

RESUME -- RAMA BANSIL

EDUCATION

- Ph.D. 1975, University of Rochester (Physics).
- M.Sc. 1969, University of Delhi, India (Physics).
- B.Sc. (Honors) 1967, University of Delhi, India (Physics).

EMPLOYMENT

- Professor of Physics, Boston University, Sep. 1997 – present.
- Program Director, Division of Materials Research, Directorate for Math and Physical Sciences, National Science Foundation, Sep. 2007- Aug. 2008.
- Visiting Professor, Dept. of Medicine, Harvard Medical School, Beth Israel Deaconess Medical Center, Sep. –Dec. 2006. (Sabbatical).
- Associate Professor of Physics, Boston University, Sep. 1984 -Aug. 1997.
- Science Scholar and Fellow, Bunting Institute, Radcliffe College, Sep. 1993 - Aug. 1994
- Assistant Professor of Physics, Boston University, Oct. 1976 – Aug. 1984.
- Research Associate, Harvard-M.I.T. Program in Health Sciences and Technology, M.I.T., Cambridge, MA, Oct. 1975 - Sep. 1976.
- Vinton Hayes Fellow in Applied Physics, Division of Engineering and Applied Physics at Harvard University, Cambridge, MA, Oct. 1974 – Sep. 1975.

HONORS

- Krishna Dave Gold Medal, for obtaining 1st position in Central Board of Secondary Education, Higher Secondary Exam, India, 1964.
- Science Exhibition Prize, Delhi University, 1964 and 1967.
- Science Talent Scholarship, N.C.E.R.T. India, 1964 -1969.
- Vinton Hayes Fellowship, Harvard University, Postdoctoral Research 1974-1975.
- Whitaker Health Sciences Fund Award, M.I.T.-BU collaboration 1978-1980.
- American Cancer Society Junior Faculty Award, 1979-1982.
- Bunting Fellow, Radcliffe College, 1993-1994
- National Lecturer, Sigma Xi Society, 1995-1997.
- NSF Special Creativity Extension, awarded by NSF DMR in 2000.
- Fellow of the American Physical Society, 2001

PROFESSIONAL SERVICE and ADMINISTRATIVE ACTIVITIES:

- ADMINISTRATIVE EXPERIENCE: Managing Materials Research Science and Engineering Centers Program at NSF-Division of Materials Research.
- COLLEGE AND UNIVERSITY COMMITTEES: University Promotion and Tenure Committee, College of Arts and Sciences Academic Promotion and Tenure Committee, Molecular and Cellular Biology and Biochemistry Program and Admissions Committee, Seed Research Grant Committee, Seven Year Medical Program Interview Board

- **PHYSICS DEPARTMENT COMMITTEES:** Graduate Curriculum Committee, Undergraduate Curriculum Committee, Graduate Admissions Committee, Colloquium Committee, Biophysics Seminar Committee, Merit Evaluation and Raise Committee, Promotion and Tenure Committee of Several Candidates
- **ADVISING UNDERGRADUATES:** CAS Freshman Orientation Advisor, Pre-Med and Seven Year Medical Interviewing. Scholarship Award Selection Committees
- **OUTREACH:** Organized conferences, panelist at conferences for women in science, lectures and demonstrations at local schools. Founding member BU WISE group.
- **PROFESSIONAL SERVICE:** NIH Special Study Section and Site Visits, NSF Site Visits and Review Panels, APS Div. of Polymer Physics Committee to Elect APS Fellows, Secretary/Treasurer of NES-APS. Selection Committee for Radcliffe College, Harvard University; Sigma Xi “Nominating Committee for Distinguished Lecturers”. Reviewer for journals, text books tenure and promotion candidates, and funding agencies.

TEACHING

- Graduate: Polymer Physics, Biophysics, Statistical Mechanics
- Undergraduate Physics Majors: Mathematical Physics, Thermodynamics and Statistical Mechanics
- Other Undergraduates: Physics for Engineers, Physics for Life Science Majors, Physics for Seven Year Medical Program, Physics for Environmental Science, Core Curriculum Physical Science.

RESEARCH SUPERVISION

- **GRADUATE:** 11 Ph.D (7 Physics, 1 Applied Physics, 2 Chemistry, 1 Cellular Biophysics)
Current: 2 Ph.D (1 Physics, 1 Molecular and Cellular Biology)
- Postdoctoral Fellows: 4 Current: 1 Postdoc
- **UNDERGRADUATE:** Many undergraduate students have done research with me supported by NSF REU Program and BU’s work-study program. This includes students from other institutions.

