) Nano-caged enzymes with enhanced activity and stability. *Nature Communications*, 7, 10619.
16. Mallik, L.$^{\perp}$, **Dhakal, S.**$^{\perp}$, Nichols, J., Mahoney, J., Dosey, A. M., Jiang, S., Sunahara, R. K., Skiniotis, G. & Walter, N. G. (2015) Electron microscopic visualization of protein assemblies on flattened DNA origami**.** *ACS Nano* 9, 7133-7141. $^{\perp}$**Co-first author**
15. Shrestha, P., Xiao, S., **Dhakal, S.**, Tan, Z. & Mao, H. (2014) Nascent RNA transcripts facilitate the formation of G-quadruplexes. *Nucleic Acids Research* 11, 7236-7246.
14. Cui, Y., Koirala, D., Kang, H., **Dhakal, S**. Yangyuoru, P., Hurley, L.H. & Mao, H. (2014) Molecular population dynamics of RNA structures in a Bcl-2 promoter sequence is regulated by small-molecules and the transcription factor hnRNP LL. *Nucleic Acids Research* 42; 5755-5764.
13. Widom. JR., **Dhakal, S.,** Heinicke, LA., Walter, N. G. (2014) Single-molecule tools for enzymology, structural biology, systems biology and nanotechnology: an update. *Archives of toxicology* 88; 1965-1985.
12. Bartke, R. M., Cameron, E. L., Cristie-David, A. S., Custer, T. C., Denies, M. S., Daher, M., **Dhakal, S.** *et al*, (2014) Invited review meeting report: SMART timing—principles of single molecule techniques course at the University of Michigan 2014. *Biopolymers* 103.
11. **Dhakal**, **S.,** Cui, Y., Koirala, D., Ghimire, C., Kushwaha, S., Yu, Z., Yangyuoru, P. M. & Mao, H. (2013) Structural and mechanical properties of individual human telomeric G-quadruplexes in molecularly crowded solutions. *Nucleic Acids Research* 41, 3915–3923.
10. Yangyuoru, P. M., **Dhakal**, **S.**, Yu, Z., Koirala, D., Mwongela, S. M. & Mao, H. (2012) Single-molecule measurements of the binding between small molecules and DNA aptamers. *Analytical Chemistry* 84, 5298-5303.
9. **Dhakal**, **S**., Lafontaine, JL., Yu, Z., Koirala, D. & Mao, H. (2012) Intramolecular folding in human ILPR fragment with three C-rich repeats**.** *PLoS ONE* 7(6): e39271. doi:10.1371/journal.pone.0039271.
8. **Dhakal**, **S.**, Yu, Z., Konik, R., Cui, Y., Koirala, D. & Mao, H. (2012) G-quadruplex and i-motif are mutually exclusive in double stranded ILPR DNA. *Biophysical Journal* 102, 2575–2584.
7. **Dhakal, S**., Mao, H., Rajendran, A., Endo, M., Sugiyama, H., Eds: Spindler L, Spada G. P, Haider S, Silva M. W. D, Fritzsche W. (2012) "G-quadruplex nanostructures probed at the single molecular level by force-based methods" in guanine quartets: structure and application. *Royal Society of Chemistry Publishing*, UK.
6. Koirala, D., **Dhakal**, **S.**, Ashbridge, B., Sannohe, Y., Rodriguez, R., Sugiyama, H., Balasubramanian, S. & Mao. H. (2011) Single-Molecule Platform for Investigation of G-quadruplex and Ligand Interactions. *Nature Chemistry* 3, 782-787.
5. **Dhakal**, **S.**, Yu, Z., Konik, R., Koirala, D. & Mao, H. Formation of human ILPR G-quadruplex in dsDNA. (2011) *International Review of Biophysical Chemistry* 2, N. 6.
4. Koirala, D., Yu, Z., **Dhakal**, **S.** & Mao, H. (2011) Detection of single nucleotide polymorphism using tension dependent stochastic behavior of a single-molecule template. *J. Am. Chem. Soc.* 133, 9988–9991.
3. **Dhakal**, **S.**, Schonhoft, JD., Koirala, D., Yu, Z. Basu S. & Mao, H. (2010) Coexistence of an ILPR i-motif and a partially folded structure with comparable mechanical stability revealed at the single molecular level. *J. Am. Chem. Soc.* 132, 8991–8997.
2. Yu, Z., Schonhoft, JD., **Dhakal**, **S.**, Bajracharya, R., Hegde, R., Basu S. & Mao, H. (2009) ILPR G-quadruplexes formed in seconds demonstrate high mechanical stabilities. *J. Am. Chem. Soc.* 131, 1876–1882.

