CURRICULUM VITAE

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Education:

1972 B. Tech., Chemical Engineering, Indian Institute of Technology, Kanpur, India
1974 M.S., Chemical Engineering, University of Delaware, Newark, DE
1976 Ph.D., Chemical Engineering, University of Delaware, Newark, DE

PRIMARY APPOINTMENTS:

1976-1978 Assistant Professor of Chemical and Biomedical Engineering
Columbia University, New York, NY
1978-1979 Assistant Professor of Chemical and Biomedical Engineering
1979-1983 Associate Professor of Chemical and Biomedical Engineering
1983-1991 Professor of Chemical and Biomedical Engineering
Carnegie Mellon University, Pittsburgh, PA
1991- Andrew Werk Cook Professor of Radiation Oncology (Tumor Biology)
Harvard Medical School, Boston, MA
1991- Director, Edwin L. Steele Laboratories for Tumor Biology
Department of Radiation Oncology, Massachusetts General Hospital, Boston, MA
1991- Affiliated Faculty, Harvard-MIT Division of Health Sciences and Technology,
Massachusetts Institute of Technology, Cambridge, MA
2001- Member, Biological and Biomedical Sciences Program, Harvard Medical School
2020- Associate Member, Broad Institute

VISITING PROFESSORSHIPS (SABBATICALS):

7/83 - 12/83 Visiting Professor of Chemical Engineering and Guggenheim Fellow
Massachusetts Institute of Technology, Cambridge, MA
1/84 - 4/84 Visiting Professor of Bioengineering and Guggenheim Fellow
University of California, San Diego, La Jolla, CA
4/84 - 6/84 Visiting Professor of Radiology and Guggenheim Fellow
Stanford University Medical School, Stanford, CA
8/90 - 1/91 Visiting Professor of Pathophysiology and Senior Scientist Awardee, Humboldt Foundation
University of Mainz, Mainz, Germany
2/91 - 5/91 Visiting Professor of Surgical Research and Senior Scientist Awardee, Humboldt Foundation
University of Munich, Munich, Germany

AWARDS AND HONORS

1979 George Tallmann Ladd Award, Carnegie Mellon University
1980-1985 Research Career Development Award, National Cancer Institute
1983 B.F. Ruth Lecturer, Iowa State University, Ames
1983 Allan P. Colburn Lecturer, University of Delaware, Newark
1983-1984 Guggenheim Fellow
1984 Research Award, International Institute for Microcirculation
1986 Hugh C. Muldoon Lecturer, Duquesne University, Pittsburgh
1990 Abbott Microcirculation Award, European Society for Microcirculation
1990-1991 Senior Scientist Award, Alexander von Humboldt Foundation, Germany
1992 Founding Fellow, American Institute for Medical and Biological Engineering
1992 Kurt Wohl Lecturer, University of Delaware, Newark
1993 Instrumentation for Physiology and Medicine Award, Microcirculation Society
1993-2000 Outstanding Investigator Grant, National Cancer Institute
1994 Distinguished Alumnus Award, Indian Institute of Technology, Kanpur
1994 Instrumentation for Physiology and Medicine Award, Microcirculation Society
1995 Whitaker Distinguished Lecturer, Biomedical Engineering Society

1996 Eugene M. Landis Award, Microcirculatory Society
1996-1999 Board of Directors, Biomedical Engineering Society
1999 William D. Kaplan Lecturer in Nuclear Medicine, Harvard Medical School
1999 Berkeley Lecturer, University of California, Berkeley
2000 Pharmaceutical and Bioengineering Award, American Institute of Chemical Engineers
2001 Honorary Fellow, Indian Institute of Chemical Engineers
2002 Gerritsen Award, Microcirculatory Society
2003 Alumni Wall of Fame, University of Delaware
2003 Elected to the National Academy of Medicine (formerly Institute of Medicine) (NAM)
2004 Elected to the National Academy of Engineering (NAE)
2004 Robert Bras Lecturer, Princess Margaret Hospital and National Cancer Institute of Canada
2005 John S. Laughlin Lecturer, Memorial Sloan-Kettering Cancer Center, New York
2005 Academic Scientist of the Year, 2005 Pharmaceutical Achievement Awards
2005 Distinguished Service Award, Nature Biotechnology-Miami Symposium on Angiogenesis
2006 Outstanding Achievement Award, Society of American Asian Scientists in Cancer Researc
2006 Robert L. Krigel Lecture, Fox Chase Cancer Center, Philadelphia
2006 Alpha Chi Sigma Research Award, American Institute of Chemical Engineers
2006 Benjamin Zweifach Distinguished Lecture, The City College, New York
2007 Research Team Award, Clinical Research Day, MGH
2007 Sam Gerson Leadership Chair of Research, Brain Tumor Society
2008 Richard D. Frisbee III Oncology Lecture, Yale University
2008 Sir Godfrey Hounsfield Medal and Lecture, Imperial College, London
2008 Peter C. Reilly Lectures, University of Notre Dame, Indiana
2008 Charles G. Moertel Lecture, Mayo Clinic, Rochester, Minnesota
2008 Ashland Distinguished Lecture, University of Kentucky, Lexington, Kentucky
2008 William E. Schiesser Lecture, Lehigh University, Bethlehem, Pennsylvania
2008 Elected to the American Academy of Arts and Sciences
2009 Benjamin Zweifach Lecture, University of California, San Diego, California
2009 Eli Ruckenstein Lecture, State University of New York, Buffalo
2009 Elected to the National Academy of Sciences (NAS)
2010-15 Breast Cancer Research Innovator Award, Department of Defense Breast Cancer Program
2010 Joseph Martin Prize for Excellence in Clinical Research, MGH
2010 Pirkey Lecture, University of Texas at Austin
2010 Kelley Lectures, Purdue University
2010 William B. Lowrie Lecture, Ohio State University
2010 Wagner Lecture, University of Michigan
2011 Distinguished Research Lecturer, Carnegie Mellon University
2011 Roland T. Lakey Award, Wayne State University
2011 American Cancer Society Basic Science Lecture, Society of Surgical Oncology
2011 Rous-Whipple Award, American Society of Investigative Pathology
2011 Irving O. Shoichet Lecture, University of Toronto, Canada
2012 One of the 18 Indians Doing Cutting-Edge Research, Forbes (India)
2012 Herman Schwan Lecture, University of Pennsylvania
2012 ASCO Science of Oncology Award and Lecture, American Society of Clinical Oncology
2013 Gerritsen Award, Microcirculation Society (for the most cited review in the past 5 years)
2014 Fellow, National Foundation for Cancer Research
2014 Earl Bakken Distinguished Lecture, Amer. Institute for Medical and Biological Engineering
2014 Gerritsen Award, Microcirculation Society (for the most cited review in the past 5 years)
2014 AACR-Princess Takamatsu Lecture/Award, American Association for Cancer Research
2014 One of 50 Oncology Luminaries, American Society of Clinical Oncology (ASCO)
2014- One of the top 1% cited researchers in Clinical Medicine, Thomson Reuters
2014 Most cited paper (2013), Annals of Biomedical Engineering
2014 **Fellow, American Association for the Advancement of Science (AAAS)**
2015 **Foreign Fellow, Indian National Science Academy (INSA)**
2015 Honorary Doctorate, Katholieke Universiteit Leuven, Belgium
2015 Methusalem Lecture, Katholieke Universiteit Leuven, Belgium

2015 Honorary Doctorate, Indian Institute of Technology (IIT), Kanpur, India
2015 Arabindo Nath Bose Distinguished Lecture, IIT-Kanpur, India
2015 Alan S. Michaels Distinguished Lecture in Medical and Biological Engineering, MIT
2015 ASGBI Lecture, Association of Surgeons of Great Britain & Ireland, Manchester, UK
2015 Honorary Doctorate, Duke University
2015-22 Outstanding Investigator Award, National Cancer Institute
2015 Fredrickson Lecture, University of Minnesota
2016 Princess Takamatsu Cancer Research Fund International Lecturer, Japan
2016 One of the Most Influential/Cited Authors on the 75th Anniversary of Cancer Research
2016 R. B. Trull Lecture, University of Texas, Austin
2016 United States National Medal of Science (for 2013)
2017 Lifetime Achievement Award, American Assoc. of Indian Scientists in Cancer Research
2017 Ramzi Cotran Lecture, Harvard Medical School/Boston Children's Hospital
2017 New England Choice Award
2017 Elected to the National Academy of Inventors
2018 Maud Menten Lecture, University of Pittsburgh
2018 Earl Benditt Award, North American Vascular Biology Organization
2019 Judah Folkman Lecture, Harvard Medical School/Boston Children's Hospital
2019 Jeffrey M. Isner Memorial Lecture, Tufts University School of Medicine
2020 Fellow, American Association for Cancer Research (AACR) Academy
2022 Inaugural Dr. Youcef Rustum Lecture, Roswell Park Cancer Center, Buffalo, NY
2022 International Honorary Member, Japanese Cancer Association
2022 Albert Szent-Györgyi Prize for Progress in Cancer Research, NFCR
2023 Smith Family Foundation Lecture, MD Anderson Cancer Center
2023 Honorary Doctorate, University of Delaware
2024 2023 Cozzarelli Prize Finalist, Proceedings of the National Academy of Science
2024. Inaugural Fellow of the Asian American Academy of Science and Engineering

MEMBER, EDITORIAL BOARD

1985- Biotechnology Progress
1985-2023 Microvascular Research
1986-1995 CRC Critical Reviews in Biomedical Engineering
1987-2007 Cancer Research
1991- Drug Delivery
1994-2001 Microcirculation
1997- Angiogenesis
1997-2010 British Journal of Cancer
1997- International Journal of Oncology
1997-2005 Journal of Theoretical Medicine
2002- Molecular Imaging
2002- Clinical Cancer Research
2003- Lymphatic Research and Biology
2004- 2012 Nature Reviews Cancer
2004-2012 Molecular Cancer Research (Senior Editor)
2005-2007 Computational and Mathematical Methods in Medicine
2008- Nature Clinical Practice Oncology/Nature Reviews Clinical Oncology
2010-2015 Journal of Clinical Oncology
2009- Nanomedicine
2012- IntraVital
2014- Molecular Cancer Therapeutics
2014- Lymphatic Research and Biology
2015-18 JAMA Oncology
2015- PNAS

GOVERNMENT AND INDUSTRIAL ADVISORY ROLE (SELECTED)

1988-1990 Consultant, DuPont Merck Pharmaceuticals, Wilmington
1988-1993 Consultant, Hybritech-Lilly, San Diego

1989-1991 Member, Advisory Board, Pittsburgh Biomedical Development Corp.
1993-1995 Member, Board of Directors, American Cancer Society (Massachusetts Division)
1994-1997 Member, Scientific Advisory Board, CytoTherapeutics, Providence, RI
1994-1997 Member, Scientific Advisory Board, Peregrine Pharmaceuticals, Princeton, NJ
1996-1999 Member, Board of Directors, Biomedical Engineering Society
1997-1998 Member, Scientific Advisory Board, Oncologic, Boston, MA
1998 -2001 Consultant, Alkermes, Cambridge, MA
1999-2002 Member, Scientific Advisory Board, Sangart, San Diego, CA
2000 Consultant, Bracco Research USA, Princeton, NJ
2000 Consultant, Janssen Pharmaceutical Research Foundation, Titusville, NJ
2000 Member, Oncology Advisory Board, AMGEN Inc., Thousand Oaks, CA
2000-2004 Member, Scientific Advisory Board, American Biosciences Inc., Santa Monica, CA
2001-2010 Consultant, AstraZeneca, London, UK
2001-2002 Member, Genentech BioOncology Advisory Board, So. San Francisco, CA
2002 Consultant, Advanced Research Technologies, Inc., Montreal, Canada
2002 Consultant, Genetic Therapy, Inc., Gaithersburg, MD
2003-2008 Member, Board of Associates, Whitehead Institute for Biomedical Research
2003 Consultant, Archemix Corporation, Cambridge, MA
2004 Consultant, FibroGen, South San Francisco, CA
2004 Consultant, Domantis, London, UK
2004 - Consultant, Gershon Lehman Group, New York, NY
2004 -2009 Member, Scientific Advisory Committee on Biotechnology, Government of India
2005 -2011 Consultant, Dyax, Cambridge, MA
2005 Consultant, Novartis, Basel, Switzerland
2006 Consultant, Nektar Therapeutics, San Carlos, CA
2006 Consultant, ThromboGenics, New York, NY
2007-2014 Member, Board of Trustees, H&Q Healthcare Investors, Boston, MA
2007-2014 Member, Board of Trustees, H&Q Life Sciences Investors, Boston, MA
2007- Member, Scientific Advisory Board, Enlight Biosciences, Boston, MA
2007- Member, Scientific Advisory Board, SynDevRx, Boston, MA
2008 Consultant, Millennium Pharmaceuticals, Inc., Cambridge, MA
2009 Consultant, MorphoSys AG, Martinsried, Germany
2009 Consultanat, Regeneron Pharmaceuticals, Inc., Tarrytown, NY
2010 Consultant, Genzyme, Waltham, MA
2010 Consultant, Astellas Pharma Europe, Leiderdorp, the Netherlands
2010-13 Consultant, Noxxon, Berlin, Germany
2010-14 Research Innovator Award,
2012-18 Co-Founder & Member, Board of Directors, XTuit Pharmaceuticals, Inc., Waltham, MA
2012-17 Advisory Committee for International Research-Intensive Center of Excellence, Taiwan
2012 Zyngenia, Gaithersburg, MD
2014-19 Ophthotech, Consultant, New York, NY
2014-23 Member, Board of Trustees, Tekla Healthcare Opportunities Fund, Boston, MA
2014-23 Member, Board of Trustees, Tekla Healthcare Investors, Boston, MA
2014-23 Member, Board of Trustees, Tekla Life Sciences Investors, Boston, MA
2015-23 Member, Board of Trustees, Tekla World Healthcare Fund, Boston, MA
2015-22 Consultant, Sun Pharma Advanced Research Company, Ltd. (SPARC), India
2016 Consultant, Pfizer, Cambridge, MA
2017 Consultant, Merck, Kenilworth, NJ
2017 Scientific Advisory Board, Center for Cancer Biology, VIB - KU Leuven, Belgium
2020- Member, Scientific Advisory Board, Accurius Therapeutics, Boston, MA
2020-22 Member, Scientific Advisory Board, Elpis Biopharmaceuticals, Lexington, MA
2021 Innocoll Therapeutics, Dublin, Ireland
2021- Consultant, Twentyeight-Seven Therapeutics, Watertown, MA
2022 - Consultant, Cur Therapeutics, Waltham, MA
2022 Consultant, Bristol Meyers Squibb, Lawrenceville, NJ
2023- Consultant, DynamiCure Therapeutics, Waltham, MA

OTHER PROFESSIONAL ACTIVITIES (SELECTED)

1986-	Director, Continuing Medical Education course on "Critical Issues in Tumor Microenvironment: Angiogenesis, Metastasis and Immunology." Carnegie Mellon University (1986-1990); Harvard Medical School (1991-)
1993	Vice-Chair, Gordon Research Conference on "Exchange in the Microvasculature," Plymouth State College, NH, June 14 - 18, 1993.
1995	Co-Chair, Keystone Symposium on "Drug Delivery," Hilton Head, SC, January 7-13, 1995.
1995	Founding Chair, Gordon Research Conference on "Angiogenesis and Microcirculation," Salve Regina College, Newport, RI, August 13-18, 1995.
1997	Chair, NCI Workshop, on "Physiological Resistance to Solid Tumor Treatment," Washington, D.C., July 25 - 27, 1997.
1997-1998	Chair, 1998 AACR Annual Meeting Program Committee, Section BL4 on "Tumor Biology: Host Tumor Interaction."
1998	Co-Chair, Forbeck Foundation Workshop on "Angiogenesis and Accessibility," Hilton Head, North Carolina, November 5 - 7, 1998.
2000, 2002	Chair, AACR Annual Meeting Program Committee, Section BL4 on "Tumor Biology: Angiogenesis and Microcirculation."
2001	Chair, 2001 Boston Angiogenesis Meeting, MA, November 2, 2001.
2002	Chair, Keystone Symposium on "Angiogenesis in Cancer and Other Diseases," Banff, Canada, February 8-13, 2002.
2002, 2007	Member, 2AACR Annual Meeting Program Committee, Section BL4 on "Tumor Biology: Angiogenesis and Microcirculation."
2003-04	Co-Chair, 2004 AACR Annual Meeting Program Committee, Orlando, FL.
2005	Chair, AACR Symposium on Antiangiogenesis and Drug Delivery, Boston, MA.
2005	Co-Chair, NCI Special Review Panel on Centers of Cancer Nantotechnology Excellence
2006	Co-Chair, ASCO Satellite Symposium on Breakthroughs in Targeted Cancer Therapy, Atlanta
2006	Selection Panel, Albert Szent-Gyorgyi Prize, National Foundation for Cancer Research
2007	Member, Landon-AACR Basic Science Award Committee
2008-	Review Panel, Grand Challenges Explorations, the Gates Foundation
2009	Chair, Folkman Young Investigator Award Committee, AACR
2010	Co-Chair, NCI Special Review Panel on Centers of Cancer Nantotechnology Excellence
2010	Member, Gertude Elion Young Investigator Award Committee, AACR
2011	Co-Chair, AACR Frontiers in Basic Cancer Research Conference, San Francisco
2011-12	Co-Chair, 2012 AACR Annual Meeting Program Committee, Chicago, IL.
2011, 14	Member, Selection Committee for the AACR Princess Takamatsu Memorial Lectureship
2010-	Member, AACR Special Conferences Committee
2014-15	Member, 2015 AACR Annual Meeting Program Committee, Philadelphia, PA,
2015	Chair, AACR Special Conference on Tumor Angiogenesis and Vascular Normalization: Bench to Bedside to Biomarkers, March 5-8, 2015, Orlando, FL.
2015-16	Member, AACR Clinical and Translational Cancer Research Grants Scientific Review Committee
2016	Chair, AACR Special Conference on Engineering and Physical Sciences in Oncology, June 25-28, 2016, Boston, MA.
2016-20	Member, Advisory Board, USA-India Chamber of Commerce
2017	Member, Evaluation Panel, Kuwait Prize for Applied Medical Sciences
2018	Chair, Forbeck Forum on Tumor Microenvironment, Colorado Springs, (Nov 2-4, 2018)
2018	Member, AACR-Women in Cancer Research Charlotte Friend Lectureship Committee
2018-	Member, AACR Publications Committee
2019	Chair, Major Symposium on "Vascular Regulation of Anti-tumor Immunity," AACR Annual Meeting, Atlanta, GA, April 2, 2019.
2019	Chair, Education Session on "Reprogramming the Tumor Microenvironment to Improve Immunotherapy," ASCO Annual Meeting, Chicago, IL, June 1, 2019.
2022-23	Chair, Szent-Györgyi Prize Selection Committee, NFCR
2022-23	Chair, Princess Takamatsu Lectureship Awards Committee, AACR
2023-24	Member, Szent-Györgyi Prize Selection Committee, NFCR

