

Harvard Medical School/Harvard School of Dental Medicine

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Education

1988	B.A. cum laude	Applied Mathematics	Harvard University
1997	Ph.D.	Electrical Engineering and Computer Science Advisor: James G. Fujimoto	Massachusetts Institute of Technology
1998	M.D. magna cum laude	Medicine	Harvard Medical School

Postdoctoral Training

1998-2001	Resident	Pathology	Massachusetts General Hospital
1999-2000	Clinical/Research Fellow	Pathology	Massachusetts General Hospital

Faculty Academic Appointments

2001-2004	Assistant Professor	Pathology	Harvard Medical School
2003-	Affiliated Faculty	Health Sciences and Technology	Harvard-MIT Division of Health Sciences and Technology
2004-2010	Associate Professor	Pathology	Harvard Medical School
2010-	Professor	Pathology	Harvard Medical School

Appointments at Hospitals/Affiliated Institutions

Past

2001-2004	Assistant Physicist	Wellman Center for Photomedicine	Massachusetts General Hospital
2001-2008	Assistant Pathologist	Pathology	Massachusetts General Hospital

Current

2004-	Associate Physicist	Wellman Center for Photomedicine	Massachusetts General Hospital
2008-	Associate Pathologist	Pathology	Massachusetts General Hospital

Other Professional Positions

1987-1991	Vice-president	Vanguard Imaging, Ltd.
1993-1994	Consultant	Signal Analytics
2000-2003	Consultant	Infraredx, Inc.
2005-	Consultant	Prescient Medical, Inc.
2005-	Consultant	Cambridge Research and Instrumentation
2007-	Consultant	Merck Research Laboratories
2009-	Consultant	NinePoint Medical

Major Administrative Leadership Positions*Local*

2007-2008	Interim Director	Wellman Center Photopathology Laboratory
2008-	Co-director of HST .035	Harvard-MIT Division of Health Sciences and Technology
2009-	Associate Director	Wellman Center for Photomedicine

Regional

2007-	Program Leader of Optical Diagnostics	Center for Integration of Medicine and Innovative Technology (CIMIT)
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Committee Service*Local*

2003-2004	Intellectual Property Committee Chairman	Wellman Center for Photomedicine, MGH
2003-2004	Search Committee for Director Member	Wellman Center for Photomedicine, MGH
2003-	Faculty Executive Committee Member	Wellman Center for Photomedicine, MGH
2007-	Faculty Search Committee Chairman	Wellman Center for Photomedicine, MGH, and HST

National

2008-	Program Committee Technical Session Chairman	Gordon Research Conference
2009-	Vulnerable Plaque Working Group Member	National Heart Lung and Blood Institute (NHLBI)
2010-	Transformation M4 Emerging Technology Team Leader	College of American Pathologists

International

2007	International Conference on Advances in Optics and Biotechnology Co-Chairman	Engineering Conferences International
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2008- International Working Group on Intracoronary OCT Standardization and Validation
 International Committee on Intracoronary OCT Standardization and Validation
 Founder and co-chairman

Professional Societies

1995- SPIE – International Society for Optical Engineering
 Member

1995- Optical Society of America
 Member

1998-2001 American Medical Association
 Member

1998-2001 Massachusetts Medical Association
 Member

2000- Association for Eradication of Heart Attack
 Member

2000- American Heart Association
 Member

2006- SPIE – International Society for Optical Engineering, Cardiovascular Photonics
 Program Committee
 Co-Chairman

2006- SPIE – International Society for Optical Engineering, Endoscopic Microscopy Program
 Committee
 Co-Chairman

Grant Review Activities

2003 NIDDK Study Section National Institutes of Health
 Ad hoc member

2005-2009 Microscopic Imaging Study Section National Institutes of Health
 Standing member

Editorial Activities

Ad hoc reviewer

1993- Applied Optics

1998- Optics Communications

1998- Journal of the Optical Society of America

1993- Optics Letters

2000- Journal of Biomedical Optics

2001- Optics Express

2001- Applied Physics Letters

2003- Circulation

2003- Journal of the American College of Cardiology

2005- Arteriosclerosis, Thrombosis, and Vascular Biology

2007- Nature

Other Editorial Roles

2001-	Editor	<i>The Handbook of Optical Coherence Tomography</i> , Marcel Dekker
2005	Guest Editor	<i>Journal of Biomedical Optics</i>
2010	Editor	<i>Atlas of Intracoronary Optical Coherence Tomography</i> , Springer

Honors and Prizes

1991-1996	NIH Fellowship	National Institute of General Medical Sciences (NIH)	Academic
1991-1998	MD/Ph.D. Fellowship	Harvard Medical School	Academic
1994	General Telephone & Electronics Engineering Fellowship	General Telephone & Electronics	Research
1995	Young investigator runner-up	American Heart Association	Research
1996	Student abstract prize runner-up	American Gastroenterology Association	Research
1996	MIT Research Laboratory of Electronics Award	Massachusetts Institute of Technology	Research
2000	Partners in Excellence Group Leader	Partners	Research
2004	Edward M. Kennedy Award for Health Care Innovation	Center for Integration of Medicine and Innovative Technology	Research
2007	International Academy of Science Technology of the Year Finalist	International Academy of Science	Research

Report of Funded and Unfunded Projects**Funding Information***Past*

2000-2003	PI	National Science Foundation (NSF) Research BES-0086709	\$270,000
		Endoscopic Confocal Microscopy by Spectral Encoding The goal of this work is to develop an endoscope compatible confocal microscope for identifying sub-cellular features diagnostic of early cancer and dysplasia.	
2001-2003	Co-PI	Advanced Cardiovascular Systems Research	
		Characterization of Coronary Plaques with OCT with Patient Event Follow-up The goal of this project is to build and analyze an OCT database of human coronary plaques and demonstrate the clinical potential of intracoronary OCT in patients.	
2002-2003	PI	Center for Innovative Minimally Invasive Technology Research	\$75,000
		Speckle Imaging for Plaque Characterization The goal of this project is to investigate a new method for characterizing atherosclerotic plaque structure and composition. The method is based on the temporal decorrelation of	

		multiply scattered coherent light.	
2002-2005	PI	The Whitaker Foundation Research	\$236,289
		Spectrally Encoded Miniature Endoscopy The goal of this project is to investigate a new imaging technology for ultraminiature endoscopy and laparoscopy, permitting the diagnosis of disease in previously inaccessible areas of the body.	
2002-2006	Investigator	National Institutes of Health Research R01HL70039	
		In-situ Measurement of Plaque Biomechanical Properties (Bouma) This goal of this project is to validate and apply an optical coherence tomography (OCT) imaging method for assessing stress, strain and compliance in coronary vessels in vivo.	
2003-2004	PI	Center for Innovative Minimally Invasive Technology Research	\$25,000
		Low Coherence Interferometry System for Guidance in Lumbar Punctures The goal of this project is to investigate the use of low coherence interferometry to provide interactive guidance of the lumbar puncture needle in real-time and identify adjacent tissue types before they are penetrated.	
2003-2004	PI	Center for Innovative Minimally Invasive Technology Research	\$75,000
		Polarization Sensitive OCT (PS-OCT) Assessment of Collagen in Atherosclerotic Plaques The objective of this study is to investigate the measurement of collagen by quantifying birefringence in atherosclerotic plaques using PS-OCT.	
2003-2008	Investigator	National Institutes of Health Research R01RR19768	
		Fast OCT Technology for Comprehensive Diagnostic Imaging (deBoer) The goals of this project are to develop a new, parallel detection form of OCT that provides vastly improved image acquisition rate and resolution. The new technology will be used for early detection and treatment of glaucoma, characterization of vulnerable plaques responsible for acute myocardial infarction, and for surveillance for esophageal neoplasia in patients with Barrett's esophagus.	
2003-2008	PI	Department of Defense, MFEL Program Research FA9550-04-1-0079	\$299,488
		Low Coherence Interferometry Guided Fine Needle Aspiration The goal of this project is to develop an optically guided needle for fine needle aspiration of palpable masses.	
2003-2008	PI	Department of Defense, MFEL Program Research FA9550-04-1-0079	\$301,932

Simultaneous Fluorescence Lifetime, Excitation, and Emission Spectral Measurement

The goal of this research is to develop a novel Fourier transform fluorescence spectroscopy technique for simultaneously detecting silicon quantum dots with unique excitation, emission, and lifetime properties.

