

Date Prepared: **September 12, 2024**Name: **Lance L. Munn****Education**

1987	B.S. summa cum laude	Chemical Engineering	University of Cincinnati
1993	Ph.D.	Chemical Engineering & Bioengineering	Rice University

Industry Experience

1984-1986	Co-op Engineer	Photolithography / Ink Chemistry	Diconix, Inc. (Kodak) Dayton, OH
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Postdoctoral Training

06/93-03/96	Postdoctoral Fellow	<i>Blood Rheology & Leukocyte Trafficking</i>	Massachusetts General Hospital
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Faculty Academic Appointments

1996-1998	Instructor	Radiation Oncology	Harvard Medical School
1999-2004	Assistant Professor	Radiation Oncology	Harvard Medical School
2004-present	Associate Professor	Radiation Oncology	Harvard Medical School
2021-present	Visiting Professor	Biomechanical and Biomedical Engineering	Université de technologie de Compiègne

Appointments at Hospitals/Affiliated Institutions

1988-1993	Asst. Fellow of Immunology	Immunology	M.D. Anderson Cancer Center
1993-1996	Research Fellow	Radiation Oncology	Massachusetts General Hospital
2004-2016	Associate Biologist	Radiation Oncology	Massachusetts General Hospital
2016-present	Investigator	MGH Research Institute	Massachusetts General Hospital

Major Administrative Leadership Positions

Local

1995-present	Director, Bioengineering, Imaging, and Computing Core, Steele Laboratories	Massachusetts General Hospital
2010-present	Deputy Director	Steele Laboratories, MGH
2017	Co-chair and organizer	2017 Boston Angiogenesis Meeting Starr Center, Boston

Regional

2006-2023	Program Steering Committee Member	City College New York / Memorial Sloan Kettering Cancer Center Partnership for Cancer Research, Training and Community Outreach
2023-present	Chair, Program Steering Committee	

National and International

2012 -2014	Expert Panelist	Assessment of Physical Sciences and Engineering Advances in Life Sciences and Oncology (APHELION) in Europe NCI, Office of Physical Sciences Oncology
2012	Co-Chair and Organizer	US National Committee on Biomechanics 4 th Symposium on Frontiers in Biomechanics: "Mechanics in Oncology"
2014	Co-Chair and Organizer	Mathematical Biosciences Institute Workshop on Metastasis and Angiogenesis, Ohio State University
2018	Co-Chair	8 th World Congress of Biomechanics, Dublin, Ireland
2019 -present	SAB member	SimBioSys, Inc.
2020-present	Chair, External Scientific Advisory Board	Center for Cancer Engineering, The Ohio State University
2021	Chair, Lymphatic Modeling	Lymphatic Forum 2021
2022	Participant	NCI/IBM Ideas Lab on Biologically Informed Models of Combination Therapies

Committee Service

Local

1993-present	Candidate Search Committee 1993-96	Steele Laboratories, MGH Chair
2016-2020	Co-Organizer, MGH site	Harvard Medical School Vascular Biology Seminar Series

National and International

2013	External thesis committee member	Univ. Waterloo, Madjid Soltani dissertation
2013	President, thesis committee	Institut Curie, Kevin Alessandri dissertation
2016	External thesis committee member	McGill University, S. Ghaffari dissertation
2023	External thesis committee member	Univ. Waterloo, Cameron Meaney dissertation
2023	External thesis committee member	Boston University, Sue Zhang dissertation
2023	External thesis committee member	Texas A&M Univ., Mutaz Mohammad dissertation

Professional Societies

<i>1993-present</i>	American Institute of Chemical Engineers 1999–2008	session chair
<i>2001-present</i>	Biomedical Engineering Society 2000-2005	session chair
<i>2002-present</i>	American Association for Cancer Research	
<i>2002-present</i>	Radiation Research Society	
<i>2010-present</i>	Microcirculatory Society	
<i>2009-present</i>	North American Vascular Biology Association	
<i>2017-present</i>	American Association for the Advancement of Science	
<i>2019-present</i>	American Physiology Society	