CONTRIBUTIONS TO SCIENCE

For four decades, my research has focused on one challenge: improving the delivery and efficacy of anti-cancer therapeutics by normalizing the tumor microenvironment. Working on the hypothesis that the abnormal tumor microenvironment fuels tumor progression and treatment resistance, we developed an array of sophisticated imaging technologies and animal models as well as mathematical models to unravel the complex biology of tumors. Using these tools, we demonstrated that the blood and lymphatic vasculature, fibroblasts, immune cells and the extracellular matrix associated with tumors are abnormal, and these collaborate together to create a hostile tumor microenvironment characterized by hypoxia, low pH and high interstitial fluid pressure and solid stress. We next hypothesized that agents that induce "normalization" of the microenvironment can improve the treatment outcome. Indeed, we demonstrated that judicious use of antiangiogenic agents—originally designed to starve tumors—could transiently "normalize" tumor vasculature, alleviate hypoxia, increase delivery of drugs and anti-tumor immune cells, and improve the outcome of various therapies, including immunotherapy (Science 2005, 2019, 2020). In parallel, we provided compelling evidence for vascular normalization in cancer patients treated with antiangiogenic agents. In fact, vascular normalization and the resultant improvement in tumor perfusion and oxygenation associated with longer survival in patients (J Clinical Oncology 2013; Cancer Cell 2014; PNAS 2015). *Our preclinical finding that vascular normalization can improve immunotherapy (PNAS 2012) was confirmed by others in randomized phase III trials on combining antiangiogenic therapy with immune-checkpoint inhibitors for lung, kidney, liver, and endometrial cancers (New England J Medicine 2018, 2019, 2020, 2021), and led to the FDA approvals of seven such combinations of antiangiogenic therapy and immune-checkpoint inhibitors for these cancers* (Science 2019; Clinical Cancer Research 2023).

The normalization hypothesis also opened doors to treating various non-malignant diseases characterized by abnormal vasculature that afflict >500 million people worldwide, such as, tuberculosis (PNAS 2015; Trends in Moleculr Medicine 2024) and neurofibromatosis-2 (NF2) (New England J. Medicine 2009). *Based on our findings, bevacizumab was approved for NF2-schwannoma patients in UK in 2014.* This hypothesis has also been validated by several laboratories worldwide and has changed the thinking about how antiangiogenic agents work alone and in combination with conventional and emerging therapeutics (Science 2005; New England J. Medicine 2009; Nature Rev Drug Discovery 2011; Physiological Rev 2011; Cancer Cell 2014; Nature Reviews Clinical Oncology 2018; Science 2019).

Finally, we discovered that anti-hypertensive drugs capable of "normalizing" the tumor matrix and stromal cells can reprogram the tumor microenvironment to an immunostimulatory milieu and improve the delivery and efficacy of cancer therapies, including immunotherapy (Nature Comm 2013; Cancer Discovery 2016; Science Translational Medicine 2017; PNAS 2019, 2020). *A phase II trial (NCT01821729) led by my clinical collaborators provided compelling evidence in support of this emerging concept for improving the treatment outcome for patients with pancreatic ductal adenocarcinoma – a uniformly fatal disease (JAMA Oncology 2019).*

Development of Innovative Imaging Technologies: For four decades, we have investigated solid tumors as complex organs, and not just a collection of malignant cells and mutated genes. To unravel the complex pathophysiology of this aberrant organ, we developed and/or employed an array of cutting-edge and innovative technologies as well as animal and mathematical models. These include transparent windows to visualize biological events in tumors growing in various organs of mice (Nature Reviews Cancer 2002; Cell 2013), multi-photon intravital microscopy (Nature Medicine 2001), second-harmonic generation microscopy (Nature Medicine 2003; Nature Methods 2009), fluorescence correlation microscopy (Nature Medicine 2004), optical frequency domain imaging (Nature Medicine 2009), wide-field endoscopy (Nature Methods 2010) and quantum dot nanotechnology (Nature Medicine 2005, Nature Nanotechnology 2012, Nature Biomedical Engineering 2017, 2020). These tools provided unprecedented molecular, cellular, anatomical and functional insight into the inner workings of solid tumors and ways to harness this insight for improving treatment with radio-, chemo- and immuno-therapies.

Discovery of the Vascular Normalization Principle: After realizing that the abnormal structure and function of tumor vessels is a result of the imbalance between endogenous pro- and anti-angiogenic molecules, I proposed a novel hypothesis: By restoring balance, anti-angiogenic therapy can transiently "normalize" the abnormal tumor vasculature, resulting in improved delivery of drugs and oxygen (a known radiation sensitizer and immunostimulator) in tumors. I also hypothesized that chemo-, immuno- and/or radiation therapy given during this window of normalization is likely to yield the best outcome for combination therapy (Nature Medicine 2001; Science 2005). This hypothesis offered a potential explanation for why drugs, such as Avastin (whose goal is to destroy tumor vessels) improve the outcome of therapeutics (that require blood vessels for delivery), and importantly, offered guidelines to improve such combination therapies (Nature Clinical Practice Oncology 2006, Cancer Cell 2014).

We first tested this hypothesis in a variety of pre-clinical models (PNAS 1996; 1998; Nature 2002; Cancer Research, 2004; Cancer Cell, 2004; Nature Nanotechnology 2012). Our work demonstrated that blockade of VEGF-signaling, or

upregulation of Thrombospondin transiently prunes the immature and leaky vessels of tumors in mice and actively remodels the remaining vasculature so that it more closely resembles the normal vasculature. This "normalized" vasculature is characterized by less leaky, less dilated, and less tortuous vessels, with a more normal basement membrane and greater vessel coverage by pericytes. These morphological changes are accompanied by functional changes: decreased interstitial fluid pressure, decreased tumor hypoxia, and improved penetration of drugs and immune cells in these tumors. The outcome of combination therapy was found to be synergistic when the cytotoxic therapy was given during the normalization window (Cancer Cell 2004).

We also dissected the molecular and cellular mechanisms of vascular normalization (Cancer Cell, 2004). We discovered that the Tie-2 activation contributes to the increased pericyte coverage and an increase in MMP activity contributes to the basement membrane normalization. We further showed that the kinetics of vascular normalization determines the outcome of combined antiangiogenic and radiation therapy (Cancer Cell, 2004).

After careful and rigorous characterization of tumor vasculature in pre-clinical models, in collaboration with medical, surgical and radiation oncologists, we evaluated the molecular, structural and functional changes in the vasculature of rectal carcinomas in patients receiving bevacizumab (Avastin) with radiation and chemotherapy. This study, published in February 2004, provided the first glimpse of how anti-angiogenic therapy actually works in patients (Nature Medicine, 2004), and supported our pre-clinical findings on vascular normalization. In collaboration with neuro-oncologists and radiologists, we also demonstrated the benefits of vascular normalization in glioblastoma patients receiving an oral antiangiogenic agent cediranib (Cancer Cell, 2007; Nature Medicine 2013; PNAS 2013), and lung or breast cancer patients receiving Avastin (PNAS 2015). We also showed that vascular normalization can improve immunotherapy (PNAS 2012) – a finding confirmed in multiple phase III trials in lung, kidney, liver and endometrial cancers by others (New England J Medicine 2018, 2019, 2020), *which led to 7 FDA approvals of checkpoint blockers with antiangiogenic agents for these patients*. *We also demonstrated that Avastin can improve hearing in NF2 patients (New Engl J of Medicine 2009), which was approved for these patients in UK in 2014*.

Our lab has led to and/or collaborated in 45+ multi-disciplinary translational trials in various malignancies, e.g., sarcomas, liver, ovarian, breast, lung, pancreatic, head and neck carcinomas, at MGH/DFCI (Nature Reviews Clinical Oncology 2009, 2019). We identified Ang2 as a potential biomarker of evasive resistance to anti-VEGF therapies (Nature Medicine 2004; Cancer Cell, 2007). Indeed, blocking both VEGF and Ang2 improves survival more than either agent alone in GBM (PNAS 2016 a, b) and has led to a clinical trial in GBM patients.

Discovery of the Matrix Normalization Principle: Our laboratory is most widely known for the discovery that the high interstitial fluid pressure is a universal characteristic of tumors in rodents and in humans, and it can impair the delivery of drugs to tumors and facilitate metastasis (Cancer Research 1988, 2007; Nature Medicine 1998, Science 2020). We also uncovered the underlying mechanisms: high vascular permeability, lack of functional lymphatics, and mechanical forces generated by tumor growth (Nature Biotechnology 1997, PNAS 1998, Science 2002, Nature 2004, PNAS 2012). Our measurement of pO2 and pH profiles around individual tumor vessels revealed how abnormal structure and function of tumor vessels lead to a hostile metabolic microenvironment in tumors that fuels malignant behavior and creates resistance to various therapies (Nature Medicine 1997, 2001; Nature 2011). Our laboratory provided the first measurements of interstitial convection and diffusion in vivo and thus demonstrated how the matrix can pose a barrier to delivery of nanomedicine (PNAS 1989, 1997, 2001, 2011). Finally, by imaging collagen in vivo (Nature Medicine 2003) and measuring drug delivery, we discovered how the extracellular matrix can impede drug delivery, and that angiotensin inhibitors, such as losartan, can improve the delivery and efficacy of therapeutics in tumors by "normalizing" the matrix and "decompressing" blood vessels (PNAS 2011; Nature Communications 2013; Cancer Discovery 2016). *Confirmed in our successful phase II clinical trial on losartan and chemo-radio-therapy in pancreatic ductal adenocarcinoma patients (NCT01821729; JAMA Oncology 2019), this concept offers new hope for improving delivery and efficacy of therapeutics in highly fibrotic tumors.*

Discovery of the Role of Host Cells: Our laboratory discovered that cancer cells co-opt the host stromal cells into producing blood vessels and matrix. By revealing that host cells are active participants rather than passive bystanders in tumor angiogenesis, metastasis, and therapeutic response (Cell 1998, 2013; Nature Medicine 1999, 2001; Nature 2002; Nature Methods 2009; PNAS 2011, 2012; Cancer Discovery 2016), we identified the host cells as a critical target for cancer therapy (Nature Medicine 2003; Cancer Cells 2014). We also discovered that by engaging the host cells, Herceptin, an anti-her2/neu antibody, down-regulates five different angiogenic pathways and acts as an anti-angiogenic cocktail (Nature 2002). Whereas Herceptin lowers VEGF expression in cancer cells, it also induces compensatory upregulation of VEGF in the host stromal cells. This surprising finding on the role of host cells led to a preclinical study

in mice with brain metastasis from Her2+ breast cancer where we combined Herceptin and Avastin and observed dramatic tumor responses and improved survival (PNAS 2012). These results provided a compelling rationale for a clinical trial to evaluate the efficacy of Avastin in combination with Herceptin in breast cancer patients with active brain metastases from their HER2-positive disease and showed promising results (NCT01004172). More recently, we discovered that the brain microenvironment confers resistance to HER2/PI3K inhibitors in brain metastasis from luminal breast cancers, and blocking HER3/NRG1 can overcome this resistance (Science Tranlational Medicine, 2017) – a preclinical finding also confirmed by an idependent clinical trial (DOI: 10.1200/JCO.2016.70.6267).

Our work also offered new insights into the treatment of prostate and breast cancers by revealing that hormone withdrawal from a hormone-dependent tumor leads to apoptosis of endothelial cells prior to the death of cancer cells and normalizes their vessels (PNAS 1998). Furthermore, the finding from our laboratory *that angiogenic molecules regulate cell adhesion molecules on the vasculature provided the first link between these two disparate fields – angiogenesis and cell trafficking – and revealed novel mechanisms by which tumors evade host immune response (*Nature Medicine 1996, PNAS 2012) and metastasize to specific sites in the lungs (PNAS 2011).

Discovery of a New Paradigm for Vascular Engineering: A rate-limiting step in the field of regenerative medicine is to engineer blood vessels that persist and function for the lifespan of the patient. Although genetic manipulations can prolong the survival of engineered vessels, such manipulations have oncogenic potential. Our lab provided a new approach that does not require genetic manipulations and results in a vasculature in the mouse cranium that is stable and functional for one year (Nature 2004). By generating endothelial and smooth muscle cells from human embryonic stem (hES) cells and induced pluripotent stem (iPS) cells, our work brings this approach closer to translation into the clinic for engineering functional and long-lasting vessels (Nature Biotechnology 2007; Blood 2008; PNAS 2013; Science Translational Medicine 2015).

Revealing Underlying Principles Using Systems Approach: As a chemical engineer by training, I have always relied on mathematical modeling to complement our experimental studies. This systems approach has allowed me to analyze the complex biology of tumors and to extract simple principles useful for developing novel diagnostic and therapeutic agents. For example, to gain insight into the origins and implications of the elevated interstitial fluid pressure in tumors, we developed a mathematical model to simulate fluid and macromolecular transport in tumors (Cancer Research 1988). The most striking prediction of this mathematical model - confirmed experimentally in 1990 - was that the pressure is relatively uniform throughout the tumor and drops precipitously in the tumor margin (Cancer Research 1990). Subsequent experimental work further validated our model predictions, showing that fluid flow rates from the tumor boundary were of the same order of magnitude as those calculated by our model for transplanted tumors in rodents (Cancer Research 1991) as well as human cancers in patients (Microcirculation 1997). This model allowed us to predict the effect of vascular normalization on decreasing interstitial fluid pressure and edema in tumors that we subsequently confirmed in rectal, brain, lung and breast cancer patients (Cancer Research 2007; PNAS 2013, PNAS 2015). This seamless integration between bench and bedside and application of engineering/physical science principles remains a hallmark of my research (Science 2020). We recently leveraged this approach to COVID-19 treatment (PNAS 2021).

Educational Contributions: My educational goals are to train basic scientists, engineers and physicians in the integrative biology of cancer. I have had the good fortune of mentoring more than 225 doctoral and postdoctoral fellows from diverse backgrounds including engineering, mathematics, physics, chemistry, molecular and cellular biology, immunology, pathology, radiology, radiation, medical and surgical oncology – many are now leaders in academia and industry (see Table on the next page). I have also had productive collaborations with a similar number of basic scientists and clinicians from Harvard, MIT and elsewhere. Findings from these collaborative efforts are summarized in >750 publications, including four in *Scientific American* to reach out to a broader audience (GoogleScholar citations >245, 322, h-index = 229; Web of Science citations >177,660; h-index = 198, February 1, 2025; ranked among the top 1% cited authors since 2014 by Clarivate; Ranked #16 in the world and #14 in US in the field of Biology and Biochemistry in 2023 and 2024 by **https://research.com/u/rakesh-k-jain**).
To foster closer interactions between cancer researchers and physical scientists/engineers and to discuss the importance of tumor microenvironment in tumor progression and treatment, I designed a week-long intensive course, in 1986, entitled, "Critical Issues in Tumor Microenvironment: Angiogenesis, Metastasis and Immunology". There were no textbooks on this subject and this topic was not covered in any courses at any of the universities. Now in its 40th year, this course is ranked among the top of all courses offered by Harvard Medical School Department of Continuing Medical Education (https://steelelabs.mgh.harvard.edu/tumorcourse).

