# "Ram" M. K. Ramasubramanian

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## PROFILE

- Proven leadership skills in managing a large scale, complex, and multiple-stakeholder funding program at the National Science Foundation, with an annual budget of $62M.
- Comprehensive understanding of the National Science Foundation's structure, programs, policies, and procedures. Proficient with solicitation development, panel management, cross-directorate coordination, fiscal management, and post-award management.
- Have a good understanding of research trends in all areas of science and engineering, including social and behavioral science, economics, and mathematics.
- Experienced in all aspects of entrepreneurship including invention, patents, presentations to venture capitalists, licensing of technology, and patent litigation, with proven aptitude for working with Industry, while in an academic setting.
- Proven record of establishing research partnerships with other colleges within the university, with other universities, and industry.
- Familiar with NIH, DOE, EPA, DARPA, ARO, ONR, and other Federal agencies through personal contacts and submission of large multi-disciplinary proposals.
- Accomplished interdisciplinary researcher, educator, administrator, and innovator with strong entrepreneurial and management skills. Fellow ASME, Senior Member IEEE, Fellow TAPPI.

## PROFESSIONAL EXPERIENCE

### PROGRAM DIRECTOR, NATIONAL SCIENCE FOUNDATION, ARLINGTON, VA (2009-PRESENT)

- As the lead Program Director for IGERT-Integrative Graduate Education and Research Traineeship, responsible for meeting overall program goals with an annual budget of $62M in FY 2010 and in 2011.
- Managed the review process for 400+ pre-proposals, and 100+ full proposals, selected and funded twenty awards in 2010 and eighteen awards in 2011. Currently managing the 2012 proposals.
- Developed and implemented an innovation thrust for IGERT, thereby aligning the program goals with the Whitehouse Innovation Strategy, and published the new solicitation for FY2012 with this major shift in direction.
- Developed and implemented budget and funding strategy for IGERT.
- Co-chair, IGERT Coordinating Committee responsible for IGERT program management, policy recommendations, and cross-directorate dissemination of program information.

- Co-manager for the MIT-STC award of 2010. Participated in pre-award site visit as part of NSF site visit team, wrote review analysis with recommendation for the STC award, a critical document for funding decision by the NSF and the National Science Board. Currently, part of the oversight team for the MIT 2010 STC.
- Mentored Junior Faculty from universities (U of Illinois, NC State U, Johns Hopkins U, and University of Nebraska) to understand funding process at the NSF through coordinating an all-day conference with several program directors and NSF senior staff at the NSF.
- Hosted the IGERT Annual PI Meeting in Washington DC with 340 attendees in May 2010. Responsible for planning, managing contractors, program agenda, chairing and conducting several conference sessions.
- Responsible for oversight of IGERT program and program evaluation studies. Conducted IGERT site visits to several institutions including University of Florida, Washington, Alaska, Arizona State U, RPI, and Columbia U as part of program oversight and to facilitate institutional support through discussions with senior administrators.
- Developed briefs on IGERT on short notice from Congressional Staff.
- Developed an innovative online doctoral student research poster competition for IGERT trainees in 2011. The competition was judged online by faculty judges from across the nation and the finalists were invited to the NSF (May 25, 2011) where ten finalists were selected by NSF. A travel award was made to the finalists for further professional development. The poster session was viewed by audience in several countries.
- Invited member of the "roadmap committee" an advisory role to the Assistant Director of EHR to develop a strategic plan, vision, mission, and organization structure for EHR that aligns with the new NSF strategic plan.
- Prepared and successfully managed the Committee of Visitors review of the IGERT program in June 2011. The meeting evaluated the program in detail and produced a report and a set of recommendations.

## PROFESSOR, MECHANICAL AND AEROSPACE ENGINEERING, NORTH CAROLINA STATE UNIVERSITY, RALEIGH, NC (2009-PRESENT)

Professor (2009-Present), Associate Professor (1999-2009), Assistant Professor (1994-1999), Associate Faculty-Biomedical Engineering (2007-present), Director, Mechatronics Program (2000-Present). Started academic career after seven years in an industrial R&D setting.

## RESEARCH ACCOMPLISHMENTS

- Strong interdisciplinary research focus in the areas of bio-mechatronics, biomimetics, and bio-manufacturing, involving biology, medicine, microfluidics, mechanics, sensing, computing, and control.
- Research projects cover a wide area of science including the mechanics of a mosquito bite for micro needle design, intraocular pressure sensor, blood agglutination sensor, microfluidic device for the mass encapsulations of islets, and traditional automation and manufacturing problems.
- Graduated 33 MS and 6 PhD and currently advising 4 PhD students Received research funding from government, industry, and private foundations, totaling over $2.5M.

Significant number of industrial funding sources, in addition to government sources including NSF, DOE.

- Developed and submitted major multi-PI proposals to major research funding agencies such as NSF, NIH, DARPA, DOE, USDA, and EPA and understand the funding structure and culture of several federal agencies.
- 60+ total publications in journals, conferences, book chapters, and magazines.
- Received two biomanufacturing-related patents (US and International) and have successfully negotiated (through NC State U Tech Transfer Office) with a licensee for the technology to commercialize a revolutionary xenotransplantation technology for the cure for diabetes. A third patent has been filed for a microfluidic device to assist with cell encapsulation.
- Established multi-institutional research collaborations with Duke University Medical Center, Wake Forest Institute for Regenerative Medicine, University of Wisconsin, and industrial partners, with several multi-investigator proposals submitted to NSF, NIH, and DARPA.

## EDUCATIONAL ACCOMPLISHMENTS

- Established an interdisciplinary graduate program, first of its kind in the US, in the area of Mechatronics in 2000 and currently directing the program at NC State. Duties include managing the program, curriculum revision, and advising students in the program and supervising some thesis projects.
- Possesses a strong teaching record in teaching courses on a wide array of topics in mechanical engineering at all levels with excellent teaching evaluations. Topics include solid mechanics, fluid mechanics, design courses, and mechatronics, instrumentation, MEMS, and Automotive Engineering.
- Developed innovative methods to offer "hands on" courses online and currently offering such a course for the fourteenth year.
- Mentored several student design competition teams (ASME, SAE, Eco Car, and Mini-Baja).

