

## BIOGRAPHICAL SKETCH

NAME <b>Gunjan Agarwal, PhD</b>	POSITION TITLE Associate Professor		
eRA COMMONS USER NAME Agarwal1			
EDUCATION/TRAINING			
INSTITUTION AND LOCATION	DEGREE	YEAR(s)	FIELD OF STUDY
University of Allahabad, India	B.S.	1991	Physics, Maths, Computer Science
Indian Institute of Technology, Delhi, India	M.S.	1993	Physics
Tata Institute of Fundamental Research, Bombay, India	Ph.D.	1993-1997	Biophysics
Albert Einstein College of Medicine, Bronx, NY	Post-doc	1997-2000	Biophysics
Procter and Gamble Pharmaceuticals, Mason, OH	Post-doc	2000-2001	Biophysics

### A. Personal Statement

I have a broad background in biophysics, with extensive training and expertise in use of microscopic techniques (light microscopy, atomic force (AFM) and electron microscopy (EM)) for biomedical applications. I have established and directed the multi-user AFM core facility at the Ohio State University (OSU) for over 8 years. We have performed ultra-structural microscopic analysis on a variety of nanoparticles, single molecules, cells and tissue samples using AFM and EM approaches. In addition I have acquired hands-on training in cell and molecular biology and small animal studies via my past NIH K25 award. I have an active IRB and IACUC protocol to study extracellular matrix structure and function. During my recently concluded sabbatical, I acquired hands-on skills in protein purification and my laboratory now routinely purifies proteins from human serum and from mammalian cell cultures.

Another major research focus in my laboratory is to understand mineral (calcium and iron) deposition in pathological tissue. Ultra-structural analytical microscopy is ideally suited towards this goal. In particular we have demonstrated how the AFM based approach, magnetic force microscopy (MFM) can be used to characterize iron oxide nanoparticles and ferritin proteins at the single particle level.

### B. Positions and Honors

#### Positions and Employment

2001-2003     Research Scientist, Biotechnology Group, Air Force Research Lab, Wright Patterson Air Force Base, WPAFB, OH

2003-2009     Assistant Professor, Biomedical Engineering (BME) and Internal Medicine (Cardiology), The Ohio State University (OSU), Columbus, OH

2004-2012     Director, Atomic Force Microscopy Core Facility at the College of Medicine, OSU

2009-present   Associate Professor, BME and Internal Medicine, OSU

2014             Faculty Professional Leave (FPL), Andrew Herr's laboratory, University of Cincinnati College of Medicine, Cincinnati, OH.

#### Other Experience and Professional Memberships

2007-2012     panelist for NDSEG Fellowship program

2007-2014     reviewer for the Lytmos Group

2007-2013     member of Publications Committee of the Biophysical Society

2008-2014     member of the American Heart Association study sections

2009-2014     panelist for NSF Graduate Research Fellowship program (alternate years)

2010             ad-hoc member of NIH IMST 16: Cell Biology & Molecular Imaging study section

2011-2014     external reviewer for West Virginia Nanotechnology Initiative (NSF-R11 award)

2011-2015     panelist for the NSF CMMI BMMB program  
 2012-present editorial board member, Journal of Nanoparticles, Hindawi Publishing Corporation  
 2015-present editorial board member, Int J. of Nanomedicine and Nanosurgery, Sciforschen  
 2015             external reviewer for West Virginia IGERT  
 2015             ad-hoc member of NIH ZRG1 CB-G (55) study section