POST-DOCTORAL FELLOWS, JUNIOR FACULTY AND STUDENTS MENTORED

Post-Doctoral Fellows and Junior Faculty

Ager E 2011-13
Alexandrakis G 2001-04
Amoozgar Z 2015-21
Andersson P 2017-22
Askoxylakis V 2013-16
Babykutty S 2013-15
Badeaux M 2012-17
Batista Ana 2010-15
Baxter L 1991-98
Berk D 1992-98
Bhaumik J 2010-11
Bockhorn M 2000-02
Booth M 2003-06
Boucher Y 1988-98
Brown E 1999-05
Burton K 1999-01
Campbell R 1999-02
Chae S 2004-10
Chang Y 1998-00
Charabati M 2023-
Chatterjee S 2014-21
Chauhan V 2012-17
Chen I 2018-19
Chen S 2021-23
Chen Y-L 2004-06
Cheng G 2005-09
Chung E 2007-10
Cruzeiro G 2019-20
Datta M 2018-21
Dawson M 2005-08
Dellian M 1993-95
Demou Z 2001-2006
Dimitrov D 1983-84
DiTomaso E 1998-09
Dong X 2020-22
Gomes-Santos IL 2020-
Duda D 2001-12
Dull R 1998-99
Endo M 1994-97
Fenton B 2000-02
Ferraro G 2013-21
Finn A 2005-06
Forbes N 2000-02
Friedrich S 1996-97
Fukumura D 1994-99
Garkavtsev I 2002-10
Ghosh, M 2016-17
Gohongi T 1997-00
Gralla O 2000-01
Griffin G 1996-98
Han X 2012-15
Hansen N 1997-98
Hartford A 1997-00
Heijn M 1997-99
Helmlinger G 1994-97
Hiratsuka S 2007-10
Hoshida T 2003-07
Huang P 1992-10
Huang Y 2008-13
Isaka N 2002-05
Izumi Y 1999-02
Jeong H 2009-11
Jung K 2013-18
Junker N 2002-03
Kadambi A 1998-01
Kamoun W 2006-11
Kashiwagi S 2003-07
Kawaguchi K 2016-18
Kirkpatrick N 2008-12
Kodack D 2010-14
Kohno M 2003-6
Koike C 1999-00
Koike N 2001-4
Kozak K 2005-8
Kozin S 1998-15
Krishnan S 2016-2022
Kristensen C 1995-97
Kristjansen P 1992-94
Kumar AS 2024-
Kumra H 2020-
Kuo A 2006-09
Kwanten W 2017-19
Lacorre D 2005-11
Lahdenranta J 2005-08
Larrouquere L 2015-17
Lee S 2021-
Lee I 1991-94
Leu A 1993-94
Leunig M 1991-93
Ley C 2006-07
Liao S 2007-13
Lichtenbeld H 1997-00
Lu-Emerson C 2010-12
Luong M 2003-08
Melder R 1989-98
Migliorini C 2000-01
Miyazaki J 2004-05
Monsky W 1996-98
Morisue R 2023-
Mouta C 1999-01
Moutardier V 1999-00
Mulivor A 2004-07
Munn L 1993-98
Nelson G 2004-07
Netti P 1994-97
Ng R 2013-18
Nia H 2014-19
Nozue M 1993-95
Ohkubo C 1989
Ohtaka K 1997-98
Padera T 2003-11
Patan S 1994-99
Pinter M 2015-17
Pluen A 1997-00
Posada J 2018-21
Preufer F 2019-21
Rahbari N 2011-13
Ramanujuan S 1998-00
Reiberger T 2012-15
Ren J 2016 - 20
Riedemann L 2011-15
Roh H 1989-91
Roose T 2001-2002
Salameti V 2023-
Samuel R 2008-11
Sasaki A 1987-89
Sckell A 1996-97
Seano G 2013-18
Shah S 1979-82
Snuderl M 2008-12
Stock R 1987-91
Stohrer M 1993-94
Stroh M 2002-05
Stylianopoulos T 08-10
Subudhi S 2021-
Sun C 2002-06
Suzuki Y 2003-04
Talele N 2017-21
Tanda S 1994-96
Taylor J 2012-14
Traykov T 1984-85
Tsukada K 2007-09
Tsuzuki Y 1998-01
Tyrrell J 2006-8
Uccello T 2022-
Ushiyama A 2000-01
Vardam T 2012-15
Vouturi C 2021-23
Wang N 2016-18
Ward K 1986-87
Willsey L 1996-97
Winkler F 2003-05
Wolf B 2023-
Wong C 2016-19
Xu L 2000-8
Yamada S 1993-94
Yamashita H 2007-2010
Yan S 2014 -15
Yuan F 1990-96
Yuan J 1997-00
Yue C 2017-19
Yun C-O 1998-00
Zhang X 2024-
Zhao Y 2015-17
Zlotecki R 1992-93

M.D. Students
Alt A 2001-02
Ang J 1998-99
Awad M 2001-03
ChandawarkarA 2009-11
Cuba J 2023
Demhartner T 1992
El-Marouk K 2024-
Greif D 1995
Hoffman S 2019-20
Lawenda B 2005-06
Losken A 1995-96
Safabakhsh N 1995-96
Salehi H 1993-94
Witwer B 1994-95

Visiting Scholars
Baish J '94-95; '13-14
Davies C 1997-98
Ivanov I 1977-78
Park K R 1997-99
Tarbell J 1997-98

Ph.D. Students
Au P 2002-08
Baxter L 1985-90
Chary S 1984-89
Chauhan V 2006-12
Chen I 2013-18
Clauss M 1983-90
Cochran D 2001-05
Datta M 2013-18
Diop B 2006-10
Dolmans D 2000-02
Dudar T 1978-82
Duyverman A 2006-10
Eskey C 1988-92
Gazit Y 1993-96
Gerlowski L 1979-84
Goel S 2009-2012
Hagendoorn J 2003-06
Ho W 2013-20
Hobbs S 1992-97
Incio J 2010-16
Kaufman E 1988-92
Kloepper J 2012-16
Koenig G 1994-98
Kumar AS 2018-24
Lanning R 2003-09
Li Chong 2012-15
Liu H 2012-17
Maldarelli C 1977-81
Martin GR 1986-91
Martin J 2009-15
McKee T 2000-05
Mok W 2003-07
Naxerova K 2009 -13
Nugent L 1978-82
Padera T 1998-03
Perentes J 2004-07
Peterson T 2009 -15
Sevick E 1985-89
Stoll B 1998-03
Swartz M 1994-98
Tam J 2002-09
Tong R 2001-05
Tse J 2004 -10
Ward K 1980-86
Weissbrod J 1976-79
Zawicki D 1976-79
Zhu H 1992-96
Znati C 1990-95

M.S. Students
Brekken C 1994-95
Chryanthopoulos 77-79
Datta, M 2011-13
Duggins E 1978-79
Lai C M 1980-82
Lindholm P 1986-88
Martin D 1983-85
Mengato R 1978-80
Misiewicz M 1984-86
Pathak P 2001-03
Park G 2014-15
Peloso R 1979-81
Poh M-Z 2006-07
Rebar V1982-84
Sien H 1976-78
Simpson S 1976-79
Townsend J G1978-80
Volpe B 1979-81

RESEARCH SUPPORT (CURRENT AND COMPLETED WITHIN LAST 7 YEARS)

Current Support (Selected)

1) NIH/NCI R01CA269672 (PI: Jain) 04/01/2022 – 03/31/2027

Reprogramming the tumor microenvironment to improve immunotherapy of glioblastoma

The goal of this R01 is to improve the outcome of αPD1 in GBM by co-targeting WNT signaling.

2) **NIH/NCI 1R01CA259253 (Co-PIs: Jain and Vander Heiden**) 05/01/2021 – 04/30/2026

Improving treatment of HER2+ breast cancer brain metastasis by targeting lipid metabolism

The goal of this project is to improve the treatment of brain metastasis from HER2+ breast cancer by targeting lipid metabolism.

3) NIH/NINDS 1R01NS118929 (PI: Fukumura) 05/01/2021 – 02/28/2026

Reprogramming the tumor microenvironment to improve immunotherapy of glioblastoma by co-targeting VEGF and Ang2. The goal of this R01 is to establish that co-targeting of angiopoietin-2 (Ang-2) and VEGF can overcome resistance to aPD1 in GBM, reduce toxicities, and improve the SoC efficacy and survival.

Role: Co-Investigator

4) NIH/NCI 1U01CA261842 (Co-PIs: Munn/Jain) 09/22/2021 – 08/31/2026

Targeting physical stress-driven mechanisms to overcome glioblastoma treatment resistance

The goal of this project is to identify mechanically-sensitive mechanisms that affect immune cell activation in glioblastoma and to target these pathways to improve the efficacy of GBM immunotherapy

5) **Nile Albert Research Foundation (PI: Jain)** 01/01/2024 – 12/31/2025

Improving treatment of pediatric medulloblastoma: Bench-to-bedside

The major goal of this grant is to identify mechanism of improved treatment of pediatric brain tumor patients by B cell depletion.

6) **National Foundation for Cancer Research (PI: Jain)** 01/01/2018-09/31/2025

Reprogramming the tumor microenvironment to improve immunotherapy of GBM

The goal of this project is to improve the efficacy of immune checkpoint blockers (ICBs) with reduced immune related adverse events in GBMs by targeting the tumor microenvironment.

7) **Ludwig Center at Harvard (PI: Jain)** 01/01/2017-09/31/2025

8) **Jane's Trust Foundation (PI: Jain)** 01/01/2013-12/31/2025

Completed Research Support within Last 7 Years (Selected)

1) **DoD W81XWH-10-1-0016 Research Innovator Award (P: Jain)** 09/01/2010-08/31/2015

Strategies for Personalized Treatment of Metastatic Breast Cancer: Vascular Normalization and Sensitization

The goal of this Breast Cancer Research Innovator Award is to improve survival of metastatic breast cancer patients by applying two complementary strategies - "vascular normalization" and "vascular sensitization".

Role: Principal Investigator

2) **NIH/NCI - R01 CA163815 (PI: Jain)** 08/06/2012-05/31/2016

Role of PlGF in Medulloblastoma (MB) Progression and Treatment

The goal of this project is to reveal the mechanisms of response to anti-PlGF therapy in MB using genetically engineered mouse models, characterized human MB cell lines and state-of-the-art intravital imaging.

Role: Principal Investigator

3) **NIH/NCI R01 CA126642 (PI: Jain)** 05/07/2008 – 02/28/2014

Probing Tumor Microenvironment Using Nanotechnology

This BRP developed nanotechnology for drug delivery, microenvironment and cell phenotype studies in collaboration with Dr. Dai Fukumura of MGH and Dr. Moungi Bawendi of MIT.

Role: Principal Investigator

4) **NIH/NCI Federal Share/NCI Proton Beam Program Income (PI: Jain)** 04/01/11 – 12/31/2014

Novel Approaches *to Anti-Metastasis Therapy in Breast Cancer*

The goal of this umbrella grant is to develop three novel approaches to treat breast cancer metastasis.

Role: Principal Investigator

5) **NIH/NCI P01 CA080124 (PI: Jain)** 08/11/2000-04/30/2018

Integrative Pathophysiology of Solid Tumors

The goal of this Program Project is to improve the outcome of anti-angiogenic treatment in glioblastoma (Project 1), colorectal cancer (Project 2), hepatocellular carcinoma (Project 3) and pancreatic ductal adenocarcinoma (Project

6) with the support of 4 Cores: Bioengineering, Imaging and Biostatistics (Core A); Molecular and Cellular Biology (Core B); Small Animal and Surgery (Core C) and Administrative (Core D).
Role: Principal Investigator; Project 1 Leader; Project 4 Co-Leader; Core D Director

7) NIH/NCI R01 CA129371 (PI: Batchelor) 09/01/2013-03/31/2019
Angiogenesis-Targeting Therapy for Glioblastoma
The goal of this project is to evaluate if bevacizumab achieves a therapeutic benefit in a subset of GBM patients by transient normalization of tumor vessels. Furthermore the project tests whether imaging and biospecimen markers of vessel normalization are useful in the identification of responsive versus resistant GBM subpopulations and if bevacizumab resistance eventually develops due to the activation of alternative pro-angiogenic or pro-invasive signal transduction pathways.
Role: Co-Investigator

8) **NIH/NCI P50CA165962 (PI: Batchelor)** 09/01/2013-08/30/2019
Targeted Therapies of Glioma (SPORE grant)
The goal of this SPORE grant is the development of new targeted therapies for glioma. **Project one** targets the tumor vascular system and will test the hypothesis that responses to VEGF pathway inhibitors can be augmented by suppression of the angiopoietin-2 signal transduction pathway.
Role: Co-Leader of Project 1

9) **NIH/NCI 1R01CA208205 (Co-PIs: Fukumura & Jain)** 6/15/2017 – 4/30/2021
Reengineering obesity-induced abnormal microenvironment to improve PDAC treatment
The goal of this project is to determine the effect of obesity on PDAC desmoplasia and mechanical properties, and develop and test new therapeutic approaches that reverse the abnormal PDAC biomechanics in obesity.

10) **NIH/NCI 1R35CA197743 (PI: Jain**) 09/14/2015 – 08/31/2021
Dissecting Pediatric Brain Tumor Microenvironment to Improve Treatment
The goal of this Outstanding Investigator Award is to study novel approaches targeting the interaction between pediatric brain tumors (e.g., medulloblastoma) with the developing brain in which they grow.

11) NIH/NCI U01CA224348 (Co-PIs: Jain & Pittet/Boucher) 09/01/2017 - 08/31/2022
Reprogramming PDAC tumor microenvironment to improve immunotherapy
The goal of this U01 is to provide novel mechanistic insights into reprogramming the immunosuppressive tumor microenvironment of pancreatic ductal adenocarcinoma (PDAC) and improve efficacy of cytotoxic agents and immune checkpoint blockers. The resulting data will directly inform the design of a multi-institutional clinical trial.

12) Bill and Melinda Gates Foundation (OPP1140482) (PI: Jain) 11/23/2015-10/31/2022
Normalizing Tuberculosis Granuloma Vasculature and Matrix to Improve Drug Delivery and Efficacy
The goal of this project – in collaboration with Drs. Clif Barry and Laura Via (Tuberculosis Research Section, NIAID) and Dr. Veronique Dartois (Rutgers) – to test the hypothesis that bevacizumab (Avastin) and losartan can drug delivery and treatment outcome.

INVITED SEMINARS IN ACADEMIA, INDUSTRY & GOVERNMENT (1990 - present)

Department of Radiation Oncology, Massachusetts General Hospital, Boston, MA (January 1990)
The Ontario Cancer Institute, Toronto, Canada (January 1990)
Department of Biophysics, University of Arizona, Tucson, AZ (February 1990)
Magee Women's Hospital, University of Pittsburgh, Pittsburgh, PA (June 1990)
Department of Physiology, University of Tokyo, Tokyo, Japan (July 1990)
Biological Response Modifiers Program, National Cancer Institute, Frederick, MD (November 1990)
Department of Chemical Engineering, University of California, Berkeley, CA (November 1990)
Immunology Division, Merck and Co., Darmstadt, Germany (December 1990)

Institute for Anatomy and Cell Biology, University of Marburg, Germany (January 1991).
Institute for Physiology, University of Munich, Munich, Germany (February 1991).
Institute for Surgical Research, University of Munich, Munich, Germany (May 1991).
Department of Pharmacology/Medicine, Dana Farber Cancer Institute, Boston, MA (November 1991)
Joint Center for Radiation Therapy, Harvard Medical School, Boston (December 1991).

