Curriculum vitae

Brett Bouma
Professor
Harvard Medical School

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Education

PhD in Physics, University of Illinois, Chicago

Work experience

Research fellow, Electrical and Computer Engineering, Massachussetts Institute of Technology

Professor of Dermatology and Health Sciences and Technology at Harvard Medical School

Physicist in the Wellman Center for Photomedicine at the Massachusetts General Hospital

Professional membership

Fellow of the Optical Society of America.

Research Interests

- **Biomedical optics**

My focus in this area is on the development of novel optical instrumentation and methods for diagnosis and therapy in medicine.

- **Cardiovascular imaging**

Cardiovascular disease remains the leading cause of death in industrialized countries, in part due to the lack of methods for detecting and monitoring the progression of disease in patients. Our work has focused on developing and utilizing novel optical techniques, primarily to study coronary artery disease.

- **Optical coherence tomography**

I have enjoyed participating in the development of OCT technology since the first demonstration of catheter-based, infrared systems. With the recent development of Fourier-domain technology, the field continues to evolve and practical systems have emerged for a spectrum of clinical and biological applications.

Publications:

1. Kim TS, Park HS, Jang SJ, Song JW, Cho HS, Kim S, Bouma BE, Kim JW, Oh WY. Single cardiac cycle three-dimensional intracoronary optical coherence tomography. Biomed Opt Express. 2016 Dec 01; 7(12):4847-4858. PMID: 28018710.

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2. Adams DC, Hariri LP, Miller AJ, Wang Y, Cho JL, Villiger M, Holz JA, Szabari MV, Hamilos DL, Scott Harris R, Griffith JW, Bouma BE, Luster AD, Medoff BD, Suter MJ. Birefringence microscopy platform for assessing airway smooth muscle structure and function in vivo. Sci Transl Med. 2016 Oct 05; 8(359):359ra131. PMID: 27708064.

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3. Rico-Jimenez JJ, Campos-Delgado DU, Villiger M, Otsuka K, Bouma BE, Jo JA. Automatic classification of atherosclerotic plaques imaged with intravascular OCT. Biomed Opt Express. 2016 Oct 01; 7(10):4069-4085. PMID: 27867716.

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4. Lo WC, Uribe-Patarroyo N, Nam AS, Villiger M, Vakoc BJ, Bouma BE. Laser thermal therapy monitoring using complex differential variance in optical coherence tomography. J Biophotonics. 2017 Jan; 10(1):84-91. PMID: 27623742.

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5. Uribe-Patarroyo N, Bouma BE. Velocity gradients in spatially resolved laser Doppler flowmetry and dynamic light scattering with confocal and coherence gating. Phys Rev E. 2016 Aug; 94(2-1):022604. PMID: 27627357.

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6. Golberg A, Villiger M, Khan S, Quinn KP, Lo WC, Bouma BE, Mihm MC, Austen WG, Yarmush ML. Preventing Scars after Injury with Partial Irreversible Electroporation. J Invest Dermatol. 2016 Nov; 136(11):2297-2304. PMID: 27393126.

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7. Blatter C, Meijer EF, Nam AS, Jones D, Bouma BE, Padera TP, Vakoc BJ. In vivo label-free measurement of lymph flow velocity and volumetric flow rates using Doppler optical coherence tomography. Sci Rep. 2016 Jul 05; 6:29035. PMID: 27377852.

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8. Villiger M, Lorenser D, McLaughlin RA, Quirk BC, Kirk RW, Bouma BE, Sampson DD. Deep tissue volume imaging of birefringence through fibre-optic needle probes for the delineation of breast tumour. Sci Rep. 2016 Jul 01; 6:28771. PMID: 27364229.

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9. van der Sijde JN, Karanasos A, Villiger M, Bouma BE, Regar E. First-in-man assessment of plaque rupture by polarization-sensitive optical frequency domain imaging in vivo. Eur Heart J. 2016 Jun 21; 37(24):1932. PMID: 27174288.

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10. Jang SJ, Park HS, Song JW, Kim TS, Cho HS, Kim S, Bouma BE, Kim JW, Oh WY. ECG-Triggered, Single Cardiac Cycle, High-Speed, 3D, Intracoronary OCT. JACC Cardiovasc Imaging. 2016 May; 9(5):623-5. PMID: 27151525.

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11. Lo WC, Villiger M, Golberg A, Broelsch GF, Khan S, Lian CG, Austen WG, Yarmush M, Bouma BE. Longitudinal, 3D Imaging of Collagen Remodeling in Murine Hypertrophic Scars In Vivo Using Polarization-

Sensitive Optical Frequency Domain Imaging. J Invest Dermatol. 2016 Jan; 136(1):84-92. PMID: 26763427.

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12. Uribe-Patarroyo N, Bouma BE. Rotational distortion correction in endoscopic optical coherence tomography based on speckle decorrelation. Opt Lett. 2015 Dec 1; 40(23):5518-21. PMID: 26625040.