## UNIVERSITY APPOINTMENTS

- Chair, College of Engineering Research Committee (2006-2009) – an advisory committee reporting to the Associate Dean for Research.
- Responsibilities include developing and implementing ways to foster multidisciplinary research collaborations, oversight role for CILs (Centers, Institutes, and Laboratories) within the college, selecting proposals for limited submissions, and disbursing seed money for new ideas through an internal competition for junior faculty.
- Communicated research policy matters to departments through their representatives in the committee.
- Served on several faculty search committees, departmental curriculum development committees, faculty grievance committee (dealt with a serious case), graduate committees, and laboratory committees.

## HONORS AND RECOGNITION

- Elected to Fellow, ASME 2010. Senior Member, IEEE. Fellow, TAPPI.
- Fulbright Research Fellowship, Norway, 2009 (Deferred due to accepting a position with the National Science Foundation as Program Director)
- Invites Speaker, U.S. Naval Academy, Annapolis, MD, "Innovation, STEM, and the Future-The Role of Graduate Education in addressing Grand Challenges", November 9, 2011.
- Invited Speaker, John Perkins Policy Session, American Association of Medical Colleges, 2011 Graduate Research, Education, and Training Annual Meeting, Hilton Head, SC, October 13-15, 2011.
- Invited Participant, Clean Energy Education, Energy-literate citizenry for the 21st century, University of Illinois at Urbana-Champaign, IL, October 13, 2011.
- Inaugural Speaker, Energy and Sustainability Conference 2011, University of Delaware, Newark, DE. September 15, 2011.
- Invited Participant, National Academy of Engineering Workshop on Lifelong Learning- A summit of thought leaders from industry, university, professional societies, and federal agencies to discuss the policy framework, Washington D.C., September 12, 2011.
- Invited Speaker and Panelist, Symposium on Biomedical Engineering Education, IEEE-EMBS Conference 2011, Boston, MA, August 31, 2011.
- Invited Speaker, Enhancing Communications in Cross-Disciplinary Research Conference, Coeur d'Alene, ID, October 3, 2010.
- Invited Speaker and Panel Moderator at the Neuroengineering Grand Challenges Conference, IEEE, EMBS, Bethesda, MD, May 8, 2010.
- Invited Speaker at the NSF Nanotechnology Conference, Arlington, VA 2009 and 2010.
- Plenary Speaker, Int. Conference on Resource Utilization and Intelligent Systems, Erode, India, 2008
- Plenary Speaker, Int. Conference on Advances in Mechanical Engineering, Chennai, India, 2006
- Member, Phi Kappa Phi Honor Society, 1982, Member, Sigma Xi, 1986
- Member, TAPPI Paper Physics Committee, 1987-present

## COMMUNITY OUTREACH

- Journal paper on mosquito bite mechanics published, September 2008. A new article appeared in Science News, a magazine in Washington DC, with external expert review of the work, September 2008.
- Research work was featured in North Carolina Now, UNC TV production, regarding the NSF Sponsored work on Mosquitoes and Painless Needle Development, 2006.
- Articles about the research appeared in News and Observer, 2005, NC State Alumni Research Bulletin, NC State Webpage, and in Lokvani Magazine, Boston Massachusetts, 2005-2006.

- Article on the research, "This bite won't hurt a bit", published in Science News Magazine, Vol. 174. No. 8, October 11, 2008, pp 11.

## PROFESSIONAL SOCIETIES

- **Fellow**, American Society of Mechanical Engineers (ASME), 1988-present, (elected to Fellow, 2010)
- Institution of Electrical and Electronic Engineers (IEEE), 2004-present, elected to Senior Member, 2010
- Engineering in Medicine and Biology Society (EMBS), 2004-present
- Technical Association of Pulp and Paper Industry (TAPPI), 1983-present, elected to Fellow, 2011.

## PROFESSIONAL SERVICE

## INTERNATIONAL CONFERENCES (from 2005)

- Session Chair, Tissue Forum, PaperCon 2011, Tappi International Conference, Covington, KY, May 1-4, 2011.
- Chairman, Symposium Special Session on "Computational Solid Mechanics in the Manufacture and Behavior of Paper", Papermaking Research Symposium-PRS2009, Kuopio, Finland, June 1-4, 2009. www.uku.fi/prs2009
- Member of the International Scientific Committee, PRS 2009, Kuopio, Finland, June 1-4, 2009
- Member, Advisory Committee, Second International Conference on Resource Utilization and Intelligent Systems, 2008, Kongu Engineering College, Perundurai, Tamilnadu, India
- Member, Advisory Committee, ICAME 2006 - International Conference on Advances in Mechanical Engineering 14-16 December 2006, Chennai, India
- Track Chair, Medical Robotics, IEEE EMBS Conference, 2005, Shanghai, China, September 1-5, 2005 (did not attend due to schedule conflict).

## REVIEWER ACTIVITIES (from 2005)

- IOP Journal of Micromechanics and Microfluidics, 2010
- Computational Material Science, 2009
- Microfluidics and Nanofluidics, 2009, 2010
- Micromechanics and Microengineering, 2009
- Mechanics of Materials, 2006
- IEEE Sensors Journal, 2006, 2007
- International Journal of Solids and Structures, 2000, 2003, 2007
- IEEE Sensors Journal 2008
- Journal of Engineering Fracture Mechanics, 200, 2006
- International Journal of Robotics and Automation, 2003

## CONSULTANT SERVICES

- Expert witness in patent litigations

- Consultant to various corporations including Caterpillar, Procter & Gamble, Kimberley Clark, Buehler Motor, and several others.

## INDUSTRIAL EXPERIENCE

- RESEARCH ASSOCIATE, GEORGIA-PACIFIC, MILFORD, OH, (1987-1994)
- Received three patents for novel manufacturing and product concepts which were implemented commercially.
- Developed and implemented a fully automated polymer extrusion process for manufacturing thin polymeric films.
- Developed a world reputation as an expert in the creping manufacturing process through advancement of the science of the process.
- Developed project management skills, and became a facilitator and instructor within the company for large and complex project management techniques

## EDUCATION

- Syracuse University, Syracuse, NY, Ph.D. in Mechanical Engineering, 1987
- Miami University, Oxford, OH, M.S. in Applied Sciences, 1983
- National Institute of technology, Durgapur, India, B.S. Mechanical Engineering, 1981