Grant Review Activities

<i>6/7/00</i>	Transfusion Medicine	NIH (NHLBI) Ad hoc Member
<i>3/23/01</i>	Oncological Sciences Rev. Committee	NIH (NCI) Ad hoc Member
<i>6/2/04 - 6/10/04</i>	FastLane review system	National Science Foundation Ad hoc Member
<i>3/9/05</i>	Microscopic Imaging Study Section	NIH Ad hoc Member
<i>10/12 - 10/13/06</i>	Tumor Microenvironment	NIH (NCI) Ad hoc Member
<i>6/4-6/6/07</i>	Modeling & Analysis of Biological Systems	NIH Ad hoc Member
<i>2010 -present</i>	Systems Biology, ZRG1 VH-D (55)	NIH (NHLBI) Member
<i>1/11-3/12</i>	Vascular Hematology SEP	NIH Ad hoc Member
<i>3/18/14</i>	SEP/ Scientific Review Group ZEB1 OSR-C (M3) Review panel	NIH (NIBIB) Ad hoc Member
<i>11/19/2015</i>	SEP/Scientific Review Group 2016/01 ZCA1 TCRB-T (J2) Review panel	NIH (NCI) Ad hoc Member
<i>4/14/2016</i>	Physical Sciences Oncology Centers (U54) Review panel	NIH (NCI) Ad hoc Member
<i>2014-present</i>	Research Council KU Leuven	University of Leuven, Belgium Reviewer
<i>2016-present</i>	Research Grants Council (RGC) of Hong Kong	University Grants Committee Reviewer

<i>2/19-2/20 2019</i>	Drug Discovery and Molecular Pharmacology Study Section	NIH (NCI) Ad hoc Member
<i>2019-present</i>	ITMO Cancer of the French National Alliance for Life and Health Sciences	Inserm, Reviewer
<i>2/19-2/20/2020</i>	Hypertension and Microvasculature	NIH (NHLBI) Ad hoc Member
<i>7/26/2021</i>	IVPP SEP	NIH (NHLBI) Ad hoc Member
<i>2/17-18/2021</i>	Integrative Vascular Physiology and Pathology	NIH (NHLBI) Ad hoc Member

Editorial Activities (reviewer)

American Journal of Physiology	Lab on a Chip
Analytical Chemistry	Lancet Oncology
Annals of Biomedical Engineering	Microcirculation
Biorheology	Microvascular Research
Biotechniques	Nature Cell Biology
Cancer Cell	Nature Methods
Cancer Research	Physical Review Letters
Integrative Biology	PLoS Computational Biology
Journal of Theoretical Biology	PNAS

Other Editorial Roles

2015-present	Guest Editor	PNAS
2017-present	Editor	Microcirculation
2021-2022	Guest Editor	Cancers

Honors and Prizes

<i>1987</i>	Engineering Honor Society, Tau Beta Pi	University of Cincinnati	
<i>1989</i>	Cox Fellowship	Rice University	
<i>1991</i>	Phillips Award for Pre-doctoral Research	Rice University	
<i>1995</i>	Postdoctoral training grant	NIH	
<i>2000</i>	LJIS Travel Award	Whitaker Foundation	
<i>2006</i>	Outstanding cover design	Taylor & Francis Group, Computational and Mathematical Methods in Medicine	Scientific illustration for journal cover
<i>2013</i>	Gerritsen Award	Microcirculatory Society	Most cited journal article

2014	Gerritsen Award	Microcirculatory Society	Most cited journal article
2015	Distinguished Alumnus Award	Rice University	
2016-present	Member of the College of Fellows	American Institute for Medical and Biological Engineering	
2018	University Delegate, Inauguration of Harvard President	Rice University	
2019	Top cited article	Wires Systems Biology and Medicine	
2020-present	Top 1% composite citation index	Elsevier Data Repository DOI: 10.17632/btchxktzyw.6	
2024-present	Highly Ranked Scholar	ScholarGPS	Top 0.05% of all scholars/neoplasms