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13. Gerbaud E, Weisz G, Tanaka A, Kashiwagi M, Shimizu T, Wang L, Souza C, Bouma BE, Suter MJ, Shishkov M, Ughi GJ, Halpern EF, Rosenberg M, Waxman S, Moses JW, Mintz GS, Maehara A, Tearney GJ. Multi-laboratory inter-institute reproducibility study of IVOCT and IVUS assessments using published consensus document definitions. Eur Heart J Cardiovasc Imaging. 2016 Jul; 17(7):756-64. PMID: 26377904.

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15. Lippok N, Villiger M, Jun C, Bouma BE. Single input state, single-mode fiber-based polarization-sensitive optical frequency domain imaging by eigenpolarization referencing. Opt Lett. 2015 May 1; 40(9):2025-8. PMID: 25927775; PMCID: PMC4421894.

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17. Han M, Kim K, Jang SJ, Cho HS, Bouma BE, Oh WY, Ryu S. GPU-accelerated framework for intracoronary optical coherence tomography imaging at the push of a button. PLoS One. 2015; 10(4):e0124192. PMID: 25880375; PMCID: PMC4400174.

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19. Quinn KP, Golberg A, Broelsch GF, Khan S, Villiger M, Bouma B, Austen WG, Sheridan RL, Mihm MC, Yarmush ML, Georgakoudi I. An automated image processing method to quantify collagen fibre organization within cutaneous scar tissue. Exp Dermatol. 2015 Jan; 24(1):78-80. PMID: 25256009; PMCID: PMC4289465 [Available on 01/01/16].

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20. Frenette M, Hatamimoslehabadi M, Bellinger-Buckley S, Laoui S, La J, Bag S, Mallidi S, Hasan T, Bouma B, Yelleswarapu C, Rochford J. Shining light on the dark side of imaging: excited state absorption enhancement of a bis-styryl BODIPY photoacoustic contrast agent. J Am Chem Soc. 2014 Nov 12; 136(45):15853-6. PMID: 25329769; PMCID: PMC4235371.

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21. Jun C, Villiger M, Oh WY, Bouma BE. All-fiber wavelength swept ring laser based on Fabry-Perot filter for optical frequency domain imaging. Opt Express. 2014 Oct 20; 22(21):25805-14. PMID: 25401614; PMCID: PMC4247181.

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22. Uribe-Patarroyo N, Villiger M, Bouma BE. Quantitative technique for robust and noise-tolerant speed measurements based on speckle decorrelation in optical coherence tomography. Opt Express. 2014 Oct 6; 22(20):24411-29. PMID: 25322018; PMCID: PMC4247190.

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23. Villiger M, Bouma BE. Practical decomposition for physically admissible differential Mueller matrices. Opt Lett. 2014 Apr 1; 39(7):1779-82. PMID: 24686603; PMCID: PMC4091979.

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24. Baac HW, Uribe-Patarroyo N, Bouma BE. High-energy pulsed Raman fiber laser for biological tissue coagulation. Opt Express. 2014 Mar 24; 22(6):7113-23. PMID: 24664059; PMCID: PMC4083053.

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28. Schlachter SC, Kang D, Gora MJ, Vacas-Jacques P, Wu T, Carruth RW, Wilsterman EJ, Bouma BE, Woods K, Tearney GJ. Spectrally encoded confocal microscopy of esophageal tissues at 100 kHz line rate. Biomed Opt Express. 2013; 4(9):1636-45. PMID: 24049684; PMCID: PMC3771834.

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33. 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. J Vis Exp. 2013 Jan 22; (71). PMID: 23381470; PMCID: PMC3582683.

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34. Hariri LP, Villiger M, Applegate MB, Mino-Kenudson M, Mark EJ, Bouma BE, Suter MJ. Seeing beyond the bronchoscope to increase the diagnostic yield of bronchoscopic biopsy. Am J Respir Crit Care Med. 2013 Jan 15; 187(2):125-9. PMID: 23322794; PMCID: PMC3570655.

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35. Zhang EZ, Oh WY, Villiger ML, Chen L, Bouma BE, Vakoc BJ. Numerical compensation of system polarization mode dispersion in polarization-sensitive optical coherence tomography. Opt Express. 2013 Jan 14; 21(1):1163-80. PMID: 23389009; PMCID: PMC3636758.

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for mechanical interlocking with tissue. Nat Commun. 2013; 4:1702. PMID: 23591869; PMCID: PMC3660066.

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45. Jamil Z, Tearney G, Bruining N, Sihan K, van Soest G, Ligthart J, van Domburg R, Bouma B, Regar E. Interstudy reproducibility of the second generation, Fourier domain optical coherence tomography in patients with coronary artery disease and comparison with intravascular ultrasound: a study applying automated contour detection. Int J Cardiovasc Imaging. 2013 Jan; 29(1):39-51. PMID: 22639296; PMCID: PMC3550705.

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