1. Schonhoft, JD., Bajracharya, R., **Dhakal**, **S.**, Yu, Z., Mao, H. & Basu S. (2009) Direct experimental evidence for quadruplex-quadruplex interaction within the human ILPR. *Nucleic Acids Research* 37, 3310–3320.

## FUNDING

Seagate Technologies, Dhakal (sole PI): DNAzyme discovery and optimization for high-yield DNA strand assembly, $75,632 (12/16/2024 – 12/16/2025)

VCU SEED Funding, Dhakal (sole PI): Two-way dynamics of DNA Holliday junctions: Watching one molecule at a time, $5,000 (05/15/2023 - 05/15/2024)

National Institute of Health (NIH)-NCI, Dhakal (PI), C. Harrell (co-PI), Single-Molecule High-Confidence Detection of miRNA Cancer Biomarkers, $626,891 (04/13/2023 - 03/31/2026)

NSF Collaborative Grant (Award#2130678), Dhakal (PI) (Lead PI: Michael Danquah – University of Tennessee Chattanooga, PI: Jian Liu, University of Tennessee Knoxville). Collaborative Research: High-precision monitoring of foodborne pathogens in food manufacturing facilities. Total grant for the three institutions $600,000. Dhakal lab amount $70,000 (01/01/2022 -12/31/2024)

Department of Defense (DoD) Discovery Award (Award#W81XWH2210102) Dhakal (co-PI) (PI: Mazhar Kanak – VCU). Bioengineering islets with aptamers that block IBMIR in islet transplantation. $309,452. Dhakal lab amount $82,419 (02/15/2022 – 02/14/24)

VCU CCTR grant, Dhakal (sole PI), Enabling ultrasensitive and high-confidence detection of nucleic acid biomarkers. $41,000 (05/2020 - 05/2022)

VCU SEED Funding, Dhakal (PI) (co-PI: Reiner, VCU Physics): Single molecule analysis of peptide modified DNA Holliday junctions for therapeutic applications, $5,000 (07/2021 - 06/2022)

Laboratory Support from VCU Undergraduate Research Opportunities Program (UROP) for undergraduate mentoring, $500, Summer 2020

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NSF REU Site: "Practices and Perspectives in Nanoscience and Chemical Biology". Role: **Mentor/Senior Personnel**. (PI: Indika Arachchige – VCU) Amount: $312,309. Duration: 4/2019 – 3/2023

## PATENT APPLICATIONS

- Dynamic FRET-based single-molecule sensor for ultrasensitive detection of nucleic acid biomarkers, Dhakal S. & Kumar Sapkota, VCU: DHA-20-012. Patent Pending US20230175041A1
- Multiplexed and recyclable single-molecule sensors for quantitative analysis of nucleic-acid biomarkers, Dhakal S. & Anisa Kaur, USPTO Serial No. 62/716,198 (US20200048710A1), Patent Granted
- High-confidence detection of novel coronavirus RNA (SARS-CoV-2 RNA). DHA-20-071. Invention Disclosure submitted

## PROFESSIONAL SERVICE

- NSF CAREER 2025, Grant Reviewer — Oct 2024
- Worldwide Cancer Research UK, Grant Reviewer — Aug 2024
- NIH Grant Reviewer (NCI Special Emphasis Panel) — Dec 2023