Wellman Labs for Photomedicine, Massachusetts General Hospital, Boston, MA (March 1992)
Radiation Oncology, University of Chicago Medical Center, Chicago, IL (May 1992)

Distinguished Lecture Series in Bioengineering, University of Illinois, Urbana, IL (May 1992)
Department of Pathology, Beth Israel Hospital, Boston, MA (May 1992).
Committee on Research, Massachusetts General Hospital, Boston, MA (June 1992)
Sterling Winthrop, Philadelphia, PA (August 1992)
Respiratory Intensive Care Unit, MGH, Boston, MA (September 1992)
B.A.S.F., Tumor Pathology, Cambridge, MA (October 1992)
Chemical Engineering Department, Princeton University, Princeton, NJ (October 1992).
Annual Funds Dinner, MGH, Boston, MA (October 1992)
Bristol-Myers Squibb, Wallingford, CT (November 1992)
University of Delaware [Kurt Wohl Lecturer], Newark, DE (November 1992).
Vascular Research Division, Brigham and Women's Hospital, Boston, MA (December 1992).
Department of Biology, Boston University, Boston, MA (December 1992).
Gynecology Grand Rounds, MGH, Boston, MA (December 1992)

Du Pont Merck, Wilmington, Delaware (February 1993).
Sunnybrook Health Science Center, Toronto, Canada (February 1993).
Department of Pathology, MGH, Boston, MA (April 1993)
Alkermes, Cambridge, MA (August 1993)
Health Sciences and Technology, MIT, Cambridge, MA (September 1993)
Hybritech, La Jolla, CA (September 1993)
Surgical and Respiratory Intensive Care Units, Mass General Hospital, Boston, MA (September 1993)
Department of Hematology, MGH, Boston, MA (October 1993)
IGEN Inc., Rockville, MD (October 1993)
Nuclear Medicine, Sloan Kettering, New York, NY (October 1993)
Hematology Oncology, Beth Israel Hospital, Boston, MA (October 1993)
Angiology Division, University of Zurich Medical School, Zurich, Switzerland (November 1993)
ETH, Zurich, Switzerland (November 1993)
Chemical Engineering, Georgia Tech, Atlanta, GA (November 1993)
Department of Biology, Boston University, Boston, MA (December 1993)

Zeneca Pharmaceuticals, Manchester, UK (February 1994)
Yale University Cancer Center, New Haven, CT (March 1994)
Cancer Center and Department of Physiology, University of South Alabama, Mobile, AL (March 1994)
Genentech, Inc., South San Francisco, CA (April 1994)
Hemosol, Inc., Ontario, Canada (May 1994)
Vascular Medicine, Brigham and Women's Hospital, Boston, MA (May 1994)
Prizm Pharmaceuticals, San Diego, CA (November 1994)
Department of Biology, Smith College, Northampton, MA (December 1994)

Yale University Cancer Center, New Haven, CT (March 1995)
Dana Farber Cancer Institute, Boston, MA (May 1995)
Vical, Inc., San Diego, CA (August 1995)
Mallinckrodt Medical Center, St. Louis, MO (September 1995)
University of Massachusetts Cancer Center, Worcester, MA (November 1995)

Preuss Foundation, Coronado, CA (January 1996)
Gastrointestinal Unit, MGH, Boston, MA (February 1996)
Joint Center for Radiation Therapy, Boston, MA (March 1996)
Institute for Surgical Research, University of Munich, Munich, Germany (March 1996)
Johns Hopkins Oncology Center, Baltimore, MD (May 1996)
Wellman Lab, Massachusetts General Hospital, Boston, MA (May 1996)
Gray Laboratory Cancer Research Trust, United Kingdom (October 1996)
Georgetown University Lombardi Cancer Center, Washington, D.C. (November 1996)
Texas A & M University, College Station, TX (December 1996)

U.S. Surgical, New Haven, CT (January 1997)
Keio University, Tokyo, Japan (February 1997)
St. Jude Children's Hospital, Memphis, TN (March 1997)
Department of Pathology, Beth Israel Hospital, Boston, MA (April 1997)
ISIS Pharmaceutical, Carlsbad, CA (April 1997)
Department of Chemical Engineering, University of Salerno, Salerno, Italy (June 1997)
National Institutes of Health, Rockville, MD (July, 1997)
Merck and Company, Rahway, NJ and West Point, PA (September 1997)
Dana-Farber/Partners Cancer Care Joint Venture, Boston, MA (September 1997)
Department of Cardiovascular Research, St. Elizabeth's Hospital, Boston, MA (September 1997)
Department of Molecular Biology, University of Helsinki, Helsinki, Finland (September 1997)
Rhone-Poulenc Rorer, Paris, France (October 1997)
Department of Biology, Northeastern University, Boston, MA (October 1997)
Onyx Pharmaceutical, Berkley, CA (November 1997)
Abbott Pharmaceutical, Chicago, IL (November 1997)
Smith Kline & Beecham, Philadelphia, PA (December 1997)

Department of Pathology, Yale University, New Haven, CT (March 1998)
Dana Farber, Department of Nuclear Medicine, Boston, MA (April 1998)
Chiron Corporation, San Francisco, CA (April 1998)
Sugen, San Francisco, CA (April 1998)
Glaxo Wellcome, Durham, NC (May 1998)
Pharmacopia, Princeton, NJ (August 1998)

Dept. of Nuclear Medicine, William D. Kaplan Lecture, Harvard Medical School, Boston, MA (March 1999)
Dept. of Chemical Engineering, Berkeley Lecture, University of California, Berkeley, CA (April 1999)
Genzyme, Framingham, MA (November 1999)
Department of Pathology, Brigham and Women's Hospital, Boston, MA (November 1999)

Cold Spring Harbor Laboratory, Cold Spring Harbor, NY (January 2000)
Bristol-Myer Squibb, Princeton, NJ (March 2000)
Department of Pathology, Seminar in Vascular Biology, Harvard Medical School (March 2000)
Department of Nuclear Medicine, Memorial Sloan Kettering Cancer Center, New York (May 2000)
Millennium Pharmaceuticals, Cambridge, MA (August 2000)
Novartis, Basel, Switzerland (September 2000)
Amgen, Los Angeles, CA (September 2000)
American Biosciences, Inc., Los Angeles, CA (November 2000)
DuPont Plenary Lectures in Bioengineering-American Institute of Chemical Engineers Annual Meeting, Los Angeles, CA (November 2000)
MIT, Controlled Drug Release Lab, Cambridge, MA (December 2000)
Harvard Medical School, Neuro-Oncology CME Course, Boston, MA (December 2000)

University of Massachusetts Medical School, Worcester, MA (January 2001)
Genentech, Bio Oncology Meeting, Sonoma Valley, CA (May 2001)
Harvard Medical School, Neuro-Oncology CME Course, Boston, MA (December 2001)

UTSW Medical School, Distinguished Univ. Lecturer, Dallas, TX (March 2002)
Beth Israel Deaconess Medical Center, Dept. of Surgery, Boston, MA (May 2002)
Massachusetts General Hospital, Spring 2002 Bulfinch Society Lecture, Boston, MA (May 2002)
MGH Renal Unit, Charlestown, MA (Dec 2002)
Harvard Medical School, Tumors of the Central Nervous System Course, Boston, MA (Dec 2002)
Advanced Research Technologies, Montreal, Canada (Dec 2002)

AstraZeneca, Macclesfield, England (February 2003)
Cancer Center, Johns Hopkins University, Baltimore, MD (May 2003)

Archemix, Cambridge, MA (July 2003)
Department of Pathology, Beth Israel Deaconess Medical Center, Boston, MA (October 2003)
Harvard-Dana Farber Cancer Center, Boston, MA (November 2003)
Center for Matrix Biology, Beth Israel Deaconess medical Center, Boston, MA (November 2003)
Joint Neurosurgery, Neuroscience and Psychiatry Grand Rounds, MGH, Boston, MA (November 2003)
Dana-Farber Partners Cancer Care Grand Rounds, Boston, MA (November 2003)

AstraZeneca, Waltham, MA (July 30, 2004)
Harvard Medical School, Tumors of the Central Nervous System Course, Boston, MA (December 2003)
Emery A. Wilson Dean's Lecture Series, University of Kentucky, Lexington, KY (November 12, 2004)
AstraZeneca, Macclesfield, England (November 2004)
Harvard Medical School, Tumors of the Central Nervous System Course, Boston, MA (November 2004)

NIH, Radiology Retreat, Bethesda, MD (April 2005)
Stanford University, Bio-X Program Interdisciplinary Seminar Series, Stanford, CA (May 2005)
Memorial Sloan Kettering Cancer Center, Laughlin Lecture in Medical Physics, New York, NY (May 2005)
New York University, Cancer Center Retreat, New York, NY (June 2005)
Harvard Medical School, Tumors of the Central Nervous System Course, Boston, MA (November 2005)
Novartis, Philadelphia, PA (November 2005)
Harvard School of Dental Medicine Grand Rounds, Boston, MA (December 2005)

MGH Cancer Center Grand Rounds, Boston, MA (January 2006)
MGH GI Division, Boston, MA (January 2006)
Cardiovascular Research Center, MGH, Charlestown, MA (January 2006)
MIT, Cambridge, MA (April 25, 2006)
Fox Chase Cancer Center, Krigel Lecture, Philadelphia, PA (April 27, 2006)
City College of City of New York, Zweifach Lecture, New York City (October 24, 2006).
Harvard Medical School, Tumors of the Central Nervous System Course, Boston, MA (December 5, 2006)

Boston University, Distinguished Lecture in Bioengineering, Boston (January 24, 2007).
The Children's Hospital, Vascular Biology Seminar, Boston (February 15, 2007)
Dana Farber/Brigham and Women's Hospital, NeuroOncology Series, Boston (February 23, 2007)
Memorial Sloan Kettering Cancer Center, President's Seminar Series, New York (March 7, 2007)
Collins Lecture Series, MGH Radiation Oncology, Boston, MA (April 24, 2007)
Keynote Lecture, UMASS Cancer Center Retreat, Oganquit, ME (May 3, 2007)

Richard D. Frisbee III Oncology Lecture, Yale University, New Haven, CT (March 6, 2008)
Sir Godfrey Hounsfield Lecture, Imperial College, London, UK (March 10, 2008)
Peter C. Reilly Lectures, University of Notre Dame, Indiana (March 25, 26, 2008)
HemOnc Grand Rounds, Beth Israel Deaconess Medical Center, Boston (May 7, 2008)
Kidney Cancer Program, Dana Farber Harvard Cancer Center, Boston (May 19, 2008)
Hambrecht & Quist Capital Management, Boston, MA (June 2009)
William E. Schiesser Lecture, Lehigh University, Bethlehem, PA (September 24, 2008)
Charles G. Moertel Lecture, Mayo Clinic, Rochester, MN (October 23, 2008)
Ashland Distinguished Lecture, University of Kentucky, Lexington, KY (October 24, 2008)

Grand Rounds, Georgetown Univ Cancer Center, Washington, DC (January 9, 2009)
Pfizer, La Jolla, CA (Jan 15, 2009)
Benjamin Zweifach Lecture, Department of Bioengineering, UCSD, La Jolla, CA (Jan 16, 2009)
Department of Systems Biology, Harvard Medical School, Boston (February 19, 2009)
Eli Ruckenstein Lecture, State University of New York at Buffalo, NY (May 4, 2009)
Alnylam, Cambrdge, MA (June 10, 2009)

Vascular Biology Program, Children's Hospital, Boston (March 18, 2010)
Pirkey Lecture, University of Texas at Austin (March 23, 2010)

Kelley Lectures, Purdue University (March 30 and 31, 2010)
William B. Lowrie Lecture, Ohio State University (May 13, 2010)
Wagner Lecture, University of Michigan (October 27, 2010)

Distinuished Research Lecturer, Carnegie Mellon University (January 26, 2011)
Roland T. Lakey Award, Wayne State University (March 14, 2011)
Irving Shoichet Lecture, University of Toronto (October 19, 2011)

Herman Schwan Lecture, University of Pennsylvanina (May 2012)
CCR Eminent Lecture Series, NCI (September 24, 2012)

ImClone/Lilly, New York, NY (January 21, 2013)
Breast Oncology Seminar Series, DFCI (February 2013)
Hematology Seminar Series, DFCI (March 5 2013)
Jiaotong University and Ruijin Hospital, Shanghai, China (July 19, 2013)
Cancer Institute and Hospital, Chinese Academy of Medical Sciences, Beijing, China (July 24, 2013)
Guangdong General Hospital, Guangzhou, China (July 25, 2013)
Pediatric Brain Tumor Series, DFCI/Children Hospital, Boston (October 17, 2013)
Department of Bioengineering, Cornell University, Ithaca, NY (October 24, 2013)
Department of Pathology, MGH (October 31, 2013)
Hematology/Oncology, Beth Israel Deaconess Medical Center (BIDMC), Boston (December 4, 2013)
Cancer Center, Dartmouth College, Dartmouth (December 10, 2013)
Center for Vascular Biology Research, BIDMC, Boston (December 11, 2013)

Cutaneous Biology Research Center, MGH (January 13, 2014)
MGH, Collins Lecture Series (May 20, 2014)
DoD, Congressionally Directed Medical Research Program **(**CDMRP), Ft. Detrick, MD (July 7, 2014)
CSHL, Brain Tumors Course, Cold Spring Harbor, NY (July 8, 2014)
NIH, Wednesdy Afternoon Lecture Series (WALS), Bethesda, MD (October 22, 2014)

Methusalem Lecture, KU Leuven, Belgium (Feb 3, 2015)
Arabindo Nath Bose Distinguished Lecture, IIT-Kanpur, India (Feb 23, 2015)
Alan S. Michaels Distinguished Lecture in Medical and Biological Engineering, MIT (April 10, 2015)
Cancer Center, Oregon Health Sciences University, Portland, OR (june 29, 2015)
Fredrickson Lecture, University of Minnesota (November 17, 2015)

Sun Phrama Advanced Research Corporation, Vadodara, India (January 27, 2016)
Princess Takamatsu Cancer Research Fund Lecture, National Cancer Center, Tokyo (February 12, 2016)
Princess Takamatsu Cancer Research Fund Lecture, Tohoku University, Sendai (February 15, 2016)
Princess Takamatsu Cancer Research Fund Lecture, Kyoto University, Kyoto (February 19, 2016)
University of Texas Engineering Foundation Lecture, UT Austin, Texas (December 1, 2016)

Sun Phrama Advanced Research Corporation, Vadodara, India (February 6, 2017)
Tata Memorial Center, Mumbai, India (February 8, 2017)
Laura and Isaac Perlmutter Cancer Center at NYU Langone, New York (February 22, 2017)
Meyer Cancer Center of Weill Cornell Medicine and NewYork-Presbyterian Hospital (March 15, 2017)
Danny Thomas Lecture Series, St. Jude Children's Research Hospital, Memphis, TN (May 19, 2017)
Ramzi Cotran Lecture, Boston Children's Hospital/Harvard Medical School, Boston (October 12, 2017)

AMGEN, Cambridge, MA (February 5, 2018)
Sun Phrama Advanced Research Corporation, Mumbai, India (February 12, 2018)
Department of Pharmacology, UCSD, La Jolla, CA (February 27, 2018)
Biomedicum, Univ of Helsinki, Helsinki, Finland (June 4, 2018)
Grand Rounds, BIDMC, Department of Surgery, Boston (June 18, 2018)
Maud Menten Lecture, Univ of Pittsburgh, Pittsburgh, PA (September 26, 2018)

Sun Phrama Advanced Research Corporation, Vadodara, India (February 11, 2019)
Tata Memorial Center, Mumbai, India (February 15, 2019)
Judah Folkman Lecture, Boston Children's Hospital/Harvard Medical School, Boston (May 23, 2019)
Department of Pathology, Northwestern University Medical School, Chicago (October 14, 2019)

Sun Phrama Advanced Research Corporation, India (April 14, 2020; VIRTUAL)
Center for Vascular Biology, BIDMC, Boston (October 9, 2020; VIRTUAL)
INSERM, University of Bordeaux, France (November 19, 2020; VIRTUAL)
Pathology Grand Rounds, Brigham & Women's Hospital, Boston (December 7, 2020; VIRTUAL)

Langer Lab, Koch Institute, MIT (March 2, 2021; VIRTUAL)
NanoBio Lab, A*STAR, Singapore (March 3, 2021; VIRTUAL)
Sun Phrama Advanced Research Corporation, India (August 10, 2021; VIRTUAL)
Cancer Center at Illinois, Univ of Illinois, Urbana-Champaign, Urbana (December 10, 2021; VIRTUAL)
Vanderbilt-Ingram Cancer Center, Vanderbilt, TN (December 15, 2021; VIRTUAL)

Molecular & Developmental Biology, Cincinnati Children's Hospital Medical Center, Cincinnati, OH (January 19, 2022; VIRTUAL)
IFIT Center of Excellence, University of Tubingen, Tubingen, Germany (August 8-10, 2022; VIRTUL)
CSHL, Brain Tumors Course, Cold Spring Harbor, NY (August 8, 2022)
JAX Cancer Course, Bar Harbor, ME (August 15, 2022; Virtual)
Inaugural Dr. Youcef Rustum Lecture, Roswell Park Cancer Center, Buffalo, NY (October 11, 2022)
Center for Immuno-Oncology, Dana Farber Cancer Institute, Boston, MA (October 14, 2022; VIRTUAL)
Neuro-Oncology Grand Rounds, Dana Farber/Harvard Cancer Canter, Boston, MA (December 9, 2022; VIRTUAL)

Advanced Angiotensin Therapeutics Network, University of British Columbia, Vancouver, Canada (January 4, 2023, VIRTUAL)
Smith Family Foundation Distinguished Lecture, MD Anderson Cancer Center, Houston, TX (February 27, 2023)
DFCI HCC Neuro-Oncology Retreat, DFHCC, Boston (March 17, 2013).
Cancer Seminar Series, University of Michigan, Ann Arbor, MI (May 15-16, 2023).