## URL:

**http://www.mae.ncsu.edu/faculty-staff/profile/ram-ramasubramanian/**

## POSITIONS HELD

- Program Director, IGERT Program, National Science Foundation, IGERT Program, Division of Graduate Education, Arlington, VA 22230, 2009-present
- Professor, Mechanical and Aerospace Engineering, NC State University, Raleigh, NC, 2009-present
- Director, Mechatronics Program, Mechanical and Aerospace Engineering, NC State University, Raleigh NC, 2001-present
- Associate Professor, Mechanical and Aerospace Engineering, NC State University, Raleigh, NC, 2000-'09
- Associate Professor, Wood and Paper Science, NC State University, Raleigh, NC, 1998-2000
- Assistant Professor, Mechanical and Aerospace Engineering, NC State University, Raleigh, NC, 1994-'98
- Research Associate, James River Corporation (now Georgia-Pacific), Research & Development, Milford, OH, 1987-'94
- Research Associate, Mechanical and Aerospace Engineering, Syracuse University, Syracuse, NY, 1985-'87
- Research Assistant, Mechanical and Aerospace Engineering, Syracuse University, Syracuse, NY, 1983-'85
- Research Assistant, Paper Science and Engineering, Miami University, Oxford, OH, 1981-'83

## PUBLICATIONS

**Journals** *(My advisees' names are underlined and boldfaced)*

1) "A Three-dimensional microfluidic approach to scaling up microencapsulation of cells", **Sameer Tendulkar**, Emmanuel Opara, M. K. Ramasubramanian et al. (in press, Biomedical Microdevices), **2012**.
2) "A scalable microfluidic device for the mass production of microencapsulated islets", **Sameer Tendulkar**, Emmanuel Opara, M. K. Ramasubramanian, et al. Transplantation Proceedings, Barry Kahan, Editor-in-Chief, Elsevier, **2011**.
3) "A Simplified Mechanics Model for the Creping Process in Low-Density Paper Manufacturing", M. K. Ramasubramanian, **Z. Sun**, and **G. Chen** ASME J. Manufacturing Sci. Eng., Vol. 133, October, **2011**.
4) "Sensor systems for high speed intelligent sorting of waste paper in recycling-Part I Sensors for waste paper characteristics measurement", M. K. Ramasubramanian1, R. A. Venditti, **P. K. Gillella**, Tappi Journal, in review, **2011.**
5) "Sensor systems for high speed intelligent sorting of waste paper in recycling-Part II Sensors fusion algorithms for paper type identification", M. K. Ramasubramanian, R. A. Venditti, **P. K. Gillella**, Tappi Journal, in review, **2011.**
6) "A Computational Fluid Dynamics Modeling and Experimental Study of the Mixing Process for the Dispersion of Synthetic Fibers in Wet-Lay Forming", M. K. Ramasubramanian, Donald Shiffler, **Amit Jayachandran** , Tappi Journal, March 2010, pp 3-13, **2010.**
7) "A capacitive displacement sensing technique for early detection of unbalanced loads in a washing machine", Melur K Ramasubramanian, **Karthik Tiruthani**, *Sensors* **2009**, *9*(12), 9559-9571; doi:**10.3390/s91209559 2009)**
8) "An Integrated Fiberoptic-Microfluidic Device for Agglutination Detection and Blood Typing" M. K. Ramasubramanian and **Stewart P. Alexander** (Biomedical Microdevices, Vol. 11, Issue 1, pp 217-229, **Feb 2009**.
9) "Mechanics of a Mosquito Bite with Applications to Microneedle Design", **O. M. Barham, V. Swaminathan,** M. K. Ramasubramanian (IOP Journal on Biomimetics and Bioinspiration, Vol. 3, Issue 4, Article Number: 046001, **Dec 2008.**

10) "Visible/Near-Infrared Spectrophotometric Blood Typing Sensor for Automated Near-Patient Testing", M. K. Ramasubramanian, **S. Anthony** and **J. Lambert** (Applied Optics, Vol. 47 Issue 22, pp.4094-4105 (2008)).
11) "Intraocular Pressure Monitoring Sensors", **Kalyan Katuri,** Sanjay Asrani, M. K. Ramasubramanian, IEEE Sensors Journal, Volume: 8, Issue: 1-2 Pages: 12-19, **2008.**
12) "A Computational Fluid Dynamics Modeling and Experimental Study of the Mixing Process for the Dispersion of Synthetic Fibers in Wet-Lay Forming", M. K. Ramasubramanian, Donald Shiffler, **Amit Jayachandran** , Journal of Engineered Fibers and Fabrics, Vol.3 Issue 1. pp 11-20, January **2008.**
13) "Behavior of Paper on a High-Speed Conveyor Subjected to Air Jet Impingement-A Method for Bending Stiffness Estimation", M.K Ramasubramanian, Richard Venditti, and **Kalyan C.Katuri,** Mechanics of Materials and Structures, Vol. 2, Issue. 2, pp 201-219, **2007.**
14) "A Non-Contact Sensor for the Identification of Paper and Board Samples on a High-Speed Sorting Conveyor", M. K. Ramasubramanian, Richard A. Venditti and **Kalyan C. Katuri** , Appita Journal, Volume: 60 Issue: 5, pp: 366-377, Sep **2007.**
15) "A Computational Micromechanics Constitutive Model for the Unloading Behavior of Paper" M. K. Ramasubramanian and **Y. Wang**, International Journal of Solids and Structures, Volume 44, Issues 22-23, pp 7615-7632, November **2007**.
16) "Focused High Frequency Ultrasonic Removal of Xerographic Toner from Paper Surfaces" Ramasubramanian, M. K., Madanshetty, S.,, and **Pornsitt, S**, Appita Journal, Vol. 59, No. 4, pp 306-316, **July 2006.**
17) **"**Adhesion interactions between poly(vinyl alcohol) and Iron Oxide Surfaces: The effect of Acetylation", **Uner, B**, Ramasubramanian, M. K., Zauscher, S., and Kadla, J. F. Journal of Applied Polymer Science, Vol. 99, Issue 6, pp: 3528-3534, March **2006.**
18) "Optical Sensor for Noncontact Measurement of Lignin Content in High-Speed Moving Paper Surfaces", Ramasubramanian, M.K, Venditti, R.A. **Ammineni, C. and Mallapragada**, V., IEEE Sensors Journal, Vol. 5, Issue 5, Page(s): 1132- 1139, October **2005.**
19) Ramasubramanian, M.K.; **Jackson, S.D.** "A Sensor for Measurement of Friction Coefficient on Moving Flexible Surfaces", IEEE Sensors Journal, Vol. 5, Issue 5, Page(s): 844- 849, October **2005.**
20) "A Computational Mechanics Model for the Brim Forming Process in Paperboard Container Manufacturing", with **K. Muthuraman** (ASME J. of Manufacturing Sci. & Eng.), Vol. 125, pp 476-483, Aug **2003.**
21) "Evolution of Mechatronics into a Graduate Degree Program in the United States-The NC State University Master of Science Program with Mechatronics Concentration" M. K. Ramasubramanian, M. N. Noori, G. K. F. Lee, Int. J. Eng. Education 19 (4): 519-524 **2003.**
22) "Mechatronic Design and performance of a laboratory creping device", M. K. Ramasubramanian and **D. L. Shmagin.** J. Manufacturing Sci. & Eng. ASME Transactions, Aug. 2000, 122(3) 576-581, **2000.**
23) "The Transverse Compression of Poly (para-Phenyleneterephthalamide) Fibers 2: Fiber Transverse Structure", M. K. Ramasubramanian, **J. N. Singletary** et al., Journal of Materials Science, 35(3): 583-592, February **2000.**
24) "The Transverse Compression of Poly (para-Phenyleneterephthalamide) Fibers 1: Single Fiber Transverse Compression Testing", M. K. Ramasubramanian, **J. N. Singletary** et. al., Journal of Materials Science, 35(3): 573-581, February **2000.**
25) "Microstructure organization in para-aramid fibers", M. K. Ramasubramanian, **J. Singletary**, H. Davis, J. Srinivasarao, W. Knoff, Textile Research J, 2000 Nov., 70(11)945-950, **2000**