- Ralph E Powe Junior Faculty Award Grant Reviewer — Sept 2023
- Israel Science Foundation (ISF) Grant Reviewer — Jan 26 2023
- NSF Grant Reviewer – EFRI Program × 2 panels — Jan 2022 and June 2022
- NSF Grant Reviewer – Biosensing program — Jan 2022
- NSF Fellowship Reviewer – GRFP ×2 panels — 2019 and 2021
- NSF Grant Reviewer (ad hoc) - Genetic Mechanisms — 2021
- NIH Grant Reviewer – NIAID × 2 panels — Feb 2019 and Feb 2020
- Grant Reviewer - Alzheimer's & Related Diseases Research Award Fund, Commonwealth of VA — 2017
- Reviewer for DBT Wellcome Fellowship — Feb 2020
- Guest Editor - Special Issue on BioMolecular Sensors — 2019-2020
- Guest Editor - Special Issue on Single Molecule Techniques, *Methods & Protocols* — 2018-2019
- Textbook Proposal Reviewer - Spectrochemical Analysis Methods for *John Wiley & Sons* — 2018
- Co-Chair - Biophysics Division - ANPA E-Conference — July 2020
- Organizer - Invited Symposium - Pittcon Conference (Conference canceled due to pandemic) — March 2022
- Organizer - Networking session on 'multiplexed sensing'- Pittcon Conference — March 2021
- Organizer - Contributed Symposium - Pittcon Conference — March 2023

*Manuscript Reviewer (numbers in parenthesis show the number of manuscripts reviewed):*

- *Nature Methods (1)*
- *Chemical Society Review (2)*
- *Trends in Analytical Chemistry (TrAC) (2)*
- *Nano Letters (5)*
- *ACS Nano (2)*
- *Journal of the American Chemical Society (4)*
- *ACS Sensors (4)*
- *Analytical Chemistry (2)*
- *FEBS Letters (2)*
- *Scientific Reports – Nature (1)*
- *ACS Applied Materials & Interfaces (1)*
- *iScience (4)*
- *Analytica Chemica A (2)*
- *Sensors & Actuators B (2)*
- *ChemBioChem (1)*
- *Advance Sciences (1)*
- *Biotechnology Journal (1)*
- *Advanced Science (2)*
- *Biotechnology Advances (2)*
- *Langmuir (1)*
- *Journal of Medicinal Chemistry (1)*
- *PlosOne (2)*
- *PeerJ (2)*
- *Molecules (2)*
- *Methods & Protocols (2)*
- *Journal of Marine Science and Engineering (1)*
- *Current Topics in Medicinal Chemistry (1)*
- *International Journal of Molecular Science (2)*
- *Polymers (2)*
- *Applied Physics A (2)*
- *Spectro Chemica Acta A (2)*
- *Communications Biology – Nature (2)*
- *Nature Communications (2)*
- *Chemical Physics (1)*
- *Journal of Physical Chemistry (1)*
- *ACS Nano (2)*
- *Biophysics Journal (1)*

*Professional Society Membership:*

- American Chemical Society (ACS) and Analytical Division ACS
- Biophysical Society (BPS)
- FRET Community

**COMMUNITY SERVICE**

- Hosted Piedmont Virginia Community College (PVCC) Students for a VCU tour and lab visits in a science outreach program — April 2023
- Advisory Board Member - Opticianry Program, Reynolds Community College — 2019 – 2021
- Judge - Analytical Oral Presentation, ACS Younger Chemist Committee (YCC) Research Symposium — Aug 2021
- Hosted two high-school students from Maggie Walker High School (Richmond, VA) 'Laboratory Techniques for the 21st Century' — Spring 2020
- Judge - Virginia Junior Academy of Sciences (VJAS) — May 2019
- Judge - Graduate Research Symposium, VCU — April 2019
- Judge - Virginia Academy of Sciences — May 2017
- Hosted one high-school student (Blue-SKY program) — Fall 2017
- Faculty Mentor - Nepalese Student Association (NSA) at VCU — Fall 2016 – present

