Miloš Nikolić

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Summary

My research specializes in using physics approaches to address fundamental questions in cell and developmental biology, particularly focusing on multicellular organization. I specialize in adapting and advancing novel imaging techniques to address fundamental questions in new contexts. Currently I work on the quantification of information transfer in genetic networks during animal development. I aim to apply my interdisciplinary expertise for scientific innovation, and I am aspiring to an academic career centered on excellence in teaching, dedicated mentorship, and pursuing innovative, high-impact research.

Education

PhD in Biophysics **University of Maryland, College Park, MD, USA** Aug 2015 – May 2022

Dissertation: "High Resolution Mapping of Intracellular Mechanical Properties during Key Stages of Cancer Progression". Advisors: Giuliano Scarcelli and Kandice Tanner

B.A. in Physics, cum laude **Princeton University, Princeton, NJ, USA** Aug 2011 – Jun 2015

Professional Experience

Postdoctoral Research Associate **Princeton University, Princeton, NJ** Jun 15, 2022 – present
Research: quantitative imaging, information theory, noise in genetic networks, embryonic development.
Advisor: Thomas Gregor,

Teaching: WRI503 "Writing an Effective Scientific Article", Fall '24, Spring '25
WRI501 "Reading and Writing about the Scientific Literature". Fall '24

Pre-doctoral Fellow **National Cancer Institute, NIH, MD** Sep 2018 – Aug 2021
Research: human cancer cell biology, cell forces and mechanics, quantitative imaging

Graduate Research Assistant **University of Maryland, College Park, MD** Feb 2016 – May 2022
Research: spectroscopy, label-free imaging, bioengineering, human and cancer cell biology

Research Assistant **Princeton University, Princeton, NJ** Jun 2013 – Jun 2015
Research: optics, photonics, quantum vacuum, machine learning, computational biology

Awards

WSE Scientific Writing Fellowship Princeton (2024–)
Institute of Physics (IOP) Trusted Reviewer status (2023-)
Named one of "The 10 Biggest Science Stories of 2022" by The Guardian (2022)
Inventor: Patent no. US20220349754A1 (2022)
Finalist of the UMD Invention of the Year awards (2017)
Newport Award for Excellence in Photonics (2015)
Allen G. Shenstone Prize in Physics (2014, 2015)

Skills

Experimental: quantitative microscopy, two-photon imaging, optical tweezers, Atomic Force Microscopy, Brillouin scattering spectroscopy, molecular biology methods, immunofluorescence.
Theoretical: probability, information theory, dynamical systems, and network theory.
Computer: MATLAB, Python, C, Java, Unix, LaTeX, algorithms, and programming systems.
Mentorship: Mentored graduate and undergraduate students on independent research projects (2018-present)
Languages: native Montenegrin, near-native English, fluent Italian, and basic Spanish.

Peer Reviewer for

Journal of Visualized Experiments (2024-), MethodsX (2024-), Nature Partner Journals: Biological Physics and Mechanics (2024-), IOP Journal of Physics: Photonics (2023-), IOP Journal of Physics: Condensed Matter (2023-), Scientific reports (2023-), Journal of Innovative Optical Health Sciences (2017-)

Professional Service

Coordinator of the Physics Postdoc Matters group at Princeton Physics Department (2024 – 2025)
Organizer and host of The Postdoc Path Podcast (2023–)
2020 Workshop Series: Understanding and Exploring Network Epidemiology in the Time of Coronavirus (Net-COVID), (April 2020).
Event organizer: ASCB symposium, NIH Campus Bethesda MD (Nov 22nd, 2019)
Teaching assistant (University of Maryland Physics Dept. and Princeton Physics Dept., 2014 – 2016)

Publications

ORCID 0000-0002-1206-1797, Google scholar.

Postdoctoral work at Princeton on positional information (in bits) as it is produced and transferred through genetic networks:

1. **Nikolić, M.**, Antonetti, V., Liu, F., Muhaxheri, G., Petkova, M.D., Scheeler, M., Smith, E.M., Bialek, W. and Gregor, T., "Scale invariance in early embryonic development." *PNAS* (2024)
2. McGough, L., Casademunt, H., **Nikolić, M.**, Aridor, Z., Petkova, M.D., Gregor, T. and Bialek, W. "Finding the last bits of positional information." *PRX Life* (2024)

PhD work: bringing in vivo Brillouin spectroscopic imaging to subcellular scale:

3. Zhang, J. [1], **Nikolić, M.**[1], Tanner, K. and Scarcelli, G. "Rapid biomechanical imaging at low irradiation level via dual line-scanning Brillouin microscopy". *Nature methods*, (2023). [1]co-first authors.
4. **M. Nikolić,** Scarcelli G., and Tanner K. " Multimodal microscale mechanical mapping of single cells as a function of environment geometry" *Biophysical Journal* (2022).
5. **Nikolić M.**, and Scarcelli G. "Long-term Brillouin imaging of live cells with reduced absorption-mediated damage at 660 nm wavelength." *Biomedical Optics Express* (2019).
6. **Nikolić M.**, Conrad C., Zhang J., and Scarcelli G. "Noninvasive Imaging: Brillouin Confocal Microscopy." In: Dong C., Zahir N., Konstantopoulos K. (eds) Biomechanics in Oncology. Advances in Experimental Medicine and Biology. *Springer, Cham* (2018).

including a number of collaborations with National Institutes of Health, Johns Hopkins, U Penn, MIT, etc.