### C. Peer-reviewed publications

#### Selected Peer-reviewed Publications (from over 35)

1. "Distinguishing Ferritin from Apoferritin with Magnetic Force Microscopy," Nocera, T.M., Zeng, Y. and **Agarwal, G.\*** *Nanotechnology*, 2014, Nov 21;25(46):461001.
2. "Magnetic anisotropy considerations in magnetic force microscopy studies of single super-paramagnetic nanoparticles", Nocera TM, Chen J, Murray CB and **Agarwal G\***, *Nanotechnology* 2012, **23(29)** 495704.
3. "Magnetic Force Microscopy of Superparamagnetic Nanoparticles" Mayur Savla, Sharon Schreiber, Camelia Selcu, Denis Pelekhov, P. Chris Hammel and **Gunjan Agarwal\*** *Small*, 2008, Feb;4(2):270-8.
4. "Magnetic force microscopy of an oxygen-sensing probe" M. Savla, R. Pandian, P. Kuppusamy and **G. Agarwal\*** invited article for special edition of *Israel J. of Chemistry* (2008) 48 (1) 33-38. (Figure published on cover page)
5. "Biomimetic Synthesis And Patterning Of Silver Nanoparticles", Naik, R. R., Stringer, S. J., **Agarwal, G.**, Jones, S. E. & Stone, M. O. *Nature Materials* (2002) **1**, Nov 01, 169-172.
6. "Sickle Hemoglobin Fibers: Mechanisms of Depolymerization", **Gunjan Agarwal**, Jiang Cheng Wang, Suzanne Kwong, Scott Cohen, Frank A. Ferrone and Robin W. Briehl, *J. Mol. Biol.* (2002) **322(2)**, 395-412.
7. "Binding of Discoidin Domain Receptor 2 to Collagen I: an AFM investigation", **Gunjan Agarwal\***, Lubomir Kovac, Czeslaw Radzizewski and Steve J. Samuelsson, *Biochemistry* (2002) **41(37)** 11091-11098.
8. "Dip Pen Nanolithography in Tapping Mode", **Gunjan Agarwal**, Laura A. Sowards, Rajesh R. Naik and Morley O. Stone, *J. Am. Chem. Soc.* (2003) 125(2); 580-583
9. "Immobilization of Histidine Tagged Proteins On Nickel By Electrochemical Dip Pen Nanolithography", **Gunjan Agarwal**, Rajesh R. Naik and Morley O. Stone, *J. Am. Chem. Soc.* (2003) Jun 18;125(24):7408-12
10. "Bio-inspired approaches and biologically derived materials for coatings" Rajesh R. Naik, Lawrence L. Brott, Francisco Rodriguez, **Gunjan Agarwal**, Sean M. Kirkpatrick and Morley O. Stone *Prog. in Org. Coat.* 47(3-4), September 2003, Pages 249-255
11. "Ceramic Nanoparticle Assemblies with Tailored Shapes and Tailored Chemistries via Biosculpting and Shape-preserving Inorganic Conversion" B. Dickerson, R. R. Naik, P. M. Sarosi, **G. Agarwal**, M. O. Stone, and K. H. Sandhage *J. Nanoscience and Nanotechnology* (2005) Volume: 5 Number: 1 Page: 63 – 67
12. "Regulation of Collagen Fibrillogenesis by Kinase-Dead DDR2", Blissett AR, Garbellini D, Calomeni E, Mihai C, Elton TS and **Agarwal G.** *J. Mol. Biol.* 2009, Jan 23; 385(3): 902-911. PMID: PMC2677101
13. "Inhibition of Collagen Fibrillogenesis by Cells Expressing Soluble Extracellular Domains of DDR1 and DDR2", Flynn LA, Blissett AR, Calomeni E and **Agarwal G.** *J. Mol. Biol.* (2010) 395(3):533-43. PMID: PMC2813395
14. "Lifting and Sorting of Charged Au Nanoparticles by Electrostatic Forces in Atomic Force Microscopy", Xu J, Kwak KJ, Lee JL and **Agarwal G.** *Small* 2010, Oct 4;6(19):2105-8.
15. "Oligomerization of DDR1 ECD affects receptor-ligand binding", D. Yeung, D. Chmielewski, C. Mihai and **G. Agarwal\***, *J. Struct. Biol.* 2013, September 4, 183, 495-500. PMID: PMC3785576