Formally Supervised Trainees

1996—1998	Hera Lichtenbeld, PhD / Currently: Assistant Director at UF Innovate Tech Licensing Postdoctoral, Project title: “Vascular Permeability of Individual Microvessels” Published one paper.
1997—2000	Jin Yuan, PhD / Currently: Senior Research Scientist at Genocoea Biosciences Postdoctoral, Project title: “Fluid Dynamics and Leukocyte Adhesion” Published three papers.
2001-2002	Cristina Sousa / Doctoral, Project title: “Trafficking of Lymphocytes and Metastatic Cancer Cells”
1998-1999	Gerald Koenig, MD, PhD / Currently: Cardiologist, Henry Ford West Bloomfield Hospital, MI Postdoctoral, Project title: “Biophysics of Lymphocyte Adhesion in Tumors” Published one manuscript, granted F32 Fellowship, co-authored patent.
1998—2000	Yong Chang, PhD / Currently: Vice President at Intellia Therapeutics, Inc. Postdoctoral, Project title: “Hydraulic Conductivity and Permeability of Endothelial Monolayers” Published three papers, one in <i>PNAS</i> .
1998—2000	Randall Dull, MD, PhD / Currently: Presidential Endowed Chair in Anesthesiology, Director, Lung Vascular Biology Laboratory, Associate Professor, Bioengineering, University of Utah Postdoctoral, Project title: “PIGF-VEGF Synergy in Endothelial Responses” Published two papers.
1998—2001	Emmanuelle di Tomaso, PhD / Currently: Vice President, Translational Medicine, Syros Pharmaceuticals, Cambridge MA Postdoctoral, Project title: “Permeability of Brain Tumor Vasculature” Published four papers, one in <i>Cancer Research</i> and one in <i>PNAS</i> ; received Claflin Distinguished Scholar Award, and Martin Prize
2000—2001	Cristiano Migliorini, PhD / Currently: Executive Director at Bank Vontobel AG, Geneva, Switzerland Postdoctoral, Project title: “Modeling Fluid Dynamics and Leukocyte Adhesion” Published three papers.

- 2000-2002 **Robert Campbell, PhD**/ Currently: Associate Professor, Massachusetts College of Pharmacy and Health Sciences
Postdoctoral, Project title: "Delivery of Liposomes to Tumor Vessels"
Published one paper, *Cancer Research*.
- 2000-2003 **Maximilian Bockhorn, MD, PhD**/ Currently: Surgeon, Department of General & Transplant Surgery; University Hospital, Essen, Germany
Postdoctoral, Project title: "Analysis of Cancer Cells Shed from a Solid Tumor"
Published two papers, *Lancet Oncology* and *Cancer Research*.
- 2000-2003 **Neil Forbes, PhD**/ Currently: Professor, U. Massachusetts Amherst
Postdoctoral, Project title: "Treating Tumors with Penetrating Bacteria"
Published one paper, *Cancer Research*.
- 2002-2006 **Chenghai Sun, PhD**/ Currently: Sr. Research Scientist, Exa Corp., Burlington, MA
Postdoctoral, Project title: "Lattice-Boltzmann Modeling of Hemodynamics"
Published five papers, two in *Biophysical Journal*.
- 2003-2007 **Aaron Mulivor, PhD**/ Currently: Senior Associate, Pharma & Life Sciences Advisory at PwC
Postdoctoral, Project title: "Blood Dynamics and Atherosclerosis"
- 2004-2008 **Michael Dupin, PhD**/ Currently: Director of PPNR Analytics, SVP at Citizens Bank, Boston, MA
Postdoctoral, Project title: "3D Simulation of Blood Rheology"
Published three papers.
- 2004-2010 **Janet Tse**/ Currently: Patent Agent, Nixon Peabody LLP, Boston
Doctoral, Project title: "Tumor Solid Stress"
Published 1 paper, *PNAS*.
- 2005-2009 **Gang Cheng, PhD**/ Currently: Head of Scientific Liaison at Roche China
Postdoctoral, Project title: "Cellular mechanisms of Angiogenesis"
Published 2 papers, one in *Blood*.
- 2006-2009 **James Alex Tyrrell, PhD**/ Currently: SVP, Health & Advanced Technology at Wolters Kluwer
Postdoctoral, Project title: "Quantitative Image Analysis of Vascular Networks"
Published three papers. Co-authored successful R01 application (R01CA149285).
- 2006-2011 **Delphine Lacorre, PhD** / Currently: Research Engineer, Lille, France
Postdoctoral, Project title: "Effects of Vascular Normalization on Drug Delivery"
Published two papers; received Komen Fellowship.
- 2006-2011 **Walid Kamoun, PhD**/ Currently: Vice President, Global Head of R&D Oncology at Servier
Postdoctoral, Project title: "Blood Flow Distribution in Tumors"
Published five papers, one in *Nature Methods*; received Komen Fellowship.
- 2008-2011 **Temitope Sodunke, PhD**/ Currently: Strategy, Innovation, Medical Device Professional at BD
Postdoctoral, Project title: "Stromal Determinants of Cancer Cell Invasion"
Received Merck Postdoctoral Fellowship.
- 2008-2011 **Abhishek Jain, PhD**/ Currently: Assistant Professor, Texas A&M;
Doctoral, Project title: "Blood Microfluidics"
Published three papers, one in *Lab Chip*
- 2008-2014 **Jonathan Song, PhD** / Currently: Associate Professor, Ohio State University
Postdoctoral, Project title: "Fluid forces control endothelial morphogenesis"
Published three papers, *PNAS*, *Lab Chip*, *Integrative Biology*