RESEARCH INTERESTS

- **POLYMER PHYSICS:** Structure and Dynamics in polymer gels and solutions. Recent work is focused on block copolymer phase transition kinetics using time-resolved small angle x-ray scattering, computer simulations and modeling. Dynamics of multiblock copolymers and gels is being investigated at several different length scales, using dynamic laser light scattering to investigate diffusional dynamics and synchrotron based x-ray photon correlation spectroscopy to investigate the internal dynamics within microphase separated domains.
- **BIOPHYSICS:** Gelation of Mucin in an attempt to determine the underlying physical/molecular mechanisms that protect the stomach. Biophysical studies using AFM, rheology and light scattering techniques have established a pH dependent gelation transition. Recombinant DNA methods in yeast and bacterial systems to express specific domains of mucin and characterize their biophysical properties and aggregation behavior. Molecular dynamics simulations are used to complement the experimental studies. Motility of bacteria (specifically the ulcer causing

bacterium, *H. pylori* in mucin as a function of pH) and the changes in the rheology of mucin and mucus with bacterial infection. Diffusion and transport of nanoparticles and biopolymers through mucin.

SELECTED PUBLICATIONS

Selected Publications since 2000 (separated by research topic, reverse chronological order within topic; Numbers refer to Complete List of Publications)

Phase Transitions and Dynamics in Block Copolymers

[95] Minghai Li, Huifen Ni, Yongsheng Liu, Milos Steinhart, Rama Bansil, “Kinetics of HEX-BCC Transition of Cylinders to Spheres: Comparison of Time-resolved SAXS data with a Model of Coupled Anisotropic Fluctuations.” *Macromolecules* 40, 9491-9502 (2007).

[94] Yongsheng Liu, Minghai Li, Milos Steinhart, Rama Bansil, “Kinetics of phase transition from lamellar to hexagonally packed cylinders for a triblock copolymer in a selective solvent”. *Macromolecules* 40, 9482-9490 (2007).

[91] Yongsheng Liu, Huifen Nie, Rama Bansil, Milos Steinhart, Joon Bang and Timothy P. Lodge, “Kinetics of disorder-to-fcc phase transition via an intermediate bcc state” *Phys. Rev. E* 73, 061803 (2006).

[82] H. Nie, R. Bansil, K. Ludwig, M. Steinhart, C. Konak, J. Bang, “Time-Resolved Small-Angle X-ray Scattering Study of the Kinetics of Disorder-Order Transition in a Triblock Copolymer in a Selective Solvent for the Middle Block” *Macromolecules* 36, 8097-8106 (2003).

[81] R. Bansil, H. Nie, C. Konak, M. Helmstedt and J. Lal, “Structure and Dynamics of Solutions of a Polystyrene-Polybutadiene Pentablock Copolymer in a Styrene Selective Solvent” *J. Pol. Sci.*, 40, 2807-2816 (2002).

[76] C. Konak, G. Fleischer, Z. Tuzar, and R. Bansil, “Dynamics of solutions of triblock copolymers in a selective solvent: Effect of varying copolymer concentration” *Journal of Polymer Science Part B: Polymer Physics* 38, 1312-1322 (2000).

[77] C. Konak, M. Helmstedt, R. Bansil, “Temperature dependence of dynamics of solutions of triblock copolymer in a selective solvent”, *Polymer* 41, 9311-9315 (2000).

Biophysics of Mucin

[93] J.P. Celli, B.S. Turner BS, N.H. Afdhal, R. Ewoldt, G.H. McKinley, R. Bansil, S. Erramilli. “Rheology of Gastric Mucin Exhibits pH-Dependent Sol-Gel Transition”. *Biomacromolecules* 8, 1580-1586 (2007).

[92] H. Fang, L. Qiu, E. Vitkin E, M.M. Zaman, C. Andersson, S. Salahuddin, L.M Kimerer, P.B. Cipollini, M.D. Modell, B.S. Turner, S. Keates, I. Bigio, I. Itzkan, S.D. Freedman, R. Bansil, E.B. Hanlon, L.T. Perelman. “Confocal light absorption and scattering spectroscopic microscopy”, *Applied Optics* 46(10),1760-9 (2007).

[90] Rama Bansil and Bradley Turner, “Structure and Function of Mucin”, Invited Review, *Current Opinions in Colloid and Interface Science* 11, 164-170 (2006).

[89] Ariel Michelman-Ribeiro, Ralph Nossal, Ryan Morris, Sarah Lange, Chein-Shiu Kuo, Rama Bansil, “Electrolysis induces pH gradients and domain orientation in agarose gels” *Phys. Rev. E* 73, 011410 (2006).