**PRESENTATIONS**

*Invited Talks:*

23. Single-molecule lab @ VCU, Richmond Community High School (May 23, 2022)
22. Single-molecule analysis of DNA Holliday junctions (HJs) and HJ-based sensing, Wesleyan University, Middletown, CT (March 30, 2022)
21. Single-molecule sensing of nucleic acid and protein biomarkers, Old Dominion University (ODU), (Oct 22, 2021)
20. Harnessing the power of "DNA Dance" for biomedical applications, ANPA Global (July 16, 2021)
19. Seeing is believing: single molecule sensing and protein-DNA interactions, University of Maryland Baltimore County (UMBC) (March 26, 2021)
18. Single-molecule protein-DNA interactions and sensing, North Carolina A&T State University, Greensboro (Sept 12, 2019)
17. Single-molecule protein-DNA interactions and sensing, 2nd Biomotor Conference, Columbus, Ohio (July 30, 2019)
16. Single-molecule protein-DNA interactions and DNA-based sensing, Department of Chemistry, North Carolina State University, Jan 18, 2019
15. Visualizing the tug-of-war between protein and four-way DNA motif at the single-molecule level, International Conference on Explorations in Physics (ICEP- 2018), Kathmandu, Nepal, May 2018
14. From material to biotechnology applications of structural DNA nanotechnology **(Keynote Speech),** Nanochemistry 2017, Atlanta, Georgia, Nov 2017
13. Seeing is believing: single molecule sensing and protein-DNA interactions, Christopher Newport University (CNU), Virginia, Dec, 2017
12. Seeing is believing: single molecule sensing and protein-DNA interactions**,** Department of Forensic Science, Virginia Commonwealth University, VA, Oct 2017

*Contributed Talks:*

12. High-confidence single-molecule detection of nucleic acid biomarkers, ACS National Meetings, Aug 21, 2024
11. High-confidence single-molecule detection of nucleic acid biomarkers, SERMACS, Oct 27, 2023
10. High-confidence single-molecule detection of nucleic acids, Pittcon 2023, March 24, 2023

9. High-confidence single-molecule detection of nucleic acids, ACS Fall 2022, August 24, 2022
8. Simultaneous and sensitive detection of nucleic acids with single-molecule FRET, Pittcon Conference, Virtual, March 11, 2021
7. Multiplexed detection of nucleic acids with single-molecule FRET, Pittcon Conference, Philadelphia, PA, March 19, 2019
6. Towards high-confidence detection of nucleic acid biomarkers, 6th Virginia Soft Matter Workshop, Virginia Tech, Sept 22, 2018
5. Protein-mediated conformational manipulation of Holliday junction DNA**,** American Chemical Society Southeastern Regional Meeting Board (SERMACS 2017), Charlotte, NC, Nov 2017
4. Single molecule investigation of aptasensing and protein-DNA interaction**,** Virginia Academy of Sciences (95th Annual Meeting)**,** Virginia Commonwealth University, VA, May 2017
3. Guiding systematic improvements of a DNA-actuated enzyme nanoreactor through single molecule analysis**,** 21st International Conference on DNA Computing and Molecular Programming**,** Harvard University, Massachusetts, August 2015
2. Mechanical modulation of enzyme activity by rationally designed DNA tweezers: from the ensemble to the single-molecule level, Biophysical Society 59th Annual Meeting, Baltimore, Maryland, February 2015
1. Formation of human ILPR G-quadruplex in dsDNA, 3rd International Meeting on G-quadruplex and G-assembly, Sorrento, Italy, June 2011

