

# Min Xu

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## 1 Education

*Ph. D in Physics* 2001, Department of Physics, The City College and Graduate Center of City University of New York

Thesis: *Optical image reconstruction in highly scattering turbid media*

Adviser: Distinguished Prof. Melvin Lax, member of National Academy of Sciences and Fellow of the American Academy of Arts and Sciences

*M. S. in Physics* 1995, Department of Physics, Fudan University, Shanghai, China

*B. S. in Physics* 1992, Department of Physics, Fudan University, Shanghai, China

## 2 Employment

*2018-present* Associate Professor of Physics (tenured), Department of Physics & Astronomy, Hunter College of the City University of New York

*2010-2018* Associate Professor of Physics (tenured), Department of Physics, Fairfield University

*2006-2010* Assistant Professor of Physics, Department of Physics, Fairfield University

*2001-2006* Principal investigator, Institute of Ultrafast Spectroscopies and Lasers, The City College of New York

## 3 Research Experience

*2018-present* Research on Photonics/Biophysics, Department of Physics & Astronomy, Hunter College

*2006-2018* Research on Biophotonics/Photonics, Department of Physics, Fairfield University

Establish a biophotonics laboratory and lead active research along the following themes (see Statement of Research for further information):

(1) *Random photonics and stochastic processes;*

(2) *Biophotonics: biomedical optical spectroscopy, microscopy and imaging;*

(3) *Numerical methods and inverse problems in physical and biological sciences;*

The research has been sponsored by DOD, NIH, NSF, and Research Corporations.

Collaborators: Prof. Shelley Phelan (Fairfield University), Prof. R. R. Alfano, Prof. S. K. Gayen and Dr. Alvin Katz (The City College of New York), Prof. J. A. Koutcher

(Memorial Sloan-Kettering Cancer Center), Prof. Jonathan Melamed (New York University Medical School), Prof. Yongchao Ge (Mount Sinai School of Medicine), and Prof. Jianan Qu (Hong Kong University of Science and Technology).

*2001-2006* Postdoctoral Research on Laser Physics and Optical Tomography, Institute of Ultrafast Spectroscopies and Lasers, City College of New York

*Principal investigator* of “Time-resolved spectral optical breast tomography” funded by US Army Medical Research and Materiel Command;  
Conducted a theoretical study on propagation and depolarization of multiply scattered light. Established new characteristic lengths describing the randomization of polarized light, which is fundamental to understand the interaction of polarized light with random media and optical imaging;  
In collaboration with Prof. R. R. Alfano and Prof. S. K. Gayen worked on novel image reconstruction methods for optical imaging. Introduced a novel paradigm of optical imaging using Independent Component Analysis.

*1995-2001* Doctoral Research on Laser Physics and Optical Tomography, Department of Physics, The City College of New York

Working with Prof. Melvin Lax conducted a theoretical study of light transport in tissues and other highly scattering random medium, inverse problems, and non-invasive imaging of highly scattering media with multiple scattering light.

*1992-1995* Master Degree Research on Condensed Matter Physics and Surface Physics, T. D. Lee Physics Laboratory and Surface Physics State Key Laboratory, Fudan University, Shanghai, China

Conducted experimental work on a meta-stable phase of manganese ( $\gamma$ -Mn).

#### 4 Research Interests

- Light interaction with random medium
  - Random medium photonics, radiative transfer, phenomena associated with multiple scattering light such as localization, coherent backscattering mirror
  - Numerical methods for studying complex coherent vector light propagation inside random media
  - Wavefront shaping for light propagation control in random media, light delivery techniques overcoming strong scattering
- Biomedical optical spectroscopy, microscopy and imaging
  - Fundamentals of tissue optics: analytical models for light scattering by cells and tissues and their applications in tissue diagnosis, fractals
  - Spectroscopic techniques (scattering, absorption, fluorescence, Raman and nonlinear effects) and their applications in biomedicine, optical biopsy, light scattering techniques for quantifying structure and dynamics of particle aggregation in geophysics

- Noninvasive imaging and tomography from nano- to meso-scales: novel quantitative microscopy for sub-cellular characterization, diffuse optical tomography for deep tissue imaging
- Optical methods and systems for objective cancer diagnosis and prognosis, optical pathology
- Physics in Biology and Medicine
  - Hemodynamics model
  - Physics model for the growth of cancer cells, Physics of Live Systems
- Computational physics and inverse problems in physical and biological sciences
  - Numerical methods in computational physics, Monte Carlo methods, finite element methods, FDTD methods
  - Inverse scattering problems and inverse problems in general
  - Noninvasive probing mesoscopic structure and dynamics of soft matters, remote sensing