2004-2006	PI	Center for Innovative Minimally Invasive Technology Research	\$75,000
		Endoscopic Full-field Optical Coherence Microscopy System for Clinical Diagnostics The goal of this research is to develop a novel imaging technology that will enable endoscopic imaging of human tissue at resolution sufficient to visualize cellular substructure, thereby providing clinicians with a tool that will bring endoscopic optical biopsy closer to realization.	
2006-2008	PI	National Institutes of Health Research R21CA122161	\$208,644
		Comprehensive Architectural and Cellular Endoscopic Microscopy The goal of this work is to develop an endoscopic confocal microscope for identifying sub-cellular features diagnostic of early cancer and dysplasia.	
2006-2008	PI	Prescient Medical Incorporated Research	\$973,852
		Raman Spectroscopy of Coronary Atherosclerosis The goal of this study is to develop a state-of-the-art Raman spectroscopy system and 3.0 F intracoronary catheter for the chemical characterization of coronary plaque in the presence of intraluminal blood.	
2006-2008	PI	Center for Innovative Minimally Invasive Technology Research 2006A014969	\$79,814
		Optical Frequency Domain Imaging for the determination of cerebral aneurysm rupture risk The goal of this research is to develop a high-resolution structural imaging method for imaging cerebral artery walls that is capable of discriminating rupture-prone from benign aneurysms.	
2007-2009	PI	Department Bridge Funding MFEL Transition Research	\$120,000
		Portable Smart Needle Device The goal of this research is to construct a miniature, battery-powered optical frequency domain imaging system for guidance of needle placement during vascular access.	
2007-2009	PI	Department Bridge Funding MFEL Transition Research	\$120,000
		Laser Speckle Imaging for Tissue Perfusion The goal of this project is to develop a laser speckle hand-held imaging system for determining depth-resolved tissue perfusion.	
2007-2009	PI	Department Bridge Funding MFEL Transition Research	\$120,000

Simultaneous Fluorescence Lifetime, Excitation, and Emission Imaging

The goal of this research is to develop a novel Fourier fluorescent technique for determining excitation, emission, and lifetime properties of biological samples.

2007-2009	PI	Department Bridge Funding MFEL Transition Research	\$120,000
		Laser Speckle Imaging for Evaluating Compartment Syndrome	
		The goal of this project is to create a portable imaging device for diagnosing the early stages of compartment syndrome, prior to the occurrence of irreversible ischemia.	
2008-2009	PI	Center for Innovative Minimally Invasive Technology	\$35,861
		Micromirror Based 3D-Endoscopy	
		The goal of this project is to investigate the clinical utility of a newly developed MEMS scanning mirror for three-dimensional microscopic imaging inside the body	
2008-2009	PI	MGH ECOR Formulaic Bridge Support Research	\$50,000
		Chemical Analysis of Coronary Atherosclerosis in Patients	
		Development of an Intracoronary Raman Catheter System. This study will develop a state-of-the-art Raman spectroscopy system and 3.0 F intracoronary catheter for the detection of lipid beneath blood.	
2008-2010	PI	Olympus Medical Research, Clinical Study	\$1,360,000
		Optical Frequency Domain Imaging of Gastrointestinal and Pulmonary Tracts	
		The goal of this project is to determine the applications of endoscopic optical frequency domain imaging in the gastrointestinal and pulmonary tracts. Clinical feasibility studies will be conducted in the esophagus, bile duct, pancreas, duodenum, liver, and colon.	
2008-2010	Mentor	National Institutes of Health Research K99 CA134920 (Suter)	\$284,310
		Optical Imaging of the Pulmonary Airways in the Assessment of Lung Cancer	
		The research is to develop an accurate screening and assessment tool, based on optical frequency domain imaging, for the detection and diagnosis of dysplastic changes and early squamous cell carcinoma within the bronchial mucosa.	
<i>Current</i>			
2004-2014	PI	National Institutes of Health (NHLBI) Research, Clinical Study R01HL076398	\$2,212,849
		Natural History of Vulnerable Coronary Plaques	
		The goal of this project is to expand the current diagnostic capabilities of OCT to investigate the incidence, prevalence, and natural history of vulnerable plaques and determine the morphologic predictors of acute myocardial infarction	
2007-2010	PI	National Institutes of Health Research R21EB007718-02	\$658,538

Miniature Laser Therapy Endoscope

The goal of this project is to further research on effective ablation therapy through the development of an integrated miniature imaging/laser-ablation probe.

2008-2012	PI	National Institutes of Health Research R01HL093717-01	\$1,903,396
		Chemical Analysis of Coronary Atherosclerosis in Patients The goal of this proposal is to develop an intracoronary catheter for measuring the chemical and molecular composition of atherosclerotic plaques in living human patients.	
2008-2010	Mentor	National Institutes of Health Research K99 EB008737 (Peng)	\$180,000
		Densely Multiplexed Fluorescence Imaging by Fourier Transform Fluorometry The research is to develop a novel Fourier transform fluorescence technique for simultaneously detecting different fluorescent markers with unique excitation, emission, and lifetime properties.	
2008-2013	PI	American Air Liquide Inc. Research	\$1,250,000
		Optical Imaging for Pulmonary Microstructure, Function, and Gas Delivery The goal of this research is to determine the three-dimensional structure and function of mammalian alveoli.	
2009-2011	PI	National Institutes of Health Research R21CA141884-01	\$799,298
		Comprehensive Confocal Microscopy for Image Guided Biopsy The goal of this research is to develop and test a novel method for imaging entire epithelial tissue surfaces to diagnose cancer and subsequently mark these locations so that they may be biopsied.	
2003-2015	PI	National Institutes of Health Research, Clinical Study R01CA103769-07	\$1,599,478
		Improving Screening and Surveillance in Barrett's Patients The goal of this project is to expand the current diagnostic capabilities of OCT, develop a standalone imaging method for systematically evaluating the distal esophagus, and test these new methods for screening and surveillance in patients.	
2007-2010	PI	National Institutes of Health STTR w/ Physical Sciences Inc. Research 1R43CA114896	\$38,117
		Smart Optical Probe for guidance of fine needle biopsy Validation of an optical method for improving the diagnostic yield of fine needle biopsy.	
2007-2010	PI	Center for Innovative Minimally Invasive Technology Research	\$25,000

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Program Leadership Award for Optical Diagnostics

This fund supports Dr. Tearney's efforts to manage CIMIT's Optical Diagnostics Program.

2008-2010	PI	Cystic Fibrosis Foundation Research 2007A052878	\$161,129
Development of Optical Coherence Tomography for Measuring of Mucociliary Clearance The goal of this project is to develop a high-resolution imaging modality for assessing respiratory epithelia cilia and the periciliary layer in Cystic Fibrosis patients in vivo.			
2008-2010	PI	Wellman Center for Photomedicine Internal Funding Photopathology / Microscopy Core	\$449,684
Dr. Tearney is the director of Wellman Center's Photopathology and Microscopy core laboratory. The core laboratory provides histopathology and advanced microscopy services to Wellman Center investigators.			
2010-2011	PI	MGH ECOR Formulaic Bridge Support Research, Clinical Study	\$50,000
Transnasal Probe for Diagnosing Eosinophilic Esophagitis The goal of this project is to develop a transnasal probe to investigate the clinical utility of using SECM for diagnosing Eosinophilic Esophagitis (EE) in patients.			
2009-2010	PI	MGH ECOR Interim Support Funds Research, Clinical Study	\$50,000
Improving Screening & Surveillance in Barrett's Patients The goal of this project is to utilize probe based Optical Frequency Domain Imaging as a tool for screening and surveillance of patients with Barrett's Esophagus (BE).			

Current Unfunded Projects

2007-	PI	Endoscopic confocal microscopy (bench research)	
The goal of this work is to develop a hand-held confocal microscope for identifying sub-cellular features diagnostic of early cancer and dysplasia.			
2006-	PI	Miniature endoscopy (bench research)	
This project will develop a new imaging technology for ultraminiature endoscopy and laparoscopy, permitting the diagnosis of disease in previously inaccessible areas of the body through a novel 250 μm -diameter endoscope.			
2006-	PI	Endoscopic optical coherence microscopy (bench research)	
This research will develop a new form of endoscopic microscopy termed, endoscopic full field optical coherence microscopy (EFFOCM). EFFOCM permits submicron resolution imaging along all three spatial dimensions (x, y, and z).			
2007-	PI	Photoactivatable amniotic membrane coronary stent (bench research)	
This project will develop a novel device for coronary stenting, comprising a photoactivatable amniotic membrane that is bonded to the artery wall using light.			
2006-	PI	Differential near field scanning optical microscopy (DNSOM) (bench research)	
The goal of this research is to develop a new paradigm for nm-scale imaging using edge			

apertures in the near-field.