7. Pahapale, G. J., Tao, J., **Nikolić, M.**, Gao, S., Scarcelli, G., Sun, S. X., Romer, L. H., Gracias, D. H., "Directing Multicellular Organization by Varying the Aspect Ratio of Soft Hydrogel Microwells." *Advanced Science* (2022).
8. Roberts, A.B., Zhang, J., Singh, V.R., **Nikolić, M.**, Moeendarbary, E., Kamm, R.D., So, P.T. and Scarcelli, G., "Tumor cell nuclei soften during transendothelial migration". *Journal of Biomechanics* (2021).
9. Scarcelli, G., Zhang, J. and **Nikolić, M.**, University of Maryland College Park, 2020. "Brillouin imaging devices, and systems and methods employing such devices". *U.S. Patent Application* 16/760,055.
10. J. Zhang, F. Alisafaei, **M. Nikolić**, X.A. Nou, H. Kim, V.B. Shenoy, G. Scarcelli, Nuclear Mechanics within Intact Cells Is Regulated by Cytoskeletal Network and Internal Nanostructures, *Small* (2020) 1907688.
11. E.O. Wisniewski, P. Mistriotis, K. Bera, R.A. Law, J. Zhang, **M. Nikolić,** M. Weiger, M. Parlani, S. Tuntithavornwat, A. Afthinos, R. Zhao, D. Wirtz, P. Kalab, G. Scarcelli, P. Friedl, K. Konstantopoulos, Dorsoventral polarity directs cell responses to migration track geometries, *Science Advances*, (2020).
12. Eitan E., **Nikolić M.**, and Scarcelli G. "Improving localization precision of Brillouin measurements using spectral autocorrelation analysis." *Journal of Innovative Optical Health Sciences* (2017).

Undergraduate work in photonics theory: I contributed to the theoretical prediction and first experimental observation of non-linear Casimir force arising from quantum vacuum.

13. Tang, Liang, Mingkang Wang, C. Y. Ng, **M. Nikolić**, Che Ting Chan, Alejandro W. Rodriguez, and Ho Bun Chan. "Measurement of non-monotonic Casimir forces between silicon nanostructures." *Nature Photonics* (2017).

Commentaries on my work by others:

- Galstyan, V. and Ten Wolde, P.R., "Quantifying the genetic origins of body plan scaling." *PNAS*, (2025).
- Hockenberry, M.A. and Legant, W.R. "Cells in the mechanical spotlight". *Biophysical Journal*, (2022).

Selected Presentations

1. The Lewis-Sigler Institute for Integrative Genomics Annual Retreat, October 15, 2024
2. American Physical Society March Meeting, March 7, 2024 (selected platform talk).
3. American Physical Society March Meeting, March 8, 2023 (selected platform talk).
4. EMBL Blue Seminar, EMBL Heidelberg, November 22, 2021 (invited seminar)
5. American Physical Society March Meting 2021, March 19, 2021 (virtual). (selected platform talk)
6. 65th Biophysical Society Annual Meeting, Feb 23, 2021. (virtual). (poster/flash talk presentation)
7. BioBrillouin2020. 10 September 2020. (virtual) Exeter, UK. (poster/flash talk presentation)
8. 2020 CSBC/PS-ON/BD-STEP Junior Investigator Meeting, August 28, 2020. (virtual) Bethesda, MD, USA. (poster/flash talk presentation)
9. SPIE Photonics-West, San Francisco, CA. February 2020 (selected platform talk)
10. UMD-NCI partnership symposium, College Park, MD. November 2019. (selected platform talk)
11. BMES Annual meeting, Philadelphia, PA. October 2019. (selected platform talk)
12. 3rd BioBrillouin meeting Porto, Portugal. September 2019. (selected platform talk)
13. 2019 CSBC/PS-ON Junior Investigator Annual Meeting, NIH, Bethesda, MD. August 2019. (selected platform talk)
14. University of Maryland Marlene and Stewart Greenebaum Comprehensive Cancer Center Cancer Imaging Retreat, College Park, MD. May 2019. (short talk)
15. Physical Science of Cancer, Gordon Research Conference and Gordon Research Seminar, Galveston TX. February 2019. (poster)