26) "Shear Strength of an Adhesively Bonded Paper-Metal Interface", M. K. Ramasubramanian and W**. R. Crews**. Journal of Pulp and Paper Science (JPPS, Canada), Vol. 24 No. 1, Pp. 31-36, **1998.**
27) "Software Implementation of a Design for Life-Cycle Analysis Scheme", M. K. Ramasubramanian and **P. Targos**, International Journal of Environmentally Conscious Design and Manufacturing, Vol. 6, No. 1, 1997.
28) "An experimental investigation of brim forming in paperboard containers", M. K. Ramasubramanian and **M. D. Swecker.** J PULP PAP SCI 27 (4): 113-117 APR 2001.
29) Computer Simulation of the Uniaxial Elastic-Plastic Behavior of Paper", M. K. Ramasubramanian & R. W. Perkins, ASME Journal of Engineering Materials and Technology, Volume 110, PP 117-123, April **1988**.
30) "Mechanique des Solids. Measure des Coefficients de Contraction laterale et leur calcul a l' aide d'une Simulation numerique pour un papier fabrique sur machine", Note de B. Castagnede, M. K. Ramasubramanian, and R.W. Perkins. (Journal) C. R. Acad. Sci.Paris, 306 Serie II, pp 105-108, **1988**.

**Magazine (Technical)**

31) "Factory Automation: Intelligent Systems in all walks of life" R. H. Bishop and M. K. Ramasubramanian, In Tech, A Magazine of the Instrumentation Society of America, April 2008, pp30-34, **2008.**

**Books (Chapters)**

32) "Biomimetic mosquito-like microneedles" – Contributed Chapter, Encyclopedia of Nantechnology, Bharat Bhushan, editor, Springer Publ., Handbook, accepted **2011**.
33) "Logic System Design", M. K. Ramasubramanian, Chapter 23, Control, Logic, and Data Acquisition, The Mechatronics Handbook, Second Edition, Vol. 2, Taylor Francis Group LLC, R. Bishop, ed., **2008.**
34) Overview of Mechatronics: "What is Mechatronics?", Chapter 1 in Mechatronics Systems Sensors and Actuators-Fundamentals of Modeling, The Mechatronics Handbook, Second Edition, Vol. 1, Taylor Francis Group LLC, R. Bishop, ed., **2008.**
35) "Logic System Design" M. K. Ramasubramanian, CRC Handbook on Mechatronics, R. Bishop, Ed., Chapter 40, pp40-1-20, **2002.**
36) "What is Mechatronics?, with Robert Bishop, CRC Handbook on Mechatronics, R. Bishop, Ed., Chapter 1, pp 1-10, **2002.**
37) "Mechanical Properties and Testing of Towel and Tissue Papers", M. K. Ramasubramanian, Chapter in the Handbook of Physical Testing of Paper", Volume I, Second Ed., Marcel Dekker, New York. (Peer reviewed), published 2001, ISBN: 0-8247-0498-3, **2001.**

**Patents**

38) "High-Bulk Paper Web" European Patent 97202758.4, 11/09/**1990**
39) "Method for Producing a High Bulk Paper Web and Product Obtained Thereby ", M. K. Ramasubramanian & C. A. Lee, U.S. Patent No. 5,098,519, Mar. 24, **1992**
40) "Forming Fabric for use in Producing High Bulk Paper Web ", M. K. Ramasubramanian & C. A. Lee, U. S. Patent No 5,211,815, May 18, **1993**
41) "Process for the Microencapsulation of cells" International Patent WO 2005/071060 A2, August 4, **2005.**
42) "Methods and Devices for Microencapsulation of Cells", U.S. Patent, 748,2152, **2009**
43) "Microfluidic device for microencapsulation of cells" US Patent Application Filed, **2011**