#### Invited Book chapters

- "Introduction to Biological Light Microscopy" (Gunjan Agarwal) for the book, Microscopic Image Analysis for Life Science Applications, editors: Jens Rittscher, Stephen T.C. Wong, and Raghu Machiraju, Copyright 2008, Available August 2008.
- "Characterization of Magnetic Nanomaterials using Magnetic Force Microscopy" (Gunjan Agarwal) for the 4<sup>th</sup> volume entitled "Magnetic Nanomaterials for Life Sciences" belonging to Wiley-VCH's ten volume series on "Nanomaterials for the Life Sciences", Copyright 2009, Available August 2009.
- "Atomic Force Microscopy" (Gunjan Agarwal and Tanya Nocera) for the Nanobiotechnology Handbook published by CRC Press/Taylor & Francis Group. Copyright 2012, Available Nov 2012.

## **D. Research Support**

### **Ongoing Research Support**

NSF CBET 1403574 Agarwal (PI)

07/15/2014 to 06/30/2017

National Science Foundation

Indirect MFM for sensing magnetic nanoparticles

The overall goal of this project is to develop a novel indirect magnetic force microscopy technique to detect purified ferritin in dry and wet conditions at the single particle level.

Role: PI

14PRE 20120012 Tonniges (PI)

07/01/14-06/30/16

American Heart Association/predoctoral fellowship

"Regulation of collagen structure and function in the vessel wall by Ddr1"

The overall goal of this project is to assess how ultrastructural changes in collagen fibers in the murine aorta in DDR1 KO mice impact platelet-collagen adhesion.

Role: mentor/sponsor

NSF CMMI 1201111 Agarwal (PI)

05/01/2012-04/30/2015 (NCE till 04/30/2016)

National Science Foundation

Regulation of micro and macro mechanics of the ECM by DDR1

The overall goal of this project is to understand how structural changes in the collagen fiber impact the mechanical properties of the underlying matrix at the macro and micro scale.

Role: PI [co-PIs: Peter Anderson, Greg Lafyatis, Heather Powell]

### **Completed Research Support**

BIPI Agarwal (PI)

(01/01/2011 to 03/31/2012)

Boehringer Ingelheim Pharmaceuticals Inc.

"DDR1 as a target-pilot study",

The overall goal of this project is to test how DDR1 and DDR2 inhibitors designed by BIPI inhibit the binding and phosphorylation of DDRs.

Role: PI

10PRE4170111 Blissett (PI)

07/01/10-06/30/12

American Heart Association/pre-doctoral fellowship

Collagen type1 endocytosis by DDR1

The goal of this predoctoral fellowship is to evaluate the role of DDR1 in collagen endocytosis and to elucidate the endocytic pathway followed by DDR1.

Role: mentor/sponsor

S10RR021199 Agarwal (PI)

06/01/2006-05/31/2008

Nat Center for Research Resources

Atomic Force Microscope

A state-of-the-art atomic force microscope (AFM) instrument to accomplish both high-resolution nanoscale imaging and a simultaneous light-microscopy examination of cell samples and tissue sections.

Role: PI

K25 HL081442 Agarwal (PI)

07/01/05-06/30/10 (no cost extension till 8/31/2011)

National Institutes of Health

Myocardial Matrix Remodeling by DDRs

The long term goals of this project are to characterize the role of full-length and kinase-dead discoidin domain receptors in binding to collagen.

Role: PI

0535370N Agarwal (PI)

07/01/05-06/30/09 (no cost extn. till 06/30/10)

American Heart Association/ National Scientist Development Grant

Regulation of Myocardial Fibrosis by Discoidin Domain Receptors

The long term goals of this project are to characterize how discoidin domain receptors modulate collagen fibrillogenesis and ultimately fibrosis.

Role: PI

“NSEC Proposal for a Center for Affordable Nanoengineering of Polymer Biomedical Devices”

National Science Foundation

(10/01/2005 to 12/31/2010)

(PI: James L. Lee)

Role: participating faculty