## 5 Teaching and Mentoring

- 2018-present* Associate Professor of Physics, Department of Physics & Astronomy, Hunter College
- 2006-2018* Assistant/Associate Professor of Physics, Department of Physics, Fairfield University
- Teaching General Physics I & II, General Physics Lab I & II, Condensed Matter Physics, Modern Optics, Lab in Optics & Lasers, Physics of Light and Color, Electrodynamics I & II, Independent Studies, Capstone, and Intensive Summer Research Experience
- Fall, 2016-Fall, 2017*  
Hosted a visiting scholar from Wenzhou Medical University, China
- Fall, 2014-Spring, 2015*  
Hosted a visiting scholar from Wenzhou Medical University, China
- 2014* Curriculum development on a physics elective course “Biomedical Optics” (with Prof. Bidyut Das)
- 2009-2014* Supported and directed two postdoctoral scientists
- 2007-present* Supervised Undergraduate Summer Research in Biophotonics each summer
- 2006-present* Mentored **21** undergraduate research students at Fairfield University
- 2009-2013* Served as an outside member of the Supervisory Committee for **one** Ph. D candidate at the City University of New York
- 2006-2007* Served as an outside member of the Supervisory Committee for **two** Ph. D candidates at the City University of New York
- 2003-2006* Mentored **two** graduate students in the Physics department at the City College of New York

- 2002-2006* Adjunct Assistant Professor teaching General Physics for physics and engineering majors and premedical students at the City College of New York
- Summer, 2004* Mentored high school students in the DISCOVERY program at the City College of New York

## 6 Professional Service

- 2016-present* The Optical Society of America (OSA) Traveling Lecturer
- 2015* Participation in drafting the International Biophotonics Community white paper titled “Label-free Optical Technologies for Biomedical Diagnostics & Imaging: Challenges and Opportunities for Clinical Transition” to make recommendations on future translational biophotonics research and development
- 2014-present* Served as member of Editor Board for International Journal of Radiology
- 2011-2014* Served as member of Editor Board for ISRN Optics
- 2011* Served as guest member of the editorial board of Journal of Biomedical Optics
- 2006-present* Reviewed grant proposals for NSF/CBET, Army Research Office, the National Medical Research Council (Singapore), Canada Research Council, PSC-CUNY, and the CUNY Collaborative Incentive Research Grant Program
- 1999-present* Served as referee for the American Physical Society (APS) and the Optical Society of America (OSA) journals, Physics Review E, Optics Letters, Optics Express, Applied Optics, Journal of Optical Society of America A, Journal of Biomedical Optics, Medical Physics, Inverse Problems, Applied Mathematics Letters, IEEE Journal of Selected Topics in Quantum Electronics, Applied Spectroscopy, Measurement Science and Technology, IEE Proceedings of Vision, Image & Signal Processing, and Journal of Optics A: Pure and Applied Optics.

## 7 University Service

- 2015-2018* Member, Faculty Committee on Sustainability, Fairfield University
- 2013-2016* Member, CAS Natural Science Merit Review Committee, Fairfield University
- 2013-2015* Member, Science Institute Advisory Board, Fairfield University
- 2014-2015* Member, Admission and Scholarships Committee, Fairfield University
- 2012-2014* Member, World Diversity Committee, Fairfield University
- 2012-2013* Member, Research Committee, Fairfield University
- 2009-2011* Member, Academic Council, Fairfield University
- 2007-2009* Member, CAS Distinguished Teaching Award Selection Committee, Fairfield University
- 2007-2008* Member, Physics Search Committee, Fairfield University