**Conference Proceedings, Special Volumes**

44) **"**A scalable microfluidic device for the mass production of microencapsulated islets", Sameer Tendulkar, M. K. Ramasubramanian, Emmanuel Opara, et al., Transplant Proceedings, International Pancreas and Islet Transplant Association, IPITA 2011 Conference special volume, Prague, CZ, June 1-4 **2011.**
45) "Modeling and Simulation of the Creping Process", G. Chen and M. K. Ramasubramanian, Tissue Forum, TAPPI Paper Con 2011, Covington, KY, May 1-4**, 2011**.
46) "A Mechatronic system for the sorting of mixed paper materials for efficient Resource Utilization", Plenary Lecture at the Second International Conference on Resource Utilization and Intelligent Systems, Kongu Engineering College, Erode, India, January 3-5, **2008**
47) "A Computational Fluid Dynamics Modeling and Experimental Study of the Mixing Process for the Dispersion of Synthetic Fibers in Wet-Lay Forming", M. K. Ramasubramanian and Donald Shiffler, a peer-reviewed full length paper presented at the International Paper Physics Conference, Gold Coast, Australia, May 8, **2007**
48) . "Microelectromechanical Systems (MEMS) - Review, Trends, and Applications" Plenary Lecture at the ICAME 2006 - International Conference on Advances in Mechanical Engineering, Chennai, India, 14-16 December **2006**
49) "Development of a Bending Stiffness Sensor for Automated Sorting of Recovered Paper", Richard A. Venditti, Jr., M. K. Ramasubramanian and Kalyan C. Katuri, TAPPI 2005 Engineering, Pulping & Environmental Conference Proceedings 28-31 August 2005, Philadelphia, PA, **2005**
50) "Visible/Near-Infrared Spectrophotometric Blood Typing Sensor for Automated Near-Patient Testing" Steve Anthony, M. K. Ramasubramanian, 27th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBS), Shanghai, China, September 1-4, **2005**
51) "Models of Diversity and Nonlinearity in Neurotransmitter Kinetics", AH Assadi, TH Lee, MK Ramasubramanian, GA Michelotti, RH Blick. Submitted to the Society of Neuroscience, 35th Annual Meeting, Washington DC. November 12-16, **2005**
52) "A real-time blood cross-matching sensor for intelligent management of transfusion safety", M. K. Ramasubramanian and Steve Anthony, to be presented at the IEEE-Engineering in Medicine and Biology Society Conference, San Francisco, CA, September 1-4, **2004**
53) "A Compact, High Speed Lignin Sensor for the Automated Sorting of Newsprint from Mixed Waste", M. K. Ramasubramanian, Richard Venditti, Vishnu Mallapragada, Tappi Spring Technical Conference, Atlanta, GA, May 3-5, **2004**
54) "A Friction Sensor for Real-Time Measurement of Friction Coefficient on Moving Flexible Surfaces" , M. K. Ramasubramanian and Steve Jackson, Sensors 2003, Second IEEE International Conference on Sensors, October 22-24, **2003**, Toronto, Canada.
55) "Mechatronic Design and Control of a Waste Paper Sorting System for Efficient Recycling", M. K. Ramasubramanian, Richard Venditti, Manukaran Karunakaran, Tappi Fall Technical Conference, Chicago, IL, Oct 27-29, **2003**
56) "Determination of adhesion forces between adhesives and metal/paper surfaces using atomic force microscopy**.** ", Uner B, Kadla JF, Ramasubramanian MK, Zauscher, S,. **ABSTRACTS** OF PAPERS OF THE AMERICAN CHEMICAL SOCIETY 223: 071-CELL Part 1 APR 7 **2002**
57) "Interfacial phenomenon between adhesives and metal/paper surfaces: Role of acid-base interactions.", Uner B, Kadla JF, Ramasubramanian M. K, **ABSTRACTS** OF PAPERS OF THE AMERICAN CHEMICAL SOCIETY, 222: 183-CELL Part 1 AUG **2001**
58) "Interfacial phenomenon between adhesives and metal/paper surfaces." Kadla JF, Ramasubramanian M. K, Uner B, **ABSTRACTS** OF PAPERS OF THE AMERICAN CHEMICAL SOCIETY, 221: 65-CELL Part 1 APR **2001**

59) " Mechatronics, MEMS, and Smart Structures" an invited review paper for the Journal of Smart Materials and Structures, SPIE Smart Materials and MEMS Conference, Proceedings, March **2001**
60) "Acoustic Coaxing Induced Microcavitation for chemical-free deinking", with S. I. Madanshetty. (Appeared in Archival Proceedings of the Tappi International Recycling Conference, **2000**).
61) "Constitutive modeling of paper unloading behavior", Y. Wang and M. K. Ramasubramanian, International Paper Physics Seminar, Ecole Francaise de Papeterie, Grenoble, France, September **2000**
62) "Debonding and buckling of low-density papers bonded to a rigid surface-mechanics of the creping process", M. K. Ramasubramanian and Z. Sun, International Paper Physics Seminar, Ecole Francaise de Papeterie, Grenoble, France, September **2000**
63) "Software Implementation of a Design for Life-Cycle Analysis Scheme", M. K. Ramasubramanian and P. Targos, "Environmentally Conscious Design and Manufacturing-Recent Advances", Mo Shahinpoor Ed., Proceedings of the fourth International Congress, Vol. 4, ECM Press, **1996**
64) "Teaching Mechatronics Design at North Carolina State University", M. K. Ramasubramanian, Proc. Mechatronics '96, ISBN # 0-9652749-0-X, June 13-15, 1996, pp. 108-115, **1996**
65) "A Test Method for Determining the Shear Strength of a Paper-Metal Interface", M. K. Ramasubramanian, Symposium Proceedings on the Mechanics of Cellulosic Materials, ASME-AMD-MD-95, **1995**
66) "Concerning Micromechanics Models for the Elastic Behavior of Paper", M. K. Ramasubramanian & R. W. Perkins. Mechanics of Cellulosic and Polymeric Materials, AMD-Vol. 99, MD-Vol. 13 pp23-33, **1989**
67) Relationship between the In-plane paper Properties and the Ball Burst Strength for Paper'. M. K. Ramasubramanian & Y. C. Ko. Mechanics of Cellulosic and Polymeric Materials, AMD-Vol. 99, MD-Vol. 13 pp105-111, **1989**
68) "Computer Simulation of the Uniaxial Stress-Strain Behavior of Paper". M. K. Ramasubramanian & R.W. Perkins. Proceedings of the TAPPI International Paper Physics Conference, Mont. Rolland, Quebec, Canada, **1987**
69) "Mechatronic Design and Control of a Waste Paper Sorting System for Efficient Recycling", Richard Venditti and M.K. Ramasubramanian, North Carolina State University, Atlanta-DOE Review Conference (Grantees Conference), **2006**
70) "Studies in Acoustic Ink Removal", M. K. Ramasubramanian and S. I. Madanshetty, proceedings of the NSF-DMII Grantee's conference, Beach, CA, **1999**
71) "Deinking using acoustic microcavitation", M. K. Ramasubramanian and S. I. Madanshetty, proceedings of the NSF-DMII Grantee's conference, Monterey, Mexico, **1999**
72) "Chemical-free acoustic deinking of paper" M. K. Ramasubramanian and S. I. Madanshetty, Proc. of the NSF-DMII Grantee's Conference, Seattle, WA, **1997**
73) "An experimental investigation of brim forming in paperboard containers", M. K. Ramasubramanian and M. D. Swecker, Symposium Proceedings on the Mechanics of Cellulosic Materials, ASME AMD Vol. 221, MD Vol. 77, pp. 101-106, **1997**

**Invited presentations**

1. Invited Speaker, "Addressing 21st Century Grand Challenges through Interdisciplinary Research and Education-An NSF Perspective", University of Illinois Urbana Champaign, IL, November 8-9, **2010.**
2. Invited Speaker at the "Enhancing communication in cross-disciplinary research: An international solutions-focused conference, Sept. 30 – Oct. 3**, 2010** in Coeur D'Alene Idaho.