INVITED PRESENTATIONS AT MEETINGS (1990 - present)

"Transport of Macromolecules and Effector Cells in Tumor Microcirculation," *Gordon Conference on Microcirculation*, New Hampshire (June 11-15, 1990)
"Tumor Physiology and Antibody Delivery," *Society for Nuclear Medicine Annual Meeting*, Washington, DC (June 18-21, 1990)
"Delivery of Novel Therapeutic Agents in Tumors: Physiological Barriers and Strategies," *Gordon Conference on Drug Delivery*, New Hampshire (July 8-13, 1990)
"Delivery of Novel Therapeutic Agents to Tumors: Microcirculatory Barriers and Strategies," *International Congress of Mucosal Immunology*, Tokyo, Japan (July 22-27, 1990)
"Determinants of Tumor Blood Flow," *15th International Cancer Congress*, Hamburg, Germany (August 16-22, 1990)
"Tumor Microcirculation: Role in Cancer Detection and Treatment," *16th European Conference on Microcirculation*, Zurich, Switzerland (August 28-31, 1990).
"Tumor Vascular Architecture and Hemodynamics," *16th L.H. Gray Conference on Vasculature as a Target for Anti-Cancer Therapy*, Manchester, United Kingdom (September 17-21, 1990)

"Delivery of Genetically Engineered Molecules and Cells in Tumors: Physiological Barriers and Strategies," *Molecular Therapeutics: Cancer Therapy into the 21st Century*," Research Triangle Park, NC (March 3-6, 1991).
"Tumor Microcirculation," *International Symposium on Angiogenesis*, St. Gallen, Switzerland (March 13-15, 1991).
"Delivery of Novel Therapeutic Agents in Tumors. Physiological Barriers and Strategies," *German Nuclear Medicine Society Annual Meeting*, Tubingen, Germany (April 11-13, 1991)

"Interstitial Hypertension in Tumors: Etiology and Therapeutic Implications," *9th International Congress of Radiation Research*, Toronto, Canada (July 7-12, 1991).
"Tumor Microcirculation," *Gordon Conference on Cancer*, Newport, RI (August 11-16, 1991).
"Delivery of Genetically Engineered Molecules and Cells in Tumors: Barriers and Strategies," *Whitaker Foundation Symposium*, Snow Bird, UT (August 16-19, 1991).
"Transport of Genetically Engineered Molecules and Cells in Tumors," *5th World Congress for Microcirculation*, Louisville, KY (August 31-September 5, 1991)
"Tumor Microcirculation: Both a Barrier and a Target for Cancer Therapy," *NCI Workshop on Magnetic Resonance Spectroscopy and Tumor Cell Biology,"* Bethesda, MD (December 11-13, 1991).

"Tumor Microcirculation - Both a Barrier and a Target for Cancer Therapy," *Keystone Symposium on Molecular Biology of Endothelial Cells,* Keystone, CO (January 17 - 19, 1992)
"Delivery of Macromolecules to Normal and Neoplastic Tissues: Problems and Strategies," *Workshop on Strategies for Delivery of Therapeutic Proteins in Inherited Metabolic Diseases*, National Institute of Diabetes and Digestive and Kidney Diseases, Bethesda, MD (January 29 - 31, 1992).
"Delivery of Therapeutic Agents to Tumors," *Preuss Foundation Symposium on "Delivery of Treatment to Brain Tumors,"* Dallas, TX (March 11 - 13, 1992)
"Tumor Physiology and Drug Delivery," *Gordon Conference on Chemotherapy of Experimental and Clinical Cancer,* New London, NH (July 13 - 17, 1992)
"Delivery of Therapeutic Agents to Solid Tumors: Physiological Barriers and Strategies," *19th International Symposium on Controlled Release of Bioactive Materials*, Orlando, FL (July 26 - 29, 1992).
"Delivery of Genetically Engineered Molecules and Cells to Tumors," *American Cancer Society's Seventh Annual Round Table*, Charlestown, MA (August 20, 1992).

"Interstitial Pressure in Tumors," *41st Annual Radiation Research Society Meeting*, Dallas, TX (March 20-24, 1993)
"Role of Rheology of Cytotoxic Lymphocytes in Immunotherapy," *The North American Society of Biorheology*, New Orleans, LA (March 29, 1993)
"Delivery of Novel Diagnostic and Therapeutic Agents to Tumors: Physiological Considerations," workshop on Quantitative Evaluation of Tissue Function with Contrast-Enhanced MRI, *National Cancer Institute*, Bethesda, MD (April 1-2, 1993).
"Pharmacokinetics Considerations in Two-Step Therapies of Solid Tumors," *10th International Meeting of Advances in the Applications of Monoclonal Antibodies in Clinical Oncology*, Paphos, Cyprus (May 3-5, 1993)
"Vascular and Interstitial Biology of Solid Tumors," *Modern Surgical Oncology for the General Surgeon*, Deaconess Hospital, Boston, MA (May 20, 1993)

"Delivery of Drugs to Tumors," *5th International Liposome Conference*, Princeton, NJ (May 24-25, 1993)
"Convection, Diffusion and Binding in the Tumor Interstitium," *Gordon Conference on Microcirculation*, Plymouth, NH (June 14-18, 1993).
"How does the Tumor Vasculature Become Arterialized," *International Union Against Cancer Meeting*," Woods Hole, MA (September 19-20, 1993).
"Tumor Microcirculation -- Role in Cancer Diagnosis and Treatment," *1st Asian Congress for Microcirculation*, Osaka, Japan (September 27-29, 1993)
"Delivery of Therapeutic Agents to Solid Tumors," *Current Concepts in Medical Oncology 1993*, Memorial Sloan-Kettering Cancer Center, New York, NY (October 25-29, 1993)
"Delivery of Antibodies to Solid Tumors: Physiologic and Pharmacokinetic Considerations," *Fourth International Conference on Antibody Engineering*, Coronado, CA (December 8-10, 1993).
"Extravasation of Proteins *In Vivo*," *NIH Vascular Leak Syndrome Workshop,* Bethesda, MD (December 17, 1993)

"An *In Vivo* Look at Microcirculation in Health and Disease," *Keystone Symposia Conferences on "Inflammation, Growth Regulatory Molecules & Atherosclerosis" and "Molecular Biology of the Endothelial Cell,"* Keystone, CO (January 16-23, 1994).
"Delivery of Therapeutic Agents to Solid Tumors: Role of Vascular and Interstitial Physiology," *Eight-fifth Annual Meeting of the American Association for Cancer Research*, San Francisco, CA (April 10 - 13, 1994).
"Vascular and Interstitial Biology of Solid Tumors," *Modern Surgical Oncology for the General Surgeon*, Cambridge, MA (May 12-14, 1994)

"Interstitial Transport in Tumors: Role of Binding," *18th European Conference on Microcirculation,"* Rome, Italy (September 4 - 8, 1994).
"Tumor Microcirculation," *Fifth International Congress of the Metastasis Research Society,* Bethesda, MD (September 28 - October 1, 1994).
"Interstitial Transport: Role of Binding," *Fifth Conference on Radioimmuno-detection and Radioimmunotherapy of Cancer,* Princeton, NJ (October 6-8, 1994).
"Delivery of Novel Therapeutic Agents to Solid Tumors," *AAPS Ninth Annual Meeting,* San Diego, CA (November 6-10, 1994)
"Intravital Studies of Leukocyte Endothelial Interactions in Tumors," *MGH-BWH Symposium on Cell Adhesion*, Boston, MA (November 21, 1994)

"Physiological Barriers to Transport in Tumors," *Keystone Symposium on Drug Delivery*, Hilton Head Island, SC (January 7-13, 1995)
"Tumor Microcirculation; Transport in Tumours; Interstitial Transport in Tumours; Scale-Up of Biodistribution from Mouse to Man," *ICMS Workshop: Tumour Growth and Development*, Edinburgh, United Kingdom (February 13 - 17, 1995).
"Tumor Angiogenesis and Delivery of Therapeutic Agents to Tumors," *International Seminar on Controversies in Chemotherapy and Biological Therapy in Cancer*, Buenos Aires, Argentina (May 4-6, 1995)
"Tumor Angiogenesis and Microcirculation: From Bench to Bedside," *Frontiers in Medicine Symposium*, Venice, Italy (May 26-28, 1995).
"New Insights Into The Structure of Tumor Vasculature: From Fractal Dimensions to Intussusception," *9th Congress of Biorheology/2nd Congress on Clinical Hemorheology,* Big Sky, MT (July 23-28, 1995).
"Tumor Microcirculation: Role of Microenvironment," *Gordon Conference on Angiogenesis and Microcirculation*, Newport, RI, (August 13-18, 1995).
"Delivery of Effector Cells to Tumors," *2nd International Conference on Cellular Engineering*, La Jolla, CA (August 19-22, 1995)
"Leukocyte-Endothelial Interactions in Tumor Microcirculation," *31st Annual Meeting of the Society for Leukocyte Biology*, Marco Island, FL (September 13-16, 1995)
"Delivery of Molecules and Cells to Solid Tumors," *Cap Cure Annual Meeting on Prostate Cancer*, Santa Barbara, CA (September 21-24, 1995).
"Delivery of Molecules and Cells to Solid Tumors," *BMES Annual Meeting*, Boston, MA (October 6-8, 1995)
"Role of Tumor Physiology in Cancer Therapy," *Monoclonal Antibodies & Cancer Therapy Symposium*," New York, NY (October 16-18, 1995)

"Delivery of Molecular Medicine to Solid Tumors: Physiological Barriers and Strategies," *AACR Special Conference on Cancer: The Interface Between Basic and Applied Research*, Baltimore, MD (November 5-8, 1995).
"Role of Microenvironment in Tumor Angiogenesis and Microcirculation," *AACR Special Conference on Novel Strategies Against Resistant Cancers*, Sanibel, FL (November 17-21, 1995)

"Gene Therapy and Brain Tumors," *The Preuss Foundation,* Coronado, CA (January 17 - 19, 1996)
"Strategies for Improving Drug Delivery to Solid Tumors," *Gordon Conference on Drug Carriers in Biology and Medicine*, California (February 25-March 1, 1996)
"Vascular and Interstitial Physiology of Tumors - Implications for Therapy," *Isolated Limb and Organ Perfusion Workshop*, Berlin, Germany (March 1-2, 1996)
"Physiological Resistance to Treatment of Solid Tumors," *9th NCI-EORTC Symposium on New Drugs in Cancer Therapy,*" Amsterdam, Holland (March 12-15, 1996)
"Tumor Physiology," *87th Annual Meeting of AACR*, Washington, D.C., (April 20-24, 1996)
"New Perspectives in Microvascular Fluid Exchange: A Hundred Years after Starling," *The Wellcome Trust,* United Kingdom (April 21-25, 1996).
"Delivery of Molecular Medicine to Solid Tumors," *Worcester Foundation for Biomedical Research Symposium*, Worcester, MA (May 4, 1996)
"Microcirculation and Transport Phenomena in Tumors," *Wenner-Gren Symposium*, Stockholm, Sweden (June 16-19, 1996)
"Delivery of Molecular Medicine in Solid Tumors," *Sixth World Congress for Microcirculation*, Munich, Germany (August 25-30, 1996)

"Delivery of Molecular Medicine to Solid Tumors: Physiological Barriers and Strategies," *NCI Symposium on Renal Carcinoma: Recent Progress and Future Directions*, Washington, D.C. (September 12-21, 1996).
"Delivery of Molecular Medicine to Solid Tumors," *Boehringer Ingelheim Fonds International Titisee Conferences*, Titisee, Germany (October 2-6, 1996)
"Delivery of Molecular Medicine to Solid Tumors: Pathophysiological Considerations," *BIOTEC-Congress Symposium*, Dusseldorf, Germany (November 20-23, 1996).

"Delivery of Molecular and Cellular Medicine to Solid Tumors," *Eighth International Symposium on Recent Advances in Drug Delivery Systems*, Salt Lake City, UT (February 24-27, 1997).
"Delivery of Molecular Medicine to Solid Tumors," *22nd Annual Meeting of the Japanese Society for Microcirculation*, Tokyo, Japan (February 28 - March 1, 1997)
"Tumor Microcirculation Role in Drug and Nutrient Delivery," *1997 - Current Issues in Blood Substitute Research and Development*, San Diego, CA (March 16-19, 1997)
"Cellular and Molecular Basis of Capillary Permeability," *Experimental Biology 1997 Meeting,* New Orleans, LA (April 7, 1997)
"Tumor Microenvironment and Microcirculation: A Dynamic Interplay," *An International Tumor Microenvironment Workshop*, Martha's Vineyard, MA (April 28 - May 2, 1997).
"Angiogenesis Suppression by Circulating Angiogenesis Inhibitors Released by PC-3: A New Model," *Joint Venture Prostate Cancer Retreat*, Dedham, MA (May 1997).
"Delivery of Molecular Medicine in Solid Tumors," *AAPS 1997 Midwest Regional Meeting*, Chicago, IL (May 19, 1997)
"Tumor Microcirculation," *Ninth Pezcoller Symposium*, Rovereto, Italy (June 4-7, 1997).
"Role of VEGF in Vascular Permeability and Adhesion," *Gordon Conference on Angiogenesis and Microcirculation*, Newport, RI (August 17 - 22, 1997)
"Integrative Pathophysiology of Solid Tumors: Role in Detection and Treatment," *Oncology Frontiers Conference, Hoechst Marion Roussel*, Grand Cayman, British West Indies (October 16 - 19, 1997).
"Angiogenesis, Vascular Permeability and Leukocyte-Adhesion in Tumors," *MDACC Annual Basic Science Research Symposium*, Houston, TX (October 28-31, 1997)
"Delivery of Molecular and Cellular Medicine to Solid Tumors," *AIChE Annual Meeting,* Los Angeles, CA. (November 11-16, 1997)

"Tumor Angiogenesis and Microcirculation," *AACR Special Conference on Angiogenesis and Cancer*, Orlando, FL (January 24-28, 1998)
"Tumor Angiogenesis and Microcirculation," *Workshop on Angiogenesis*, Toronto, Canada (February 6, 1998)
"Delivery of Molecular and Cellular Medicine in Tumors," *National Institutes of Health Conference on Bioengineering Research: Building the Future of Biology and Medicine*, Bethesda, MD (February 27-28, 1998).
"Tumor Microcirculation," *Cold Spring Harbor Conference on Pathways to Cancer*, Cold Spring Harbor, NY (March 11-14, 1998).
"Angiogenesis and Microcirculation," *AACR Annual Meeting*, New Orleans, LA (March 28-April 1, 1998)
"Angiogenesis and Microcirculation in Tumors: Role of Microenvironment," ASIP *President's Symposium on Angiogenesis and Microcirculation*, San Francisco, CA (April 20, 1998).
"Tumor Angiogenesis and Microcirculation: Role of Host Organ," *The Sigrid Jusélius Foundation*, Helsinki, Finland (June 4 - 7, 1998).
"Tumor Microenvironment and Microcirculation: Role in Drug Delivery," *10th NCI-EORTC Symposium on New Drugs in Cancer Therapy,* Amsterdam, Holland (June 16-19, 1998).
"Delivery of Molecular and Cellular Medicine to Tumors," *International Conference on Advances in Biomaterials and Tissue Engineering*, Capri, Italy (June 14-19, 1998).
"Tumor Angiogenesis and Microcirculation," *British Oncological Association Lecture,* Nottingham, United Kingdom (July 5 - 7, 1998)
"Tumor Angiogenesis and Microcirculation: New Insights," *Gordon Conference on Angiogenesis and Microcirculation*, Newport, RI (August 2 - 7, 1998).
"Transport in Lymphatics," *20th European Conference on Microcirculation,* Paris, France (Aug 30-Sept 2, 1998).
"The Role of Brain Microenvironment in Vascular Physiology," *National Institutes of Health, NINDS AIDS Meeting*, Alexandria, VA (September 24 - 26, 1998)

"Integrative Pathophysiology of Solid Tumors: Novel Techniques and Treatment Relevance," *Advances in Neuro-Oncology*, Boston, MA (September 28, 1998).
"Role of Host-Tumor Interaction on Angiogenesis and Microcirculation," *Forbeck Research Foundation Forum on Angiogenesis an Accessibility,* Hilton Head, NC (November 5 - 7, 1998).
"The New Frontier of Molecular Medicine: Delivery of Therapeutics," *Nature Medicine Meeting on the Molecular Medicine Revolution,* Tokyo, Japan (November 8 - 10, 1998).
"Delivery of Molecular Medicine to Solid Tumors," *XXXI World Meeting of the International College of Surgeons*, Buenos Aires, Argentina (November 15-19, 1998)

"Imaging Gene Expression at Cellular Level," *Quantitative In Vivo Functional Imaging in Oncology,* Bethesda, MD (January 6 - 8, 1999)
"New Insights into Tumor Angiogenesis and Microenvironment from In Vivo Microscopy," *Gordon Conference on Radiation Oncology*, Ventura, CA (January 31 - February 5, 1999)
"Tumor Microcirculation," *AACR Special Conference on Molecular Determinants of Sensitivity to Anti-Tumor Agents*, Whistler, British Columbia, Canada (March 4 - 8, 1999)
"Delivery of Molecular Medicine to Solid Tumors" *AIMBE Meeting*, Washington, D.C. (March 12-14, 1999).
"Role of Physiology in Drug Delivery Into Tumors," *Controlled Release Society*, Boston, MA (June 20 - 25, 1999).
"Tumor Angiogenesis and Microcirculation," *4th Cancer Research Campaign - Beatson International Cancer Conference*, Glasgow, United Kingdom (June 27 - 30, 1999)
*"*Tumor Angiogenesis and Microcirculation: New Insights," *Gordon Research Conference on "Angiogenesis and Microcirculation,"* Salve Regina College, Newport, RI (August 15 - 19, 1999).
"In Vivo Microscopy of Gene Expression and Function using Intravital Microscopy," Inter-*Institute Workshop on In Vivo Optical Imaging*, NIH, Bethesda, MD (September 16-17, 1999)
"Micro-environment and Tumor Angiogenesis," 2nd *Dutch Association of Gastro-Intestinal Surgery Symposium*, Utrecht, The Netherlands (September 23-24, 1999)
"Tumor Angiogenesis and Microcirculation," *13th International Conference on Brain Tumour Research and Therapy*, Lake Toya, Hokkaido, Japan (October 3 - 6, 1999)
"Tumor Angiogenesis and Microcirculation," *Boston Angiogenesis Meeting,* Boston, MA (Nov. 1, 1999)