[88] R. Bansil, J. Celli, B. Chasan, S. Erramilli and Z. Hong, N. H. Afdhal, K. R. Bhaskar and B. S. Turner, “pH-dependent Gelation of Gastric Mucin” *Materials Research Society, Symposium J Proceedings*, Vol. 897E, J02-04 (2005).

- [87] Zhenning Hong, Bernard Chasan, Rama Bansil, Bradley S. Turner, K. Ramakrishnan Bhaskar and Nezam H. Afdhal, "Atomic Force Microscopy reveals aggregation of gastric mucin at low pH" *Biomacromolecules* 6, 3458-3466 (2005).
- [86] Jonathan Celli, Brian Gregor, Bradley Turner, Nezam H. Afdhal, Rama Bansil, Shyamsunder Erramilli, "Viscoelastic Properties and Dynamics of Porcine Gastric Mucin" *Biomacromolecules*, 6, 1329-1333 (2005).
- [80] T.A. Waigh, A. Papagiannopoulos, A. Voice, R. Bansil, A.P. Unwin, C.D. Dewhurst, B. Turner and N. Afdhal, "Entanglement Coupling in Porcine Stomach Mucin" *Langmuir* **18**, 7188-7195, 2002.

Selected Earlier Publications (separated by research topic, chronological order within topic)

Biophysics

- [1] R. Bansil, J. Herzfeld and H. E. Stanley, "Hemoglobin Kinetics and the Effect of Organic Phosphates," *Science* 186, 929-932 (1974).
- [3] R. Bansil, J. Herzfeld and H. E. Stanley, "Kinetics of Cooperative Ligand Binding in Proteins: The Effects of Organic Phosphates on Hemoglobin Oxygenation," *J. Mol. Biol.* 103, 89-126 (1976).
- [6] R. Bansil, J. Day, M. Meadows, D. Rice, and E. Oldfield "Raman Spectroscopy of Specially Deuterated Phospholipid Bilayers," *Biochemistry* 19, 1938-1943 (1980).

Chemical Physics

- [13] J. Wiafe-Akten and R. Bansil, "Intermolecular coupling in HOD solutions" *J. Chem. Phys.* 78, 7132-7137 (1983).
- [14] R. Bansil, H. J. Herrmann and D. Stauffer, "Computer simulation of kinetics of gel formation by addition polymerization in the presence of a solvent," *Macromolecules* 17, 998-1003 (1984).
- [15] S. Krishnamurthy and R. Bansil, "Nucleation and growth in a polymer solution," *Phys. Rev. Lett.* 50, 2010-2013 (1983).
- [19] S. Krishnamurthy, R. Bansil and J. Wiafe-Akten, "Low-frequency Raman spectrum of supercooled water," *J. Chem. Phys.* 79, 5863-5870 (1983).
- [23] R. Bansil, T. Berger, K. Toukan, M. A. Ricci and S. H. Chen, "A molecular dynamics study of the OH stretching Vibrational Spectrum of liquid water," *Chem. Phys. Lett.* 132, 165 (1986).

Polymer Physics: Gelation and Phase Separation

- [25] I. Nishio, J. C. Reina and R. Bansil, "Quasi-elastic light scattering study of the movement of particles in gels," *Phys. Rev. Lett.* 59, 684 (1986).
- [27] R. Bansil, J. Lal and B. Carvalho, "Effects of gelation on kinetics of spinodal decomposition in gelatin" *Polymer*, 33 2961 (1992).
- [34] R. Bansil, S. Pajevic and C. Konak, "Diffusion of polystyrene in gels" *Macromolecules* 23 3380 (1990).
- [37] J. Lal and R. Bansil "Light Scattering Study of Kinetics of Spinodal Decomposition in a Polymer Solution" *Macromolecules* 24 290 (1991).
- [49] F. Sciortino, R. Bansil, H. E. Stanley and P. Alstrom "Interference of Phase Separation and Gelation: A zeroth-order model" *Phys Rev E*, 47 4615 (1993).

- [59] S. Pajevic, R. Bansil and C. Konak, "Diffusion of a linear polyelectrolyte in a gel" *Macromolecules* 28 7536 (1995).
- [62] Y. Xie, K.F. Ludwig Jr., R. Bansil, P. Gallagher and C. Konak, "Time-resolved Small Angle X-ray Scattering Studies of Spinodal Decomposition Kinetics in a Semidilute Polystyrene-dioctylphthalate Solution", *Macromolecules* 29, 6150-6157 (1996).
- [63] C. Konak, L. Mrkvieková and R. Bansil, "Dynamics of Pregel Solutions and Gels in a θ -Solvent near a Spinodal" *Macromolecules* 29, 6158-6164 (1996).
- [64] E. L. Cabarcos, C. S. Kuo, A. Scala and R. Bansil, "Crossover between Spatially Confined Precipitation and Periodic Pattern Formation in Reaction Diffusion Systems" *Phys. Rev. Lett.* 77, 2834-2837 (1996).
- [78] G. Liao, Y. Xie, K.F. Ludwig Jr., R. Bansil and P. Gallagher, "Small Angle X-ray Scattering Study of Kinetics of Spinodal Decomposition in N-isopropylacrylamide Gels", *Physical Rev. E* 60, 4473 - 4481 (1999).