3. Invited Speaker and Panel Moderator at the Neuroengineering Grand Challenges Conference, IEEE, EMBS, Bethesda, MD, May 8, **2010**.
4. Invited Speaker at University of Florida, Gainesville, FL, "Facilitating Research through interdisciplinary training", April 29, **2010**.
5. "Sensor systems for high speed intelligent sorting of waste paper in recycling", MeadWestvaco Research, March **2009.**
6. Invited Speaker at the Nanotechnology Grantees Conference, National Science Foundation, Arlington, VA **2009.**
7. "Material Models and Computational Mechanics of Creping Process", Procter & Gamble Company, Research and Development, Cincinnati, Ohio, October 17, **2008**
8. "A Mechatronic system for the sorting of mixed paper materials for efficient Resource Utilization", Plenary Lecture at the Second International Conference on Resource Utilization and Intelligent Systems, Kongu Engineering College, Erode, India, January 3-5, **2008**
9. "Microelectromechanical Systems (MEMS) - Review, Trends, and Applications" Plenary Lecture at the ICAME 2006 - International Conference on Advances in Mechanical Engineering 14-16 December **2006**
10. "Mechatronics Design of Complex Engineering Systems" Invited Paper at the Battelle Memorial institute, Columbus, Ohio, September 18, **2002**
11. "Mechatronics, the past, present, and future" –invited paper at the Smart Electronics and MEMS conference, Newport Beach, CA, March **2001**
12. "Mechatronics Program Development at NCSU"- invited presentation to University of Delaware, Department of Mechanical Engineering, Newark, DE, January **2001**
13. "Mechatronics- the inter-disciplinary design approach to product and manufacturing process design", presented at Kimberley-Clark Corporation, Invited seminar speaker, September **2000**
14. "The Role of Mechatronics in manufacturing Process Research and Development", Procter & Gamble Company, Winton Hill Technical Center, October **1997**
15. "Improving Tissue Operations", U.S.-Egypt Joint Workshop on Manufacturing Technologies, (Organized by NSF), Alexandria, Egypt, Dec 2-10, **1996**
16. " An Experimental Investigation of the Creping Process", James River Corporation, Neenah, WI, July **1996**
17. "Mechatronic Design of a Brim-Forming Device", James River Corporation, Neenah, WI, July **1996**
18. "Automation of Manufacturing Processes", ABB, Inc., Raleigh, NC, March **1996**
19. "A Mechanics Approach to the Study of the Creping Process", Hercules Incorporated, Wilmington, DE, March **1996**

## EXTERNAL RESEARCH FUNDING (TOTAL $2,567,143)

***Highlights***

- A Computational Mechanics Model for the Simulation of Creping Process Budget Period: 12/01/2007 - 11/30/2010.Sponsor: PROCTOR & GAMBLE Status: Active (A), PI Name: RAMASUBRAMANIAN, M. K. Project Period: 12/01/2007 - 11/30/2010 Awarded: **$412,175.**
- Mechatronic Design and Control of a Waste Paper Sorting System for Efficient Recycling Budget Period: 01/28/2003 - 07/30/2007 Sponsor: U.S. DEPT OF ENERGY $320,000 (as reported in SPARCS $320,335.71 actual expenses)+$80K Industrial Partner cost sharing (Required by the DOE). Budget **$400,000**

- Mechatronic Design & Control of a Waste Paper Sorting Sys. Budget Period: 01/28/2000 - 01/27/2003 Sponsor: U.S. DEPT OF ENERGY $240K (as reported in SPARCS $235392 actual expenses) + $60K Industrial Partner cost sharing (Required by DOE). Budget **$300,000**
- A Novel Biologically Inspired Painless Blood Collection Method, PI Name: RAMASUBRAMANIAN, M. K. Project Period: 12/01/2003 - 12/31/2005 Sponsor: NAT'L SCIENCE FOUND. Co-PI Jay Tu. (SPARCS $69,532), Awarded: **69,569.**
- CHEMICAL-FREE DE-INKING METHOD/NON-IMPACT RESIN-BASED INKS Budget Period: 09/15/1996 - 05/31/2000, PI Name: RAMASUBRAMANIAN, M. K. Project Period: 09/15/1996 - 05/31/2000, Sponsor: NAT'L SCIENCE FOUND. (As reported in SPARCS $209,660 as actual expenses), Awarded: **$210,013**

**Proposals Submitted**

1) "Design, Processing, and Characterization of a Dielectric Electroactive Polymer Composite with Tunable Anisotropy" co-PI, with Tushar Ghosh, Submitted to MPM program, 2009, 9/1/09-9/1/12, **$567,311,—withdrawn** due to IPA Assignment at NSF
2) "Fundamentals of Cutting and Penetration of Tissue by Insects-Biomimetic Microsurgery and implantable surgical tools", NSF Emerging Frontiers in Research and Innovation, EFRI 2009, 9/1/2009-8/30/2012, **$1,77M, Declined.** Will be resubmitted with revisions
3) "Mechanics of a Mosquito Bite with Applications to Biomimetic Microneedles", NSF, CMMI, MOM, 5/15/2009-5/14/2012, **$352,992**. Withdrawn due to IPA Assignment
4) "Early Vibration Detection in Horizontal Axis Washing Machines", BSH Appliances, (Funded through IMSEI), 8/15/2007-5/15/2008, **$20,000**. **Funded**
5) "Design of LCD protection systems in a mobile phone during free fall", MAE 416 project, Sony Ericsson, RTP, NC, 2008, **$10,000. Funded**
6) "An Integrated Implantable Device for continuous measurement of Intraocular Pressure for the Treatment of Glaucoma", Proposal to the NSF, with Dr. G. Lazzi of University of Utah, and Dr. Asrani, MD, of Duke University Medical Center, Eye Institute. Total Estimated Budget **$250K**, (in preparation)
7) "A Microfluidic Device for the Microencapsulation of Islet Cells", A SBIR Phase I proposal with BioCell Inc, Cary, NC, to the NSF, Total Estimated Budget **$100K** (in preparation)