- 2010-2015 **Christian Kunert, PhD/** Currently: Amgen, Cambridge, MA
Postdoctoral, Project title: "Mechanobiology of lymphatic transport"
Received DFG Fellowship; publication in *PNAS*
- 2011-2015 **Gabriel Gruionu, PhD/** Currently: Instructor, Massachusetts General Hospital
Postdoctoral, Project title: "Determinants of vascular remodeling in tumors"
Published 2 patents and one paper
- 2011-2016 **Despina Bazou, PhD**
Postdoctoral, Project title: "Endothelial dynamics and tumor tissue engineering"
Published 5 papers
- 2012-2019 **Nir Maimon, PhD**
Postdoctoral, Project title: "Communication between blood vessel cells in tumors"
- 2014-2019 **Hadi Tavakoli Nia, PhD/** Currently: Assistant Professor, Boston University
Postdoctoral, Project title: Quantifying tumor mechanopathologies
- 2017-2019 **Huabing Li, PhD**
Postdoctoral, Project title: "Lymphatic valve mechanics"
- 2018-2020 **Mohammad Reza Nikmaneshi**
Doctoral, Project title: "Tumor tissue engineering and computational modeling"
- 2020-2021 **Tuoye Xu**
Postdoctoral, Project title: "Stress-induced tumor immune suppression"
- 2022-2023 **Stacie (Si) Chen**
Postdoctoral, Project title: "Mechanobiology of glioma immune suppression"
- 2020-2024 **Mohammad Razavi**
Postdoctoral, Project title: "Systems biology of anti-cancer immunity"
- 2022-2024 **Kohji Uzawa**
Postdoctoral, Project title: "Role of the glycocalyx in anti-cancer immunity"
- 2020-present **Meghan O'Melia**
Postdoctoral, Project title: "Lymphatic regulation of anti-tumor immunity"
- 2023-present **Mohammad Reza Nikmaneshi**
Postdoctoral, Project title: "Tumor Immunotherapy and Personalized Medicine"
- 2023-present **Julia Linke**
Doctoral, Project title: "Mechanobiology of cancer immunology"
- 2024-present **Xingjian Zhang**
Doctoral, Project title: "Glycocalyx immune mechanobiology"

Local Invited Presentations

No presentations below were sponsored by outside entities

- November 3, 2008 *"Multiscale analyses of blood dynamics."* Martinos Center for Biomedical Imaging, Neurovascular Seminar Series, MGH, Charlestown, MA

- October 14, 2009 *"Blood dynamics and tumor micro-anatomy."* Harvard Catalyst, Center for Nanoscale Systems Special Seminar: Applying Nanoscale Technologies in Biomedical Research, Cambridge MA.
- November 5, 2010 *"Connection of vascular networks via wrapping-and-tapping anastomosis."* Boston Angiogenesis Meeting, MEEI, 2010, Boston MA
- March 8, 2011 *"Microanatomy and mechanobiology: how the cell microenvironment influences coordinated migration and vascular morphogenesis."* Topics in Bioengineering Seminar Series, Harvard School of Engineering and Applied Sciences (SEAS), Cambridge, MA.
- April 21, 2013 *"Mechanobiology of Vascular Dynamics."* Mechanical Forces in Development meeting, Tufts Medical School, Boston
- November 7, 2013 *"Biomechanical control of vessel morphogenesis, adaptation and function."* Boston Angiogenesis Meeting, MEEI, 2013, Boston MA
- March 8, 2013 *"Vascular Biology and Mechanobiology."* MGH T32 Lecture Series
- November 4, 2015 *"Untangling tumor vasculature."* Boston Angiogenesis Meeting, MEEI, 2015, Boston MA
- March 9, 2020 *"Physical Traits of Cancer,"* Physics Seminar Series, Department of Radiation Oncology, Massachusetts General Hospital, Boston
- November 9, 2020 *"Physical Traits of Cancer."* Ludwig Center, Harvard Medical School
- January 26, 2021 *"Systems Biology Modeling of COVID-19."* Nanomedicine Academy at Northeastern University Lecture Series
- December 13, 2021 *"Identifying COVID-19 Patient Phenotypes and Biomarkers using Mathematical Modeling."* Ludwig Center, Harvard Medical School

Report of Regional, National and International Invited Teaching and Presentations

Those presentations below sponsored by outside entities are so noted and the sponsor is identified.

