

# Yong-Qing Li, Ph.D.

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## **Education**

- 1986-1989 Ph.D. in Physics, Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences, China.
- 1983-1986 M.S. in Optics, Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences, China.
- 1979-1983 B.S. in Physics, Sun Yat-sen University, Guangzhou, China

## **Employment History**

- 2011 - Pres Professor (tenured), Department of Physics, East Carolina University, Greenville, NC 27858. Biomedical Physics and Biomedical Optics.
- 2005-2010 Associate Professor (tenured), Department of Physics, East Carolina University, Greenville, NC 27858
- 1999- 2005 Assistant Professor (tenure-track), Department of Physics, East Carolina University, Greenville, NC 27858
- 1996-1999 Research Associate, Department of Physics, University of Arkansas, Fayetteville, AR 72701, USA.
- 1995-1996 Research Associate, Faculty of Information Sciences and Engineering, University of Canberra, Australia.
- 1993-1995 Visiting Assistant Professor, Department of Physics, University of Arkansas, Fayetteville, AR 72701, USA.
- 1992-1993 Research Associate, Max-Planck-Institute for Quantum Optics, Garching, Germany.
- 1991-1992 Research Associate Professor, Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences, China.
- 1989-1991 Research Assistant Professor, Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences, China.

## **Other Relevant Experiences and Profession Memberships**

- Senior member of Optical Society of America.
- Member of American Physical Society.
- Member of American Microbiology Society.

## **Honors and Awards**

- 2000 Ralph E. Powe Junior Faculty Enhancement Award, Oak Ridge Associated Universities
- 1991 Young Scientist Award, Chinese Academy of Sciences, China
- 1989 Daheng Optics Award, Chinese Academy of Sciences, China

## **Teaching Activities**

**Courses from the Teaching Schedule:** Advanced Physics Lab, Adv Readings in Physics I (Doctoral), DISSERTATION RESEARCH (Doctoral), ELECTRODYNAMICS (Doctoral), ELECTRODYNAMICS I, GENERAL PHYSICS, GENERAL PHYSICS LAB, MODERN OPTICS, READINGS IN PHYS II, RES PROBS IN BOIM PHY (Doctoral), RSCH PROB BIOMED PHYS, THERMO AND STAT PHYS.

**Courses taught, but not in the Schedule:**

PHYSICS 7715 -- Biomedical Optics. Biomedical Physics

**Student Assign-Supervised Research (GRAD)**

**Ph.D. students:**

Changan Xie, (Ph.D., East Carolina University, graduated July 2004).

De Chen, (Ph.D., East Carolina University, graduated June 2008).

Charles Goodman, (PhD candidate, East Carolina University, 2009- 2011).

Zhan Chen, (PhD candidate, East Carolina University, 2010- 2011).

**M.S. students:**

Amol Ambardekar, "Optical levitation of stuck micro particles with a pulsed laser tweezers" (Applied Physics M.S., East Carolina University, graduated July 2005).

Adam Hart, "Optical pulling and deflection of airborne particles" (Applied Physics M.S., East Carolina University, 2014- 2017).

Joshua Mangum, Bioaerosols detection and identification (2015-2017).

**Graduate thesis/dissertation committee:**

Deborah Schofield, (M.S., 2000, Department of Physics, East Carolina University)

Robert Hughes, (M.S., 2003, Department of Chemistry, East Carolina University)

Jenifer Fay Ojeda, (M.S., 2004, Department of Biology, East Carolina University)

Julie DiNitto, (Ph.D., 2010, Department of Physics, East Carolina University)

Alexander Garner (M.S.2010, Department of Chemistry, East Carolina University)

**Postdoctoral and Visiting Scholars Mentoring:**

Dr. Chengying Jiang (2018-2019), Institute of Microbiology, CAS

Dr. Jianghui Yuan (2018- present), Guangxi Medical University

Dr. Guihua Chen (2017-2018), Dongguan University of Technology

Dr. Lin He (2017-2018), Dongguan University of Technology

Dr. Xiuping Lin (2016 – 2017),

Dr. Shiwei Wang (2014- 2016), Institute of Microbiology, CAS

Dr. Li Wang (2013-2014), Institute of Microbiology, CAS

Dr. Jinda Lin (2013 – 2014), Shanghai Institute of Optics and Fine Mechanics, CAS

Dr. Jintao Liang (2013 – 2014)

Dr. Lin Ling (2012 – 2013)

Dr. Pengfei Zhang (2008 – 2011)

Dr. Lingbo Kong (2009 – 2013)

Visiting Prof. Guiwen Wang (2010 – 2012)

Dr. Xue-fen Xu (2011-2012)

Dr. Weidong Mao (2007 - 2008)

Mr. Li-xin Peng (2007 -2009)

Prof. Lei Yang (2005-2006)