Biophysics of Mucin

- [41] K. R. Bhaskar, D. Gong, R. Bansil, S. Pajevic, J. A. Hamilton, B. S. Turner and J. T. LaMont "Profound Increase in Viscosity and Aggregation of Pig Gastric Mucin at Low pH" *Am. J. of Physiology: Gastroenterology and Liver Physiology*, G827, (1991).
- [48] K. R. Bhaskar, B. S. Turner, P. Garik, J. D. Bradley, R. Bansil, H. E. Stanley and J. T. LaMont "Viscous Fingering of HCl Through Gastric Mucin" *Nature*, 360 458 (1992).
- [57] R. Bansil, H. E. Stanley and J. T. LaMont, "Mucin Biophysics" *Annual Rev. of Physiology* 57 635 (1995).
- [60] N. H. Afdhal, N. Niu, D. P. Nunes, R. Bansil, X. X. Cao, D. Gantz, D. M. Small and G. D. Offner, "Mucin-vesicle Interactions in model Bile: Evidence for Vesicle Aggregation and Fusion before Cholesterol Crystal Formation" *Hepatology*, 22 856-865, 1995.
- [72] X. Cao, R. Bansil, D. Gantz, E.W. Moore, N. Niu and N. Afdhal, "Diffusion behavior of lipid vesicles in entangled polymer solutions" *Biophysical Journal* 73, 1932-1939 (1997).
- [77] X. Cao, R. Bansil, K. R. Bhaskar, B. S. Turner, J. T. LaMont and N. Afdhal, "pH-dependent Conformational Change Leads to Sol-Gel Transition of Gastric Mucin" *Biophysical Journal*, 76, 1250-1258 (1999).

SELECTED LECTURES

Over 140 talks at Meetings, Colloquia and Seminars. Gave lectures for broad audiences as Sigma Xi LECTURER during 1995-1997. Some recent invited lectures are listed below.

- [143] INVITED LECTURE: Food Colloids 2008 Le Mans, France April 2008. "Gelation of Mucin-- Protecting the stomach from digesting itself"
- [142] INVITED SEMINAR: Dept. of Chemistry and Chemical and Biology, Rensselaer Polytechnic Institute, Feb. 2008. "Gelation of Mucin--A mechanism for protecting the stomach from digesting itself"
- [141] INVITED SEMINAR: Center for Interdisciplinary Research in Complex Systems (CIRCS), Northeastern University, Boston, MA. Dec. 2007. "Biophysics of Mucin Gels"
- [139] COLLOQUIUM: Dept. of Physics, University of Mass., Lowell, MA Mar. 2007 "Gelation : How Does it Prevent the Stomach From Digesting Itself"
- [138] INVITED LECTURE: Pan American Scientific Institute (PASI) : From Disordered systems to complex systems. Mar Del Plata, Argentina, Dec. 2006. "Mucin Gels and Motility of the Ulcer Causing Bacterium, H. Pylori"

[135] INVITED LECTURE: XV International Materials Research Congress, Symposium 10: "New Trends in Polymer Chemistry and Characterization". Cancun, Mexico, Aug. 20-24, 2006 "Kinetics Of Order-Order Transitions Between Lamellar And Cylindrical Phases In Block Copolymers In Selective Solvents".

[134] INVITED LECTURE: 45th Microsymposium Prague Meetings on Macromolecules: Structure and Dynamics of Self-organized Macromolecular Systems: Prague, Czech Republic: 9-13 July 2006 "Kinetics of Order-Order Transitions between Cylinders, Spheres and Lamella: Comparison of Time-resolved SAXS data with a Model of Coupled Anisotropic Fluctuations".

[131] INVITED LECTURE: Seminar, Laboratory for Integrative and Molecular Biophysics, NICHD, NIH May. 2006 "Gelation of Mucin and Its Impact on H. pylori Motility"

[129] INVITED LECTURE: Materials Research Society Fall Meeting, Symposium on Biomimetic Polymers and Gels, Nov. 28-Dec. 1, 2005 "pH dependent Gelation of Gastric Mucin"