Matthew B. Applegate

Curriculum Vitae

11 Hinckley Street, Unit 2
Somerville, MA 02145
607.216.2848
mapple03@bu.edu
www.matthewbapplegate.com
NCBI Bibliography

Current Position

2016 - present **F32 Postdoctoral Fellow**, *Boston University*.
Biomedical Optical Technologies Lab

Education

2016 **PhD, Biomedical Engineering**, *Tufts University*.
Thesis title: Sculpting with light: light/matter interaction in biocompatible polymers

2009 **BS, Electrical Engineering**, *Cornell University*.
Concentration in Signal Processing

Publications in preparation

- "Recent advances in high speed diffuse optical imaging in biomedicine", APL Photonics. Invited. (under review)
- "Shortwave infrared spatial frequency domain imaging for quantification of lipid and water." with Yanyu Zhao (under review)
- "Hyperspectral shortwave infrared spatial frequency domain imaging system" with Sam Spink

Peer-reviewed Publications (J numbers are links)

2020

J23 **Applegate MB**, Karrobi K, Angelo JP, Austin W, Tabassum SM, Aguénounon E, Tilbury K, Saager RB, Gioux S, Roblyer D, "OpenSFDI: an open-source guide for constructing a spatial frequency domain imaging system," *J. Biomed. Opt.* 25(1): 016002, 2020

2018

J22 **Applegate MB**, Zhao Y, Istfan R, Roblyer D, "Quantitative real-time pulse oximetry with ultrafast frequency-domain diffuse optics and deep neural network processing" *Biomedical Optics Express*. 9(12): 5997, 2018

J21 **Applegate MB**,Roblyer D, "Multi-distance diffuse optical spectroscopy with a single optode via hypotrochoidal scanning" *Optics Letters*. 43(4): 747-50, 2018

2017

J20 **Applegate MB**, Roblyer D. "High-speed spatial frequency domain imaging with temporally modulated light" *Journal of Biomedical Optics*. 22(7): 076019, 2017

J19 Franklin AM, **Applegate MB**, Lewis SM, Omenetto FG. "Stomatopods detect and assess achromatic cues in contests" *Behavioral Ecology*. 28(5): 1329-36, 2017

J18 Tseng P, Napier B, Zhao S, Mitropoulos AN, **Applegate MB**, Marelli B, Kaplan DL, Omenetto FG. "Directed assembly of bio-inspired hierarchical materials with controlled nanofibrillar architectures" *Nature Nanotechnology*. 12(5): 474-80, 2017

J17 Tseng P, Zhao S, Golding AS, **Applegate MB**, Mitropoulos AN, Kaplan DL, Omenetto FG. "Evaluation of Silk Inverse Opals for 'Smart' Tissue Culture" *ACS Omega*. 2(2): 470-7, 2017

J16 Landry MJ, **Applegate MB**, Bushuyev OS, Omenetto FG, Kaplan DL, Cronin-Golomb M, Barrett CJ. "Photo-induced structural modification of silk gels containing azobenzene side groups" *Soft Matter*. 13(16): 2903-6, 2017

2016

J15 Partlow BP, **Applegate MB**, Omenetto FG, Kaplan DL. "Dityrosine Cross-Linking in Designing Biomaterials" *ACS Biomaterials Science & Engineering*. 2(12): 2108-21, 2016

J14 **Applegate MB**, Alonzo C, Georgakoudi I, Kaplan DL, Omenetto FG. "A simple computational model of multiphoton micromachining in silk hydrogels" *Applied Physics Letters*. 108(24): 241903, 2016

J13 **Applegate MB**, Partlow BP, Coburn J, Marelli B, Pirie C, Pineda R, Kaplan DL, Omenetto FG. "Photocrosslinking of silk fibroin using riboflavin for ocular prostheses." *Advanced Materials*. 28(12): 2417-20, 2016

J12 Zhao S, Chen Y, Partlow BP, Golding AS, Tseng P, Coburn J, **Applegate MB**, Moreau JE, Omenetto FG, Kaplan DF. "Bio-functionalized silk hydrogel microfluidic systems." *Biomaterials*. 93: 60-70, 2016