- 2006- PI Self-interference fluorescence coherence tomography (bench research)
The goal of this work is to develop a new type of cross-sectional fluorescence imaging using the phenomena of fluorescence self-interference.
- 2008- PI Mid-infrared optical tomography
The goal of this research is to investigate the use of mid-infrared electromagnetic radiation for human disease diagnosis.
- 2009- PI Stimulated emission depletion microscopy for deep tissue superresolution microscopy
In this project we are developing a new way of performing STED superresolution microscopy that can be implemented over large fields and in human tissue in vivo.
- 2010- PI Optical coherence tomography with 1- μm resolution (μOCT)
The goal of this research is to develop a cross-sectional imaging method capable of visualizing subcellular detail in human patients.
- 2010- PI Device for accurate placement of devices within the trachea
The goal of this research is to develop an optical device for determining when a bougie or tracheostomy tube has been correctly inserted in the trachea in the trauma setting.

Report of Local Teaching and Training

Teaching of Students in Courses

Harvard-MIT Health Sciences and Technology (HST)

2002-	HST .569, Biomedical Optics		
10 (graduate students)	Instructor		80 hours per semester
2003-	Wellman Biomedical Optics Summer Institute		
12 (undergraduate students)	Lecturer		20 hours
2003-	HST .035, Principles and Practice of Human Pathology		
20 (graduate students)	Instructor		40 hours per semester
2005	HST .864 Evaluating a Biomedical Business Concept		
20 (graduate students)	Lecturer		4 hours
2006	HST .186 Frontiers in Biomedical Engineering and Physics		
20 (graduate students)	Lecturer		4 hours
2011-	Clinical Applications of Optical Coherence Tomography		
	Lecturer		1 Hour
2011-	HST .569, Biomedical Optics		
	Lecturer		12 Hours
2012-	Introduction to Clinical/Translational Research: Device Development		
	Lecturer		2 Hours

Formal Teaching of Residents, Clinical Fellows and Research Fellows (post-docs)

Wellman Center for Photomedicine, Massachusetts General Hospital, Harvard Medical School

1997- 50 (graduate students, postdoctoral, clinical fellows)	Wellman Tutorial Lecture Series Lecturer	10 hours
2001- 50 (graduate students, postdoctoral, clinical fellows)	Wellman Photomedicine Lecture Series Lecturer	10 hours
2002 50 (graduate students, postdoctoral, clinical fellows)	Optical Diagnostics Tutorial Series Lecturer	10 hours

Laboratory and Other Research Supervisory and Training Responsibilities

Wellman Center for Photomedicine, Massachusetts General Hospital, Harvard Medical School

1997- Supervision of undergraduate, graduate, post- doctoral research fellows	Daily mentorship since 2001
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Formally Supervised Trainees

1997-1999 Stefan Brand, M.D.	Staff gastroenterologist, University of Munich
Co-author on three manuscripts, one as first author (Endoscopy).	
1998-2000 John Ponerros, M.D.	Assistant Professor, Harvard Medical School, staff gastroenterologist, Brigham and Women's Hospital
Co-author on four manuscripts, two as first author (Gastroenterology and Gastrointestinal Endoscopy).	
1998-2000 Kelly Schlendorf	Medical Student, Emory Medical School
Co-author on four manuscripts.	
1998-2003 George Asimellis, Ph.D.	Scientist, Philips Electronics North America
As first employee of Tearney lab, assisted in developing first imaging probes.	
1999-2001 Dong-Heon Kang, M.D., Ph.D.	Staff cardiologist, Saint Mary's Medical Center, Seoul, Korea
Co-author on three manuscripts.	
1999- Milen Shishkov, Ph.D.	Instructor, Harvard Medical School
Co-author on twenty-two manuscripts. He has become one of the leading experts on developing optical imaging probes.	
2000-2002 Chris Kauffman	Medical Student, University of Indiana Medical School
Co-author on four manuscripts.	
2000-2002 Hiroshi Yabushita, M.D.	Staff cardiologist, Kinki University School of Medicine, Osaka, Japan
Co-author on four manuscripts, one as first author (Circulation).	

- 2000-2005 Nicusor Iftimia, Ph.D. Instructor, Harvard Medical School
Co-author on thirteen manuscripts, three as first author (JBO, Optics Express, Rev. Sci. Instr.).
- 2001-2002 Costas Pitris, M.D., Ph.D. Assistant Professor, EECS, Cyprus University
First author on one manuscript (Optics Express), graduated with honors from HMS.
- 2001-2002 Tina Helg, Ph.D. Post-doctoral Associate, University of Texas, Austin
Co-author on one manuscript.
- 2001-2003 Masamichi Takano, M.D. Staff cardiologist, Nippon Medical School, Tokyo, Japan
Co-author on five manuscripts. First author on a book chapter (Handbook of Vulnerable Plaque).
- 2002-2007 Caroline Boudoux, Ph.D. Assistant Professor
Co-author on seven manuscripts, three as first author (Optics Express, J. Voice, Arch. Otolaryngol. Head Neck Surg.).
- 2002-2007 Dvir Yelin, Ph.D. Assistant Professor, Technion
Co-author on fourteen manuscripts, nine as first author, one publication in Nature.
- 2002- Alyx Chau, B.S. Graduate Student, EECS, MIT
Co-author on four manuscripts, two as first author (JBO, Annals of Biomedical Engineering).
- 2002- Briain MacNeill, M.D. Cardiology Fellow, Massachusetts General Hospital
Co-author on five manuscripts, two as first author (JACC and J. Nuclear Cardiology).
- 2003-2005 Andy Yun, Ph.D. Assistant Professor, Harvard Medical School
Co-author on twenty-seven manuscripts, eight as first author, one publication in Nature Medicine.
- 2003-2006 Raymond Chan, Ph.D. Research Scientist, Philips Medical
Co-author on five manuscripts, one as first author (Optics Express).
- 2003-2007 Ronit Yelin, Ph.D. Research Scientist, Technion
Co-author on three manuscripts, one as first author (JBO).
- 2003-2008 Jason Motz, Ph.D. Research Scientist, Physical Sciences, Inc.
Co-author on six manuscripts, one as first author (Optics Letters).
- 2003-2008 Seemantini Nadkarni, Ph.D. Assistant Professor, Harvard Medical School
Co-author on six manuscripts, five as first author, including Circulation and JACC.
- 2003- Brian Goldberg, B.S. Graduate Student, EECS, MIT
Co-author on two manuscripts, one as first author (JBO).
- 2003- W. Matthew White, M.D. ENT Fellow, Massachusetts Eye and Ear Infirmary
Co-author on four manuscripts.
- 2003- John Evans, M.D. Gastroenterology Fellow,

		Massachusetts General Hospital
Co-author on four manuscripts, two as first author (Gastrointestinal Endoscopy and Clin. Gastro. Hep.).		
2004-2008	Benjamin Vakoc, Ph.D.	Assistant Professor, Harvard Medical School
Co-author on nineteen manuscripts, four as first author.		
2004-	William Oh, Ph.D.	Instructor, Harvard Medical School
Co-author on fifteen manuscripts, seven as first author.		
2005-2007	Adrien Desjardins, B.S.	Graduate Student, Biophysics, HMS
Co-author on thirteen manuscripts, four as first author.		
2005-	Alberto Bilenca, Ph.D.	Instructor, École Polytechnique Fédérale de Lausanne
Co-author on ten manuscripts, five as first author.		
2005-	Melissa Suter, Ph.D.	Instructor, Harvard Medical School
Co-author on five manuscripts, two as first author (Gastrointestinal Endoscopy). Recipient of NIH K99/R00 award.		
2005-	Leilei Peng, Ph.D.	Instructor, Harvard Medical School
First author on two manuscripts (Optics Express and Optics Letters). Recipient of NIH K99/R00 award.		
2006-2007	Aydogan Ozcan, Ph.D.	Assistant Professor, UC Los Angeles
Co-author on six manuscripts, three as first author, including Nano Letters.		
2006-	Patrick Yachimski, M.D.	Gastroenterology Fellow, Massachusetts General Hospital
Co-author on one manuscript.		
2006-	Lida P. Hariri, M.S.	Graduate Student, EECS, University of Arizona
First author on one manuscript submitted to IEEE Trans. Med. Im.		
2007-	Priyanka Jillela	Undergraduate Student, University of Texas
Two manuscripts in preparation.		
2007	Amneet Gulati	Undergraduate Student, Rice University
Demonstrated feasibility of respiratory FFOCM (results are currently unpublished).		
2007-2008	Max Colice, Ph.D.	Technology Specialist, Hamilton, Brook, Smith and Reynolds
Co-author on one manuscript.		
2007-2009	Lisa Bartlett	Graduate Student, Tufts University
Co-author on one manuscript.		
2007-	Dong-Kyun Kang, Ph.D.	Post-doctoral Associate, Harvard Medical School
First author on one manuscript accepted to Optics Express. First author on a second manuscript for Gastrointestinal Endoscopy/		
2007-2008	Michael Choma, M.D., Ph.D.	Pediatric Fellow, Children's Hospital