Invited Presentations and Courses

Regional

- March 31, 2009 *"Multi-scale Analyses of tumor physiology and blood vessel dynamics."* 2009 Seminar Series, Center for Fluid Dynamics, Brown University, Providence, RI.

National

- July 23-28, 1995 *"The Role of Erythrocytes in Leukocyte-Endothelial Interactions."* Annual Conference on Biorheology and Clinical Hemorheology, Big Sky, MT.
- October 4-6, 1996 *"Quantification of Metastatic Cell Arrest, Extravasation, and Colonization."* Annual Meeting of the Biomedical Engineering Society, Penn State University.
- June 4, 1999 *"Molecular Determinants of Tumor Pathophysiology."* American Association of Clinical Chemistry Meeting, Boston, MA
- June 25-26, 1999 *"Transvascular Transport in Tumors."* 8th Annual Workshop on Advanced Methods of Pharmacokinetic and Pharmacodynamic Systems Analysis, Los Angeles, CA.
- Jan 11-15, 2000 *"Visualization and Quantification of Gene Function in Vivo."* Quantitative Challenges in the Post-genomic Sequence Era: A Workshop and Symposium, San Diego, CA
- January 19, 2001 *"Tumor Angiogenesis at the Cellular Level."* (Mayo Clinic) Mayo Clinic Goldman Symposium on Innovative Research in Multiple Myeloma, Amelia Island, FL

- April 29, 2001 *"Vascular Development and Anti-angiogenic Strategies."* Pediatric Academic Societies' 2001 Annual Meeting, Baltimore, MD
- November 8, 2001 *"Modeling leukocyte adhesion in small vessels: a Lattice Boltzmann approach."* Plenary Talk (selected abstract), American Institute of Chemical Engineering Annual Meeting, Reno, NV
- September 6-8, 2002 *"Tumor Physics and Biology: Impact of Aberrant Vascular Architecture on Therapy."* Third Annual BioMEMs & Biomedical Nanotechnology World 2002 Columbus, OH
- October 25, 2002 *"Influence of Vessel Geometry on Leukocyte Adhesion: a Lattice-Boltzmann Model."* Annual Meeting of the Biomedical Engineering Society, Houston, TX.
- February 27, 2003 *"Tumor Vessel Abnormalities and Leukocyte-Erythrocyte Dynamics."* Penn State University, State College, PA
- November 11, 2004 *"Microfluidic device for auto-separation of white blood cells from whole blood."* Plenary Talk (selected abstract), American Institute of Chemical Engineering Annual Meeting, Austin, TX
- December 1, 2004 *"Reverse engineering of blood cell dynamics."* City College of New York, Fall 2004 Seminar Series, Department of Biomedical Engineering
- February 17-21, 2005 *"The Tumor Microenvironment: Modeling and Experimental Validation."* Mathematical Oncology: Bridging the Scientific Divide, AAAS Annual Meeting, Washington DC
- May 10, 2005 *"Biomimetic Design of a Microfluidic Device for Auto-separation of Leukocytes from Whole Blood."* NSTI Nanotechnology Conference, Anaheim CA
- December 18-19, 2006 *"Microfluidics and particle transport in tumors."* Fine Particle Society Nanotechnology in Life Sciences Symposium, San Diego, CA
- December 18-21, 2006 *"Biomimetic Design of a Microfluidic Device for Auto-separation of Leukocytes from Whole Blood."* Symposium on Nanotechnology in Life Sciences 20th International Conference on Bio and Pharmaceutical Science and Technology, San Diego, CA
- October 2-4, 2008 *"Isolation of Rare Cells from Whole Blood Using Microfluidics."* Plenary Talk (selected abstract), Annual Meeting of the Biomedical Engineering Society, St Louis, MA
- October 26-28, 2008 *"Isolation of Rare Cells from Whole Blood Using Microfluidics."* NCI Innovative Molecular Analysis Technologies (IMAT) program, Cambridge, MA
- November 30, 2008 *"Isolation of Rare Cells from Whole Blood Using Microfluidics."* Materials Research Society: Cancer Nanotechnology Med School- Real World Challenges and Nano's Strengths in Cancer Prevention, Diagnosis, and Treatment, Boston, MA
- January 26-30, 2009 *"Multi-scale tumor physiology and blood vessel dynamics."* Mathematical Biosciences Institute Workshop on Cancer Development, Angiogenesis, Progression and Invasion, Columbus, OH
- October 8, 2009 *"Tumor blood vessel dynamics."* Quantitative Pharmacology Technical Summit (Eli Lilly), Indianapolis, IN
- October 7-10, 2009 *"Tumor blood vessel dynamics."* Plenary Talk (selected abstract), Annual Meeting of the Biomedical Engineering Society, Pittsburgh, PA
- November 23, 2009 *"Tumor blood vessel dynamics."* 62nd Annual Meeting of the APS Division of Fluid Dynamics, Minneapolis, Minnesota
- April 24-28, 2010 *"Wrapping-and-tapping anastomosis between engrafted endothelial networks and host vasculature."* Plenary Talk (selected abstract), Experimental Biology Meeting, Anaheim, CA
- October 6-8, 2010 *"Wrapping-and-tapping anastomosis between engrafted endothelial networks and host vasculature."* Plenary Talk (selected abstract), Annual Meeting of the Biomedical Engineering Society, Austin, TX