J11 Brenckle MA, Partlow BP, Tao H, **Applegate MB**, Reeves A, Paquette M, Marelli B, Kaplan DL, Omenetto FG. "Methods and applications of multilayer silk fibroin laminates based on spatially controlled welding in protein films." *Advanced Functional Materials*. 26(1): 44-50, 2016

2015

J10 **Applegate MB**, Coburn J, Partlow BP, Moreau JE, Mondia J, Marelli B, Kaplan DL, Omenetto FG. "Laser-based 3-dimensional multiscale micropatterning of biocompatible hydrogels for customized tissue engineering scaffolds." *Proceedings of the National Academy of Sciences*. 112(39): 12052-7, 2015

J9 **Applegate MB**, Perotto G., Kaplan DL, Omenetto FG. "Biocompatible silk step-index optical waveguides." *Biomedical Optics Express*. 6(11): 4221-7, 2015

J8 Mitropoulos A, Marelli B, Ghezzi CE, **Applegate MB**, Partlow BP, Kaplan DL, Omenetto FG. "Transparent, nanostructured silk fibroin hydrogels with tunable mechanical properties." *ACS Biomaterials Science & Engineering*. 1(10): 964-70, 2015

2014

J7 Partlow BP, Hannah CW, Rnjak-Kovacina J, Moreau JE, **Applegate MB**, Burke KA, Marelli B, Mitropoulos AN, Omenetto FG, Kaplan DL. "Highly tunable elastomeric silk biomaterials." *Advanced Functional Materials*. 24(29): 4615-24, 2014

2013

J6 **Applegate MB**, Marelli B, Kaplan DL, Omenetto FG. "Determination of multi-photon absorption of silk fibroin using the Z-scan technique." *Optics Express*, 21, 29637–42, 2013

J5 Hariri LP, **Applegate MB**, Mino-Kenudson M, Mark EJ, Medoff BD, Luster AD, Bouma BE, Tearney GJ, Suter MJ, "Volumetric optical frequency domain imaging of pulmonary pathology with precise correlation to histopathology." *Chest Journal*, 143(1): 64-74, 2013.

J4 Hariri LP, Mino-Kenudson M, **Applegate MB**, Eugene MJ, Tearney GJ, Lanuti M, Channick CL, Chee A, Suter MJ. "Towards the guidance of transbronchial biopsy: Identifying pulmonary nodules with optical coherence tomography." *Chest Journal*, 144(4): 1261-8, 2013.

J3 Hariri LP, Villager M, **Applegate MB**, Mino-Kenudson M, Mark EJ, Bouma BE, Suter MJ. "Seeing beyond the Bronchoscope to Increase the Diagnostic Yield of Bronchoscopic Biopsy." *American Journal of Respiratory and Critical Care Medicine*, 187(2): 125-9, 2013.

2012

J2 Hariri LP, **Applegate MB**, Mino-Kenudson M, Mark EJ, Bouma BE, Tearney GJ, Suter MJ. "Optical Frequency Domain Imaging of Ex vivo Pulmonary Resection Specimens: Obtaining One to One Image to Histopathology Correlation." *Journal of Visualized Experiments: JoVE*, 71, 2012.

J1 Tan KM, Shishkov M, Chee A, **Applegate MB**, Bouma BE, Suter MJ. "Flexible transbronchial optical frequency domain imaging smart needle for biopsy guidance." *Biomedical Optics Express*, 3(8): 1947-54, 2012.

Other Publications

O2 **Applegate MB**, Brenckle MA, Marelli BM, Tao H, Kaplan DL, Omenetto FG. "Silk: A different kind of 'fiber optics'," *Optics and Photonics News*. June 2014. (cover)

O1 **Applegate MB**, Hariri LP, Beagle J, Tan KM, Chee C, Hales CA, Suter MJ. "Assessment of smoke inhalation injury using volumetric optical frequency domain imaging in sheep models," *Proc. of the SPIE* 8207, 2012.