Prof. Shushi Huang (2005-2007)

**Grant Support (>\$4.0 M in total as PI or co-PI)**

- “Identify factors that control germinant sensitivity during *Clostridium difficile* spore germination”, National Institutes of Health, \$405,000, 2016-2018, co-PI (with PI: Aimee Shen and co-PI: Peter Setlow).
- “Characterization of atmospheric biological particles using confocal Raman spectroscopy and optical trapping”, US Army Research Office, \$450,000, 2012-2016, Sole PI.
- “Single molecule imaging for biological research”, US Department of Defense, \$249,995, 2013-2014, Sole PI.
- “Inactivation of spores of *Bacillus* species by wet heat: studies on single spores using laser tweezers Raman spectroscopy”, US Army Research Office, \$375,000, November 1, 2008 - October 31, 2012. PI: Yong-qing Li, co-PI: Peter Setlow of University of Connecticut Health Center (Molecular, Microbial and Structural Biology).
- “Mechanism of bacterial spore germination and heterogeneity”, US Army Research Office MURI program (DoD), \$6.25 M in total, \$1,375,000 (to Dr. Li at ECU), November 1, 2009 – October 31, 2014. PI: Yong-qing Li at ECU, with PI Peter Setlow of University of Connecticut Health Center (Molecular, Microbial and Structural Biology).
- “Analysis of Kaposi’s Sarcoma-Associated Herpes virus Infection Using Raman Tweezers”, National Institutes of Health, National Institutes of Biomedical imaging and bioengineering, \$285,000 direct cost, July 1, 2007 – June 30, 2010, Co-PI: Yong-qing Li with PI Shaw M. Akula (Microbiology).
- “Study of the mechanism of germination of *Bacillus* spores via analysis of dipicolinic acid (DPA) release from single spores using laser tweezers Raman spectroscopy”, East Carolina University Research Development Grant, Division of Research and Graduate Studies, \$35,000, July 1, 2008 – June 30, 2009, Sole PI: Yong-qing Li.
- “Stabilization of biosensor cells used in CANARY pathogen detection”, Innovative Biosensors, Inc, \$135,187, 2006-2007, Co-PI: Yong-qing Li with PI Arthur P. Bode (Pathology and Laboratory Medicine).
- “New approaches to cancer detection and diagnosis using Raman tweezers spectroscopy”, East Carolina University Research Development Grant, Division of Research and Graduate Studies, \$24,000, July 1, 2005 – June 30, 2006, PI: Yong-qing Li with co-PIs Thomas McConnell (Biology) and John Wiley (Pediatrics/Medical Genetics).
- “Targeted Defense for Asymmetric Biological Attack (TDABA)”, US Army Space and Missile Defense Command (DoD), \$988,455, 2003-2005, co-PI: Yong-qing Li with PI J. Sutherland (Physics) and co-PI M.A. Dinno and R. Kempf.
- “Identification and sorting of biological agents by Raman tweezers”, East Carolina University Research/Creative Activity Grants, \$10,000, 2004-2005, Sole PI: Yong-qing Li.
- “Detection and manipulation of single biological particles with optical tweezers and Raman spectroscopic microscopy”, East Carolina University, Faculty Senate Research/Creative Activity Grants, \$18,311, July 1, 2001 – June 30, 2002. Sole PI: Yong-qing Li.
- “Development of optical tweezers for cell biology application Source”, ORAU Ralph E. Powe Junior Faculty Enhancement Award, Oak Ridge Associated Universities, \$10,000, 2000-2001, Sole PI: Yong-qing Li.
- “Quantum statistical properties and applications of atomic coherence in multi-level atomic system”, National Science Foundation, PHY-9732431, \$205,000, 1998-2001, Co-PI: Yong-qing Li with PI Min Xiao (University of Arkansas).

**Patents**

- “Laser tweezers and Raman spectroscopy systems and methods for the study of microscopic particles”, Inventors: **Y.Q. Li**, M.A. Dinno and C.A. Xie, U.S. patent No. 6897950, issued may 24, 2005.

### **Professional Services**

- Journal Review: *Nature Communications*, *Nature Protocols*, *Analytical Chemistry*, *Physical Review A*, *Optics Letters*, *Applied Physics Letters*, *Optics Express*, *Journal of the Optical Society of America B*, *Physics Letters A*, *The European Physical Journal D*
- Panel Review: US Department of Energy Bioengineering Instrumentation proposal review panel, 2010-2011.
- Panel Review: National Science Foundation, Bioengineering and Environmental Systems proposal review panel, 2003-2004
- University and Community Service: Department Computer Committee (1999 - 2000); Undergraduate Curriculum Committee (2000-2003); Laboratory Committee (2000 – 2002); New Faculty Search Committee (2001-2003); Graduate Committee (2002-2003) Personnel Committee (2006-2007); Chair of Executive Committee (2009-2010); executive committee (2012-2014).