First author on one manuscript submitted to Nature.		
2008-2008	Kendall Bate	Undergraduate Student, New York University
Established SOP's for intracoronary OCT core lab.		
2008-2010	Jing Yuan, Ph.D.	Post-doctoral Associate, Huazhong University of Sci. & Tech. (HUST)
First author on one manuscript		
2008-	Hongki Yoo, Ph.D.	Post-doctoral Associate, Harvard Medical School
Co-author on four manuscripts, two as first author		
2008-	Linbo Liu, Ph.D.	Post-doctoral Associate, Harvard Medical School
Co-author on two manuscripts, one as first author		
2009-2010	Eman Namati, Ph.D.	Post-doctoral Associate, Harvard Medical School
Co-author on one manuscript		
2009-	Jacqueline Namati, Ph.D.	Post-doctoral Associate, Harvard Medical School
Supervisor of clinical regulatory effort		
2009-	Parama Pal, Ph.D.	Post-doctoral Associate, Harvard Medical School
New member of lab.		
2009-	Atsushi Tanaka, M.D.	Assistant Professor, Wakayama Medical University
Co-author on three manuscripts, one as first author		
2009-	Hao Wang, M.S.	Graduate Student, Boston University
New member of lab.		
2009-	William Warger, Ph.D.	Post-doctoral Associate, Harvard Medical School
Co-author on one manuscript		
2010-	Christine Fleming, Ph.D.	Post-doctoral Associate, Harvard Medical School
New member of lab.		
2010-	Emmanuel Coron, M.D. Ph.D.	Post-doctoral Associate, University Hospital Nantes
New member of lab.		
2010-	Simon Schlachter, Ph. D.	Post-doctoral Associate, University of Cambridge
New member of lab.		
2010-	Paulino Vacas Jacques, Ph. D.	Post-doctoral Associate, Centro De Investigaciones en Optica

New member of lab.

2010- Michalina Gora, Ph. D. Post-doctoral Associate, Nicolaus Copernicus University

New member of lab.

Formal Teaching of Peers (e.g., CME and other continuing education courses)

2000-2001	Endoscopic Management of Tumors of the Upper Aerodigestive Tract Boston, MA	12 hours Partners Health Care
	Clinical Applications of Optical Coherence Tomography	
2003	Thrombosis and Thromboembolism: New Strategies for Improved Patient Care Boston, MA	12 hours Partners Health Care
	Imaging the Vulnerable Plaque	

Local Invited Presentations

1999	Optical Coherence Tomography in the Cardiovascular System Wellman Center for Photomedicine, MGH	Lecture None
1999	Clinical Applications of Optical Coherence Tomography Center for Integration of Medicine and Innovative Technology	Lecture None
2002	Optical Diagnostics Center for Integration of Medicine and Innovative Technology	Lecture None
2002	Optical Techniques for Minimally Invasive Imaging Wellman Center for Photomedicine	Lecture None
2002	In Vivo Optical Microscopy: A New Field Department of Pathology, MGH	Grand Rounds None
2003	Endoscopic Confocal Microscopy Center for Integration of Medicine and Innovative Technology	Lecture None
2003	Optical Imaging of Coronary Plaque Macrophages in Human Patients Wellman Center for Photomedicine, MGH	Lecture None
2004	Cardiovascular Optical Coherence Tomography at MGH Center for Integration of Medicine and Innovative Technology	Lecture None
2005	OFDI for Assessing Cerebral Aneurysm Risk Center for Integration of Medicine and Innovative Technology	Lecture None
2006	Optical Diagnosis: An Overview Wellman Center for Photomedicine, MGH	Lecture None

2007	Optical Diagnosis: An Overview	Lecture
	Center for Integration of Medicine and Innovative Technology	None
2008	Seeing Inside the Body: Microendoscopy and Endoscopic Microscopy	Lecture
	Department of Pathology, MGH	None
2008	Seeing Inside: OFDI and Ultraminiature Endoscopy	Lecture
	Center for Integration of Medicine and Innovative Technology	None
2010	Endoscopic Microscopy for Gastrointestinal Applications	Grand Rounds
	Department of Gastrointestinal Medicine, MGH	None
2010	Endoscopic Microscopy	Grand Rounds
	Department of Pulmonary Medicine, MGH	None

Report of Regional, National and International Invited Teaching and Presentations

Local

2009	Imaging Human Coronary Arteries with Light	Grand Rounds
	Brigham and Women's Hospital	None
2011	Intravascular OCT a Translational Story	Lecture
	French American Innovation Day, Boston, MA	Embassy of France in the United States Office for Science and Technology
2012	R-Level Grant Writing Workshop	Lecture
	Office for Research Career Development Grant Writing Workshop, Boston, MA	Massachusetts General Hospital
2012	Academic Industrial Partnerships for Translation of in vivo Imaging Systems for Cancer	Lecture
	National Institute of Health: Industrial Partnership Meeting	Department of Health and Human Services

Regional

2006	Endoscopic Microscopy	Grand Rounds
	Yale School of Medicine, New Haven, CT	None
2007	Seeing Inside the Body with Microendoscopy and Endoscopic Microscopy	Invited Lecture
	Tufts School of Bioengineering, Medford, MA	None
2007	The Future of Optical Medicine: Seeing Inside the Body	Invited Lecture

Boston University Biomedical Engineering, Boston, MA	None
<i>National</i>	
1995 Optical Biopsy in Human Tissue Using Optical Coherence Tomography and Microscopy Optical Society of America Annual Meeting, Baltimore, MD	Invited Lecture Optical Society of America
1996 Optical Biopsy using Optical Coherence Tomography Gordon Research Conference, Meriden, NH	Invited Lecture None
1996 Endoscopic Optical Coherence Tomography Lasers and Electro-Optics Society Annual Meeting, Boston, MA	Invited Lecture IEEE
2000 Clinical Applications of Optical Coherence Tomography Gordon Research Conference, New London, CT	Invited Lecture None
2001 OCT Imaging of Coronary Lesions: Investigating the Vulnerable Plaque Model Optical Society of America Annual Meeting, Long Beach, CA	Invited Lecture Optical Society of America
2002 Cardiovascular Optical Coherence Tomography Mount Sinai Medical Center, New York, NY	Grand Rounds None
2003 Endoscopic Microscopy: Emerging Techniques for Clinical Medicine Montefiore Medical Center, New York, NY	Invited Lecture None
2004 Cellular Imaging in Coronary Atherosclerotic Plaques using Optical Coherence Tomography Cardiovascular Medical Imaging Symposium, Baltimore, MD	Invited Lecture American Society of Nuclear Cardiology
2004 Intracoronary Optical Coherence Tomography: Emerging Techniques and Clinical Application Frontiers in Optics, Rochester, NY	Invited Lecture Optical Society of America
2004 Intravascular Optical Coherence Tomography Imaging National Institutes of Health: Optical Diagnostic Imaging from Bench to Bedside, Bethesda, MD	Invited Lecture Optical Society of America
2004 Cellular Imaging in Coronary Atherosclerotic Plaques using Optical Coherence Tomography Photonic Applications, Systems and Technologies (PhAST) Conference, San Francisco, CA	Invited Lecture Optical Society of America
2004 Pathology and Imaging of the Esophagus American College of Gastroenterology, Orlando, FL	CME American College of Gastroenterology
2005 Wellman-MGH Intracoronary Optical	Invited Lecture

