Taylor M. Cannon, Ph.D.

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Education

2017 – 2023 **Harvard-MIT Health Sciences and Technology (HST) PhD Program**
PhD, Medical Engineering and Medical Physics
Concentration in Electrical Engineering
Thesis: *Volumetric optical imaging of tissue microstructure for grading of dysplasia in vivo*

2013 – 2016 **Vanderbilt University**
Bachelor of Engineering, Biomedical Engineering
GPA 3.96/4.0; Top 5% of graduating class.

Experience

2026 – · · · · **Tenure-track assistant professor,** Biomedical Engineering, University of Minnesota - Twin Cities

2023 – 2026 **Postdoctoral scholar,** Bioelectronics Group, Massachusetts Institute of Technology
NRSA F32 Ruth L. Kirschstein Postdoctoral fellow, NIH BRAIN Initiative
K. Lisa Yang Brain-Body Center Fellow
• **Optical imaging FiberScopes**: Developing approaches for the fabrication and implantation of flexible, micro-scale, minimally-invasive multifunctional devices for optical imaging of neural activity in behaving animals [18]
• **Neural recording and stimulation**: Fabricating polymer-based devices integrating multi-core waveguides, microelectrodes, and microfluidic channels using bulk machining and thermal fiber drawing [2]
• **Volumetric neural imaging**: Developing computational methods for 3-D reconstruction of optical fields to enhance the spatial and temporal resolution of scalable, polymer fiber-based imaging devices

2017 – 2023 **Graduate student researcher,** Center for Biomedical Optical Coherence Tomography (OCT) Research and Translation, Harvard Medical School and Massachusetts General Hospital
NIH F31 Ruth L. Kirschstein Predoctoral fellow; NSF Graduate Research Program fellow
• **Clinical optical imaging**: Designed and built 3 custom OCT imaging systems with single-shot polarimetric and scattering angle contrast, corresponding acquisition software, and a novel dual-fiber catheter-based imaging probe used in a clinical pilot study for early cancer detection in the esophagus [20], [5], [7], [9]
• **Optical signal processing**: Developed a physics-based signal processing framework to extract sub-resolution histologic features from structural optical imaging data for in vivo grading of cancerous lesions [19], [4], [20], [7]
• **Flexible multiparametric imaging**: Extended imaging and signal processing paradigms to label-free classification of coronary artery plaques and applications in ophthalmology [21], [25], [27]

2016–2017 **Visiting researcher,** Photonics Group, Imperial College London
Whitake International Program fellow
• **Fluorescence lifetime spectroscopy**: Developed and optimized optical instrumentation, acquisition software, and data analysis software for a cuvette-based time-resolved fluorescence spectroscopy system [8]

Experience (continued)

2013–2016 **Undergraduate student researcher,** Biophotonics Center, Vanderbilt University
• **Optical metabolic imaging**: Conducted multiple independent research projects using a multiphoton microscope, plate reader, and flow cytometer to quantify cellular metabolic state in breast cancer cells based on relative autofluorescent coenzyme presences (NADH and FAD) and measure metabolic response to anti-cancer drugs via fluorescence lifetime microscopy [11]–[13]

2015–2015 **Undergraduate student researcher,** Wellman Center for Photomedicine, MGH
NSF REU, HST-Wellman Biomedical Optics Summer Institute
• **Photoconverting cancer cells**: Contributed to a multi-center project to isolate ovarian cancer cells labeled with photoconvertible membrane dyes from within a 3D tumor model using confocal microscopy and fluorescence-activated cell sorting [10]

Awards

2024 **NIH F32 NRSA Ruth L. Kirschstein Postdoctoral Fellowship**: A multifunctional fiber platform for wireless, volumetric imaging and modulation of neural activity in vivo

Materials Research Society (MRS) Rising Star Award

2023 **K. Lisa Yang Brain-Body Center Fellow**

MIT Graduate Women of Excellence award

Massachusetts General Brigham Commercialization and Inclusive Leadership Fellow

2022, 2018 Massachusetts General Hospital (MGH) Grad Student Division Travel Award Recipient