## 8 Research Grants

- 2017-2020*      Awarded a NSF Award “RUI: Cell growth laws and quantitative microscopy for cancer aggressiveness imaging” (\$238,000, PI)
- 2010-2015*      Awarded a DOD PCRP New Investigator Award “Hyperspectral Low Coherence Enhanced Backscattering Mesoscopic Tomography for Analysis and Risk Stratification of Prostate Cancer” (\$298,600, PI)
- 2010-2012*      Awarded a Multi-investigator Cottrel College Science Award “Multimodal monitoring of oxidative stress, proliferation and cell death with light: the role of peroxiredoxins in breast cancer” (\$100,000, PI: Drs. Min Xu and Shelley Phelan)
- 2009-2011*      Awarded an AREA grant “Low Coherence Enhanced Backscattering Tomography” by National Institutes of Health (\$219,396, PI)
- 2008-2011*      Awarded an Idea Award “Development of rectal near infrared scanning polarization imaging unit and independent component analysis algorithm for prostate cancer detection” by U. S. Army Medical Research and Materiel Command (\$542,960, co-PI)
- 2007-2009*      Awarded a Cottrel College Science Award “Backscattering of partially coherent polarized light from a turbid medium” by Research Corporation (\$51,908, PI)
- 2004-2005*      Awarded a PSC-CUNY-36 research award “Optical fluorescence imaging using independent component analysis” by Research Foundation of the City University of New York
- 2001-2004*      Awarded an award “Time-resolved spectral optical breast tomography” by U. S. Army Medical Research and Materiel Command (\$150,000, PI)
- 1999-2000*      The research on optical medical tomography received PSC-CUNY-31 research award
- 1998-1999*      The research on optical medical tomography received PSC-CUNY-30 research award

## 9 Honors and Fellowships

- 2015-present*    Senior Member of OSA
- 2000*             Dissertation Year Fellowship, the Graduate Center of City University of New York
- 1995-2000*      Faculty Fellowship, the City College and Graduate Center of City University of New York
- 1993-1994*      Graduate Fellowship and Guang-hua Fellowship, Fudan University
- 1992*             *Outstanding University Graduate of Shanghai*
- Nov. 1987*        Winner of an Excellence prize of the 4th National Youth Physics Contest sponsored by the Society of Physics, China
- Oct. 1987*        Winner of an Excellence prize of the National Youth Mathematics Contest’87 sponsored by the Society of Mathematics, China

## 10 Memberships

The Optical Society of America (OSA), the International Society of Optical Engineering (SPIE), New York Academy of Sciences (NYAS), and the American Association for the Advancement of Science (AAAS)

## 11 Publications

A total of 164 publications including Book (1), Book Chapters (4), Patents (3), Journal Publications (56), Conference Proceedings (50), and Presentations (50).

### 11.1 Book

- [1] M. Lax, W. Cai, and M. Xu. *Random Processes in Physics and Finance*. Oxford University Press, USA, 2006.

### 11.2 Book Chapters

- [1] Min Xu, Wei Cai, and Robert R. Alfano. *Deep Tissue Imaging with Linear and Non-linear Optics*, chapter Overview of the Cumulant Solution to Light Propagation Inside a Turbid Medium and Its Applications in Deep Imaging Beyond the Diffusion Approximation. Pan Stanford Publishing Pte. Ltd., 2017.
- [2] Yang Pu, Wubao Wang, Min Xu, James A. Eastham, and Robert R. Alfano. *Deep Tissue Imaging with Linear and Non-linear Optics*, chapter Deep Imaging of Prostate Cancer Using Diffusion Reconstruction of Banana Paths with Near Infrared Prostateoscope Analyzer. Pan Stanford Publishing Pte. Ltd., 2017.
- [3] W. Cai and M. Xu. *Light Scattering Reviews*, volume XI, chapter Analytical solution of radiative transfer using cumulant expansion. Springer, 2016.
- [4] M. Xu and A. Katz. *Light Scattering Reviews*, volume III, chapter Statistical Interpretation of Light Anomalous Diffraction by Small Particles and its Applications in Bio-agent Detection and Monitoring, pages 27–68. Springer, 2008.

### 11.3 Patents

- [1] Min Xu. Photonic structural and chemometric pathology system. US Patent Application US62/031,387 filed on 07/31/2014.
- [2] Min Xu. Low coherence enhanced backscattering tomography and techniques. US Patent No. 8,823,954.
- [3] R. R. Alfano, M. Xu, M. Alrubaiee, and S. K. Gayen. Optical tomography using independent component analysis for detection and localization of targets in turbid media. US Patent Application US60/633,412 filed on 01/04/2005.