	Diagnostics Program	
	Transcatheter Cardiovascular Therapeutics Conference, Washington, DC	Cardiovascular Research Foundation
2005	Low-coherence Interferometry for Guidance of Lumbar Punctures	Invited Lecture
	Telemedicine and Advanced Technology Research Center, Fort Detrick, MD	Department of Defense
2005	Optical Coherence Tomography	Invited Lecture
	Digestive Disease Week, Chicago, IL	American Gastroenterological Association
2006	Endoscopic Microscopy: Bridging the Radiology-Pathology Divide	Plenary Lecture
	Photonics West, San Jose, CA	SPIE
2006	Optical Coherence Tomography for Detection of Atherosclerotic Plaque	Invited Lecture
	Food and Drug Administration (FDA) Science Forum, Washington, DC	FDA
2006	Beyond OFDI: Laser Speckle Imaging, Raman Spectroscopy, and More	Invited Lecture
	Transcatheter Cardiovascular Therapeutics Conference, Washington, DC	Cardiovascular Research Foundation
2006	Optical Imaging of the Vulnerable Plaque	Invited Lecture
	Vulnerable Plaque Summit, Houston, TX	None
2006	Optical Imaging Diagnostics	Grand Rounds
	Institute for Surgical Research, Houston, TX	Department of Defense
2006-	Optical coherence tomography/Raman spectroscopy: Cellular imaging and composition	CME
	ViP – A Vulnerable Plaque Summit, Houston, TX	The Methodist Hospital
2006-	Intracoronary OCT	CME
	High Risk Plaques: Detection and Management, Boston, MA	CIMIT
2007	Pathology for Endoscopic Microscopists	Invited Lecture
	Photonics West, San Francisco, CA	SPIE
2007	Imaging Barrett's Esophagus with Optical Coherence Tomography	Grand Rounds
	University of Alabama Medical Center, Birmingham, AL	None
2007	Cardiovascular Optical Reflectance Microscopy	Invited Lecture
	Center for Biophotonics Science & Technology, Lake Tahoe, CA	None
2007	Optical Coherence Tomography/Raman Spectroscopy: Cellular Imaging and	Invited Lecture

Composition		
	Vulnerable Plaque Summit, Houston, TX	None
2007	Raman Spectroscopy for Plaque Characterization: Advantages, Drawbacks, and Development of an Endovascular Catheter	Invited Lecture
	Transcatheter Cardiovascular Therapeutics Conference, Washington, DC	Cardiovascular Research Foundation
2008	The Technology II: Polarization Sensitive OCT, Laser Speckle And Beyond	Invited Lecture
	Transcatheter Cardiovascular Therapeutics Conference, Washington, DC	Cardiovascular Research Foundation
2008	New Generation Fourier-Domain OCT: Advantages and Limitations	Invited Lecture
	Transcatheter Cardiovascular Therapeutics Conference, Washington, DC	Cardiovascular Research Foundation
2008	Preclinical Assessment of Coverage: Experience with OCT/OFDI	Invited Lecture
	Transcatheter Cardiovascular Therapeutics Conference, Washington, DC	Cardiovascular Research Foundation
2008	Seeing Inside the Body: Microendoscopy and Endoscopic Microscopy	Invited Lecture
	NIDDK Technology in Urology and Nephrology, Boston, MA	NIH
2008	OCT and OFDI for Dermatology	Invited Lecture
	American Academy of Dermatology Annual Meeting, San Antonio, TX	AAD
2008	Seeing Inside the Body with Microendoscopy and Endoscopic Microscopy	Seminar
	BIOMED, St. Petersburg, FL	Optical Society of America
2009	Contrast in Endoscopic Microscopy	Invited Lecture
	Photonics West, San Francisco, CA	SPIE
2009	Optical Imaging of Human Coronary Arteries	Invited Lecture
	UC Davis, Davis, CA	None
2009	Basics of OCT/OFDI Image Interpretation	Invited Lecture
	i2 Summit, ACC Annual Meeting, Orlando, FL	ACC
2009	Translating Intracoronary OCT	Seminar
	National Heart Lung and Blood Institute, Bethesda, MD	NIH
2010	Vulnerable Plaque Criteria and Standards	Invited Lecture
	22nd Annual Scientific Symposium of Transcatheter Cardiovascular Therapeutics	None
2010	Immunostains, Infra-red Microscopy, FTIR and Beyond	Invited Lecture
	22nd Annual Scientific Symposium of Transcatheter	None

Cardiovascular Therapeutics

2010	Imaging Technologies for Tumor Identification and Diagnosis Association of Pathology Chairs Annual Meeting	Invited Lecture None
2010	Spectra-encoded and OCT Endoscopy Gordon Research Conference, Holderness, NH	Invited Lecture None
2011	Endoscopic Microscopy: Bridging the Radiology- Pathology Divide Pathology Grand Rounds, Bronx, New York	Lecture Montefiore Medical Center
2011	Cath Case Conference Hahnemann University Hospital- Heart Failure Conference, Philadelphia, Pennsylvania	Sheldon Goldberg Cardiovascular Institute of Philadelphia
2011	Endoscopic Microscopy: Bridging the Radiology- Pathology Divide Annual Layton/Finley Lectureship Series, Tucson, Arizona	Lecture University of Arizona
2011	Endoscopic Microscopy: Bridging the Radiology- Pathology Divide United States and Canadian Academy of Pathology Annual Lecture, San Antonio, Texas	Lecture United States and Canadian Academy of Pathology
2011	Endoscopic Microscopy: Bridging the Radiology- Pathology Divide Gregory Derringer Grand Rounds, Indianapolis, Indiana	Lecture Indiana University of Pathology and Laboratory
2011	Scanning the Depths: Enabling Targeted Intervention in Esophageal Disorders American Society for Gastrointestinal Endoscopy Digestive Disease Week, Chicago Illinois	Invited Presentation NinePoint Medical
2011	The Future of Superhuman Vision: Boldly Going Where No Man's Gone Before/ OFDI Image Interpretation Clinical Advisory Board Meeting, Chicago, Illinois	Lecture NinePoint Medical
2011	Advances in Endoscopy and Intravascular OCT Stanford Photonics Research Center 2011 Annual Symposium, Stanford, California	Lecture Stanford University: Stanford Photonics Research Center
2011	Endoscopic Microscopy: Bridging the Radiology- Pathology Divide	Lecture

National Institute of Health Inter-Institute Workshop 2011, Bethesda, Maryland	National Institution of Biomedical Imaging and Bioengineering
2011 Kornel L. Terplan Lecture 12 th Annual Kornel Terplan Memorial Lecture Day, Buffalo, New York	Invited Speaker The Department of Pathology and Anatomical Sciences: University at Buffalo
2011 Intravascular Imaging Developments; OCT Merck Non-Human Atherosclerosis Imaging Scientific Input Engagement 2011, Whitehouse Station, New Jersey	Lecture Merck Research Laboratories
2011 Optical Coherence Tomography National Cancer Institute Workshop , Washington, DC	Lecture The Catholic University of America
2011 Introduction to OCT Image Interpretation Transcatheter Cardiovascular Therapeutics 2011 Program, San Francisco, California	Lecture Transcatheter Cardiovascular Therapeutics
<i>International</i>	
2004 Intracoronary Optical Coherence Tomography XIIIth International Vascular Biology Meeting, Ontario Canada	Invited Lecture None
2005 Endoscopic Confocal Microscopy Biomedical Optics Meeting, St. Andrews, Scotland	Invited Lecture None
2006 Imaging the Vulnerable Plaque Pt 1: Beyond Optical Coherence Tomography Vulnerable Plaque Meeting 2006, Capri, Italy	Invited Lecture Cardialysis
2006 Intracoronary Optical Coherence Tomography and Optical Frequency Domain Imaging Erasmus Medical Center, Rotterdam, Netherlands	Seminar None
2007 Optical Frequency Domain Imaging (OFDI) Vulnerable Plaque Meeting 2007, Santorini, Greece	Invited Lecture Cardialysis
2007 Intracoronary Optical Frequency Domain Imaging Bergamo Hospital Grand Rounds, Bergamo, Italy	Grand Rounds None
2008 Intracoronary OCT and OFDI EuroPCR, Barcelona, Spain	Invited Lecture None
2008 Intracoronary OCT and OFDI Vulnerable Plaque Meeting 2008, Athens, Greece	Invited Lecture Cardialysis
2008 Optical Imaging of Coronary Atherosclerosis University Hospital of Muenster, Muenster, Germany	Invited Lecture None
2009 Intracoronary OCT: Principles, Second Generation and Beyond EuroPCR, Barcelona, Spain	Invited Lecture None