2022 Harvard Culture Lab Express Grant co-recipient

MIT Kauffman Teaching Certificate

MIT Student Travel Conference Grant recipient

2021 **NIH F31 NRSA Ruth L. Kirchstein Predoctoral Fellowship**: Volumetric mapping of tissue microstructure with OCT for enhanced dysplasia detection

MGH Scientific Advisory Committee distinguished poster award and travel scholarship

Women in Innovation and STEM Database at MIT (WISDM) fellow

2020 SPIE (International Soc. for Optics and Photonics) Photonics West Top Session Presenter

2017 **MIT Ida M. Green Fellowship**

National Science Foundation Graduate Research Fellow

2016 **Whitaker International Program Fellow**

Vanderbilt Biomedical Engineering Program Professional Development Award

Vanderbilt Engineering Dean's Award for Outstanding Scholarship

2016 – 2016 Vanderbilt University Dean's List for Academic Distinction

2015 **Goldwater Scholarship** Honorable Mention

NSF Research Experience for Undergraduates Harvard-MIT HST Biomedical Optical Summer Institute

Harvard-MIT Health Science and Technology Summer Research Program, 1st place poster

2014 Vanderbilt School of Engineering Undergraduate Research Summer Fellowship

Vanderbilt University Summer Undergraduate Research Program, 2nd place poster

SPIE Travel Scholarship

2013 National Merit Scholarship

Research Publications

Journal Articles

1. K. Bell*, **T. M. Cannon***, A. M. Eltony*, *et al.*, "Starting a conversation about social issues in optics and photonics," *Nature Reviews Physics*, vol. 6, 5 2024. DOI: 10.1038/s42254-024-00705-4.

2. N. Driscoll*, M. J. Antonini*, **T. M. Cannon***, *et al.*, "Fiber-based probes for electrophysiology, photometry, optical and electrical stimulation, drug delivery, and fast-scan cyclic voltammetry in vivo," *Advanced Materials*, Nov. 2024. DOI: 10.1002/adma.202408154.

3. Y. J. Kim, N. Kent, E. V. Paniagua, *et al.*, "Magnetoelectric nanodiscs enable wireless transgene-free neuromodulation," *Nature Nanotechnology*, 2024. DOI: 10.1038/s41565-024-01798-9.

4. **T. M. Cannon**, B. E. Bouma, and N. Uribe-Patarroyo, "Mapping optical scattering properties to physical particle inforamtion in singly and multiply scattering samples," *Biomedical Optics Express*, vol. 14, 8 2023. DOI: 10.1364/BOE.494518.

5. S. Ruiz-Lopera, R. Restrepo, **T. M. Cannon**, M. Villiger, B. E. Bouma, and U.-P. N, "Computational refocusing in phase-unstable polarization-sensitive optical coherence tomography," *Optics Letters*, vol. 48, 18 2023. DOI: 10.1364/OL.499051.

6. **T. M. Cannon**, N. Uribe-Patarroyo, M. Villiger, and B. E. Bouma, "Measuring collagen injury depth for burn severity determination using polarization sensitive optical coherence tomography," *Scientific Reports*, vol. 12, 1 2022. DOI: 10.1038/s41598-022-14326-3.

7. **T. M. Cannon**, B. E. Bouma, and N. Uribe-Patarroyo, "Layer-based, depth-resolved computation of attenuation coefficients and backscattering fractions in tissue using optical coherence tomography," *Biomedical Optics Express*, vol. 12, 8 2021. DOI: 10.1364/BOE.427833.

8. **T. M. Cannon***, J. L. Lagarto*, B. T. Dyer, *et al.*, "Characterization of nadh fluorescence properties under one-photon excitation with respect to temperature, ph, and binding to lactate dehydrogenase," *OSA Continuum*, vol. 4, 5 2021. DOI: 10.1364/OSAC.423082.

9. N. G. Ferris, **T. M. Cannon**, M. Villiger, B. E. Bouma, and N. Uribe-Patarroyo, "Forward multiple scattering dominates speckle decorrelation in whole-blood flowmetry using optical coherence tomography," *Biomedical Optics Express*, vol. 11, 4 2020. DOI: doi.org/10.1364/BOE.384539.