## TEACHING ACTIVITIES

- Highly rated teacher, graduate advisor, developed innovative graduate courses and a graduate program

*Verbatim Student Comments from Anonymous Course Evaluations*

- "Great teacher!!! Presented material very clearly, made sure students had a good understanding before he moved on." MAE206
- "He was a good teacher who was really willing to help outside of class whenever a student had a question or problems." MAE206
- "Very good instructor. Explained expectations well. Understood and answered questions very well. Should teach more courses." MAE416
- "Great enthusiasm and prompt feedback. Was always available outside of class and more than willing to lend a hand and help troubleshoot.", MAE416
- "This course provides a thorough grounding in the basics of mechatronics and applies that knowledge in a hands-on fashion. The course leaves no option but to truly learn the material: it is sink-or-swim.", MAE534
- "I think Dr. Ram is a great teacher. Sometimes he can move a little fast for me, but all around great teacher." MAE 534

**Instructional Development**

- Microsystems Engineering (MAE 589R) Developed a course on Microsystems Engineering and Fabrication (aka MEMS) and taught the course in summer 2007 as extra load. This course is innovative in that it plans to involve coordination and collaboration with a similar course at Duke University in order to share microfabrication resources and give a hands-on experience in MEMS design.
- Automotive Engineering (MAE 442) Developed a module on Automotive Mechatronics and taught two weeks of MAE 442, assigned and graded a take home project.
- Instrumentation and Signal Processing (MAE 517) Developed and offered it in Fall 2005- a hands-on course on instrumentation and experimental methods. Although it is an old course number on the catalog, the course has been completely redesigned and updated with laboratory component with LabView.
- Mechatronics Design (MAE 534) developed and taught for thirteen years with strong enrollment since 1996. A unique course with strong hands-on component for both on and off campus students, taught through distance education worldwide since 2003. Currently being taught online, while I am at the NSF on my own time (2011).
- Mechatronics Concentration in M.S. Program -Developed the Mechatronics option in Mechanical Engineering master's program (2000). Maintaining the Mechatronics Curriculum.
- Tissue Manufacturing, a self-paced audio-visual course developed for Buckman Corporation, 1999. This is an 18-hour series of CDs used for training personnel in tissue paper manufacturing.
- Mechatronics Engineering, Short Course to Industry, taught in summer 2000, and 2001.
- Introduction to Pulp and Paper Technology, Short Course team taught every Fall and Spring (1995-2000).

**Mentoring Activities**

*Eco Car Challenge Student Team 2008-2009*

- Advisor, Mechatronics aspects of the Challenge Eco Car Design

*ASME Design Team Advisor 2007-08, 2008-2009*

- Advised five students in Fall and Spring semesters 2007-2008 year, for participating in an ASME design competition in Virginia, 3/2008

*MAE 496 project ASME Design Competition, 2009.*

- Microbaja Car Team Advisor2003
- Advised a team of two students to participate in the SAE Microbaja contest in Detroit, MI. (Won 3rd place overall and 1st )

*Mechatronics Graduate Student Advising 2000-present as director of Mechatronics program*

## MASTER'S THESIS DIRECTED

| No. | Student Name | Thesis Title | Year |
|---|---|---|---|
| 33 | Gupta, Swapnil | Computational Model for the creping process-MS Project | 2010 |
| 32 | Tendulkar, Sameer | Microfluidic Device Design for Microencapsulation-MS Project | 2009 |
| 31 | Singer, David | Autonomous Following Vehicles MS Project Work | 2009 |
| 30 | Karthik, Tiruthani | Dynamics of imbalance in a horizontal axis washing machine | 2008 |
| 29 | Alexander,Stewart | An Integrated Microoptical-Microfluidic Device for Agglutination Detection and Blood Typing | 2007 |

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|---|---|---|---|
| 28 | Barham, Oliver | A mathematical model for the mechanics of a mosquito bite with applications to microneedle design | 2007 |
| 27 | Gillella, Pradeep | Mechatronic design of a waste paper sorting system for efficient recycling | 2007 |
| 26 | Swaminathan, Vinay | Mechanics of mosquito bite | 2006 |
| 25 | Lambert, Jeremy | A miniaturized device for blood typing using a simplified spectrophotometric approach | 2006 |
| 24 | Fisher, Sarah | A Method for the Encapsulation of MicroSpherical Particles | 2006 |
| 23 | Katuri, Kalyan | Development of online stiffness sensor for high speed sorting of recovered paper | 2006 |
| 22 | Anigulu, Deepak Kumar | Design of fully integrated wireless CMOS MEMS device for intraocular pressure measurement (Co-Chair) | 2006 |
| 21 | Tompkins, Michael | Automated Method For Fiber Length Measurement (Co-Chair) | 2006 |
| 20 | Anthony, Steven | A simplified visible/near-infrared spectrophotometric approach to blood typing for automated transfusion safety | 2005 |
| 19 | Lorek, James | A point-of-care diagnostic device for quantifying estradiol levels in human saliva | 2004 |
| 18 | Mallapragada, Vishnu | Online lignin sensor for high speed sorting of newsprint from recovered paper | 2004 |
| 17 | Sanders, Keith | Electronically tower micro vehicles | 2003 |
| 16 | Hughes, Robert | Analysis and redesign of the brim forming manufacturing process | 2003 |
| 15 | Jayachandran, Amit | Fundamentals of fiber dispersion in water | 2001 |
| 14 | Gay, John | A free motion control algorithm for an excavating linkage | 2001 |
| 13 | Ammineni, Chandini | Design of lignin sensor for identification of waste paper grades for an automatic waste paper sorting system | 2001 |
| 12 | Landahl, William | Analysis and control of Flex length in the Manufacture of Carbon Brushes | 2000 |
| 11 | Hemnani, Dinesh | Mechatronic Apparatus for Bottom Forming of Paperboard Containers | 2000 |
| 10 | Pornsitt, Suwan-acksorn | Effect of Acoustic Coaxing Induced Microcavitation (ACIM) deinking on xerographic paper | 1999 |
| 9 | Desai, Monish | Tissue manufacturing and the creping process | 1999 |
| 8 | Beacham, Jimmie | Mechatronic simulation of a tissue manufacturing process | 1998 |
| 7 | Muthuraman, Kashyap | A computational mechanics model for the brim forming process in paperboard container manufacturing | 1998 |
| 6 | Davila, Benjamin | Design and construction of a digitally controlled environmental chamber for hygroscopic material testing | 1997 |
| 5 | Shmagin, Dmitry | Design of the laboratory creping device | 1997 |
| 4 | Crews, Russell | Shear strength of an adhesively bonded paper-metal interface | 1996 |
| 3 | Swecker, Matthew | Design of a mechatronic device for high-speed, automated brim curling of paper containers | 1996 |
| 2 | Targos, Peter | Software Implementation of a Design for Life-Cycle Analysis Scheme | 1995 |
| 1 | Serad, Samuel | Design of an air-conditioning expansion valve for Automated Assembly | 1995 |