- November 1-2, 2010 *"Compression-induced cancer cell invasion: don't push me 'cause I'm close to the edge."* UCSD/NSF Physics of Cancer Metastasis Meeting Arlington, VA
- April 3-6, 2011 *"Tumor vessel dynamics during anti-angiogenic therapy."* American Conference on Pharmacometrics, San Diego, CA
- Aug 30-Sept 3, 2011 *"Cell-Matrix Interactions within Tumors and Normal Tissue."* 33rd Annual International Conference of the IEEE Engineering in Medicine and Biology Society Boston, MA
- March 7, 2011 *"Tumor blood vessel dynamics."* Physical Sciences – Oncology Center Steering Committee meeting
- October 28, 2011 *"Imaging vascular dynamics"* Multiscale Systems Biology working group of the Multiscale Modeling (MSM) Consortium
- October 24, 2012 *"Solid and Fluid Biomechanics in the Tumor Environment"*. US National Committee on Biomechanics 4th Symposium on Frontiers in Biomechanics: Mechanics in Oncology
- April 2, 2013 *"Mechanobiology and Vascular Dynamics,"* IME Seminar Series, University of Pennsylvania
- September 27, 2013 *"Biomechanical determinants of cell invasion, angiogenesis and lymphatic function."* Custer Workplace Lecture Series, University of Western Michigan
- October 15, 2014 *"Biomechanics of cancer invasion and vessel function."* Mathematical Biosciences Institute Workshop on Metastasis and Angiogenesis, Columbus, OH.
- April 3, 2015 *"Deconvolving tumor dynamics."* Department of Mechanical and Aerospace Engineering Seminar Series, Ohio State University
- March 29, 2016 *"Deconvolving tumor dynamics."* Rice University's Bioengineering Colloquium
- October 27, 2016 *"Systems Biology of Lymph Transport."* NHLBI Systems Biology meeting, Bethesda, MD.
- April 10, 2018 *"Tumor Engineering and Mechanobiology."* Department of Chemical and Biomolecular Engineering Seminar Series, Ohio State University
- September 7, 2018 *"Engineered tumors for personalized medicine."* Duke University Lecture Series, Durham, NC
- March 5, 2019 *"Reverse engineering tumors and vasculature."* (Keynote) University of North Carolina Integrative Vascular Biology research symposium. Chapel Hill, NC
- September 12, 2019 *"Mechanobiological control of vascular function."* American Physiological Society meeting, Interface of mathematical models and experimental biology: Role of microvasculature. Scottsdale, AZ
- January 20, 2020 *"Reengineering the Physical Microenvironment of Tumors to Improve Treatment Response"* Cambridge Healthtech Institute; Engineering Next Generation Cancer Immunotherapies; Part of the 19th Annual PepTalk, San Diego, CA
- July 20, 2020 *"Optimizing treatment for COVID-19 using computational modelling: Implications for cancer patients."* AACR Virtual Meeting: COVID-19 and Cancer
- October 6-9, 2021 *"In Silico Dynamics of COVID-19 Phenotypes for Optimizing Clinical Management,"* Annual Meeting of the Biomedical Engineering Society, Orlando, FL
- November 18, 2021 *"Deconstructing and Reconstructing the Tumor Environment,"* Distinguished Lecture Series, Simbiosys, Chicago
- December 1, 2021 *"Systems Biology of Inflammation and The Tumor Environment,"* Mechanical and Industrial Engineering Department Seminar Series, New Jersey Institute of Technology
- October 24, 2022 *"Systems Biology Modeling of Tumor Immunotherapy,"* American Association for Cancer Research Meeting, Tumor Immunology and Immunotherapy. Boston, MA
- November 10, 2022 *"A chemical Engineer's Journey into Cancer Research,"* Howard University Chemical Engineering
- November 9, 2023 *"The Impact of Mechanical Stress on Glioblastoma Biology,"* NCI CSBC / PS-ON Investigators Meeting. Bethesda, MD