10. S. Osseiran, L. A. Austin, **T. M. Cannon**, C. Yan, D. M. Langenau, and C. L. Evans, "Longitudinal monitoring of cancer cell subpopulations in monolayers, 3d spheroids, and xenografts using the photoconvertible dye dir," *Scientific Reports*, vol. 9, 1 2019. DOI: 10.1038/s41598-019-42165-2.

11. **T. M. Cannon**, A. T. Shah, and M. C. Skala, "Autofluorescence imaging captures heterogeneous drug response differences between 2d and 3d breast cancer cultures," *Biomedical Optics Express*, vol. 8, 3 2017. DOI: 10.1364/BOE.8.001911.

12. A. T. Shah, **T. M. Cannon**, J. N. Higginbotham, R. J. Coffey, and M. S. Skala, "Autofluorescence flow sorting of breast cancer cell metabolism," *Journal of Biophotonics*, vol. 10, 8 2017. DOI: 10.1002/jbio.201600128.

13. **T. M. Cannon**, A. T. Shah, A. J. Walsh, and M. C. Skala, "High-throughput measurements of the optical redox ratio using a commercial microplate reader," *Journal of Biomedical Optics*, vol. 20, 1 2015. DOI: 10.1117/1.JBO.20.1.010503.

*Denotes equal contribution

Patent Applications

1. **T. M. Cannon**, M. Shishkov, B. E. Bouma, N. Uribe-Patarroyo, and M. Villiger, *Multi-fiber catheter probe for multi-parametric optical coherence tomography*, Filed, Dec. 2023. URL: https://patentscope.wipo.int/search/en/detail.jsf?docId=WO2024124171.

Oral Conference Presentations and Proceedings

1. **T. M. Cannon**, P. Maretich, G. L. Eberly, E. J. Frey, K. Nagao, and P. O. Anikeeva, "Multifunctional fiberscopes for optical imaging and neuromodulation in vivo," in *Optica Biophotonics Congress*, Apr. 2025.
2. **T. M. Cannon**, P. Maretich, G. L. Eberly, E. J. Frey, K. Nagao, and P. O. Anikeeva, "Multifunctional fiberscopes for optical imaging and neuromodulation in vivo (**Invited**)," in *Optica Biophotonics Congress*, Apr. 2025.
3. **T. M. Cannon**, P. Maretich, N. Driscoll, M. J. Antonini, K. Nagao, and P. O. Anikeeva, "Multifunctional fibers for volumetric imaging and modulation of neural activity in vivo," in *Gordon Research Seminar on Neuroelectronic Interfaces*, Mar. 2024.
4. **T. M. Cannon**, P. Maretich, K. Nagao, *et al.*, "Multifunctional fibers for volumetric imaging and electrical recording of neuronal activity in vivo," in *Materials Research Society Fall Meeting*, Rising Star Award - Biotronics Symposium, Dec. 2024.
5. **T. M. Cannon**, B. E. Bouma, and N. Uribe-Patarroyo, "Functionally-multiplexed optical coherence tomography for comprehensive and volumetric analysis of tissue microstructure," in *SPIE Photonics West: Optical Coherence Tomography and Coherence Domain Optical Methods in Biomedicine*, Jan. 2023. DOI: 10.1117/12.2652969.
6. **T. M. Cannon**, M. Shishkov, M. Villiger, G. J. Schmidt, B. E. Bouma, and U.-P. N, "Dual-resolution endoscopic oct in vivo for improved tissue scattering property characterization (**Invited**)," in *European Conference on Biomedical Optics*, Jun. 2023. DOI: 10.1117/12.2670505.
7. **T. M. Cannon**, M. Shishkov, M. Villiger, G. J. Schmidt, N. Uribe-Patarroyo, and B. E. Bouma, "Dual-resolution, catheter-based probe for visualization of angular-diverse scattering contrast of esophagus in vivo with optical coherence tomography," in *SPIE Photonics West: Endoscopic Microscopy*, Jan. 2023. DOI: 10.1117/12.2650387.
8. **T. M. Cannon**, B. E. Bouma, and N. Uribe-Patarroyo, "Enhancing oct microstructural scattering parameter imaging with angular diversity," in *SPIE Photonics West: Optical Coherence Tomography and Coherence Domain Optical Methods in Biomedicine*, Jan. 2022. DOI: 10.1117/12.2613074.
9. **T. M. Cannon**, B. E. Bouma, and N. Uribe-Patarroyo, "Quantitative light scattering analysis for characterization of layers of the retina using optical coherence tomography," in *SPIE Photonics West: Ophthalmic Technologies*, Mar. 2021. DOI: 10.1117/12.2577675.
10. **T. M. Cannon**, B. E. Bouma, and N. Uribe-Patarroyo, "Quantitative scattering parameters measured with optical coherence tomography are sensitive to microstructural tissue pathologies," in *SPIE Photonics West: Optical Coherence Tomography and Coherence Domain Optical Methods in Biomedicine*, Mar. 2021. DOI: 10.1117/12.2577858.
11. **T. M. Cannon**, N. Uribe-Patarroyo, M. Villiger, and B. E. Bouma, "Layer-based approach for determining quantitative scattering parameters of atherosclerotic plaque components using optical coherence tomography," in *SPIE Photonics West: Light in Cardiology*, Mar. 2021. DOI: 10.1117/12.2577587.
12. **T. M. Cannon**, N. Uribe-Patarroyo, M. Villiger, and B. E. Bouma, "Polarization-sensitive optical coherence tomography for comprehensive and clinically informative assessment of burn wound severity," in *Military Health System Research Symposium*, Aug. 2021.
13. **T. M. Cannon**, N. Uribe-Patarroyo, M. Villiger, and B. E. Bouma, "Quantifying scattering contrast in intravascular optical coherence tomography for improved characterization of atherosclerotic plaques (**Invited**)," in *European Conference on Biomedical Optics*, Jun. 2021.
14. **T. M. Cannon**, B. E. Bouma, and N. Uribe-Patarroyo, "Quantitative microstructure sensing for epithelial characterization with optical coherence tomography," in *SPIE Photonics West: Optical*