"Tumor Angiogenesis and Microcirculation: Role of Host Microenvironment," *2nd International Symposium on Anti-Angiogenic Agents*, Dallas, TX (January 28-29, 2000).
"Role of Physiology in Drug Delivery into Tumors," *Gordon Research Conference on Drug Carriers on Medicine and Biology*, Ventura, CA (February 20-25, 2000)
"Role of Host-Tumor Interactions in Angiogenesis and Vascular Function," *Keystone Symposium on Experimental and Clinical Regulation of Angiogenesis*, Salt Lake City, Utah (March 2-7, 2000)
"Imaging Angiogenesis and Vascular Function", *91st Annual Meeting of AACR*, San Francisco, CA (April 1-5, 2000)
"Tumor Angiogenesis and Microcirculation: Lessons from In Vivo Microscopy of Gene Expression and Function," *Eppley Institute Short Course in Cancer Biology*, Omaha, NE (May 8-12, 2000).
"Tumor Angiogenesis and Microcirculation: Role of Host-Tumor Interaction," *Conference on Vascular Biology of Diabetic Microangiopathy*, Var Gard, Saltjsobaden, Sweden (May 17-19, 2000).
"In Vivo Molecular and Functional Imaging of Tumors: New Insights from Intravital Microscopy," *Gordon Research Conference on Lasers in Medicine and Biology*, New London, CT, June 10-15, 2000).
"Vascular Heterogeneity in Tumors: Lesson from Intravital Microscopy," *UICC Study Group Meeting on Basic and Clinical Cancer Research: Tumor Angiogenesis II*, Woods Hole, MA (June 16-18, 2000).
"Tumor Angiogenesis and Microcirculation," *Gordon Research Conference on Vascular Cell Biology,* Plymouth, NH (July 2-7, 2000)
"Tumor Angiogenesis," *NCI Epithelial-Stromal Interactions and Tumor Progression Workshop*, Bethesda, MD (September 13-15, 2000).
"Real Time Imaging of Gene Expression and Function in Tumors," *42nd Symposium of the Society for Histochemistry,* Les Diablerets/Switzerland (September 20-23, 2000)
"Delivery of Molecular Medicine to Tumors: Lessons from In Vivo Imaging of Gene Expression and Function," *NIH International Symposium on Tumor-Targeted Delivery Systems*, Bethesda, MD (September 25-28, 2000).
"Tumor Angiogenesis and Microcirculation," *AACR Special Conference in Cancer Research Angiogenesis & Cancer: From Basic Mechanisms to Therapeutic Applications,* Traverse City, MI (October 11-15, 2000).

"Role of Host-Tumor Interactions in Tumor Angiogenesis and Response to Therapy," *The 3rd Annual Jack Little Symposium: Genetic and Cellular Factors in Human Cancer Therapy*, Boston, MA (Oct. 20-21, 2000).
"Tumor Angiogenesis and Microcirculation: Role of Host-Tumor Interactions," *The First Hematology-Oncology/Charlestown Cancer Center Retreat,* Boston, MA (October 21, 2000).
"Imaging Gene Expression in Tumors" *American Society for Therapeutic Radiology and Oncology,* Boston, MA (October 22-26, 2000)

"Imaging Gene Expression, Angiogenesis and Microcirculation in Tumor: Role of Microenvironment" *Keystone Symposium Cell Migration*, Tahoe City, CA (March 12-17, 2001).
"Tumor Angiogenesis & Therapeutic Response: Role of Host Tumor Interaction" *American Society of Investigative Pathology at Experimental Biology 2001,* Orlando, FL (April 2, 2001).
Keynote Address: "Delivery of Therapeutics to Solid Tumors: Role of Host-Tumor Interactions" *14th International Research Group in Immunoscintigraphy and Immunotherapy (IRIST) Meeting*, Nijmegen, the Netherlands (May 18-19, 2001).
"Tumor Angiogenesis and Vascular Function: Lessons from In-Vivo Imaging" *Society of Nuclear Medicine Meeting*, Toronto, Canada (June 23-27, 2001).
"Tumor Angiogenesis and Vascular Function: Role of Host-Tumor Interactions" *Gordon Conference Chemotherapy of Experimental and Clinical Cancer,* New London, NH (July 15-19, 2001).
"In Vivo Imaging of Gene Expression, Physiological Function and Therapeutic Response in Tumors" *Imaging Life: From Cells to Whole Animals*, *Microscopy Society of America*, Long Beach, CA (August 4-5, 2001).
"Tumor Angiogenesis and Microcirculation" *Gordon Conference Angiogenesis & Microcirculation*, Newport, RI (August 12-17, 2001).
"Leakiness of Tumor Vessels: Functional Abnormalities" & "Discussion of Blood Vessel Leakiness in Cancer," *Forbeck Foundation Meeting*, Napa Valley, CA (October 5-6, 2001).
"Gene Expression, Angiogenesis and Vascular Function in Tumors: Lessons from Intravital Microscopy," *International Conference on New Treatments for Brain Tumor: Gene Therapy & Neural Stem Cells,* Parma, Italy (October 17-20, 2001).
"Imaging Gene Expression and Function in Tumors: Implications for Angiogenesis and Metastasis" *AACR/NCI/EORTC International Conference*, Miami Beach, Florida (October 29-November 2, 2001).
"Chemical Engineering and Cancer Medicine in the Post-Genomic Era," *AIChE Annual Meeting*, Reno, NV (November 4-9, 2001)
"Gene Expression, Angiogenesis and Physiological Function in Tumors: Novel Insights from In Vivo Microscopy" *43rd Annual American Society for Therapeutic Radiology and Oncology (ASTRO),* San Francisco (November 4-8, 2001).
"Gene Expression, Angiogenesis and Vascular Function in Tumors: Lessons from Intravital Microscopy," *1st Merck Symposium on Advances on Cancer Biotherapy*, Barcelona, Spain (November 29-30, 2001).

"Molecular, Anatomic and Functional Imaging of Tumors using Intravital Microscopy," *Keystone Meeting on Angiogenesis in Cancer and Other Diseases: From Genes to Function to Therapy*, Banff, Canada (Feb 8-13, 2002)
"In Vivo Imaging of Gene Expression, Angiogenesis and Physiological Function in Tumors," *AACR 93rd Annual Meeting*, San Francisco, CA (April 6-10, 2002)
"Angiogenesis and Lymphangiogenesis in Tumors: New Insights from Intravital Microscopy," *67th Cold Spring Harbor Symposium on Quantitative Biology*, Cold Spring Harbor, NY (May 29-June 3, 2002).
"Lymphatic Metastasis: New Insights," *International Union Against Cancer Workshop on Metastasis*, Woods Hole, MA (June 6-9, 2002).
"Imaging Tumor Vessels and Lymphatics," *1st Int'l Conference on Vascular Targeting*, Cambridge, MA (June 12-14, 2002)
"Angiogenesis and Lymphangiogenesis in Tumors: New Insights from Intravital Microscopy," *18th UICC Intl Cancer Congress*, Oslo, Norway (June 30-July 5, 2002).
"Angiogenesis and Lymphangiogenesis in Tumors: New Insights from Intravital Microscopy," *Int'l Society for Oncodevelopmental Biology & Medicine*, Boston, MA (September 8-12, 2002).
"Intravital Microscopy of Tumors," *Gordon Conference on Lasers in Biology and Medicine,* Meriden, N.H. (July 14-19, 2002)
"Angiogenesis and Lymphangiogensis in Tumors: New Insights from Intravital Microscopy," *First Annual Meeting of the Society for Molecular Imaging*, Boston, MA (August 24-26, 2002).

"Angiogenesis and Lymphangiogenesis in Tumors: New Insights from Intravital Microscopy," *NABTT Meeting*, Boston, MA (October 24, 2002).
"Imaging the Inner Workings of Solid Tumors," *CIMIT Forum*, Boston, MA (November 5, 2002).

"Molecular and Physiological Rationale for Combined Anti-angiogenic and Radiation Therapy," *Gordon Research Conference on Radiation Oncology,* Ventura, CA (January 29, 2003)
Keynote Address: "Imaging the Inner Workings of Solid Tumors: A Twenty Five Year Odyssey," *Fourth National Forum on Biomedical Imaging in Oncology,* Bethesda, MD (February 6, 2003).
"Angiogenesis and Lymphangiogenesis in Tumors: New Insights from Intravital Microscopy", *Thirty Years of Angiogenesis Research*, Boston, MA (February 28, 2003).
Keynote Address: "A Journey through the Inner World of Tumors", *Modeling and Computers in Cancer Therapy*, Turin, Italy (March 3-4, 2003).
"Dissecting Tumor-Host Interactions Using In Vivo Imaging", *Genes, Environment& Disease,* Boston, MA (June 7-9. 2003)
"Normalizing Tumor Vasculature Using Anti-VEGF Therapy: Pre-Clinical and Clinical Evidence," *Gordon Research Conference on Angiogenesis and Microcirculation*, Newport, RI (August 10-15, 2003)
"Dissecting tumor angiogenesis and pathophysiology", *European Cancer Conference*, Copenhagen, Denmark (September 21-23, 2003)

"Angiogenesis and lymphangiogenesis in tumors: New insights from intravital microscopy," *Keystone Symposium on Angiogenesis,* Santa Fe, NM (January 13-19, 2004)
"Inaugural Robert Bras Lecture - Imaging the Inner Workings of Solid Tumors: A 25 Year Odyssey," *National Cancer Institute of Canada Meeting on Strategic Directions in Cancer Therapy*, Nassau, Bahamas (February 12-14, 2004)
"Formation and Function of Tumor-Associated Lymphatics", *Gordon Research Conference on Lymphatics,* Ventura, CA (March 7-11, 2004)
"Tumor as an Aberrant Organ: Insights from Intravital Microscopy", *95th Annual Meeting of AACR*, Orlando, FL (March 27-31, 2004)
"Angiogenesis and Lymphangiogenesis in Tumors: New Insights from Intravital Microscopy", *Annual Meeting of Experimental Biology/ASIP*, Washington, DC (April 17-21, 2004)

Keynote Address: "A Journey into the World of Solid Tumors", *International Conference for Mathematics in Biology and Medicine: Annual Meeting of the Society for Mathematical Biology*, Ann Arbor, MI (July 25-28, 2004)
"Imaging the Inner Workings of Solid Tumors", *Experimental Genetics of the Laboratory Mouse in Cancer Research*, The Jackson Laboratory, Bar Harbor, ME (August 22- September 2, 2004)
Keynote Address: "Imaging the Inner Workings of Solid Tumors: A 25-Year Odyssey", *Gordon Conference on Drug Carriers in Medicine and Biology*, Blue Sky, MT (September 5-10, 2004)
"Imaging the Inner Workings of Solid Tumors: A 25-Year Odyssey", *ARENA Conference*, Oslo, Norway (September 24-25, 2004)
Keynote Address: "Angiogenesis and Lymphangiogenesis in Tumors: New Insights and Clinical Translation", *46th Annual Meeting of the American Society for Therapeutic Radiology and Oncology*, Atlanta, GA (October 6, 2004)
NABTT Lecture: " Normalization of Tumor Vasculature and Microenvironment using Anti-Angiogenic Agents," *NABTT CNS Consortium Meeting*, Cleveland, OH (November 11, 2004)
"Imaging the Inner Workings of Solid Tumors," *Charles River Symposium on Modeling Disease: New Windows on a Hidden World*, Harvard Medical School, Boston, MA (November 17, 2004)

"Interactions of Angiogenic Therapy with Cytotoxic Chemotherapy," *GOG Symposium*, San Diego, CA (January 13, 2005)
"Normalization of Tumor Vasculature: An Emerging Concept in Antiangiogenic Therapy of Cancer," *96th Annual AACR Meeting,* Anaheim, CA (April 16, 2005).
"Interstitial Transport in Tumors: Barriers and Strategies," *96th Annual AACR Meeting*, Anaheim, CA (April 16, 2005).
"Normalization of Tumor Vasculature: An Emerging Concept in Antiangiogenic Therapy of Cancer," *Whitehead Institute Press Seminar*, Cambridge, MA (May 13, 2005).

"Normalization of Tumor Vasculature: An Emerging Concept in Antiangiogenic Therapy of Cancer," *Gordon Conference on Angiogenesis and Microcirculation*, Newport, RI (August 18, 2005).
"Normalization of Tumor Vasculature: An Emerging Concept in Antiangiogenic Therapy of Cancer," *U.S. Oncology Meeting*, Dallas, TX (August 19, 2005).
"Normalization of Tumor Microenvironment: An Emerging Concept in Antiangiogenic Therapy of Cancer," *2nd International Conference on Tumor Progression and Drug Resistance*, Boston, MA (September 19, 2005).
Plenary Session: "Normalization of Tumor Microenvironment by Antiangiogenic Therapy: From Bench to Bedside and Back," *13th European Union Gastroenterology Week*, Copenhagen, Denmark (October 18, 2005).
"Normalization of Tumor Vasculature by Antiangiogenic Therapy: From Bench to Bedside and Back," *AACR Special Meeting on Anti-Angiogenesis and Drug Delivery to Tumors: From Bench to Bedside and Back*, Boston, MA (November 9, 2005).
"Normalization of Tumor Microenvironment by Antiangiogenic Therapy: From Bench to Bedside and Back," *AACR Special Meeting on Cancer, Proteases and Microenvironment"*, Bonita Springs, FL (December 1, 2005).

Keynote Lecture: "Normalization of Tumor Microenvironment by Antiangiogenic Therapy: From Bench to Bedside and Back,"*8th International Meeting on Anti-Angiogenesis Agents*, La Jolla, CA (February 3, 2006).
Distinguished Service Award Lecture: "Normalization of Tumor Vasculature: An Emerging Concept in Antiangiogenic Therapy of Cancer," *Nature Biotechnology Winter Symposium,* Miami, FL (February 7, 2006).
"Normalization of Tumor Microenvironment by Antiangiogenic Therapy: From Bench to Bedside and Back," *17th Annul Cancer Progress Conference,* New York, NY (March 7, 2006).
Plenary Session/Keynote Talk: "Normalization of Tumor Microenvironment by Antiangiogenic Therapy: From Bench to Bedside and Back," *4th International Symposium on Targeted Anticancer Therapies*, Amsterdam, the Netherlands (March 16, 2006).
"Normalization of Tumor Microenvironment: An Emerging Concept in Antiangiogenic Therapy of Cancer," *97th AACR Annual Meeting,* Washington, DC (April 2, 2006).
Plenary Lecture: "Molecular, Cellular, Anatomical and Functional Imaging of Tumors In Vivo: From Bench to Bedside and Back," *International Symposium on Biomedical Imaging*, Washington, DC (April 6, 2006).
Keynote Lecture: "Normalization of Abnormal Vessels: An Emerging Concept in Anti-angiogenic Therapy of Cancer and other Diseases," *Association for Research in Vision and Ophthalmology (ARVO) 2006 Annual Meeting*, Ft. Lauderdale, FL (April 30, 2006).
Keynote Lecture: "Normalization of Tumor Vasculature and Microenvironment by Antiangiogenic Therapy: From Bench to Bedside and Back," *4th Hematology & Oncology Tumor Targeting Symposium*, Melbourne, Australia (May 6, 2006).
Keynote Lecture: "Delivery of Nano-Medicine to Solid Tumors: Physiological Barriers and Strategies," *NCI/NSTI Symposium on Cancer Nanotechnology*, Boston, MA (May 9, 2006).
"Normalization of Tumor Vasculature and Microenvironment by Antiangiogenic Therapy: From Bench to Bedside and Back," *Pathways to Progress: Breakthroughs in Targeted Cancer Therapy* - an ASCO Satellite Symposium, Atlanta, GA (June 2, 2006).
"Normalization of Tumor Vasculature and Microenvironment Using Targeted Therapies: From Bench to Bedside and Back," *18th Pezcoller Symposium on Tumor Microenvironment: Heterotypic Interactions*, Trento, Italy (June 27-29, 2006).
"Normalization of Tumor Vasculature by Antiangiogenic Therapy: Implications for Engineering Functional Vasculature", *Gordon Research Conference on Endothelial Cell Phenotypes in Health and Disease*, Biddeford, ME (August 6-11, 2006).
"Imaging the Inner Workings of Solid Tumors", *17th Annual Course of Experimental Models of Human Cancer*, Jackson Lab, Bar Harbor, ME (August 25, 2006).
"Dissecting Steps of Lymphatic Metastasis", *Gordon Research Conference on Molecular Mechanisms in Lymphatic Function and Disease*, Les Diablerets, Switzerland (September 3-8, 2006)
Keynote Lecture: "Normalization of Tumor Vasculature and Microenvironment by Antiangiogenic Therapies: From Bench to Bedside and Back," *10th International Workshop on Tumor Microenvironment: Hypoxia, Angiogenesis and Vasculature,* Boston (September 15-17, 2006).
"Normalization of Tumor Vasculature and Microenvironment by Antiangiogenic Therapies: From Bench to Bedside and Back," *4th Annual Angiogenesis and Vascular Targeting Drug Discovery and Development Summit,* Boston (September 19-20, 2006).