### **Press Reports on the Li Group**

1. “Tracking refractive and molecular changes during bacterial spore germination”, Nancy D. Lamontagne, *Analytical Chemistry*, May, 2010.
2. “Raman spectroscopy and optical trapping combined to study mitochondria”, Gary Boas, *Biophotonics International*, December, 2007. pp.25-26.
3. “Optical traps illuminate the subcellular world”, Lauren I. Rugani, *Biophotonics International*, September, 2006. pp.40-45.
4. “Combing tweezers and spectroscopy”, Kim Douglass, *Optics & Photonics News*, pp.10-11, August (2003).
5. “Capturing suspicious agents in air and water”, CLEO/QELS 2003 PRESS LUNCHEON, *CLEO/QELS news conference highlights advances with lasers*, Washington, DC, May 29, 2003.
6. “Raman tweezers probe living cells”, Optics.org. J. Hewett, <http://optics.org/article/news/8/2/25>, 27 February (2002).
7. “Optical-trapping system testes on living cells”, T. Krupa, *Optics & Photonics News*, pp.8-9, June (2002).
8. “Raman spectra”, E. J. Lerner, *The Industrial Physicist*, 14, August/September (2002).
9. “Tweezers catch and analyze particles”, K. Robinson, *Photonics Technology News*, October (2002).
10. “From microscopy to surgery, lasers pervade biomedicine”, E.J. Lerner, *Laser Focus World*, September (2002), pp. 99-105.
11. “How to less a cell”, *Edge*, East Carolina University research and creative activity, Spring (2001).

## FULL List of Publications

### Articles in Journals (\* corresponding author)

1. G.H. Chen, L. He, M.Y. Wu, **Y.-Q. Li\***, Temporal dependence of photophoretic force optically induced on absorbing, *Phys. Rev. Applied*, 10, 054027 (2018).
2. L. He, S.W. Wang, M. Cortesão, M. Y. Wu, R. Moeller, P. Setlow, **Y.-Q. Li\***, Single-cell analysis reveals novel insights in the spore resistance to simulated space vacuum, *npj Microgravity*, 4:26 (2018).
3. L. He, Z. Chen, S.W. Wang, M.Y. Wu, P. Setlow, **Y. -Q. Li\***, Germination, outgrowth, and vegetative growth kinetics of dry heat-treated individual spores of *Bacillus* species, *Appl. Environ. Microbiol.* 84 (7), e02618-17, doi:10.1128/AEM.02618-17 (2018).
4. L. Rao, F. E. Feeherry, S. Ghosh, X. Liao, X.P. Lin, P.F Zhang, **Y.-Q. Li**, C. J. Doona, P. Setlow, Effects of lowering water activity by various humectants on germination of spores of *Bacillus* species with different germinants, *Food Microbiol.* 72, 112-127 (2018).
5. M.-Y. Wu, D.-X. Ling, L. Ling, W. Li, **Y.-Q. Li\***, Stable optical trapping and sensitive characterization of nanostructures using standing-wave Raman tweezers, *Scientific Reports*, 7, 42930 (2017).
6. P. Setlow, S.W. Wang, **Y.-Q. Li**, Germination of spores of the orders *Bacillales* and *Clostridiales*, *Annu. Rev. Microbiol.* 71:459–77 (2017).
7. J. Lin, J. Deng, R. Wei, **Y.-Q. Li**, Y.Z. Wang, Measurement of mass by optical forced oscillation of absorbing particles trapped in air, *J. Opt. Soc. Am. B*, 34 (6), 1242-1246 (2017).
8. M. L. Donnelly, W. Li, **Y.-Q. Li**, L. Hinkel, P. Setlow, A. Shen, A *Clostridium difficile*-specific, gel-forming protein required for optimal spore germination, *mBio*, 8, e02085-16 (2017).
9. S.W. Wang, J. Brunt, M W. Peck, P. Setlow, **Y.-Q. Li\***, Analysis of the germination of individual *Clostridium sporogenes* spores with and without germinant receptors and cortex-Lytic enzymes, *Frontiers in Microbiology*, 8:2047 (2017).
10. S.W. Wang, B. Setlow, P. Setlow, **Y.-Q. Li\***, Uptake and levels of the antibiotic berberine in individual dormant and germinating *Clostridium difficile* and *Bacillus cereus* spores as measured by laser tweezers Raman spectroscopy. *J. Antimicrob. Chemoth.* 71(6):1540-6 (2016).
11. S.W. Wang, C. J. Doona, P. Setlow, **Y.-Q. Li\*** (2016) Characterization of cold atmospheric plasma inactivation of individual bacterial spores using Raman spectroscopy and phase contrast microscopy. *Appl. Environ. Microbiol.* 82: 5775-5784.
12. L. del Carmen Huesca-Espitia, M. Suvira, K. Rosenbeck, G. Korza, B. Setlow, W. Li, S.W. Wang, **Y.-Q. Li**, P. Setlow\* (2016) Effects of steam autoclave treatment on *Geobacillus stearothermophilus* spores. *J. Appl. Microbiol.* 121(5):1300-1311.
13. C. Doona, F. Feeherry, B. Setlow, S.W. Wang, W. Li, F. C. Nichols, P. K. Talukda, M. R. Sarker, **Y.-Q. Li**, A. Shen, P. Setlow\* (2016) Effects of high pressure treatment on spores of *Clostridium* species. *Appl. Environ. Microbiol.* 82(17): 5287-97.
14. Z.H. Tao, P.F. Zhang, Z. Qin, **Y.-Q. Li**, G.W. Wang (2016) Poly(3-hydroxybutyrate) anabolism in *Cupriavidus necator* cultivated at various carbon-to-nitrogen ratios: insights from single-cell Raman spectroscopy, *J. Biomed. Opt.* 21(9), 097005.
15. Z.H. Tao, L.X. Peng, P.F. Zhang, **Y.-Q. Li**, G.W. Wang (2016) Probing the kinetic anabolism of Poly-Beta-Hydroxybutyrate in *Cupriavidus necator* H16 using single-cell Raman spectroscopy, *Sensors*, 16, 1257; doi:10.3390/s16081257.