*Posters:*

9. IMAT Annual PI Meeting 2024 (Oral Poster on Dec 17). Title: Towards High-Confidence Single-Molecule Detection of miRNA Cancer Biomarkers
8. Biophysical Society Meeting 2021 (Virtual, Oral Poster on Feb 23). Title: Probing the biomechanics of RuvA-Holliday junction complex
7. The Gordon Research Conference – Single Molecule approaches to Biology, Mount Snow, Vermont, July 15-20, 2018 Title: Visualizing the tug-of-war between protein and four-way DNA motif at the single-molecule Level
6. The 3rd Chesapeake Bay Area Single Molecule Biology Meeting, Johns Hopkins University, Maryland, May 12, 2018, Title: Visualizing the tug-of-war between RuvA and four-way DNA motif at the single-molecule Level
5. Year-2 Review, Multidisciplinary University Research Initiative (MURI), Arizona State University, Arizona, January 2015, Title: Guiding systematic improvements of a DNA-actuated enzyme nanoreactor through single molecule analysis
4. 3rd Midwest Single Molecule Workshop, University of Illinois, Urbana-Champaign, August 2014, Title: Mechanical modulation of enzyme activity by dynamic DNA tweezers
3. Year-1 Review, Multidisciplinary University Research Initiative (MURI), Arlington, Virginia, October 2013, Title: Spatially controlled DNA nanodevice: a promising tool for single-molecule detection of enzyme activity
2. Pittcon Conference, Philadelphia, PA, March 2013, Single-molecule measurements of the binding between small molecules and DNA aptamers
1. Second International Meeting on Quadruplex DNA, Camberley-Brown Hotel, Louisville, Kentucky, April 2009, Title: Equilibrium of parallel and antiparallel ILPR G-quadruplexes revealed by single molecule experiments

## SCHOLARSHIP DEVELOPMENT ACTIVITIES

- Participated in the Faculty Success Program (FSP) by National Center for Faculty Development & Diversity (NCFDD) Workshop — Aug 25 – Nov 16, 2019
- Attended the NSF Chemistry Early CAREER Workshop — May 19 – May 21, 2019
- Attended the VCU Grant Academy — July 2018 – June 2019
- Attended the ACS New Faculty Workshop Webinar NSF CAREER Grants — Feb 14, 2019
- Completed the ACS Reviewer Lab online training — Sep 30, 2018
- Participated in the VCU peer mentoring program — Jan 2018
- Attended webinars on "Writing Science" — Feb 15, 22 & Mach 1, 2018
- Attended the ACS New Faculty Workshop (Washington D.C.) — Aug 2-4, 2017
- Attended one-day grant writing workshop (NSF/NIH) at VCU — May 17, 2017

## Fellowships/Awards Received by Research Students:

- *Graduate:*

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|---|---|
| Chamika Algama – Gerald and Susan Bass Scholarship ($1,250) | 2024 |
| Srishty Sethi – Lidia M. Vallerino Scholarship in Chemistry ($600) | 2024 |
| Roaa Mahmoud – Gerald and Susan Bass Scholarship ($1,250) | 2023 |
| Kalani Wijesinghe – Albert T. Sneden III Scholarship ($1,400) | 2023 |
| Kalani Wijesinghe – Altria Fellowship (~$21,000 stipend + tuition/fees) | 2022 |
| Roaa Mahmoud – Departmental Summer Fellowship ($6,000 stipend) | 2022 |
| Roaa Mahmoud – Albert T. Sneden III Scholarship in Chemistry ($1,400) | 2022 |
| Kalani Wijesinghe – Lidia M. Vallerino Scholarship in Chemistry ($1,500) | 2021 |
| Dalton Gibbs – Distinguished Chemist Fund ($1,100) | 2020 |
| Anisa Kaur – Lidia M. Vallerino Scholarship in Chemistry (~$1,500) | 2020 |
| Kumar Sapkota – Altria Fellowship ($19,000 stipend + tuition/fees) | 2020 |
| Anoja Megalathan – Distinguished Chemist Fund ($1,100) | 2019 |
| Anisa Kaur – Outstanding Teaching Assistant Award | 2019 |
| Dalton Gibbs – Altria Fellowship ($19,000 stipend + tuition/fees) | 2019 |
| Anisa Kaur – Altria Fellowship ($19,000 stipend + tuition/fees) | 2019 |
| Kumar Sapkota – Mary E Kapp Fund | 2017 |
| Anisa Kaur – Billy Stump/Ray Ottenbrite Fellowship | 2017 |
| Anisa Kaur – Outstanding Analytical Chem. Grad. Student Award | 2017 |