Keynote Lecture: "Normalization of Tumor Vasculature and Microenvironment by Antiangiogenic Therapies: From Bench to Bedside and Back," *4th Asia Pacific Oncology Summit,* Sydney, Australia (October 7-8, 2006).
Keynote Lecture: "Normalization of Tumor Vasculature and Microenvironment by Antiangiogenic Therapies: From Bench to Bedside and Back," *5th International Colorectal Cancer Congress,* Naples, FL (October 12-15, 2006).
"Normalization of Tumor Vasculature and Microenvironment Using Targeted Therapies: From Bench to Bedside and Back," *37th Princess Takamatsu Cancer Symposium on Cancer Cells and their Microenvironment,* Tokyo, Japan (November 14-17, 2006).

"Normalization of Tumor Vasculature and Microenvironment Using Targeted Therapies: From Bench to Bedside and Back," *18th Annual Cancer Progress Conference,* New York, NY (March 6, 2007).
Opening Lecture: "Normalization of Tumor Vasculature and Microenvironment by Antiangiogenic Therapies: From Bench to Bedside and Back," *National Cancer Institute Early Drug Development Meeting,* Washington DC (March 12-13, 2007).
"Normalization of Tumor Vasculature and Microenvironment Using Targeted Therapies: From Bench to Bedside and Back," *40 Years of Metastasis Research: A Symposium in Honor of Dr. Fidler,* Houston, TX (March 23-24, 2007).
"Dissecting the Steps of Lymphatic Metastasis," *98th Annual AACR Meeting*, Los Angeles, CA (April 14-18, 2007).
"Normalization of Tumor Vasculature and Microenvironment by Antiangiogenic Therapies: From Bench to Bedside and Back," *Advances in Oncology,* New York, NY (April 21, 2007).
Keynote Lecture: "Normalization of Tumor Vasculature and Microenvironment Using Targeted Therapies: From Bench to Bedside and Back," *New England NeuroOncology Meeting*, Boston, MA (April 28, 2007).
Keynote Lecture: "How to Conduct a Multi-Disciplinary Clinical Trial," *NCI-Genentech Avastin Summit*, Washington, DC (May 11-12, 2007).
"Vascular Normalization by Antiangiogenic Therapy", *Days of Molecular Medicine – Nature Medicine Meeting*, Boston, MA (May 22-24, 2007).
"Vascular Normalization as a Mechanism of Antiangiogenic Therapy: Clinical Evidence and Implications", *ASCO Annual Meeting*, Chicago, IL (June 1-5, 2007).
"Normalization of Tumor Vasculature and Microenvironment by Antiangiogenic Therapies: From Bench to Bedside and Back," *25th Beatson International Cancer Meeting,* Glasgow, UK (June 18-20, 2007).
Keynote Lecture: "Creation of Functional Blood Vessels for Cancer Treatment and Tissue Engineering", *Gordon Research Conference on Biomaterials and Tissue Engineering,* Plymouth, NH (July 22-26, 2007).
"Normalization of Tumor Vasculature: Some New Insights", *Gordon Research Conference on Angiogenesis and Microcirculation,* Newport, RI (August 19- 23, 2007).
"Imaging the Inner Workings of Solid Tumors", *17th Annual Course of Experimental Models of Human Cancer*, Jackson Lab, Bar Harbor, ME (August 25, 2007).
Keynote Lecture: "How deos bevacizumab work?," *Novel Agents in the Treatment of Lung Cancer, Fifth Cambridge Conference,* Cambridge, MA (October 1-2, 2007).
"Normalization of Tumor Vasculature and Microenvironment by Antiangiogenic Therapies: From Bench to Bedside and Back," *Boston Glioma Research & Therapy,* Boston, MA (October 10-11, 2007).
"Normalization of Tumor Vasculature and Microenvironment by Antiangiogenic Therapies: From Bench to Bedside and Back," *International Society of Biological Therapy*, Boston, MA (November 1, 2007).
"Normalization of Tumor Vasculature and Microenvironment by Antiangiogenic Therapies: From Bench to Bedside and Back," *AACR Centennial Conference on Translational Cancer Medicine*, Singapore (Nov 5-8, 2007).
"Normalization of Tumor Vasculature and Microenvironment by Antiangiogenic Therapies: From Bench to Bedside and Back," *AACR Meeting on Colon Cancer,* Boston, MA (Nov 15, 2007).
"Lymphangiogenesis and Lymphatic Metastasis," *9th Annual Boston Angiogenesis Meeting* (Nov 16, 2007)
"Normalization of Tumor Vasculature and Microenvironment by Antiangiogenic Therapies: From Bench to Bedside and Back," *Optical Imaging for Medicine and Biology: Applications Cancer,* Boston, MA (Nov 30, 2007).
"Normalization of Tumor Vasculature and Microenvironment by Antiangiogenic Therapies: From Bench to Bedside and Back," *Eradicating Metastasis, NCI Workshop,* Bethesda, MD (December 5-6, 2007).
"Normalization of Tumor Vasculature and Microenvironment by Antiangiogenic Therapies: Lessons from Multi-Disciplinary Clinical Trials," *Canadian Phase I Research Meeting,* Ottawa, Canada (Dec 7, 2007).

"Vascular Biology of Brain Metastasis," *NCI-Biology of Brain Metastasis Meeting*, Bethesda, MD (January 30 – February 2, 2008)

"Tissue, Circulating and Imaging Biomarkers from Multidisciplinary Translational Trials on Antiangiogenic Therapy of Cancer," *NCI-CTEP Investigational Drug Steering Committee - Angiogenesis Task Force Meeting*, Rockville, MD (March 18, 2008)
"Lessons from Multi-Disciplinary Clinical Trials of Antiangiogenic Therapy of Cancer," *99th Annual AACR Meeting*, San Diego, CA (April 12-16, 2008)
"Normalization of Tumor Vasculature and Microenvironment by Targeted Therapies: From Bench to Bedside and Back," *4th Protein Engineering Summit*, Boston (April 28, 2008)
Opening Lecture: "Creation of Functional Vasculature for Cancer Treatment and Tissue Engineering," *Gordon Conference on Signal Transduction by Engineered Extracellular Matrix*, Bates College, Lewiston, ME (July 6-11, 2008).
Plenary Lecture: "Normalization of Tumor Vasculature and Microenvironment Using Targeted Therapies: From Bench to Bedside and Back," *35th Annual Meeting of Controlled Release Society,* New York, NY (July 14, 2008).
"Deconstructing Solid Tumors Using Intravital Microscopy," *Gordon Conference on Lasers in Biology and Medicine*, Holderness School, Holderness, NH (July 20-23, 2008)
"Angiogenesis in Brain Tumors," *5th Biannual Course on Mechanisms of Neural Differentiation and Brain Tumors*, Cold Spring Harbor, New York, NY (July 30, 2008)
"Imaging the Inner Workings of Solid Tumors", *17th Annual Course of Experimental Models of Human Cancer*, Jackson Lab, Bar Harbor, ME (August 25, 2008).
"Delivery of macromolecules and nanoparticles in tumors." *Society of Advanced Therapeutics*, Boston, MA (September 18, 2008)
"Lessons from multidisciplinary translational trials on antiangiogenic therapy of cancer," *50th Annual Meeting of American Society of Therapeutic Radiation Oncology*, Boston, MA (September 22, 2008)
"Antiangiogenic Therapy of Brain Tumors," *8th Annual Carolyn Frye-Halloran Symposium*, Boston, MA (October 2, 2008)
Plenary Lecture: "Normalization of Tumor Vasculature and Microenvironment Using Targeted Therapies: From Bench to Bedside and Back," *National Cancer Research Institute Annual Meeting,* Birmingham, UK (October 5, 2008).
Future of Medicine Lecture: "Antiangiogenesis: Emerging Paradigms," *The M. Judah Folkman Conference on Antiangiogenesis: New Frontiers in Therapeutic Development,* Cambridge, MA (October 14, 2008).
"Normalization of Tumor Microenvironment for Cancer Treatment," *AACR Centennial Symposium*, Buffalo, NY (October 27, 2008)

"Molecular Markers of Response and Resistance to Angiogenesis Inhibitors," *ASCO-NCI-EORT Conference on Molecular Markers in Oncology*, Hollywood, FL (November 1, 2008)
"Delivery of Nano-Medicine to Solid Tumors: Physiological Barriers and Strategies," *Materials Research Society*, Boston, MA (December 1, 2008).
"Normalization of Tumor Microenvironment for Cancer Treatment: Bench to Bedside and Back," *NCI Executive Committee Retreat*, Bethesda, MD (January 27-28, 2009).
"Insights from Imaging Tumor Vessels during Antiangiogenic Therapy: Bench to Bedside to Biomarkers," *100th Annual AACR Meeting*, Denver, CO (April 18-19, 2009).
"Delivery of Nanotherapeutics to Tumors: Barriers and Strategies," *100th Annual AACR Meeting*, Denver, CO (April 18-19, 2009).
"Normalization of Tumor Microenvironment for Cancer Treatment: Bench to Bedside and Back," *ASIP Annual Meeting*, New Orleans, LA (April 20-21, 2009).
Nobel Forum: "Normalization of Tumor Microenvironment: Insights from Intravital Microscopy," *Nobel Forum on High Resolution In Vivo Imaging of Cell Biology*, Stockholm, Sweden (May 15-16, 2009).
"Normalization of Tumor Microenvironment for Cancer Treatment: Bench to Bedside and Back," *The Expanding Role of Angiogenesis in Cancer Therapeutics: The Folkman Legacy*, *New York Academy of Sciences*, Bethesda, MD (May 26, 2009).
"Predictors of Response and Resistance in Antiangiogenic Therapy," *45th Annual ASCO Meeting*, Orlando, FL (May 29-June 2, 2009)
"Anti-angiogenesis Therapy of Cancer: Lessons from Bench and Bedside," *Gordon Conference on Angiogenesis, Salve Regina University,* New Port, RI (August 2-6, 2009).
"Tumor Angiogenesis and Microenvironment", 18th *Annual Course of Experimental Models of Human Cancer*, Jackson Lab, Bar Harbor, ME (August 22, 2009).

Keynote Lecture: "Delivery of Molecular and Nanomedicine to Solid Tumors," *Gordon Conference on Drug Carriers, Waterville Valley,* NH (August 16, 2010).
"Tumor Angiogenesis and Microenvironment", *19th Annual Course of Experimental Models of Human Cancer*, Jackson Lab, Bar Harbor, ME (August 23, 2010)
"Seed and Soil Hypothesis Revisited," Metastasis and the Tumor Microenvironment, AACR-MRS Meeting, Philadelphia, PA (September 12, 2010)
Keynote Lecture: "Towards Personalizing Antiangiogenic Therapy of Cancer," *12th Boston Angiogenesis Meeting*, Boston (October 5, 2010).

American Cancer Society Basic Science Lecture: "Normalization of Tumor Microenvironment for Cancer Treatment: Bench to Bedside to Biomarkers," *64th Society of Surgical Oncology Meeting*, San Antonio, TX (March 4, 2011).
Rous-Whipple Award Lecture: "Normalization of Tumor Microenvironment for Cancer Treatment: Bench to Bedside to Biomarkers," *Annual Meeting of the American Society of Investigative Pathology*, Washington, DC (April 11-12, 2011).
Keynote Lecture: "Normalizing tumor microenvironment to treat cancer: From mathematical model to mouse to man," *23rd Pezcoller Symposium*, Trento, Italy (June 16-18, 2011).
"Tumor Angiogenesis and Microenvironment," *20th Annual Course of Experimental Models of Human Cancer*, Jackson Lab, Bar Harbor, ME (August 24, 2011).
"Normalizing tumor microenvironment to improve the treatment outcome," *AACR Frontiers in Basic Cancer Research Meeting*, San Francisco, CA (September 16, 2011).

"Building and Managing a Multidisciplinary Program," *NCI Think Tank on Team Science*, Bethesda, MD (February 2012)
Keynote Lecture: "Lessons from Antiangiogenic Trials in Glioblastoma: Bench to Bedside to Biomarkers," 30th *German Cancer Congress*, Berlin, Germany (February 23, 2012)
Plenary Session Lecture: "Normalization of Tumor Microenvironment to Improve Cancer Treatment," *Annual Meeting of the AACR*, Chicago (April 2, 2012).
Science of Oncology Award Lecture: "Normalization of Tumor Microenvironment for Cancer Treatment: Bench to Bedside to Biomarkers," *Annual Meeting of the American Society of Clinical Oncology*, Chicago (June 3, 2012).
"Tumor Angiogenesis and Microenvironment,"21st *Annual Course of Experimental Models of Human Cancer*, Jackson Lab, Bar Harbor, ME (August 30, 2012).
Plenary Lecture: "Normalization of Tumor Microenvironment to Treat Cancer: Insights from Intravital Microscopy," *World Molecular Imaging Congress*, Dublin, Ireland (September 7, 2012).
Opening Lecture: "Delivering Nanomedicine to Solid Tumors: Challenges and Novel Strategies," *Workshop on Enhanced Permeability and Retention Effect,* NCI, Bethesda, MD (October 10, 2012).
Keynote Lecture: "Normalization of Tumor Microenvironment for Cancer Treatment: Bench to Bedside to Biomarkers," *Targeting the Tumor Microenvironment* Conference, Boston (October 17-18, 2012).
Keynote Lecture: "Normalization of the Biochemical and Mechanical Tumor Microenvironment to Treat Cancer: Bench to Bedside," *The Fourth USNCB Symposium on Frontiers in Biomechanics: Mechanics in Oncology,* Atlanta, GA (October 24, 2012).
"Normalization of Tumor Vasculature and Microenvironment to Overcome Tumor Heterogeneity," *33rd Princess Takamatsu Cancer Symposium on Understanding Tumor Heterogeneity*, Tokyo, Japan (November 14-16, 2012)
"Treatment of Brain Metastasis," *17th Annual Society for Neuro-Oncology Scientific Meeting*, Washington, DC (November 18, 2012)

Plenary Lecture: "Re-engineering Tumor Microenvironment for Cancer Treatment: Bench to Bedside," Congress on NanoEngineering, ASME, Boston, MA (February 203, 2013)
"Trageting Stroma to Treat Barin Metastasis," *Annual Meeting of the AACR*, Washington, DC (April 9, 2013)
"Normalizing Biochemical and Mechanical Tumor Microenvironment to Enhance Cancer Treatment: Bench to Bedside to Biomarkers," *Cancer Biology & Therapeutics Meeting*, Cold Spring Harbor Laboratory, NY (April 23-7, 2013).
"Normalizing Vasculature using Anti-angiogenic Agents for Treatment of Cancer and Other Diseases: Bench to Bedside to Biomarkers," *Trans-NIH Angiogenesis Workshop*, NIH, Bethesda, MD (May 20-21, 2013)

"Tumor Angiogenesis and Microenvironment", 22nd *Annual Course of Experimental Models of Human Cancer*, Jackson Lab, Bar Harbor, ME (August 23, 2013).
Keynote Lecture: "Normalization of Tumor Microenvironment for Cancer Treatment: Bench to Bedside to Biomarkers," *Chinese Society of Clinical Oncology (CSCO) Summit of Anti-Angiogenesis Treatment in Lung Cancer,* Shanghai, China (October 17-18, 2013).
Keynote Lecture: "Normalization of Tumor Microenvironment for Cancer Treatment: Bench to Bedside to Biomarkers," *Chinese Society of Clinical Oncology (CSCO) Anti-Angiogenesis Expert Symposium,* Beijing, China (October 17-18, 2013).
"Overcoming treatment resistance by re-engineering tumor microenvironment," *29th Forbeck Research Foundation Forum of Resistance Mechanisms*, Hilton Head, S Carolins (Nov 7-10, 2013).
Kenote Speaker: "Normalization of Tumor Microenvironment for Cancer Treatment: Bench to Bedside to Biomarkers," *African Organization of Research and Training in Cancer (AORTC),* Durban, S. Africa (November 21, 2013).
Keynote Lecture: "Normalization of Tumor Microenvironment for Cancer Treatment: Bench to Bedside to Biomarkers," *Immuno Targeting and Delivery Symposium*, Dartmouth Center for Cancer Nanotechnology Excellence, Hanover, NH (December 10, 2013).