16. **S.W. Wang, J. R. Faeder, P. Setlow, Y.Q. Li\***, Memory of germinant stimuli in bacterial spores, *mBio*, 6(6), e01859-15 (2015).
17. **S.W. Wang, J. Yu, M. Suvira, P. Setlow, Y.Q. Li\***, Uptake of and resistance to the antibiotic berberine by individual dormant, germinating and outgrowing *Bacillus* spores as monitored by laser tweezers Raman spectroscopy, *Plos One*, 10 (12), e0144183 (2015).
18. **J. Lin, A. G. Hart, and Y.Q. Li\***, Optical pulling of airborne absorbing particles and smut spores over a meter-scale distance with negative photophoretic force, *Appl. Phys. Lett.* 106 (17), 171906 (2015).
19. **S.W. Wang, A. Shen, P. Setlow, Y.Q. Li\***, Characterization of the dynamic germination of individual *Clostridium difficile* spores using Raman spectroscopy and differential interference contrast microscopy, *J. Bacteriol.* 197, 2361–2373 (2015).
20. **S.W. Wang, P. Setlow, Y.Q. Li\***, Slow leakage of Ca-dipicolinic acid from individual *Bacillus* spores during initiation of spore germination, *J. Bacteriol.* 197, 1095 - 1103 (2015).
21. **P.F. Zhang, J. Liang, X. Yi, P. Setlow, and Y.Q. Li\***, Monitoring of commitment, blocking and continuation of nutrient germination of individual *Bacillus subtilis* spores, *J. Bacteriol.* 196, 2443–2454 (2014).
22. **J. Liang, P.F. Zhang, P. Setlow and Y.Q. Li\***, High precision fitting measurements of the kinetics of size changes during germination of individual *Bacillus* spores, *Appl. Environ. Microbiol.* 80, 4606-4615 (2014).
23. **J. Lin and Y.Q. Li\***, Optical trapping and rotation of airborne absorbing particles with a single focused laser beam. *Appl. Phys. Lett.* 104, 101909 (2014).
24. **J. Lin and Y.Q. Li\***, “Ultralow frequency Stokes and anti-Stokes Raman spectroscopy of single living cells and microparticles using a hot rubidium vapor filter”, *Optics Letters*, 39:108-110 (2014).
25. **L.B. Kong, C. J. Doona, P. Setlow and Y.-Q. Li\***, “Monitoring rates and heterogeneity of high pressure germination of *Bacillus* spores using phase contrast microscopy of individual spores”, *Appl. Environ. Microbiol.* 80(1), 345-53 (2014).
26. **L.B. Kong, P. Setlow and Y.Q. Li\***, “Observation of dynamic germination of single bacterial spores using rapid Raman imaging”, *J. Biomed. Opt.* 19, 011003 (2014).
27. **K. Nagler, P. Setlow, Y.Q. Li, and R. Moeller**, “High salinity alters the germination behavior of *Bacillus subtilis* spores with nutrient and non-nutrient germinants”, *Appl. Environ. Microbiol.* 80(4):1314 -1321 (2014).
28. **B. Setlow, S. Phillips, P. Zhang, Y.Q. Li, C. Neely, P. Setlow**, “Mechanism of killing of spores of *Bacillus anthracis* in a high-temperature gas environment, and analysis of DNA damage generated by various decontamination treatments of spores of *Bacillus anthracis*, *Bacillus subtilis* and *Bacillus thuringiensis*”. *J. Appl. Microbiol.* 116 (4), 805-14 (2014).
29. **L.B. Kong, P. Setlow, and Y.Q. Li\***, “Direct analysis of water content and movement in single dormant bacterial spores using confocal Raman microspectroscopy and Raman imaging”, *Anal. Chem.* 85, 7094–7101 (2013).
30. **L. Ling, Y.Q. Li\***, “Measurement of Raman spectra of single airborne absorbing particles trapped by a single laser beam”, *Optics Letters.* 38(4):416-418 (2013).
31. **A. Perez-Valdespino, S. Ghosh, E.P. Cammett, L. Kong, Y.-Q. Li and P. Setlow**, “Isolation and characterization of *Bacillus subtilis* spores that are superdormant for germination with dodecylamine or Ca<sup>2+</sup>-dipicolinic acid”, *J. Appl. Microbiology.* 114(4):1109-1119 (2013).
32. **B. Setlow, S. Parish, P. Zhang, Y.-Q. Li, W.C. Neely, P. Setlow**, “Mechanism of killing of spores of *Bacillus anthracis* in a high-temperature gas environment, and analysis of DNA