2010	3D Intracoronary Microscopy with Optical Frequency Domain Imaging CCT, Kobe, Japan	Invited Lecture None
2010	Standardization in Endoscopic Microscopy ICCU, Paris, France	Plenary Talk Mauna Kea Technologies
2010	Future of Coronary OCT The 8th Conference of Advanced Cardiovascular Ultrasound, Osaka, Japan	Invited Lecture Daiichi – Sankyo
2010	International Working Group Update Vulnerable Plaque Meeting, Lisbon, Portugal	Invited Lecture Cardialysis
2010	Endoscopic Microscopy: Bridging the Radiology-Pathology Divide Leica Scientific Forum, Cambridge, Liverpool, and London, England	Invited Lecture Leica
2010	Intravascular Imaging: is there light at the end of the tunnel? Euro PCR, Paris, France	Invited Lecture None
2011	New Generation Optical Biopsy Technology Including Endoscopic Imaging and Preclinical/Clinical Challenges The 75 th Annual Scientific Meeting of the Japanese Circulation Society, Yokohama, Tokyo	Lecture The Japanese Circulation Society
2011	OCT Tissue Characterization – Boston Approach 9 th International Vulnerable Patient Meeting, Cascais, Portugal	Lecture Cadialysis Clinical Trial Management- Core Laboratories
2011	Endoscopic Microscopy: Bridging the Radiology- Pathology Divide Italian Physical Society: Microscopy Applied to Biophotonics, Varenna, Italy	Lecture The International School of Physics
2011	Endoscopic Microscopy: Bridging the Radiology- Pathology Divide 1 st Congress of the International Academy of Digital Pathology, Quebec City, Canada	Lecture International Academy of Digital Pathology
2011	Raman Spectroscopy/ OCT Image Interpretation Optics in Cardiology 2011, Rotterdam, Netherlands	Lecture Optics in Cardiology

Report of Clinical Activities and Innovations

Current Licensure and Certification

2001- Board Certification, Anatomic Pathology

Practice Activities

Since completion of his residency in 2001, Dr. Tearney has devoted 100% effort to research.

Report of Technological and Other Scientific Innovations

Greater than 120 disclosures submitted to Massachusetts General Hospital, 80 patents pending, and 35 US patents issued.

Granted US patents

Apparatus and method for monitoring visually accessible surfaces of the body

US Patent 5,016,173. 1991 May 14

This invention comprises devices and methods for digital imaging of skin using polarized light and oil immersion. The invention spawned a field called digital epiluminescence microscopy, which provides improved pigmented lesion diagnosis compared to visual inspection. Currently, several commercial products utilize this technology.

Apparatus and method for spatially positioning images

US Patent 5,291,889. 1994 March 08

This patent describes devices and methods for whole-body digital imaging of the skin. These concepts have been adopted for longitudinal follow-up of patients with dysplastic nevus syndrome.

Digital optical visualization, enhancement, quantification, and classification of surface and subsurface features of body surfaces

US Patent 5,836,872. 1998 November 17

This patent describes devices and algorithms for automated pigmented lesion ABCDE classification.

Grating based phase control optical delay line

US Patent 6,111,645. 2000 August 29

This patent describes a novel pulse-shaping apparatus for performing high speed scanning of an optical delay and its application for performing optical interferometry, ranging, and imaging, including cross sectional imaging using optical coherence tomography. The device has enabled human OCT imaging of internal organs, has been utilized by many researchers world wide, and has been incorporated into a commercial ophthalmic OCT system, with an installed base of thousands of machines.

Grating based phase control optical delay line

US Patent 6,282,011. 2001 August 28

Continuation-in-part for US Patent 6,111,645.

Method and apparatus for performing optical measurements using a fiber optic imaging guidewire, catheter or endoscope

US Patent 6,134,003. 2000 October 17

This invention comprises novel catheters for delivering light inside the body for optical imaging. The technology has been licensed to multiple companies and is currently utilized in dozens of clinical research studies and several commercial products.

Confocal microscopy with multi-spectral encoding

US Patent 6,341,036. 2002 January 22

This invention enables confocal microscopy to be conducted in living human patients through small diameter endoscopic probes. The technique has been used in multiple animal and human studies.

Interferometric imaging with a grating based phase control optical delay line

US Patent 6,421,164. 2002 July 16

Continuation-in-part for US Patent 6,111,645.

Methods and apparatus for forward-directed optical scanning instruments

US Patent 6,485,413. 2002 November 26

This patent describes imaging probes and endoscopes that provide optical beam scanning in a forward direction. The technology has been licensed and utilized in multiple research studies.

Fiber optic imaging endoscope interferometer with at least one faraday rotator

US Patent 6,501,551. 2002 December 31

This patent describes the use an optical element called a circulator that greatly increases the efficiency of light utilization in interferometric imaging systems. The technology has been utilized in the majority of OCT systems for imaging non-ophthalmic human tissue, has been licensed to multiple companies, and is an important component of several commercial products.

Referencing optical catheters

US Patent 6,615,062. 2003 September 02

This patent describes devices and methods for calibrating optical diagnostic catheters so that spectroscopic techniques can be applied reproducibly in patients. The technology has been licensed and is utilized commercially.

Apparatus and method for the optical imaging of tissue samples

US Patent 6,654,630. 2003 November 25

This patent describes a catheter for spectroscopic imaging that contains multiple optical fibers. The technology has been licensed and is utilized commercially.

Multi-path optical catheter

US Patent 6,701,181. 2004 March 02

This patent describes a catheter for infrared absorption spectroscopy imaging that contains multiple optical fibers and different beam directing elements. The technology has been licensed and is utilized in a coronary catheter product.

Balloon catheter

US Patent 6,706,004. 2004 March 16

This invention is a balloon-based coronary optical imaging catheter that is configured to minimize optical signal loss caused by blood. The technology has been licensed.

Confocal microscopy with multi-spectral encoding and system and apparatus for spectroscopically encoded confocal microscopy

US Patent 6,831,781. 2004 December 14

This patent extends spectrally-encoded confocal microscopy by describing miniature probe and endoscope optical configurations that enable internal organ imaging.

Apparatus and method for low coherence ranging

US Patent 7,310,150. 2007 December 18

This patent describes the use of an optical component termed an axicon to conduct optical coherence tomography with high transverse resolution and focal depth.

Optical methods for tissue analysis

US Patent 7,231,243. 2007 June 12

This invention comprises methods and devices for determining the biomechanical properties of tissue by utilizing the temporal and spatial analysis of laser speckle patterns.

Phase discrimination for detection of vulnerable-plaque

US Patent 7,313,432. 2007 December 25

This patent describes the use of modulated light to discriminate spectroscopic signatures deep within human tissue. The technology has been licensed.

Apparatus and method for ranging and noise reduction of low coherence interferometry LCI and optical coherence tomography OCT signals by parallel detection of spectral bands

US Patent 7,355,716. 2008 April 08

This invention describes the use of a new parallel signal detection method to increase sensitivity of LCI and optical coherence tomography. The technology has been licensed and is utilized in multiple commercial systems for OCT imaging.

System and method for optical coherence imaging

US Patent 7,366,376. 2008 April 29

This patent describes monolithic optical elements for catheter and endoscope imaging that are configured to compensate for aberrations. The technology has been licensed and incorporated into a commercial product.

Apparatus for controlling at least one of at least two sections of at least one fiber

US Patent 7,418,169. 2008 August 26

This patent describes methods and devices for guiding minimally invasive surgery using microscopic imaging. The technology has been optioned to a commercial entity.

Imaging system and related techniques

US Patent 7,447,408. 2008 November 4

This patent describes methods and devices that utilize a multi-clad fiber for conducting optical microscopy in patients.

Process and apparatus for a wavelength tuning source

US Patent 7,519,096. 2009 April 14

This patent describes a new wavelength-tuned laser that permits high speed in vivo microscopy.

Methods and systems for monitoring and obtaining information of at least one portion of a sample using conformal laser therapy procedures, and providing electromagnetic radiation thereto

US Patent 7,538,859. 2009 May 26

This patent describes a new form of image-guided therapy.

Method and apparatus for three-dimensional spectrally encoded imaging

US Patent 7,551,293. 2009 June 23

This patent describes a method and apparatus for 3D miniature endoscopy.

Speckle reduction in optical coherence tomography by path length encoded angular compounding

US Patent 7,567,349. 2009 July 28

This patent describes an apparatus and method for reducing speckle noise in OCT images.

Apparatus and method for ranging and noise reduction of low coherence interferometry LCI and optical coherence tomography OCT signals by parallel detection of spectral bands

US Patent 7,643,153. 2010 January 5

This patent describes a new form of coherence domain imaging.