- *Undergraduate:*

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|---|---|
| Sydney Pettit – NIH Postbaccalaureate Fellowship | 2021 |
| Mischa Ellison – ACS Bridge Program Fellowship (funded for MS degree) | 2021 |
| Mischa Ellison – UROP Fellowship VCU ($1,500 stipend + $500 lab) | 2020 |
| Benjamin Kass – Baker Fund | 2019 |
| Benjamin Kass – VCU Honors Academic Achievement Award | Fall 2018 & Spring 2019 |

## Student Presentations

20. Versatile DNA logic gates (**talk**), Chamika Algama and Soma Dhakal, Pittcon Conference & Expo, March 24, 2023
19. DNA branch migration under biomimetic environments (**talk**), Roaa Mahmoud and Soma Dhakal Pittcon Conference & Expo, March 24, 2023

18. FRET-based single molecule miRNA sensing (**talk**) Kalani Wijesinghe and Soma Dhakal, Pittcon Conference & Expo, March 22, 2023
17. FRET-based high-confidence single-molecule detection of DNA biomarkers (**talk**) Kalani M. Wijesinghe, Ajona Megalathan & Soma Dhakal, ACS Meeting 2022, Virtual, March 21, 2022
16. FRET-based high-confidence detection of DNA (**talk**), Kalani M. Wijesinghe,; Ajona Megalathan & Soma Dhakal, ANPA Conference, Virtual, July 16, 2021
15. Single-molecule analysis of DNA branch migration under biomimetic environments (poster), Roaa Mahmoud & Soma Dhakal, ACS annual meeting, Virtual, August 21, 2021
14. Branch migration of Holliday junction DNA (**talk**), Roaa Mahmoud, & Soma Dhakal, ANPA Conference, July 16, 2021
13. DNA-based sensor capable of detecting and distinguishing linear vs circular DNA targets (Poster), Kalani. M. Wijesinghe, Anoja Megalathan & Soma Dhakal, ACS Meeting 2021, Virtual, April 12, 2021
12. Single-molecule analysis of branch migration kinetics (**talk**) Roaa Mahmoud & Soma Dhakal, ACS Meeting 2021, Virtual, April 12, 2021
11. Single molecule investigation of the behavior of Holliday junction processing proteins (**talk**) Dalton R. Gibbs & Soma Dhakal, Pittcon Conference, Philadelphia, PA, March 20, 2019
10. Sensors with tunable inter-dye distance for multiplexed detection of nucleic acids (**talk**) Anisa Kaur, Kumar Sapkota & Soma Dhakal, Pittcon Conference, Philadelphia, PA, March 19, 2019
9. Probing i-motif dynamics under biomimetic conditions (**talk**) Anoja Megalathan & Soma Dhakal, Pittcon Conference, Philadelphia, PA, March 20, 2019
8. A single-molecule sensor for the ultrasensitive detection of biomolecules (**talk**) Kumar Sapkota & Soma Dhakal, Pittcon Conference, Philadelphia, PA, March 19, 2019
7. Single-molecule investigation of Holliday junction binding proteins (**talk**) Dalton R. Gibbs and Soma Dhakal, *6th Virginia Soft Matter Workshop*, Virginia Tech, Sept 22, 2018
6. Comparative analysis of i-motif formed within DNA duplexes and self-assembled DNA mini-circles (**Talk**) Anoja Megalathan and Soma Dhakal, *6th Virginia Soft Matter Workshop*, Virginia Tech, Sept 22, 2018
5. Multiplex nucleic acid sensing by tuning the inter-dye distance (**talk**) Anisa Kaur and Soma Dhakal, *6th Virginia Soft Matter Workshop*, Virginia Tech, Sept 22, 2018
4. Aptamer-based Single Molecule Sensing on DNA Platforms (poster) Natalia Mangaroo, Anisa Kaur, Anoja Megalathan and Soma Dhakal, VCU, Aug 4, 2017
3. An investigation of Holliday junction DNA in complex with junction processing protein RuvA (poster) Dalton R. Gibbs and Soma Dhakal, *Virginia Academy of Sciences (95th Annual Meeting),* VCU, May 18, 2017
2. Multiplex aptasensor for small molecule detection (poster) Anisa Kaur and Soma Dhakal, *Virginia Academy of Sciences (95th Annual Meeting),* VCU, May 18, 2017
1. Studies of i-motif formed within self-assembled DNA circles (poster). Ajona Megalathan, Anisa Kaur and Soma Dhakal and Soma Dhakal, *Virginia Academy of Sciences (95th Annual Meeting),* VCU, May 18, 2017