- damage generated by various decontamination treatments of spores of *Bacillus anthracis*, *Bacillus subtilis* and *Bacillus thuringiensis*”, *J. Appl. Microbiol.* DOI: 10.1111/jam.12421 (2013).
33. **B. Setlow, J. Yu, Y.-Q. Li, P. Setlow**, “Analysis of the germination kinetics of individual *Bacillus subtilis* spores treated with hydrogen peroxide or sodium hypochlorite”, *Lett. Appl. Microbiol.* 57(4):259-65 (2013).
  34. **T.T. Zhou, Z.Y. Dong, P. Setlow and Y.-Q. Li\***, “Kinetics of germination of individual spores of *Geobacillus stearothermophilus* measured by Raman spectroscopy and differential interference contrast microscopy”, *PLoS One.* 8(9):e74987 (2013).
  35. **X. Yi, A. J. Troiano, W. H. Coleman, K. K. Griffiths, C. Doona, F. E. Feeherry, G.W. Wang, Y.Q. Li and P. Setlow**, “Analysis of the effects of a *gerP* mutation on the germination of spores of *Bacillus subtilis*”, *J. Bacteriol.* 194(21):5749-58 (2012).
  36. **L.B. Kong, P. Setlow, Y.Q. Li\***, “Analysis of the Raman spectra of  $\text{Ca}^{2+}$ -dipicolinic acid alone and in the bacterial spore core in both aqueous and dehydrated environments”, *Analyst*, **137**, 3683-3689 (2012).
  37. **G.W. Wang, D. Paredes-Sabja, M. R. Sarker, C. Green, P. Setlow and Y.Q. Li\***, “Effects of wet heat-treatment on the germination of individual spores of *Clostridium perfringens*”, *J. Appl. Microbiol.* 113(4):824-36 (2012).
  38. **P. Zhang, L. Kong, G. Wang, M. Scotland, S. Ghosh, B. Setlow, P. Setlow and Y.Q. Li\***, “Analysis of the slow germination of multiple individual superdormant *Bacillus subtilis* spores using multifocus Raman microspectroscopy and differential interference contrast microscopy”, *J. Appl. Microbiol.* 112: 526-536 (2012).
  39. **A. Ramirez-Peralta, P.F. Zhang, Y.Q. Li, and P. Setlow**, “Effects of sporulation conditions on the germination and germination protein levels of *Bacillus subtilis* spores”, *Appl. Environ. Microbiol.* 78:2689-2697 (2012).
  40. **Y.F. Li, A. Davis, G. Korza, P.F. Zhang, Y.Q. Li, B. Setlow, P. Setlow, and B. Hao**, “Role of a SpoVA protein in dipicolinic acid uptake into developing spores of *Bacillus subtilis*”, *J. Bacteriol.* 194:1875-1884 (2012).
  41. **P.F. Zhang, S. Thomas, Y.Q. Li, & P. Setlow**, “Effects of cortex peptidoglycan structure and cortex hydrolysis on the kinetics of  $\text{Ca}^{2+}$ -dipicolinic acid release during *Bacillus subtilis* spore germination”, *J. Bacteriol.* 194 (3), 646-652 (2012).
  42. **J. Shao, M. Lin, Y. Q. Li\*, X. Li, J. Liu, J. Liang, H. Yao**, “In vivo blood glucose quantification using Raman spectroscopy”, *PLOS ONE*, 7, e48127 (2012).
  43. **J. Shao, H. Yao, L. Meng, Y.Q. Li\*, M. Lin, X. Li, J. Liu, J. Liang**, “Raman spectroscopy of circulating single red blood cells in microvessels in vivo”, *Vibrational Spectroscopy*, 63 367–370 (2012).
  44. **L.B. Kong, P.F. Zhang, G.W. Wang, P. Setlow, and Y.Q. Li\***, “Characterization of bacterial spore germination using phase contrast microscopy, fluorescence microscopy, Raman spectroscopy and optical tweezers”, *Nature Protocols*, 6, 625-639 (2011).
  45. **L.B. Kong, P.F. Zhang, J. Yu, P. Setlow, and Y.Q. Li\***, “Rapid confocal Raman imaging using a synchro-multifoci-scan scheme for dynamic monitoring of single living cells”, *Appl. Phys. Lett.* 98, 213703 (2011).
  46. **L.B. Kong, P.F. Zhang, P. Setlow, and Y.Q. Li\***, “Multifocus confocal Raman microspectroscopy for rapid single-particle analysis”, *J. Biomed. Opt.* 16, 120503 (2011).

