

## BIOGRAPHICAL SKETCH

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NAME Thomas Abraham		POSITION TITLE Director, Microscopy Imaging Core Facility Penn State College of Medicine	
eRA COMMONS USER NAME (credential, e.g., agency login)			
EDUCATION/TRAINING (Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable.)			
INSTITUTION AND LOCATION	DEGREE (if applicable)	MM/YY	FIELD OF STUDY
Mahatma Gandhi University, Kottayam, India.	B. Sc.	06/83-05/86	Chem., Physics, Math.
Cochin University of Science and Technology, Cochin, India.	B. Tech.	06/86-05/89	Chemical Technology
Indian Institute of Technology, New Delhi, India	M. Tech.	9/90-12/91	Chemical Technology
Laval University, Quebec, Canada [Max Planck Institute for Polymer Research, Mainz, Germany (3 Months)]	Ph. D.	09/96-04/00	Chemical Engineering
University of Alberta, Canada [Royal Institute of Technology, Stockholm, Sweden (3 Months)]	Posdoc	05/00-03/01	Colloid Science
Nanotechnology Research Institute, Tsukuba Science City, Japan	Posdoc	03/01-09/03	Biophysics
University of Alberta, Canada	Posdoc	10/01-05/05	Biophysics
Canadian Neutron Beam Centre, Canada	Posdoc	06/05-09/06	Biophysics/ Structural Biology

### A. Personal Statement:

I am a microscopy expert with significant experience in modern biomedical optics and lung, heart, tendon, vasculature, skin and brain biological structures, with specialization in high resolution imaging methods based on confocal, harmonic generation and multiphoton microscopy methods. I have successfully implemented various confocal/multiphoton imaging protocols and complex image processing operations including deconvolution, quantitative colocalization analysis, segmentation analysis, quantitative live cell imaging, etc., to answer biologically significant questions at sub-cellular levels. My expertise includes strong hands-on experience and in-depth theoretical knowledge of modern optical microscopy principles including fluorescence, confocal, harmonic generation and multiphoton microscopy methods, as well as the interferometry, ellipsometry, diffraction and various light scattering methods along with structural analysis of biological matters. For the past 17 years, I have been involved in various multidisciplinary research projects dealing with biomedical sciences using these advanced biomedical optical methods. I have demonstrated successes in these research projects, which resulted in ***thirty seven*** original peer reviewed research publications in high quality journals, plus *nine* published proceedings/ books chapters and *twenty four* published abstracts. My lead role in these high resolution imaging modalities has already resulted in invited review articles on the potential use of these imaging modalities in cellular level remodeling as well as several invited presentations at the international conferences including the *American Thoracic Society*. As a Director of Microscopy Imaging at the Penn State Hershey College of Medicine my role involves collaborating with investigators regarding applications of advanced confocal microscopy systems for visualizing and quantifying physiological events involving cells, proteins, lipids, other relevant macromolecular complexes in fixed, *ex vivo*, *in vivo* as well as in relevant intra-vital high resolution imaging approaches.

### B. Positions and Honors

#### Positions and Employment

1993-1996	Lecturer: Dept. of Chemical Engineering, Annamalai University, Tamilnadu, India
2006-2012	Imaging Head, Institute for Heart + Lung Health, University of British Columbia, Canada
2013-pres.	Director of Microscopy Imaging, Penn State Hershey College of Medicine, Hershey, PA

## Honors

1990	Graduate Aptitude Test in Engineering, GATE 1990 Scholarship (National level, India)
2001	Japan Society for Promotion of Science Award (International level)
2005	NSERC- Visiting Fellowship Award (National level, Canada)
2011	New Investigator Award - Canadian Lung Association (National level)
2012	Invited Speaker - American Thoracic Society 2012 International Conference

## Professional Membership

1994	Member, Indian Society of Technical Education
2002	Member, Chemical Institute of Canada
2004	Member, Biophysical Society (USA)
2009	Member, Society of Photo Optical Instrumentation Engineers [SPIE]
2010	Member, Microscopy Society of America [MSA]

## Professional Activities

**Reviewer** for Nature Protocol, Methods, Journal of Biomedical Optics, Applied Physics Letters, Atherosclerosis, Journal of American Chemical Society, Journal of Physical Chemistry, Macromolecules, Carbon, Histology and Histo-Pathology, International Journal of COPD, Respiratory Research, Respirology.

**Reviewer:** Austrian Science Fund - Erwin Schrödinger Fellowship Program.

**Guest Lecturer in Biophotonics:** Biomedical Engineering Program, Faculty of Applied Sciences, Simon Fraser University, Burnaby Campus, Canada.

**Consultant:** biOasis Technologies, Inc. Vancouver, BC, Canada.

## Contributions to Research and Development

- Author of 37 peer reviewed research publications.
- Author of 8 published proceedings/ books chapters.
- Author of two invited reviews
- Author of 24 published abstracts.
- Presented invited talks at 6 conferences/ meetings/ seminars.
- Presented work at 18 International/ North American conferences.

**C. Selected Recent Peer-Reviewed Publications** (*Selected from 37 peer-reviewed publications, in chronological order. These peer reviewed publications cited 537 times based on the information collected from Web of Science on November 26, 2013*).