Coherence Tomography and Coherence Domain Optical Methods in Biomedicine, Top Session Presenter Award, Jan. 2020.

15 **T. M. Cannon**, P. Keahey, N. Uribe-Patarroyo, M. Villiger, and B. E. Bouma, "Multi-parameter polarization-sensitive optical coherence tomography for improved burn depth determination," in *SPIE Photonics West: Photonics in Dermatology and Plastic Surgery*, Jan. 2020.

Community Engagement

2023 - ...	**Admissions committee member**, Harvard-MIT Medical Engineering and Medical Physics (MEMP) PhD program
	Member, MIT EECS Committee for Diversity, Equity, and Inclusion
	Mentor, MIT Summer Research Program
2020 - 2023	**Co-founder and Demographics Committee Chair**, Wellman Anti-Racism Effort
2021 - 2023	**Co-organizer**, Wellman Center Healthcare Disparities Hack-a-Thon
	Student liaison to admission committee, Harvard-MIT Medical Engineering and Medical Physics (MEMP) PhD program
2020 - 2022	**Student member**, HST-IMES Committee on Academic Programs
2021 - 2022	**Founder and President**, Wellman Center Optica (OSA) Student Chapter
	Mentor, HST Summer Biomedical Optics Institute
2020 - 2021	**Chair**, Harvard-MIT HST Joint Council
	Student liaison, National Photonics Initiative Congressional Visits Day
2019 - 2020	**Secretary**, Harvard-MIT HST Joint Council
2018 - 2020	**Volunteer**, MEMP Application Assistance Program
	Student representative, MIT Graduate Student Council and Advising Relations Sub-committee

References

Polina Anikeeva, PhD *Postdoctoral mentor*, anikeeva@mit.edu

Brett E. Bouma, PhD *Predoctoral mentor*, bouma@mgh.havard.edu

Nestor Uribe-Patarroyo, PhD *Predoctoral mentor*, UribePatarroyo.Nestor@mgh.harvard.edu

Elfar Adalsteinsson, PhD *Thesis committee chair*, elfar@mit.edu