47. **G.W. Wang, X. Yi, Y.Q. Li, and P. Setlow**, “Germination of individual *Bacillus subtilis* spores with alterations in the GerD and SpoVA proteins important in spore germination”, *J. Bacteriol.* 193, 2301–2311 (2011).
48. **G.W. Wang, P.F. Zhang, P. Setlow, and Y.Q. Li\***, “Kinetics of germination of wet heat-treated individual spores of *Bacillus* species as followed by Raman spectroscopy and differential interference contrast microscopy”, *Appl. Environ. Microbiol.* 77, 3368-3379 (2011).
49. **G. Wang, P. Zhang, D. Paredes-Sabja, C. Green, P. Setlow, M.R. Sarker and Y.Q. Li\***, “Analysis of the germination of individual *Clostridium perfringens* spores and its heterogeneity”, *J. Appl. Microbiol.* 111, 1212-23 (2011).
50. **P.F. Zhang, L.B. Kong, G.W. Wang, P. Setlow, and Y.Q. Li\***, “Monitoring the wet-heat inactivation dynamics of single spores of *Bacillus* species by using Raman tweezers, differential interference contrast microscopy, and nucleic acid dye fluorescence microscopy”, *Appl. Environ. Microbiol.* 77, 4754–4769 (2011).
51. **S. Ghosh, A. Ramirez-Peralta, E. Gaidamakova, P. Zhang, Y.-Q. Li, M.J. Daly and P. Setlow**, “Effects of Mn levels on resistance of *Bacillus megaterium* spores to heat, radiation and hydrogen peroxide”, *J. Appl. Microbiol.* 111, 663–670 (2011).
52. **J. Sanchez-Salas, B. Setlow, P.F. Zhang, Y.Q. Li, and P. Setlow**, “Maturation of released spores is necessary for acquisition of full spore heat resistance during *Bacillus subtilis* sporulation”, *Appl. Environ. Microbiol.* 77, 6746–6754 (2011).
53. **Z. Tao, G. Wang, X. Xu, Y. Yuan, X. Wang and Y.Q. Li**, “Monitoring and rapid quantification of total carotenoids in *Rhodotorulaglutinis* cells using laser tweezers Raman spectroscopy”, *FEMS Microbiol. Lett.* 314, 42–48 (2011).
54. **P.F. Zhang, L.B. Kong, P. Setlow and Y.Q. Li\***, “Multiple-trap laser tweezers Raman spectroscopy for simultaneous monitoring of the biological dynamics of multiple individual cells”, *Opt. Lett.* 35, 3321-3323 (2010).
55. **L.B. Kong, P.F. Zhang, P. Setlow, and Y.Q. Li\***, “Characterization of bacterial spore germination using integrated phase contrast microscopy, Raman spectroscopy and optical tweezers”, *Anal. Chem.* 82, 3840–3847(2010).
56. **L.B. Kong, P.F. Zhang, J. Yu, P. Setlow, and Y.Q. Li\***, “Monitoring the kinetics of uptake of a nucleic acid stain during the germination of single spores of *Bacillus* species”, *Anal. Chem.* 82, 8717–8724 (2010).
57. **P.F. Zhang, L.B. Kong, P. Setlow, and Y.Q. Li\***, “Characterization of wet-heat inactivation of single spores of *Bacillus* species by dual-trap Raman spectroscopy and elastic light scattering”, *Appl. Environ. Microbiol.* 76, 1796–1805 (2010).
58. **P.F. Zhang, W. Garner, X. Yi, J. Yu, Y.Q. Li\* and P. Setlow\***, “Factors affecting the variability in the time between addition of nutrient germinants and rapid DPA release during germination of spores of *Bacillus* species”, *J. Bacteriol.* 192, 3608-3619 (2010).
59. **P. F. Zhang, L.B. Kong, G.W. Wang, P. Setlow, and Y.Q. Li\***. “Combination of Raman tweezers and quantitative differential interference contrast microscopy for measurement of dynamics and heterogeneity during the germination of individual bacterial spores”, *J. Biomed. Opt.* 15, 056010 (2010).
60. **W. H. Coleman, P.F. Zhang, Y. Q. Li and P. Setlow**, “Mechanism of killing of spores of *Bacillus cereus* and *Bacillus megaterium* by wet heat”, *Lett. Appl. Microbiol.*, 50, 507-514 (2010).