**TEACHING**

*VCU (Number in parenthesis represents the number of students completing the course)*

- Spectrochemical Analysis - CHEM 635
  Fall 2024 *(10)*
  Spring 2023 (*14*)

Fall 2021 *(5)*
Fall 2020 *(11)*
Fall 2019 *(20)*
Fall 2018 *(11)*
Fall 2017 *(18)*
Fall 2016 *(14)*

- Instrumental Lab - CHEZ 409
  - Spring 2023 (*One section 7*)

  Fall 2022 (*two sections, 8 + 6 = 14*)
- Instrumental Analysis - CHEM 409
  Fall 2023 (*23*)
  Spring 2022 (*16*)
- Quantitative Analysis - CHEM 309
  Spring 2024 *(58)*
  Spring 2021 *(47)*
  Spring 2020 *(51)*
  Spring 2018 *(53)*
  Spring 2017 *(72)*
- Chemistry Perspectives and Ethics - CHEM 693
  Fall 2021 *(19)*
- Guest Lectures:
  Chemistry Perspectives and Ethics (CHEM 693) - Publishing in Academic Journals (Fall 2017 & Fall 2018)
  Chemical Biology I (CHEM 601) - DNA/RNA Nanotechnology (Fall 2016 – Fall 2021, Fall 2023, Fall 2024)
  P-Chem/A-Chem Course (MEDC 591, Course Instructor Glen Kellogg @ VCU Medicinal Chemistry) – Thermodynamics Revisited (Fall 2022, Fall 2023, Fall 2024)

*Prior joining VCU:*

- Leo Lecturer, Investigations in Chemistry (Chem 211), University of Michigan, 2015
- Substitute Lecture (Biol. Chem. 451) for Prof. Nils G. Walter, University of Michigan, March 11, 2015
- Teaching Assistant – Undergraduate Labs, Kent State University, Analytical Chemistry I & II, General Chemistry I & II (2008-2013)
- Undergraduate Lab Development, Kent State University, *Developed an experimental setup to measure Henry's law coefficient of toluene in water* (Fall 2008)
- Instructor – Chemistry (Grade 11 & 12), Kathmandu Model College, Nepal (2004-2007)
- Instructor – Engineering Diploma, Tribhuvan University, Nepal (2006-2007)

**OTHER SERVICES**

*Department:*

- GEAC Committee (Chair) Spring 2024 – Present
- Promotion & Tenure Committee (Outside member 1) Fall 2024
- Promotion & Tenure Committee (chair 1, member 1) Fall 2023
- Analytical Faculty Search Committee Spring 2022, Fall 2022
- Graduate Award Committee Fall 2021 – Present

- Analytical Faculty Coordinator Fall 2021 – Present
- Graduate Admission Committee Fall 2017 – Fall 2019
- Departmental By Laws Committee Spring 2018
- Seminar Committee Fall 2016 – Spring 2017, Spring 2020
- Graduate Evaluation Committee Fall 2016 – Spring 2017, Spring 2022, Fall 2022
- Scribe - Faculty Meeting Minutes Fall 2016 – Spring 2017
- Served/serving on more than 20 chemistry graduate students and 3 outside-department graduate students (Physics and Biomedical Engineering) on the dissertation committees

*University:*

- Affiliate Member, Massey Cancer Center, VCU (2023 – to date)
- Affiliate Member, Institute of Engineering and Medicine, VCU (2022 – to date)
- Engaged in promoting VCU internationally by contacting faculty at different universities in Nepal.
- Organized VCU Recruiting Booth at 2017 Southeastern Regional ACS meeting (SERMACS 2017) in Charlotte, NC