## 11.4 Journal Publications

- [1] Xiuwei Zhu, Luyao Lu, Zili Cao, Bixin Zeng, and Min Xu. Transmission matrix-based electric field Monte Carlo study and experimental validation of the propagation characteristics of Bessel beams in turbid media. *Opt. Lett.*, 2018. (in press).
- [2] Weihao Lin, Bixin Zeng, Zili Cao, Xinlin Chen, Kaiyan Yang, and Min Xu. Quantitative diagnosis of tissue microstructure with wide-field high spatial frequency domain imaging. *Biomed. Opt. Express*, 9(7):2905–2916, 2018.
- [3] Al Katz, Stephanie Peña, Alexandra Alimova, Paul Gottlieb, Min Xu, and Karin A. Block. Heteroaggregation of an enveloped bacteriophage with colloidal sediments and effect on virus viability. *Sci. Total Environ.*, 637-638:104–111, 2018.
- [4] Xinlin Chen, Weihao Lin, Chenge Wang, Shaoheng Chen, Jing Sheng, Bixin Zeng, and M. Xu. In vivo real-time imaging of cutaneous hemoglobin concentration, oxygen saturation, scattering properties, melanin content, and epidermal thickness with visible spatially modulated light. *Biomed. Opt. Express*, 8:5468–5482, 2017.
- [5] Min Xu. Plum pudding random medium model of biological tissue toward remote microscopy from spectroscopic light scattering. *Biomed. Opt. Express*, 8:2879–2895, 2017.
- [6] Zhang Xu, Michael Reilley, Run Li, and Min Xu. Mapping absolute tissue endogenous fluorophore concentrations with chemometric wide-field fluorescence microscopy. *J. Biomed. Opt.*, 22(6):066009, jun 2017.
- [7] M. Xu, Zili Cao, Weihao Lin, Xinlin Chen, Longfei Zheng, and Bixin Zeng. Single snapshot multiple frequency modulated imaging of subsurface optical properties of turbid media with structured light. *AIP Advances*, 6(12):125208, 2016.
- [8] I. Zeylikovich and M. Xu. Dynamic coherent backscattering mirror. *AIP Advance*, 6:025105, 2016.
- [9] Min Xu. Diagnosis of the phase function of random media from light reflectance. *Sci. Rep.*, 6:22535, 2016.
- [10] A. Katz, M. Xu, J.C. Steiner, A. Trusiak, A. Alimova, P. Gottlieb, and K. Block. Influence of cations on aggregation rates in mg-montmorillonite. *Clays and Clay Minerals*, 61(1):1–10, 2013.
- [11] Binlin Wu, M. Alrubaiee, W. Cai, M. Xu, and S. K. Gayen. Diffuse optical imaging using decomposition methods. *International Journal of Optics*, 2012:185435, 2012.
- [12] Yang Pu, Wubao Wang, Mohammad AL-Rubaiee, Swapan Kumar Gayen, and Min Xu. Determination of optical coefficients and fractal dimensional parameters of cancerous and normal prostate tissues. *Appl. Spectroscopy*, 66:828–834, 2012.
- [13] Yang Pu, Wubao Wang, Min Xu, J. A. Eastham, Guicheng Tang, and Robert R. Alfano. Characterization and three-dimensional localization of cancerous prostate tissue using backscattering scanning polarization imaging and independent component analysis. *J. Biomed. Opt.*, 17:081419, 2012.

- [14] Min Xu. The scattering-phase theorem: anomalous diffraction by forward-peaked scattering media. *Opt. Express*, 19:21643–21651, 2011.
- [15] Min Xu, Yang Pu, and Wubao Wang. Clean image synthesis and target numerical marching for optical imaging with backscattering light. *Biomed. Opt. Express*, 2:850–857, 2011.
- [16] Binlin Wu, W. Cai, M. Alrubaiee, M. Xu, and S. K. Gayen. Time reversal optical tomography: locating targets in a highly scattering turbid medium. *Opt. Express*, 19:21956–21976, 2011.
- [17] Y. Pu, W. B. Wang, Min Xu, G. C. Tang, Y. Budansky, M. Sharanov, S. Achilefu, J. A. Eastham, and R. R. Alfano. Near infrared photonic finger imager for prostate cancer screening. *Technol. Cancer Res. Treat.*, 10:507–517, 2011.
- [18] Alexandra Alimova, A. Katz, Julian Orozco, Hui Wei, Paul Gottlieb, Elizabeth Rudolph, J. C. Steiner, and Min Xu. Broadband light scattering measurements of the time evolution of the fractal dimension of smectite clay aggregates. *J. Opt. A*, 11:105706, 2009. (Feature Article).
- [19] Min Xu. Low coherence enhanced backscattering beyond diffusion. *Opt. Lett.*, 33:1246–1248, 2008.
- [20] M. Xu, Tao T. Wu, and Jianan Y. Qu. Unified Mie and fractal scattering by cells and experimental study on application in optical characterization of cellular and subcellular structures. *J. Biomed. Opt.*, 13:038802, 2008.
- [21] M. Xu, M. Alrubaiee, S. K. Gayen, and R. R. Alfano. Optical diffuse imaging of an *ex vivo* model cancerous human breast using independent component analysis. *JSTQE*, 14:43–49, 2008.
- [22] John Sawicki, Nikolas Kastor, and Min Xu. Electric field Monte Carlo simulation of coherent backscattering of polarized light by a turbid medium. *Opt. Express*, 16:5728–5738, 2008.
- [23] Tao T. Wu, Jianan Y. Qu, and Min Xu. Unified Mie and fractal scattering by biological cells and subcellular structures. *Opt. Lett.*, 32:2324–2326, 2007.
- [24] M. Xu. Superposition rule for light scattering by a composite particle. *Opt. Lett.*, 31:3223–3225, 2006.
- [25] M. Alrubaiee, M. Xu, S. K. Gayen, and R. R. Alfano. Localization and cross section reconstruction of fluorescent targets in *ex vivo* breast tissue using independent component analysis. *Appl. Phys. Lett.*, 89:133902, 2006.
- [26] M. Xu, M. Alrubaiee, S. K. Gayen, and R. R. Alfano. Three-dimensional localization and optical imaging of objects in turbid media using independent component analysis. *Appl. Opt.*, 44:1889–1897, 2005.
- [27] M. Xu, M. Alrubaiee, S. K. Gayen, and R. R. Alfano. Optical imaging of turbid media using independent component analysis: Theory and simulation. *J. Biomed. Opt.*, 10:051705, 2005.