61. **L. Peng, G. Wang, W. Liao, H. Yao, S. Huang, Y.Q. Li\***. “Intracellular ethanol accumulation in yeast cells during aerobic fermentation: a Raman spectroscopic exploration”, *Lett. Appl. Microbiol.* 51(6):632-8 (2010).
62. **Y. Li, G.W. Wang, H.L. Yao, J. Liu, Y.Q. Li\***, “Dual-trap Raman tweezers for probing dynamics and heterogeneity of interacting microbial cells”, *J. Biomed. Opt.* 15(6), 067008 (2010).
63. **L. Peng, D. Chen, P. Setlow, and Y. Q. Li\***, “Elastic and inelastic light scattering from single bacterial spores in an optical trap allows the monitoring of spore germination dynamics”, *Anal. Chem.* 81, 4035–4042 (2009).
64. **D. Chen, L. Shelenkova, Y. Q. Li, C. Kempf, and A. Sabelnikov**, “Laser tweezers Raman spectroscopy potential for studies of complex dynamic cellular processes: single cell bacterial lysis”, *Anal. Chem.* 81, 3227–3238 (2009).
65. **P.F. Zhang, P. Setlow, and Y.Q. Li\***. “Characterization of single heat-activated *Bacillus* spores using laser tweezers Raman spectroscopy”, *Opt. Expr.* 17, 16480-16491 (2009).
66. **B. Setlow, L. Peng, C. Loshon, Y. Q. Li, G. Christie, P. Setlow**, “Characterization of the germination of *Bacillus megaterium* spores lacking enzymes that degrade the spore cortex”, *J. Appl. Microbiol.* 107, 318-328 (2009).
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194. **Y.Q. Li, and Y.Z. Wang**, "Instabilities, mode coexistence and bistable behavior in a multimode dye laser near the threshold", in IQEC '90, Proceedings of XVII International Quantum Electronics Conference, Anaheim, California, USA, May (1990).
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**Invited Speaker and Seminar**

1. Monitoring and analysis of single cell dynamics using confocal Raman imaging and ultralow frequency Raman micro-spectroscopy. The XXIV International Conference on Raman Spectroscopy, August 10-15, Jena, Germany (**Invited speaker**).
2. The discovery of cellular memory and heterogeneity in bacterial spore response to nutrient exposures, Guangxi University, Nanning, China, June 23, 2014 (**Seminar**).
3. Novel Biomedical Tools - Optical tweezers Raman spectroscopy and microscopy for the characterization of cellular dynamics and heterogeneity of single cells, Guangxi Medical University, June 24, Nanning, China, 2014 (**Seminar**).
4. Identification of single airborne absorbing particles and bioaerosols using negative photophoretic forces, Guilin University of Electronics and Technology, Guilin, China, June 27, 2014 (**Seminar**).
5. Optical pulling of airborne absorbing particles using negative photophoretic forces. The 6th International Symposium on Cold Atom Physics (ISCAP-VI), June 14-17, 2014, Tiayuan, China (**Invited speaker**).
6. Optical trapping and Raman spectroscopy of single bacterial spores and absorbing aerosol particles. Bioaerosols: Characterization and Impact workshop, Austin, Texas, USA, March 26, 2014 (**Invited speaker**).
7. Confocal Raman imaging and spectroscopy analyze biological dynamics of single living cells. The 3rd workshop on Imaging in Biology and Medicine, Chengdu, China-PRC, July 1 2012 (**Invited speaker**).
8. Optical trapping and Raman Spectroscopy for single-cell microbiology. The 5th International Symposium on Cold Atom Physics (ISCAP-V), Three Gorges Yichang, China-PRC, June 23, 2012 (**Invited speaker**).
9. Laser tweezers Raman spectroscopy for characterization of cellular dynamics and heterogeneity of single living cells, 北京大学, Beijing University, Beijing China, June 12, 2012 (**Seminar**). Beijing China, June 12, 2012 (**Invited Seminar**).
10. Biophotonics - tweezers Raman spectroscopy for characterization of cellular dynamics and heterogeneity of single living cells, 中科院北京物理研究所, Beijing China, June 10, 2012 (**Invited Seminar**).
11. Biophotonics - Optical trapping and Raman Spectroscopy, Guilin University of Electronics and Technology, Guilin, China, July 21, 2012 (**Seminar**).
12. Biophotonics - Laser tweezers Raman spectroscopy and microscopy for characterization of cellular dynamics and heterogeneity of single living cells, 上海交通大学, Shanghai, China, August 3, 2012 (**Invited seminar**).
13. Analyze single biological particles using Raman tweezers, Amgen Inc. California, USA, August 18, 2011 (**Seminar**).
14. Biophotonics: Laser tweezers Raman spectroscopy & microscopy for characterization of cellular dynamics and its heterogeneity of single living cells, Shenzhen University, Shenzhen, China, July 27, 2011 (**Seminar**).
15. Bio-optics: monitoring cellular dynamics of individual cells, 中科院上海光学精密机械研究所, Shanghai, China, July 1, 2011 (**Seminar**).
16. Laser tweezers and Raman spectroscopy (LTRS) for single cell analysis, **Seminar** at East Carolina University School of Medicine, Microbiology, NC, USA, April 18 (2011).