International

- August 25-30, 1996 *"Interaction of Activated Leukocytes with Tumor Vessels."* Sixth World Congress for Microcirculation, Munich, Germany
- October 3-7, 1998 *"Tumor Angiogenesis and Microcirculation."* 10th Annual Conference of the International Society of Differentiation, Houston, TX
- Oct 22-25, 1999 *"Tumor Angiogenesis."* Conference on Angiogenesis and Tumors, Paris, France
- Oct 12-15, 2002 *"Tumor Vessel Abnormalities."* Second Interdisciplinary Euroconference on Angiogenesis, Cascais, Portugal
- April 23-24, 2004 *"The interaction of circulating cells with tumors: pharmacokinetic and fluid dynamic models."* Workshop on Mathematical Oncology, The Fields Institute, Toronto, ON
- August 1, 2006 *"Tumor vessel abnormalities affect blood cell dynamics and flow distribution."* Cancer and Bioengineering; World Congress of Biomechanics, Munich Germany
- July 2-4, 2008 *"Multi-scale analyses of tumor physiology and blood vessel dynamics."* Fields Institute Workshop on Growth and Control of Tumors: Theory and Experiment Toronto, CA
- July 9-13, 2008 *"Blood dynamics in normal and abnormal vessel networks."* International Congress of Biorheology, Penn State University, State College, PA
- January 4-7, 2010 *"Modeling Tumor blood vessel dynamics."* Workshop on Mathematical Methods in Systems Biology, Tel Aviv, Israel
- March 18-20, 2010 *"Modeling Tumor blood vessel dynamics."* Fields Institute Workshop on Mathematical Oncology Toronto, CA
- May 10-12, 2010 *"Modeling Tumor blood vessel dynamics."* Centre European de Calcul Atomique et Moléculaire (CECAM) Workshop on Trends in Computational Hemodynamics, Lausanne, Switzerland
- Sept. 17-20, 2011 *"Vascular dynamics and anti-angiogenic therapy."* Tumor -Vessel Interface meeting, Kloster Seeon Germany
- March 28-30, 2011 *"Targeting vascular dynamics."* VIIIth Academician Nicolae Cajal Symposium, Bucharest, Romania
- December 3, 2013 *"Biomechanical determinants of morphogenesis and vascular function"* Institut Curie, Paris France
- May 29-30, 2014 *"Microsystems for probing blood, vessel and tumor dynamics."* (Keynote) Ontario-on-a-Chip Conference, University of Toronto, Toronto, CA
- July 6-11, 2014 *"Biomechanical Control of Vessel Morphogenesis, Adaptation and Function."* Seventh World Congress of Biomechanics, Boston, MA
- July 6-11, 2014 *"Biomechanical autoregulation of lymphatic transport."* Seventh World Congress of Biomechanics, Boston, MA
- October 2-8, 2014 *"Biomechanical processes and topological dynamics in tumors"* Annual Symposium of Physics of Cancer, University of Leipzig
- June 25-28, 2016 *"Visualizing cell and matrix dynamics in tumors"* AACR Special Conference on Engineering and Physical Sciences in Oncology, Westin Boston Waterfront, Boston, MA
- February 5-9, 2017 *"Tumor solid stress and mechanobiology"* Physical Science of Cancer Gordon Research Conference, Galveston, TX
- Dec. 7-10, 2017 *"Accelerating revascularization."* Innovations in Wound Healing Conference, Bimini, Bahamas.