- [28] M. Xu and R. R. Alfano. Random walk of polarized light in turbid media. *Phys. Rev. Lett.*, 95:213905, 2005.
- [29] M. Xu and R. R. Alfano. Fractal mechanisms of light scattering in biological tissue and cells. *Opt. Lett.*, 30:3051–3053, 2005.
- [30] M. Xu and R. R. Alfano. Circular polarization memory of light. *Phys. Rev. E*, 72:065601(R), 2005.
- [31] Kevin G. Phillips, Min Xu, S. K. Gayen, and R. R. Alfano. Time-resolved ring structure of circularly polarized beams backscattered from forward scattering media. *Opt. Express*, 13:7954–7969, 2005.
- [32] A. Katz, Alexandra Alimova, M. Xu, Paul Gottlieb, Elizabeth Rudolph, J. C. Steiner, and R. R. Alfano. *In Situ* determination of refractive index and size of Bacillus spores by light extinction. *Opt. Lett.*, 30:589–591, 2005.
- [33] W. Cai, M. Xu, and R. R. Alfano. Analytical form of the particle distribution based on the cumulant solution of the elastic Boltzmann transport equation. *Phys. Rev. E*, 71:041202, 2005. (10 pages).
- [34] M. Alrubaiee, M. Xu, S. K. Gayen, and R. R. Alfano. Tomographic imaging of scattering objects in tissue-like turbid media using independent component analysis. *Appl. Phys. Lett.*, 87:191112, 2005.
- [35] M. Xu. Electric field Monte Carlo for polarized light propagation in turbid media. *Opt. Express*, 12:6530–6539, 2004.
- [36] M. Xu, W. Cai, and R. R. Alfano. Multiple passages of light through an absorption inhomogeneity in optical imaging of turbid media. *Opt. Lett.*, 29:1757–1759, 2004.
- [37] M. Xu. Light extinction and absorption by arbitrarily oriented finite circular cylinders using geometrical path statistics of rays. *Appl. Opt.*, 42:6710–6723, 2003.
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- [42] M. Xu, W. Cai, M. Lax, and R. R. Alfano. Photon migration in turbid media using a cumulant approximation to radiative transfer. *Phys. Rev. E*, 65:066609, 2002.
- [43] W. Cai, M. Xu, M. Lax, and R. R. Alfano. Diffusion coefficient depends on time not on absorption. *Opt. Lett.*, 27(9):731–733, 2002.