Honors & Awards

2019 **Awardee**, *NIH F32 Ruth L. Kirschstein National Research Service Award (NRSA) Individual Postdoctoral Fellowship*.
International 2-year fellowship

2017 **3rd place**, *Poster competition*.
ECI Advances in Optics for Biotechnology XV Conference

2015 **Recipient**, *Incubic Milton Chang Student Travel Grant*.
International

2014 **Awardee**, *National Defense Science and Engineering Graduate Fellowship*.
National 3-year fellowship

2014 **Winner**, *Tufts University Graduate Student Research Competition*.
University-wide

2013 **Honorable Mention**, *National Science Foundation Graduate Research Fellowship*.
National

2012 **Recipient**, *Stern Fellowship, Tufts University*.
College of Engineering 2-year fellowship

Invited Talks

2016 **"Photostructuring silk biomaterials"**, *Institute for Theoretical Atomic, Molecular, and Optical Physics (ITAMP) seminar*.
Harvard University

2016 **"'Subtractive' 3D printing via multiphoton absorption in silk hydrogels"**, *SelectBio Conference*.
Boston, MA

Presentations

2018 **Hyperspectral spatial frequency domain imaging (HS-SFDI) for monitoring rapid changes in tumor oxygenation**, *SPIE Photonics West*, San Francisco, CA.
Podium Presentation

2018 **Real-time diffuse optical B-mode Imaging (DOBI) for cancer monitoring**, *SPIE Photonics West*, San Francisco, CA.
Podium Presentation

2017 **High-speed spatial frequency domain imaging with temporally modulated light**, *ECI Advances in Optics for Biotechnology XV*, Snowmass, CO.
Poster Presentation

2015 **Biocompatible silk fibroin optical waveguides**, *Advanced Photonics Congress*, Boston,MA.
Podium Presentation

2015 **3D laser ablation of silk fibroin hydrogels for biomedical applications**, *Conference on Lasers and Electro-Optics (CLEO)*, San Jose, CA.
Podium Presentation

2013 **Direct Laser Writing of Three Dimensional Microscale Features in Silk Fibroin Hydrogels**, *Biomedical Engineering Society (BMES) Annual Meeting*, Seattle, WA.
Podium Presentation

2009 **A novel method of electrothermal weed control**, *Cornell University Undergraduate Research Symposium*, Ithaca, NY.
Poster Presentation

Teaching Experience

2014 **Teaching Assistant**, *Tufts University*.
Design of Medical Instrumentation

2013 **Teaching Assistant**, *Tufts University*.
Systems Biology

2011 **Volunteer Math Tutor**.

2009 **Volunteer Math Tutor**, *Tompkins Learning Partners*.

Service

2018 **Instructor**, *Artemis Project Summer Program*, Boston University.

2017 **Reviewer**, *Journal of Biomedical Optics*.

2016 **Reviewer**, *Applied Physics Letters: Photonics*.

2014–2015 **Reviewer**, *Graduate Student Research Competition*, Tufts University.

2015 **Vice President**, *Optical Society of America Student Chapter*, Tufts University.

2015 **Optics Outreach**, *O-mazing Optics*, Discovery Museum, Acton, MA.

2014 **Optics Outreach**, *Community Day*, Tufts University.

Research Experience

2017 **Diffuse optical spectroscopic imaging (DOSI), spatial frequency domain imaging (SFDI)**.
Boston University

2012–2016 **Nonlinear Optics, Microscopy, Multiphoton Micromachining, Biopolymers, Photopolymerization, Tissue Engineering Scaffolds**.
Tufts University

2010–2012 **Optical Coherence Tomography (OCT), Lung Biology**, *Suter Lab*.
Massachusetts General Hospital

2009 **Organic Cropping Systems**.
Cornell University

Relevant skills

Electronics

- Firmware design
- PCB Design
- DSP in FPGA
- PCB Layout

Optics

- FD diffuse optics
- Beam alignment
- Supercontinuum generation
- Micromachining
- Spatial frequency domain imaging
- Optical Coherence Tomography
- Microscopy
- Interferometry

Programming

- C++
- Python
- LabView
- ImageJ
- VHDL
- Matlab
- R
- LaTeX

Biomaterials

- Mechanical testing
- 3D printing
- SEM
- Biopolymer processing