Microscope objectives

US Patent 7,684,134. 2010 March 23

This patent describes devices for high resolution imaging that comprise high refractive index materials and utilize low index immersion media

Process and apparatus for a wavelength tuning source

US Patent 7,724,786. 2010 May 25

This patent describes a high-speed wavelength swept laser for conducting optical frequency domain imaging.

Method and apparatus for performing optical imaging using frequency-domain interferometry

US Patent 7,733,497. 2010 June 8

This patent describes a device and method for obtaining high-resolution cross-sectional images of tissue at high frame rates.

Methods, arrangements and systems for polarization-sensitive optical frequency domain imaging of a sample

US Patent 7,742,173. 2010 June 22

This patent describes devices and methods for obtaining birefringence information from a sample utilizing optical frequency domain imaging.

System and method for identifying tissue using low-coherence interferometry

US Patent 7,761,139. 2010 July 20

This patent describes the use of OCT to characterize different tissues within the body.

Systems and methods for generating data based on one or more spectrally-encoded endoscopy techniques

US Patent 7,796,270. 2010 September 14

This patent describes devices and methods for obtaining information from a sample that utilizes spectral dispersion to encode spatial information.

Apparatus and method for ranging and noise reduction of low coherence interferometry LCI and optical coherence tomography OCT signals by parallel detection of spectral bands

US Patent 7,797,119. 2010 September 14

This patent describes novel devices and methods for obtaining OCT images that utilizes the detection of spectral interference using a plurality of detectors.

Imaging system and related techniques

US Patent 7,809,225. 2010 October 5

This patent describes the use of double clad optical fibers to obtain diagnostic information from tissues.

Report of Education of Patients and Service to the Community

Educational Material for Patients and the Lay Community

Books, monographs, articles and presentations in other media

Information based on interviews

- | | | | |
|------|--|--------|--|
| 2006 | 3-D Miniature Endoscope opens new diagnostic possibilities | online | Popular Mechanics
(http://www.popularmechanics.co.za/content/news/singlepage.asp?key=175) |
| 2007 | A Better Body Cam | online | Popular Science |

			(http://www.popsi.com/scitech/article/2007-03/better-body-cam)
2008	7Healthcast: Endoscopic imaging	TV / online	WHDH (http://www3.whdh.com/features/articles/healthcast/BO80845)
2008	A closer look at the heart	TV	ABC Good Morning America
2008	7Healthcast: Artery cam	TV / online	WHDH (http://www1.whdh.com/features/articles/healthcast/BO95630/)
<i>Information written on my research projects</i>			
2005	Optical coherence tomography can successfully identify the characteristics of coronary plaques	online	News-Medical.Net (http://www.news-medical.net/?id=8775)
2005	Optical technique identifies vulnerable plaques in cardiac patients	online	Innovations Report (http://www.innovations-report.de/html/berichte/medizin_gesundheit/bericht-42219.html)
2005	MGH and CIMIT Researchers Use Laser Light to Identify Atherosclerotic Plaques That Cause Heart Attacks	online	RedOrbit (http://www.redorbit.com/news/health/193841/mgh_and_cimit_researchers_use_laser_light_to_identify_atherosclerotic/index.html)
2005	MGH and CIMIT Researchers Use Laser Light to Identify Atherosclerotic Plaques That Cause Heart Attacks	online	CIMIT (http://www.cimit.org/news/Tearney_Press_Release.pdf)
2005	MGH and CIMIT Researchers Use Laser Light to Identify Atherosclerotic Plaques That Cause Heart Attacks	online	All Business (http://www.allbusiness.com/medicine-health/diseases-disorders-cardiovascular-disease/5019340-1.html)
2006	Tiny Endoscope Images in 3-D	online	Photonics (http://www.photonics.com/Content/ReadArticle.aspx?ArticleID=27105)
2006	Tiny Souped-Up Scope	online	MIT Technology Review (http://www.technologyreview.com/biomedicine/17638/)
2007	Endoscope, Veterinary Endoscope and Video Oscope	online	Endoscope Blogspot (http://endoscope.blogspot.com/)
2008	Diagnostic Imaging: Speedy Imaging Technique moves into Human Trials	online	Laser Focus World (http://www.laserfocusworld.com/display_article/317035/12/none/none/New)

			s/DIAGNOSTIC-IMAGING:-Speedy-imaging-technique-moves-into-human-trial)
2008	Imaging technologies take charge in war on cancer	online	BioOptics World (http://www.bioopticsworld.com/articles/article_display.html?id=316642)
2008	Prescient Medical, Inc. to Present Data on Identification and Treatment of Rupture Prone Plaques	online	Reuters News Services (http://www.reuters.com/article/pressRelease/idUS134023+08-May-2008+PRN20080508)
2008	Three-dimensional, miniature endoscope opens new diagnostic possibilities	online	PhysOrg (http://www.physorg.com/news80397043.html)
2008	Technology gives 3-D view of human coronary arteries	online	Science Codex (http://www.sciencecodex.com/technology_gives_3d_view_of_human_coronary_arteries)
2008	Technology gives 3-D view of human coronary arteries	online	PhysOrg (http://www.physorg.com/news146162010.html)
2008	Optical frequency domain imaging provides 3-D view of human coronary arteries	online	News-Medical.Net (http://www.news-medical.net/?id=43053)
2008	Seeing Arteries in 3D	online	HealthCentral (http://www.healthcentral.com/newsdetail/408/8020155.html)
2008	Seeing Arteries in 3D	online	First Science (http://www.firstscience.com/home/news/breaking-news-all-topics/technology-gives-3-d-view-of-human-coronary-arteries_56200.html)
2008	Technology gives 3-D view of human coronary arteries	online	EurekAlert (http://www.eurekalert.org/pub_releases/2008-11/mgh-tgt111208.php)
2008	Technology gives 3-D view of human coronary arteries	online	ScienceCentric (http://www.sciencecentric.com/news/article.php?q=08111855-technology-gives-3-d-view-human-coronary-arteries)
2008	Seeing Arteries in 3D	online	RedOrbit (http://www.redorbit.com/news/health/1601562/seeing_arteries_in_3d/index.html#)

2008	Seeing Arteries in 3D	online	Women's Fitness (http://www.womenfitness.net/news/cardiovascular_health/seeing_arteries_in_3d.htm)
2008	Moving beyond OCT: New technique provides better 3D view of coronary arteries	online	Health Imaging (http://www.healthimaging.com/index.php?option=com_articles&view=portal&id=publication:17:article:15112:moving-beyond-oct-new-technique-provides-better-3d-view-of-coronary-arteries)
2008	New optical imaging technique gives detailed look at the interior of human coronary arteries	online	A to Z of Optics (http://www.azooptics.com/Details.asp?NewsID=3495)
2008	First 3-D Images Inside Human Arteries	online	International Hospital Equipment (http://www.ihe-online.com/e-newsflash/details/archive/2008/november/article/first-3-d-view-of-human-coronary-arteries/index.html)
2008	Technology gives 3-D view of human coronary arteries	online	Zimbio (http://www.zimbio.com/Ischemia+Heart+Disease/articles/113/Technology+Gives+3+View+Human+Coronary+Arteries)
2008	First 3-D Images Inside Human Arteries	online	Live Science (http://www.livescience.com/health/081124-3-d-arteries.html)
2008	First 3-D Images Inside Human Arteries	online	US News and World Report (http://www.usnews.com/articles/science/medical-science/2008/11/24/first-3-d-images-inside-human-arteries.html)

Report of Scholarship

Peer-Reviewed Publications in print or other media

Research investigations

1. Kenet RO, Herrold EM, Hill JP, Wong KK, **Tearney GJ**, Borer JS. Coronary luminal morphology: Reconstruction from digital angiograms. *American Journal Cardiac Imaging* 1990;4:11-19.
2. Bouma BE, **Tearney GJ**, Boppart SA, Hee MR, Brezinski ME, Fujimoto JG. High resolution optical coherence tomographic imaging using a mode locked Ti:Al₂O₃ laser. *Optics Letters* 1995;20:1486-88.