- [44] M. Xu, M. Lax, and R. R. Alfano. Time-resolved Fourier optical diffuse tomography. *J. Opt. Soc. Am. A*, 18(7):1535–1542, 2001.
- [45] M. Xu, W. Cai, M. Lax, and R. R. Alfano. A photon transport forward model for imaging in turbid media. *Opt. Lett.*, 26(14):1066–1068, 2001.
- [46] W. Cai, S. K. Gayen, M. Xu, M. Zevallos, M. Alrubaiee, M. Lax, and R. R. Alfano. Optical tomographic image reconstruction from ultrafast time-sliced transmission measurements. *Appl. Opt.*, 38(19):4237–4246, 1999.
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- [48] G. S. Dong, M. Xu, Y. Chen, X. Jin, and Xun Wang. XPS study of Mn thin films grown on GaAs(001) surfaces. *Surface and Interface Analysis*, 24(9):653–656, 1996.
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- [50] X. Jin, Y. Chen, G. S. Dong, M. Zhang, M. Xu, X. G. Zhu, Xun Wang, E. D. Lu, H. B. Pan, P. S. Xu, X. Y. Zhang, and C. Y. Fan. Synchrotron-radiation study of the electronic structure of fcc Mn thin films grown on GaAs (001) surface. *Phys. Rev. B*, 51(15):9702–6, 1995.
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## 11.5 Conference Proceedings

- [1] Bixin Zeng, Jian Liu, Xin Chen, Wenlei Yu, Dandan Wang, Xiuwei Zhu, Weihao Lin, Yang Zheng, and Min Xu. Fermat single pixel camera for characterizing optical properties of biological tissues over the visible to SWIR spectral range. In *Optical Biopsy XVI: Toward Real-Time Spectroscopic Imaging and Diagnosis*, volume 10489 of *Proc. SPIE*, 2018.
- [2] Weihao Lin, Bixin Zeng, Zili Cao, Danfeng Zhu, and M. Xu. Wide-field high spatial frequency domain imaging of tissue microstructure. In *Advanced Biomedical and Clinical Diagnostic and Surgical Guidance Systems XVI*, volume 10484 of *Proc. SPIE*, page 1048416, 2018.
- [3] Yang Zheng, Xinlin Chen, Weihao Lin, Zili Cao, Xiuwei Zhu, Bixin Zeng, and M. Xu. Two dimensional microcirculation mapping with real time spatial frequency domain imaging. In *High-Speed Biomedical Imaging and Spectroscopy III: Toward Big Data Instrumentation and Management*, number 10505 in *Proc. SPIE*, page 105050X, 2018.
- [4] Z. Cao, W. Lin, X. Chen, B. Zeng, and M. Xu. Real-time spatial frequency domain imaging by single snapshot multiple frequency demodulation technique. In *Optical Tomography and Spectroscopy of Tissue XII*, volume 10059 of *Proc. of SPIE*, page 100590Z, 2017.
- [5] Run Li, Kevin Vasquez, and M Xu. Chemometric endogenous fluorescence for tissue diagnosis. In *Optical Biopsy XV: Toward Real-Time Spectroscopic Imaging and Diagnosis*, volume 10060 of *Proc. of SPIE*, page 1006017, 2017.
- [6] Longfei Zheng, Shuangshuang Cai, Bixin Zeng, and Min Xu. Lung cancer diagnosis with quantitative DIC microscopy and support vector machine. In Xingde Li and Qingming Luo, editors, *International Conference on Innovative Optical Health Science*, volume 10245 of *Proc. of SPIE*, page 102450K. SPIE, 2017.
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- [9] Michael Reilly and M. Xu. Analytical model for sub-diffusive light reflection and the application to spatial frequency-domain imaging. In Bruce J. Tromberg, Arjun G. Yodh, Eva Marie Sevick-Muraca, and Robert R. Alfano, editors, *Optical Tomography and Spectroscopy of Tissue XI*, volume 9319 of *Proc. SPIE*, page 93191A, 2015.
- [10] Xiuwei Zhu, Xiaolei Lin, Zili Cao, Bixin Zeng, and M. Xu. Electric field monte carlo study of coherent complex light in turbid media. In *Biomedical Applications of Light Scattering IX*, volume 9333 of *Proc. SPIE*, page 933316. SPIE, 2015. <http://dx.doi.org/10.1117/12.2082605>.

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- [12] B. Wu, S. K. Gayen, and M. Xu. Fluorescence spectroscopy using excitation and emission matrix for quantification of tissue native fluorophores and cancer diagnosis. In *Photonic Therapeutics and Diagnostics X*, volume 8926 of *Proc. SPIE*, page 1M, 2014.
- [13] Guichen Tang, Fanting Kong, Y. C. Chen, and M. Xu. Full field photothermal dynamics microscopy. In *Three-Dimensional and Multidimensional Microscopy: Image Acquisition and Processing XXI*, volume 8949 of *Proceedings of SPIE*, page 89490X, 2014.
- [14] Htet Aung, Bianca DeAngelo, John Soldano, Piotr Kostyk, Braulio Rodriguez, and M. Xu. On alterations in the refractive index and scattering properties of biological tissue caused by histological processing. In Adam O. Wax and Vadim Backman, editors, *Biomedical Applications of Light Scattering VII*, volume 8592 of *Proceedings of SPIE*, page 85920X. SPIE, 2013.
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## 11.6 Presentations

A total of 50 presentations including Invited Talks (14) and Conference Presentations (36).