## DOCTORAL DISSERTATIONS DIRECTED

| No. | Name | Dissertation Title | Year |
|---|---|---|---|
| 10 | Agarwala, Ranjeet | Microneedle Design from Mosquito biting mechanics | (Spring 2012) |
| 9 | Tendulkar, Sameer | Microencapsulation through Microfluidics Design Methods | (Spring 2012) |
| 8 | Gupta, Swapnil | A computational model for the creping process in low density paper manufacturing | (Spring 2012) |
| 7 | Katuri, Kalyan | A MEMS Pressure Sensor with Remote Telemetry for continuous monitoring of intraocular pressure | (Fall 2011) |

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|---|---|---|---|
| 6 | Chen, Guang | Micromechanics Constitutive model for paper for explicit dynamic simulation of low density paper manufacturing | 2011 |
| 5 | Uner, Birol | Adhesion Mechanism between Polymer and Metal Interface | 2002 |
| 4 | Sun, Zhaohui | Debonding and buckling of a thin short-fiber nonwoven bonded to a rigid surface and its application to the creping process | 2001 |
| 3 | Jackson, Steven | A sensor for friction measurement on a moving web | 2001 |
| 2 | Wang, Yun | Constitutive modeling of the unloading behavior of paper material using the asymptotic fiber and bond model | 2001 |
| 1 | Singletary, James | Experimental characterization of the transverse compression of poly(para-phenylene terephthalamide) and other, highly oriented fibers | 1998 |

## PROFESSIONAL SERVICE AT NCSU

- Chair, College of Engineering Research Committee, 2006-2009
- Member, Micro/Nano Faculty Search Committee, 2008-2009
- Member, MAE Graduate student recruiting committee, 2008-09
- Co-Chair, College of Engineering Mechatronics Committee, 2005-present
- Director, Mechatronics Program. 2000-present
- NCSU Mechatronics Curriculum Committee, for the Program at UNC Asheville, 2003-present
- MAE Undergraduate Laboratory Committee (2006-to present)
- MAE 416 Senior Design Committee, 2003-present
- MAE Undergraduate Program Committee (2005-2006)
- MAE Graduate Program Committee (2004-2005)
- MAE Manufacturing Laboratory Committee, 2003-2004
- MAE Mechatronics Committee 2000-2005
- MAE Member, Open House Committee, 2002-2003,
- MAE Design and Manufacturing Faculty Search Committee, 2002-2003
- MAE Seminar Committee, 1994-1996 (Chair), 2001, MAE Departmental Computer Committee: 1995-1997Member, MAE Graduate student recruiting committee, 2008-09

## PROFESSIONAL SERVICE OFF CAMPUS

*Conference Organization Activities:*

- Session Chairman, "PaperCon 2011 – TAPPI Papermakers, TAPPI Coating and PIMA Joint Conference", May 1 – 4, 2011, Northern Kentucky Convention Center, Covington, KY.
- Chairman, Symposium Special Session on "Computational Solid Mechanics in the Manufacture and Behavior of Paper", Papermaking Research Symposium-PRS2009, Kuopio, Finland, June 1-4, 2009. www.uku.fi/prs2009
- Member of the International Scientific Committee, PRS 2009, Kuopio, Finland, June 1-4, 2009.
- Member and Plenary Speaker, International Planning Committee, "Resource Utilization and Intelligent Systems", an international conference, Kongu College of Engineering, Erode, India, 2007.
- Member and Plenary Speaker, International Program Committee, "Advances in Mechanical Engineering", an international Conference, Chennai, India, December 2006.
- Track Chair, Biosensors and Robotics, IEEE EMBS Conference, San Francisco, CA September 1-4, 2004
- International Program Committee, Mechatronics AIM 2004 Conference, Ankara, Turkey, 2004

- ASME-AMD -Materials Division- Co-Chair, Mechanics of Cellulosic Materials Symposium, VPI-SU, July 1999
- ASME-AMD -Materials Division- Co-Chair, Mechanics of Cellulosic Materials Symposium, Northwestern U, July 1997
- Member, TAPPI, Paper Physics Committee, dealing with mechanics of paper and cellulosic materials 1998-present

*Referee Activities*

- National Science Foundation Proposals (DMII) 2000-present (reviewed CAREER proposals 2006)
- National Science Foundation (DMII) 2003
- USDA Fiber Utilization Program, 1998
- Advanced Intelligent Mechatronics, Zurich, 2007
- Progress in Paper Recycling Journal, 2000-present
- Tappi Journal, 1998-present
- ASME Journal of Engineering Materials and Technology, 2003-present

## EXTENSION AND ENGAGEMENT WITH CONSTITUENCIES OUTSIDE THE UNIVERSITY

*List accomplishments as applicable*

- Journal paper on mosquito bite mechanics published, September 2008. A new article appeared in Science News, a magazine in Washington DC, with external expert review of the work, September 2008.
- http://sciencenews.org/view/generic/id/36364/title/This_bite_wont_hurt_a_bit
- Research work was featured in North Carolina Now, UNC TV production, regarding the NSF Sponsored work on Mosquitoes and Painless Needle Development, 2006.
- Articles about the research appeared in News and Observer, 2005, NC State Alumni Research Bulletin, NC State Webpage, and in Lokvani Magazine, Boston Massachusetts, 2005-2006.
- Article on the research, "This bite won't hurt a bit", published in Science News Magazine, Vol. 174. No. 8, October 11, 2008, pp. 11.
- Article on the research appeared in http://www.sciencenews.org/view/generic/id/36364/title/This_bite_wont_hurt_a_bit