3. Fujimoto JG, Brezinski ME, **Tearney GJ**, Boppart SA, Bouma BE, Hee MR, Southern JF, Swanson EA. Biomedical imaging and optical biopsy using optical coherence tomography. *Nature Medicine* 1995;1:970-72.
4. **Tearney GJ**, Brezinski ME, Southern JF, Bouma BE, Hee MR, Fujimoto JG. Determination of the refractive index of highly scattering human tissue by optical coherence tomography. *Optics Letters* 1995;20:2258-60.
5. Boppart SA, Brezinski ME, Bouma BE, **Tearney GJ**, Fujimoto JG. Investigation of developing embryonic morphology using optical coherence tomography. *Developmental Biology* 1996;177:54-63.
6. Boppart SA, Bouma BE, Brezinski ME, **Tearney GJ**, Fujimoto JG. Imaging developing neural morphology using optical coherence tomography. *Journal of Neuroscience Methods* 1996;70:65-72.
7. Bouma BE, **Tearney GJ**, Bilinsky IP, Golubovic B, Fujimoto JG. A self-phase-modulated Kerr-lens-modelocked Cr:forsterite laser source for optical coherence tomography. *Optics Letters* 1996;21:1839-41.
8. Brezinski ME, **Tearney GJ**, Bouma BE, Izatt JA, Hee MR, Swanson EA, Southern JF, Fujimoto JG. Optical coherence tomography for optical biopsy: properties and demonstration of vascular pathology. *Circulation* 1996;93:1206-13.
9. Brezinski ME, **Tearney GJ**, Boppart SA, Bouma BE, Hee MR, Swanson EA, Southern JF, Fujimoto JG. High-resolution vascular imaging with optical coherence tomography. *Journal of the American College of Cardiology* 1996;27:29.
10. Brezinski ME, **Tearney GJ**, Bouma BE, Boppart SA, Hee MR, Swanson EA, Southern JF, Fujimoto JG. Imaging of coronary artery microstructure with optical coherence tomography. *The American Journal of Cardiology* 1996;77:92-93.
11. Sathwani A, Schomacker KT, **Tearney GJ**, Nishioka NS. Determination of Teflon thickness with laser speckle. I. Potential for burn depth diagnosis. *Applied Optics* 1996;35:5727-35.
12. **Tearney GJ**, Boppart SA, Bouma BE, Brezinski ME, Weissman NJ, Southern JF, Fujimoto JG. Scanning single-mode fiber optic catheter-endoscope for optical coherence tomography. *Optics Letters* 1996;21:1-3.
13. **Tearney GJ**, Bouma BE, Boppart SA, Golubovic B, Swanson EA, Fujimoto JG. Rapid acquisition of in vivo biological images by use of optical coherence tomography. *Optics Letters* 1996;21:1408-10.
14. **Tearney GJ**, Brezinski ME, Boppart SA, Bouma BE, Weissman NJ, Southern JF, Swanson EA, Fujimoto JG. Catheter-based optical imaging of a human coronary artery. *Circulation* 1996;94:3013.
15. Boppart SA, Bouma BE, Pitris C, **Tearney GJ**, Fujimoto JG. Forward-scanning instruments for optical coherence tomographic imaging. *Optics Letters* 1997;22:1618-20.

16. Bouma BE, Nelson LE, **Tearney GJ**, Jones DJ, Brezinski ME, Fujimoto JG. Optical coherence tomographic imaging at 1.55 μm and 1.8 μm using Er-and Tm-doped fiber sources. *Journal of Biomedical Optics* 1997;3:76-79.
17. Brezinski ME, **Tearney GJ**, Boppart SA, Swanson EA, Southern JF, Fujimoto JG. Optical biopsy with optical coherence tomography, feasibility for surgical diagnostics. *Journal of Surgical Research* 1997;71:32-40.
18. Brezinski ME, **Tearney GJ**, Weissman NJ, Boppart SA, Bouma BE, Hee MR, Weyman AE, Swanson EA, Southern JF, Fujimoto JG. Assessing atherosclerotic plaque morphology: comparison of optical coherence tomography and high frequency intravascular ultrasound. *Heart* 1997;77:397-403.
19. Golubovic B, Bouma BE, **Tearney GJ**, Fujimoto JG. Optical frequency domain reflectometry using rapid wavelength tuning of Cr⁴⁺ forsterite laser. *Optics Letters* 1997;22:1704-06.
20. Boppart SA, **Tearney GJ**, Bouma BE, Southern JF, Brezinski ME, Fujimoto JG. Noninvasive assessment of the developing xenopus cardiovascular system using optical coherence tomography. *Proceedings of the National Academy of Sciences* 1997;94:4256-61.
21. **Tearney GJ**, Bouma BE, Fujimoto JG. Phase and group delay relationships for the phase control rapid-scanning optical delay line. *Optics Letters* 1997;22:1811-13.
22. **Tearney GJ**, Brezinski ME, Bouma BE, Boppart SA, Southern JF, Fujimoto JG. Optical biopsy in human gastrointestinal tissue using optical coherence tomography. *American Journal of Gastroenterology* 1997;92:1800-1804.
23. **Tearney GJ**, Brezinski ME, Bouma BE, Boppart SA, Pitris C, Southern JF, Fujimoto JG. In vivo endoscopic optical biopsy with optical coherence tomography. *Science* 1997;276:2037-9.
24. **Tearney GJ**, Brezinski ME, Bouma BE, Boppart SA, Southern JF, Fujimoto JG. Optical Biopsy in human urologic tissue using optical coherence tomography. *Journal of Urology* 1997;157:1913.
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Reviews, chapters, monographs and editorials

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Books/Textbooks for the medical or scientific community

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Letters to the Editor

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Thesis

1. **Tearney GJ**. Optical characterization of human tissues using low coherence interferometry [Master's dissertation]. Cambridge (MA): Massachusetts Institute of Technology; 1995.
2. **Tearney GJ**. Optical biopsy of in vivo tissue using optical coherence tomography [Doctoral dissertation]. Cambridge (MA): Massachusetts Institute of Technology; 1997.

3. **Tearney GJ.** Spectral encoding for confocal microscopy [MD honors dissertation]. Boston (MA): Harvard Medical School; 1998.

Abstracts, Poster Presentations and Exhibits Presented at Professional Meetings:

(Over 300 abstracts presented at scientific meetings)

Narrative Report

My research interests are primarily focused on the development and validation of non-invasive, high-resolution optical imaging methods for disease diagnosis. In particular, I have conducted research to develop and establish a new imaging modality, termed “optical coherence tomography” (OCT), which provides cross-sectional images of tissue architectural microstructure at a resolution of 10 μm . I was the first to perform human imaging in the coronary arteries and gastrointestinal tract with this method, and my laboratory has imaged over 500 patients to date. Additionally, I have developed an endoscopic confocal microscopy system that is capable of obtaining images at a resolution of 1.0 μm through an endoscope accessory port. Images obtained by OCT and endoscopic confocal microscopy may be used to guide biopsies during screening procedures and may potentially allow for primary diagnosis at tissue sites where excisional biopsies are difficult to obtain. In my work, I have developed several other technologies, including an ultraminiature three-dimensional endoscope, a highly efficient form of near field scanning optical microscopy (NSOM), and novel fluorescence spectroscopy and imaging techniques. I have an active program in Raman spectroscopy and have conducted the first intracoronary Raman in vivo. I have successfully transitioned several of my inventions into the commercial sector. Examples include the rapidly scanning optical delay line (RSOD) that is utilized for ophthalmic OCT and optical frequency domain imaging (OFDI) technology that is being commercialized by multiple companies for intracoronary and gastrointestinal uses.

My training in the field of pathology has complemented my research by providing a foundation for the interpretation of images obtained by these new, non-invasive diagnostic modalities. Also, while in my Pathology Residency, I established several active collaborations within the Massachusetts General Hospital (MGH). These collaborations involve pathologists, clinicians, physicists and engineers, and also include clinical studies in the fields of Gastroenterology, Cardiology, Pulmonology, and Otolaryngology. My work extends beyond MGH, as I now direct multicenter, national, and international clinical studies to validate technologies developed in my laboratory. In addition, I have recently founded the International Working Group on Intracoronary OCT Standardization and Validation, a group that is dedicated to ensuring the widespread adoption of this imaging technology.

With respect to teaching, I have actively participated in the development of a program to increase graduate student participation at the Wellman Center for Photomedicine. Currently, I supervise the Ph.D thesis research of several MIT graduate students and have supervised M.D. honors theses conducted by Harvard Medical School students. Additionally, I helped found the graduate course on biomedical optics at MIT in the HST program (HST .569), am a co-director for the HST Human Pathology course (HST .035), and a lecturer for the Wellman Biomedical Optics Summer Program. I also teach on the national level, including CME courses, training courses for interpreting optical images, and numerous presentations to the lay public relating the benefits of our imaging technology to health care.