## 11.7 Invited Talks

- [1] Min Xu. Harnessing scattering for bio-sensing, Jan 2015. Department of Bioengineering, Zhejiang Univ, China.
- [2] Min Xu. Lighting up tumor: harnessing scattering for cancer detection and pathology, Apr 2014. Department of Bioengineering, Dartmouth College.
- [3] Min Xu. Photons in disordered media: random walk and applications in cancer, Feb 2014. Department of Physics & Astrophysics, Lehman College, CUNY.
- [4] Min Xu. Early detection of cancer & real-time pathology: "lighting up tumors" a new kind of pathological analysis, March 2013. Hologic inc., CT.
- [5] Min Xu. Lighting up tumor: toward an optical index for malignancy, Apr 2012. School of Chemical and Biomedical Engineering, Nanyang Technological University.
- [6] Min Xu. Lighting up tissue, Nov 2009. Department of Physics, Southern Connecticut State University.
- [7] Min Xu. Principle and some recent progress in biomedical optics, Nov 2007. Department of Biomedical Engineering, Wenzhou Medical College, China.
- [8] Min Xu. Biomedical optical imaging: principle and application in mammography, May 2007. Department of Biomedical Engineering, The City College of New York.
- [9] Wei Cai, Min Xu, X. H. Ni, and Robert R. Alfano. Analytical cumulant solution of the radiative transfer equation for light scattering in turbid media, March 2006. PIERS, Cambridge.
- [10] Min Xu. Toward optical imaging of small tumors in breasts using cumulant/forward model and independent component analysis, June 2005. Era of Hope DOD BCRP Meeting Symposia Presentation.
- [11] Min Xu. Random walk of vector photons in soft matter, November 2005. Department of Physics, The City College of New York.
- [12] Min Xu. Optical biomedical imaging: diffusing waves and beyond, June 2005. Chance Lab, Department of biochemistry and biophysics, University of Pennsylvania.



- [13] Min Xu. Optical bacteria characterization: two simple and intuitive approaches, February 2005. Chance Lab, Department of biochemistry and biophysics, University of Pennsylvania.
- [14] Min Xu. Diffusing waves in turbid media: imaging tissue with light, July 2005. Department of Biomedical Engineering, Texas A&M University.

## 11.8 Conference Presentations

- [1] Run Li and M. Xu. Chemometric endogenous fluorescence for tissue diagnosis. In *Image Science Gordon Research Conference*, Stonehill College, Easton, MA, June 5-10 2016.
- [2] Zili Cao, Weihao Lin, Bixin Zeng, and M. Xu. High spatial frequency modulated imaging for tissue histological evaluations. In *SPIE/NIH Biophotonics from Bench to Bedside*, National Institutes of Health, Natcher Conference Center, Bethesda, MD 20892, Sept. 24-25 2015.
- [3] Michael Reilly, Kyle Scherer, Yongchao Ge, Jonathan Melamed, and M. Xu. Quantitative photonic pathology for cancer diagnosis and prognosis. In *Optical Biopsy XII*, San Francisco, CA, 2014. SPIE.
- [4] Htet Aung, Bianca DeAngelo, Piotr Kostyk, Braulio Rodriguez, Jonathan Melamed, and M. Xu. Prognostic value of quantitative phase map derived by differential interference microscopy of prostate cancer tissue sections: a preliminary retrospective study. In *2012 SBUR Fall Symposium*, Miami Beach, Florida, 2012. Society for Basic Urologic Research.
- [5] H. Aung, J. Buckley, P. Kostyk, B. Rodriguez, S. Phelan, and M. Xu. Imaging three-dimensional refractive index distribution with differential interference contrast (dic) microscopy. In *Focus on Microscopy 2012*, Singapore, 2012.
- [6] Min Xu. Quantifying microarchitectural and light scattering differences between tumorigenic and non-tumorigenic cell models of tissue: analysis with unified Mie and fractal model. In *Biomedical Optics/Digital Holography and Three-Dimensional Imaging/Laser Applications to Chemical, Security and Environmental Analysis on CD-ROM*, page BTuF11, Optical Society of America, Washington, DC, 2008.
- [7] Min Xu, Mohammad Alrubaiee, Swapan K. Gayen, and Robert R. Alfano. Optical tomography using independent component analysis. In *Era of Hope: Department of Defense Breast Cancer Research Program Meeting*, Baltimore, MD, June 25-28 2008. DOD.
- [8] Swapan K. Gayen, Mohammad Alrubaiee, M. Xu, and Robert R. Alfano. Optical imaging of an ex vivo model cancerous human breast using independent component analysis. In *Era of Hope: Department of Defense Breast Cancer Research Program Meeting*, Baltimore, MD, June 25-28 2008. DOD.
- [9] M. Xu, M. Alrubaiee, S. K. Gayen, and R. R. Alfano. Optical high resolution cross section imaging of a human breast model using independent component analysis. In