- 1) Allan, S. E., Zhao, G. X., **Abraham, T.**, McMurchy, A. N., Levings, M. K. (2008) Inducible reprogramming of human T cells into Treg cells by a conditionally active form of FOXP3, *European Journal Immunology* 38, 3282–3289 [PMID: 19039775].
- 2) Sharma, V., **Abraham, T.**, So, A., Allard, M. F. and McNeill, J. H. (2009) The control of cardiac carnitine palmitoyltransferase-1 activity and malonyl CoA sensitivity by post translational modifications, *Molecular and Cellular Biochemistry* 337, 223–237 [PMID: 19862603].
- 3) Marchant, D., Wu, W., Si, X., Luo, Z., **Abraham, T.**, Petersen, T., Hegele, R., McManus, B. (2009) ERK MAP kinase activated Arf6 trafficking directs CVB3 into an unproductive compartment during virus-host cell entry, *Journal of General Virology* 90, 854–862 [PMID: 19264606].
- 4) **Abraham, T.\***, Hogg, J. (2010) Extracellular matrix remodeling of lung alveolar wall in three dimensional space identified using second harmonic generation and multiphoton excitation fluorescence, *Journal of Structural Biology* 171, 189-196 [PMID: 20412859] {\*Corresponding author}.
- 5) **Abraham, T.\***, Carthy, J., McManus, B. (2010) Collagen matrix remodeling in 3-dimensional cellular space resolved using second harmonic generation and multi photon excitation fluorescence, *Journal of*

- Structural Biology* 169, 36-44 [PMID: 19651220] {\*Corresponding author}.
- 6) **Abraham, T.\***, Allan, S. E., Levings, M. K. (2010) Deconvolution and chromatic aberration corrections in quantifying colocalization of a transcription factor in three dimensional cellular space, *Micron* 41, 633-640 [PMID: 20392647] {\*Corresponding author}.
  - 7) **Abraham, T.\***, Wadsworth, Hirota, J. A., Knight, D. (2011) Minimally invasive multiphoton and harmonic generation imaging of extracellular matrix structures in lung airway and related diseases, *Pulmonary Pharmacology and Therapeutics* 24, 487- 496 [PMID: 21497667] {\*Corresponding author}.
  - 8) **Abraham, T.\***, Wadsworth, S., Carthy, J., Petchkovski, D., McManus, B. (2011) Minimally invasive imaging method based on multiphoton excitation fluorescence and harmonic generation in translational respiratory research, *Respirology* 16, 22–33 [PMID: 21054675] {\*Corresponding author}.
  - 9) Kandalam, V., Basu, R., **Abraham, T.**, Wang, X., Soloway, P. D., Jaworski, D. M., Oudit, G. Y., Kassiri, Z. (2010) TIMP2-deficiency accelerates early adverse post-myocardial infarction remodeling due to enhanced MT1-MMP activity despite lack of MMP2 activation, *Circulation Research* 106, 796-808 [PMID: 20056917].
  - 10) Sharma, A., **Abraham, T.**, Sampaio, R., Cowan, M., Underhill, M., Scott, A. (2011) Sodium Cromolyn Reduces Expression of CTGF, ADAMTS1, and TIMP3 modulates post-injury patellar tendon morphology, *Journal of Orthopaedic Research* 29, 687-83 [PMID: 21437947].
  - 11) Hiebert, P. R., **Abraham, T.**, Pazooki, S., Boivin, W. A., Zhao, H., Granville, D. J. (2011) Accelerated skin aging in western diet fed apolipoprotein E deficient mice, *Experimental Gerontology* 46, 489-499 [PMID: 21316440].
  - 12) Wijesekara, N., Zhang, L., Kang, M. H., **Abraham, T.**, Bhattacharjee, A., Warnock, G. L., Verchere, B. C., Hayden, M. R. (2011) miR-33a modulates ABCA1 expression, cholesterol accumulation and insulin secretion in pancreatic islets, *Diabetes* 60, 3186-3196 [PMCID: PMC3282802]
  - 13) Leung, C., Utokaparch, S., Sharma, A., Yu, C., **Abraham, T.**, Borchers, C., Bernatchez, P. (2011) Proteomic identification of dysferlin-interacting protein complexes in human vascular endothelium, *Biochemical and Biophysical Research Communications*, 415, 263-9 [PMID: 22037454].
  - 14) **Abraham, T.**, Fong, G. Scott, A. (2011) Second harmonic generation analysis of early Achilles tendinosis in response to in vivo mechanical loading, *BMC Musculoskeletal Disorders* 12, 26 [PMCID: PMC3045393]
  - 15) **Abraham, T.\***, Kayra, D., McManus, B., Scott, A. (2012) Quantitative assessment of forward and backward second harmonic three dimensional images of collagen Type I matrix remodeling in a stimulated cellular environment, *Journal of Structural Biology* 180 (2012) 17–25 [PMID: 22609365] {\*Corresponding author}.

## D. Research Support

### Current Support

Canadian Lung Association (Canada) Abraham (PI) 10/1/2011-12/31/2013  
 Detection of the earliest lung lesions in COPD in three dimensional space using high resolution multiphoton and harmonic generation imaging.  
 The primary objective of this proposal is to visualize and quantify the earliest stages of the remodeling of collagen and elastic fibers within the lung matrix during emphysematous destruction in their native states.  
 Role: Principal Investigator

National Sanitarium Association (Canada) Dorscheid (PI) 1/1/2011-12/31/2015  
 Bio-airway Research Offering New Concepts in Health (BRONCH) Partnership – Building  
 The primary objective is to develop fully functional 3-D human “Bio-airways” containing differentiated human airway epithelial, fibroblast and smooth muscle cells for discovery research and drug testing.  
 Role: Co-Investigator