17. Analyze single biological cells using laser tweezers Raman spectroscopy, August 20, 2010 (Seminar). 清华大学, Beijing China, June 12, 2012 (**Seminar**). Beijing China
18. Combination of confocal Raman spectroscopy, optical tweezers, phase contrast & fluorescence microscopy for noninvasive analysis of single living cells, **Seminar** at NIH/NHLBI, Bethesda, MD, November 3 (2010).
19. Monitor single bacterial spores during germination using confocal Raman spectroscopy, optical tweezers and quantitative phase contrast microscopy. The Fourth Shanghai International Conference on Biophysics and Molecular Biology, Shanghai, China-PRC, August 8-12, 2010 (**Invited speaker**).
20. Characterization of bacterial spore germination and its heterogeneity. The 2nd Workshop on Imaging in Biology and Medicine, Chengdu, China-PRC. 2010, July 10-12, 2010 (**Invited speaker**).
21. Monitoring biological dynamics of single cells and cellular heterogeneity using laser tweezers and Raman spectroscopy. The 7th International Conference on Photonics and Imaging in Biology and Medicine, Wuhan, China, 2008 (**Invited talk**).
22. Laser tweezers and Raman spectroscopy. The 1<sup>st</sup> Workshop on Imaging in Biology and Medicine, Li Jiang, China-PRC. 2008, July (**Invited speaker**).
23. Probing biological dynamics of single cells using laser tweezers and Raman spectroscopy, **Seminar** at Wake Forest University, NC, USA, April 10, 2008.
24. Optical tweezers and Raman spectroscopy of living cells, **Seminar** at East Carolina University School of Medicine, Anatomy and Cell Biology, April 11, 2007.
25. Raman tweezers spectroscopy on living cells, **Seminar** at Rochester University, Rochester, NY, USA, March 23, 2007.
26. "Optical tweezers and Raman spectroscopy of living cells", **Seminar** in Department of Anatomy and Cell Biology, East Carolina University School of Medicine, April 11, 2007.
27. From quantum optics to biomedical optics, 中山大学, Guangzhou, China, December 14, 2006 (**Seminar**).
28. Optical trapping, Raman spectroscopy and microfluidic manipulation of single biological cells: technology and applications, 华中科技大学, Wuhan, China, December 12, 2006 (**Seminar**).
29. Optical trapping, Raman spectroscopy and microfluidic manipulation of single biological cells: technology and applications, 中山大学, Guangzhou, China, September 6, 2006 (**Seminar**).
30. "Raman-Tweezers Spectroscopy of Single Biological Cells and Chromosomes", **Seminar** in Department of Electrical and Computer Engineering, Duke University, April 19, 2005 (**Invited**).
31. "Raman tweezers spectroscopy of single biological cells", **Seminar** in Department of Chemistry, University of North Carolina, November 14, 2005.
32. "Raman Spectroscopy and optical trapping of Single microbial Cells", **Seminar** in Institute of Marine Sciences, University of North Carolina, March 21, 2005.
33. "Optical Trapping and Raman Spectroscopy of Single Living Cells", **Seminar** in Department of Biology, East Carolina University, February 12, 2004.
34. "Manipulation and Identification of Single Living Cells and Organelles Using Optical Tweezers and Raman Spectroscopy: Principles and Applications", **Seminar** in Biochemistry & Molecular Biology Department, East Carolina School of Medicine, April 14, 2003.

35. “Optical trapping, manipulation, and biological applications”, **Seminar** in Guangxi Academy of Sciences, Nanning, China, July 25, 2001.
36. “Optical trapping, manipulation, and biological applications”, **Seminar** in Department of Physics, East Carolina University, November 12, 1999.
37. “Highly-sensitive optical sensing techniques for biomedical research”, **Seminar** in Department of Physics, East Carolina University, April 29, 1999.
38. “Quantum noise properties of optoelectronic devices”, **Seminar** in Department of Physics, University of Arkansas, May 2, 1999.