*5th Inter-institute Workshop on Optical Diagnostic Imaging from Bench to Bedside at the National Institutes of Health*, National Institutes of Health, Natcher Conference Center, Bethesda, MD 20892, Sept. 25-27 2006.

- [10] M. Alrubaiee, M. Xu, S. K. Gayen, and R. R. Alfano. Time-sliced imaging and monte carlo simulation study of ex vivo cancerous and normal breast tissues. In *the Junior Scientist Conference 2006*, Vienna University of Technology, Vienna, Austria, April 19-21 2006.
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- [12] Min Xu and Robert R. Alfano. Light depolarization by Mie scatterers. In *CLEO/QELS and PhAST*, Baltimore Convention Center, Baltimore, Maryland, May 22-27 2005. OSA.
- [13] Alvin Katz, Alexandra Alimova, Min Xu, Paul Gottlieb, Elizabeth Rudolph, Jeff C. Steiner, and R. R. Alfano. Changes in refractive index and size of Bacillus Subtilis during activation, measured by light transmission. In *CLEO/QELS and PhAST*, Baltimore Convention Center, Baltimore, Maryland, May 22-27 2005. OSA.
- [14] Wei Cai, Min Xu, and Robert R. Alfano. Light distribution from the analytical solution of the radiative transfer equation. In *CLEO/QELS and PhAST*, Baltimore Convention Center, Baltimore, Maryland, May 22-27 2005. OSA.
- [15] M. Alrubaiee, M. Xu, S. K. Gayen, and R. R. Alfano. Three-dimensional localization of several scattering targets in a turbid media using independent component analysis. In *CLEO/QELS and PhAST*, Baltimore Convention Center, Baltimore, Maryland, May 22-27 2005. OSA.
- [16] Min Xu and Robert R. Alfano. Fractal mechanisms of light scattering in biological tissue and cells. In *Frontiers in Optics*, Tucson, Arizona, October 16-20 2005. OSA.
- [17] K. G. Phillips, M. Xu, S. K. Gayen, and R. R. Alfano. Backscattering of circularly polarized light from a forward-peaked scattering medium: an electric field Monte Carlo study. In *Einsteins in the city: a student research conference at the city college of new york*, The City College of New York, new york city, NY 10031, Apr. 11-12 2005.
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- [20] M. Xu, M. Alrubaiee, S. K. Gayen, and R. R. Alfano. Information theory approach to detect small inhomogeneities within tissue-like turbid media. In *4th Inter-institute Workshop on Optical Diagnostic Imaging from Bench to Bedside at the National Institutes of Health*, National Institutes of Health, Natcher Conference Center, Bethesda, MD 20892, Sept. 20-22 2004.
- [21] M. Alrubaiee, M. Xu, S. K. Gayen, and R. R. Alfano. Three-dimensional localization and reconstruction of objects in a turbid medium using independent component analysis of optical transmission and fluorescence measurements. In *4th Inter-institute Workshop on Optical Diagnostic Imaging from Bench to Bedside at the National Institutes of Health*, National Institutes of Health, Natcher Conference Center, Bethesda, MD 20892, Sept. 20-22 2004.
- [22] M. Xu, M. Alrubaiee, W. Cai, S. K. Gayen, and R. R. Alfano. Simulated and experimental separation and characterization of absorptive inhomogeneities embedded in turbid media. In *Biomedical Topical Meetings on CD-ROM (OSA)*, page WF25, Fontainebleau Hilton Resort and Towers, Miami Beach, Florida, Apr 2004.
- [23] A. Katz, A. Alimova, M. Xu, P. Gottlieb, and R. R. Alfano. Rapid optical detection of bio-agents. In *International Conference on Advanced Technologies for Homeland Security*, Univ. Conn. Storrs, CT., Sept 25-26 2003.
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