July 10, 2018	"Leaky Blood Vessels, GAGs and Metastasis" World Congress of Biomechanics 2018, Dublin, Ireland
June 1, 2020	"Physical Hallmarks of Cancer," Third Workshop on Hallmarks in cancer and the development of diagnostic tools, Porto, Portugal. [Cancelled due to COVID-19 pandemic] In Vitro Systems for Deconvolving Tumor Dynamics
August 30, 2021	"The impact of tumor-generated forces on cell biology and immunotherapy" 12th symposium, Physics of Cancer, University of Leipzig
October 27, 2021	Keynote talk, "In Vitro Systems for Deconvolving Tumor Dynamics," FoReCaST Conference on 2D and 3D In Vitro Tissue Models for Drug Screening, Porto, Portugal.
June 14, 2024	"Systems Biology of Tumor Immunology" Université de technologie de Compiègne, Compiègne, France

Report of Scholarship

Publications

Peer reviewed publications in print or other media

[more than 30,000 citations; h-index= 81 (Google), 71 (Web of Science)]

Research Investigations

1. **Munn LL**, Glacken MW, Mcintyre BW, Zygorakis K. Analysis of lymphocyte aggregation using digital image analysis. *J Immunol Methods*. 1993; 166:11-25.
2. Teague TK, **Munn L**, Zygorakis K, Mcintyre BW. Analysis of lymphocyte activation and proliferation by video microscopy and digital imaging. *Cytometry*. 1993; 14:772-82.
3. **Munn LL**, Melder RJ, Jain RK. Analysis of cell flux in the parallel plate flow chamber: implications for cell capture studies. *Biophys J*. 1994; 67:889-95.
4. Melder RJ, **Munn LL**, Yamada S, Ohkubo C, Jain RK. Selectin- and integrin-mediated T-lymphocyte rolling and arrest on TNF-alpha-activated endothelium: augmentation by erythrocytes. *Biophys J*. 1995; 69:2131-8.
5. **Munn LL**, Koenig GC, Jain RK, Melder RJ. Kinetics of adhesion molecule expression and spatial organization using targeted sampling fluorometry. *Biotechniques*. 1995; 19: 622-6, 628-31.
6. Melder RJ, Koenig GC, **Munn LL**, Jain RK. Adhesion of activated natural killer cells to tumor necrosis factor-alpha-treated endothelium under physiological flow conditions. *Nat Immun*. 1996a; 15:154-63.
7. Melder RJ, Koenig GC, Witwer BP, Safabakhsh N, **Munn LL**, Jain RK. During angiogenesis, vascular endothelial growth factor and basic fibroblast growth factor regulate natural killer cell adhesion to tumor endothelium. *Nat Med*. 1996b; 2:992-7.
8. **Munn LL**, Melder RJ, Jain RK. Role of erythrocytes in leukocyte-endothelial interactions: mathematical model and experimental validation. *Biophys J*. 1996; 71:466-78.
9. Patan S, **Munn LL**, Jain RK. Intussusceptive microvascular growth in a human colon adenocarcinoma xenograft: a novel mechanism of tumor angiogenesis. *Microvasc Res*. 1996; 51:260-72.
10. Neelamegham S, **Munn LL**, Zygorakis K. A model for the kinetics of homotypic cellular aggregation under static conditions. *Biophys J*. 1997; 72:51-64.
11. Shioda T, **Munn LL**, Fenner MH, Jain RK, Isselbacher KJ. Early events of metastasis in the microcirculation involve changes in gene expression of cancer cells. Tracking mRNA levels of metastasizing cancer cells in the chick embryo chorioallantoic membrane. *Am J Pathol*. 1997; 150:2099-112.
12. Lichtenbeld HC, Ferrara N, Jain RK, **Munn LL**. Effect of local anti-VEGF antibody treatment on tumor microvessel permeability. *Microvasc Res* 1999; 57:357-62.
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Patents

Method for mitigating metastasis
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System and method for measuring solid stress in tissues
G Gruionu, L Gruionu, LL Munn, RK Jain
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