"Emerging role of RAS blockade in cancer treatment," *Gordon Conference on the Renin-Angiotensin System Beyond Angiotensin II*, Renaissance Tuscany Il Ciocco Resort, Lucca (Barga), Italy (March 2-7, 2014)
Keynote Lecture: "Normalization of Tumor Microenvironment for Cancer Treatment: Bench to Bedside to Biomarkers," *5th International Meeting on Angiogenesis, Amsterdam, Netherlands* (March 12-14, 2014).
Earl Bakken Distinguished Lecture: "Reengineering the Tumor Microenvironment for Cancer Treatment: Bench to Bedside," *AIMBE Annual Meeting*, Washington DC (March 24 2014).
AACR-Princess Takamtsu Memorial Lecture: "Reengineering the Tumor Microenvironment to Enhance Cancer Treatment: Bench to Bedside to Biomarkers", *Annual Meeting of the AACR*, San Diego, CA (April 5, 2014).
"Emerging concepts in the treatment of metastasis: Insights from Intravital Microscopy" and "Solid stress and interstitial fluid pressure in tumors: Coevolution, implications and alleviation", *World Congress of Biomechanics*, Boston, MA (July 8-9, 2014).
"Tumor Angiogenesis and Microenvironment", 23rd *Annual Course of Experimental Models of Human Cancer*, Jackson Lab, Bar Harbor, ME (August 21, 2014).
"Strategies to Improve Delivery and Efficacy of Cancer Nanomedicines," *Roche-Nature Biotechnology Forum*, Buonas, Switzerland (September 3-5, 2014).
Keynote Lecture: "Reengineering the Tumor Microenvironment to Enhance Cancer Treatment: Bench to Bedside to Biomarkers", *US Oncology Science Forum*, Dallas, TX (September 19, 2014).
Keynote Lecture: "Reengineering the Tumor Microenvironment to Enhance Cancer Treatment: Bench to Bedside to Biomarkers", ONCOLOGY *IMPACT Meeting,* Oslo, Norway (October 16, 2014).

Keynote Lecture: "Antiangiogenesis strategies revisited: From starving tumors to alleviating hypoxia", *AACR Special Conference on Tumor Angiogenesis and Vascular Normalization: Bench to Bedside to Biomarkers*, Orlando, FL (March 5-8, 2015).
"Insights from imaging biomarkers", *Current Concepts session on Biomarkers of Anti-Angiogenic Therapy, AACR Annual Meeting,* Philadelphia, PA (April 19-22, 2015).
ASGBI Lecture: "Taming vessels to treat cancer", *Association of Surgeons of Great Britain & Ireland* (ASGBI), Manchester, UK (April 23, 2015).
Plenary Lecture: "Reengineering the microenvironment to improve treatment of fibrotic diseases" *International Liver Congress,* Vienna (April 24, 2015)
Keynote Lecture: *Chinese Thoracic Oncology Group Meeting on Anti-Angiogenesis*, Guangzhou, China (August 1, 2015)
Keynote Lecture: *Chinese Society of Clinical Oncology (CSCO) Anti-Angiogenesis Summit,* Shanghai, China (August 2, 2015).
"Tumor Angiogenesis and Microenvironment", 24th *Annual Course of Experimental Models of Human Cancer*, Jackson Lab, Bar Harbor, ME (August 27, 2015).
"Reengineering the tumor stroma to improve cancer treatment: Bench to bedside," *Innovation in Cancer Science and Therapy*, Sanofi, Cambridge, MA (October 15, 2015)

"Reengineering the tumor stroma to improve cancer treatment: Bench to bedside" *Chabner Colloquium: Collaboration in Clinical Trials*, Boston, MA (October 26, 2015)
Keynote Lecture: "Reengineering the Tumor Microenvironment to Enhance Cancer Treatment: Bench to Bedside", *NSF Workshop on Cell-Matrix Mechanobiology: Current State and Future Directions,* Univ of Illinois, Urbana-Champaign (October 27, 2015).

Keynote Lecture: "Reengineering the Tumor Microenvironment to Enhance Cancer Treatment: Bench to Bedside", Keystone Symposia on Antibodies as Drugs, Whistler, Canada (March 7, 2016).
Keynote Lecture: "Reengineering the Tumor Microenvironment to Enhance Cancer Treatment: Bench to Bedside", 90th American Chemical Society Symposium, Harvard University, Cambridge, MA (June 7, 2016).
"Tumor Angiogenesis and Microenvironment: Bench to bedside", *25th Annual Course of Experimental Models of Human Cancer*, Jackson Lab, Bar Harbor, ME (August 27, 2016).
"Reengineering the Tumor Microenvironment to Enhance Cancer Treatment: Bench to Bedside", *Targeted Drug Delivery Symposoium*, Pfizer, Cambridge, MA (September 19, 2016).
Keynote Lecture: "Reengineering the Tumor Microenvironment to Enhance Delivery and Efficacy of Nanomedicine", *NCI INCA Cancer Nanomedicine Meeting*, Paris (November 9-11, 2016).
"Reprogramming the tumor microenvironment to improve survival of metastatic cancer patients", *Metastasis Cancer Research Task Force*, Murtha Cancer Center, Walter Reed National Medical Center, Bethesda, MD (December 12-13, 2016).

"Reprogramming the tumor microenvironment to improve immunotherapy of cancer", *Tumor Immune Microenvironment Workshop*, NCI, Rockville, MD (January 17-19, 2017).
Meet-the-Expert Lecture: "Reprogramming the tumor microenvironment using angiotensin system inhibitors to enhance cancer treatment: Bench to bedside", *AACR Annual Meeting*, Washington DC (April 1-5, 2017).
"Vascular normalization: Emerging strategy to enhance immunotherapy", *Angiogenesis/Immuno-Oncology Meeting*, Merck, Washington DC (April 5, 2017).
State-of-the-Art Lecture: "Insights from Intravital Microecopy of Tumors: Bench to bedside", *32nd Congress of the International Society for Advancement of Cytology*, Boston, MA (June 10-14, 2017)
"Reprogramming the tumor microenvironment to improve immunotherapy of cancer", *Evergrande Symposium on Immunity and Inflammation in Disease and Tissue*, Harvard Medical School, Boston (July 21, 2017).
"Reprogramming the tumor microenvironment to enhance cancer treatment: Bench and Bedside," *National Foundation for Cancer Research Symposium,* Washington, DC (August 2-4, 2017).
"Reprogramming the tumor microenvironment to enhance cancer treatment: Bench and Bedside," *Gordon Conference on Angiogenesis,* Salve Regina University*,* New Port, RI (August 6-11, 2017).
"Reengineering the tumor microenvironment to improve cancer treatment: Bench to bedside", *26th Annual Course of Experimental Models of Human Cancer*, Jackson Lab, Bar Harbor, ME (August 18, 2017).
"Translating insights from cancer treatment to improve TB Treatment," *Bill & Melinda Gates Foundation Grand Challenges Meeting*, Washington, DC (October 1-4, 2017).
"Reprogramming the tumor microenvironment to improve cancer treatment: Bench to bedside", *Next Generation Cancer Clinical Trials*, Cold Spring Harbor Lab, NY (October 14 -15, 2017).
Keynote Lecture: "Reengineering the tumor microenvironment to improve cancer treatment: Bench to bedside", *Physical Science of Oncology Network Meeting,* MIT, Cambridge, MA (October 17-19, 2017).
Keynote Lecture: "Reengineering the tumor microenvironment to enhance cancer treatment: Bench to bedside", *Antibody-Drug Conjugates: Oncology and Beyond*, New York Academy of Sciences Meeting, NYC (Nov 14, 2017)
"Reengineering the tumor microenvironment to improve cancer treatment: Bench to bedside", Nobel Forum, Karolinska Institute, Stockholm (March 8-9, 2018)
"Microenvironment determines the differential response of primary tumor versus metastasis", Annual AACR Meeting, Chicago (April 15-18, 2018)
Plenary Speaker: "Reengineering the tumor microenvironment to improve cancer treatment: Bench to bedside", Japanese Breast Cancer Society Meeting, Kyoto, Japan (May 16-17, 2018)
Special Lecture: "Microenvironment determines the therapeutic response of primary tumor versus metastasis", Kyoto Breast Cancer Society Meeting, Kyoto, Japan (May 17-18, 2018)
Plenary Speaker, "Reengineering the tumor microenvironment to improve cancer treatment: Bench to bedside", International Vascular Biology Meeting, Helsinki (June 3-7, 2018)

Keynote Speaker: "Reengineering the tumor microenvironment to improve cancer treatment: Bench to bedside", Controlled Release Society Meeting, NYC (July 22-23, 2018)
Earl Benditt Award/Lecture: "Reengineering the tumor microenvironment to improve cancer treatment: Bench to bedside", North American Vascular Biology Organization, Newport, RI (October 14-18, 2018)
Forbeck Forum on Tumor Microenvironment, Colorado Springs, Colorado (November 2-4, 2018)

"Reengineering the tumor microenvironment to improve cancer treatment: Bench to bedside", Cancer Fibroblasts and Therapies, Banbury Center, Cold Spring Harbor Lab, Lloyd Harbor, NY (March 10-13, 2019)
"Improving immunotherapy of cancer by normalizing tumor vessels" *AACR Annual Meeting*, Atlanta, GA (March 29 - April 3, 2019)
"Reprogramming the Tumor Microenvironment to Improve Immunotherapy: Bench to Bedside", Advances in Immunotherapy, Harvard Medical School, Boston (May 17, 2019)
"Reprogramming the Tumor Microenvironment to Improve Immunotherapy: Bench to Bedside", ASCO Annual Meeting, Chicago, IL (May 29-June 2, 2019)
Plenary Speaker: "Reengineering the tumor microenvironment to enhance cancer treatment: Bench to bedside", 17th International Photodynamic Association World Congress, Cambridge, MA (July 1, 2019)
"Improving Cancer Treatment by Normalizing the Tumor's Neighborhood," Congress of Future Medical Leaders, National Academy of Future Physicians and Medical Scientists, Lowell, MA (June 25, 2019)
Keynote Speaker: "Reprogramming the Tumor Microenvironment to Enhance Cancer Treatment: Bench to Bedside", Gordon Research Conference on Angiogenesis, Salve Regina, Newport, RI (August 4-9, 2019).

Keynote Speaker: "Reprogramming the Tumor Microenvironment to Improve Immunotherapy: Bench to Bedside", 21st International Vascular Biology Meeting, Seoul, S. Korea, VIRTUAL (Sept 9 -1 2, 2020).
Keynote Speaker: "Normalizing the Tumor Microenvironment to Improve Immunotherapy: Bench to Bedside", 2nd Annual Congress of Immuno-Oncology Society of India, VIRTUAL (October 30- Nov 1, 2020).

Keynote Speaker: "Normalizing the Tumor Microenvironment to Improve Cancer Treatment: From Math Modeling to Mice to Patients and Back," 11th Internatl Conference on Biomolecular Engineering, VIRTUAL (January 9, 2021).
"Reprogramming the Tumor Microenvironment to Improve Immunotherapy: Bench to Bedside", Annual AACR Meeting VIRTUAL (May 18, 2021).
"Improving Treatment of Brain Metastases from Breast Cancer," Australasian Metastasis Research Society Meeting VIRTUAL (June 24, 2021).

Meet-the-Expert Lecture: "Improving treatment of primary and metastatic brain tumors: Emerging strategies," *AACR Annual Meeting*, New Orleans, LA (April 1-5, 2022).
"Normalizing the Tumor Microenvironment to Improve Immunotherapy: Bench to Bedside," SITC Tumor Immune Microenvironment Workshop, San Diego, CA (April 20-23, 2022).
"Lessons from my journey from IIT-K to Harvard", Leadership for Academicians Program, New Delhi, India, VIRTUAL (June 14, 2022).
"Improving treatment of primary and metastatic brain tumors: Emerging targets and insights," CSHL Course on Brain Tumors, Cold Spring Harbor, NY (August 8-10, 2022).
"Normalizing the Tumor Microenvironment to Improve Immunotherapy: Bench to Bedside," JAX Genomic Medicine, VIRTUAL (August 15, 2022).
International Honorary JCA Member Lecture: "Normalizing the Tumor Microenvironment to Improve Immunotherapy: Bench to Bedside and Back," Japanese Cancer Association (JCA), VIRTUAL (October 1, 2022).
"Improving treatment of metastatic brain tumors: Emerging strategies," AACR Special Conference on Cancer Metastsis, Portland, OR (November 14-18, 2022).

"Improving treatment of adult and pediatric brain tumors: Emerging strategies," and "What is the Future of Antiangiogenesis in the Era of Immunotherapy?", AACR Annual Meeting, Orlando, Fl (April 14-18, 2023).
"Reprogramming the Tumor Microenvironment to Improve Immunotherapy: Bench to Bedside", Advances in Immunotherapy: Annual Update, MGH/HMS, Copley Plaza, Boston (May 1-2, 2023)
"Normalizing the Tumor Microenvironment to Improve Cancer Treatment: Bench to Bedside,"
The Resistant Tumor Microenvironment, Vancouver, BC, Canada (May 7-10, 2023).

Keynote Speaker: "New strategies to improve treatment of primary and metastatic brain tumors," CerebroVascular Biology Meeting (CVB2023), Uppsala, Sweden (June 18-22).
"Overcoming Resistance to Immunotherapy in Glioblastoma: Emerging Insights and Strategies," Gordon Research Conference on Advances in Brsin Tumor Research and Therapy, Bryant University, Smithfield, RI (June 25-30, 2023).
"Normalizing the Tumor Microenvironment to Improve Immunotherapy: Bench to Bedside," JAX Genomic Medicine, Bar Harbor, ME (August 15, 2023).
Keynote Speaker: "Normalizing the tumor microenvironment to improve immunotherapy of brain tumors: Emerging insights and strategies," 16th International Symposium on Translational Research in Oncology, Dublin, Ireland (Sept 27-29, 2023).

"Improving cancer treatment: From math modeling to mice to patients," PanIIT Global Conference, Washington DC (January 12-14, 2024).
"Improving Immunotherapy of Glioblastoma: Emerging Insights and Strategies," CSHL Course on Brain Tumors, Cold Spring Harbor, NY (June 24-25, 2024).
"Normalizing the Tumor Microenvironment to Improve Immunotherapy: Bench to Bedside," 33rd Annual JAX Course on Experimental Models of Human Cancer, Bar Harbor, ME (August 6, 2024).
"Improving Immunotherapy of Glioblastoma: Emerging Insights and Strategies," 83rd Annual Meeting of the Japan Neurosurgical Society, Yokohama, VIRTUAL (October 16-18, 2024).

PUBLICATIONS (Key publications in bold; GoogleScholars citation >245,322; h-factor = 229; Web of Science citations >177,660; h-factor = 198; February 1, 2025)
(https://www.ncbi.nlm.nih.gov/myncbi/rakesh.jain.2/bibliography/public/
and https://scholar.google.com/citations?user=8Zwiu-oAAAAJ&hl=en)

1. E. Ruckenstein and R.K. Jain, "Spontaneous rupture of thin liquid films, " *J. Chemical Society, Faraday Transactions II,* **70:**132-147 (1974).
2. R.K. Jain and E. Ruckenstein, "Stability of stagnant viscous films on a solid surface," *J. Colloid and Interface Science,* **54:**108-116 (1976).
3. R.K. Jain and M.M. Denn, "Short term regulation of BOD upsets in an estuary," *Trans. ASME J. Dynamic Systems, Measurement and Control,* **98**, Series G, 30-31 (1976).
4. R.K. Jain and J. Wei, "Dynamics of drug transport in solid tumors: distributed parameter model," *J. Bioengineering*, **1**:313-329 (1977).
5. R.N. Pierson, D.C. Price, J. Wang and R.K. Jain, "Extracellular water measurements: organ tracer kinetics of bromide and sucrose in rats and man," *Am. J. Physiology*, **235**:254-264 (1978).
6. R.K. Jain, "Effect of inhomogeneities and finite boundaries on temperature distribution in a perfused medium with application to tumors," *Trans. ASME J. Biomechanical Engineering*, **100**:235-241 (1978).
7. R.K. Jain, C. Maldarelli and E. Ruckenstein, "Onset of microvilli in normal and neoplastic cells," *A.I.Ch.E. Symposium Series, Biorheology*, **74**:120-124 (1978).
8. J.M. Weissbrod, R.K. Jain and F.M. Sirotnak, "Pharmacokinetics of methotrexate in leukemia cells: effect of dose and mode of injection," *J. Pharmacokinetics and Biopharmaceutics*, **6**:487-503 (1978).
9. R.K. Jain, "Transient temperature distributions in an infinite perfused medium due to a time-dependent, spherical heat source," *Trans. ASME J. Biomechanical Engineering*, **101:**82-86 (1979).
10. R.K. Jain, J. Wei and P.M. Gullino, "Pharmacokinetics of methotrexate in solid tumors," *J. Pharmacokinetics and Biopharmaceutics*, **7**:181-194 (1979).
11. R.K. Jain, F.H. Grantham and P.M. Gullino, "Blood flow and heat transfer in Walker 256 mammary carcinoma," *J. National Cancer Institute*, **62**:927-933 (1979).
12. H.P. Sien and R.K. Jain, "Temperature distributions in normal and neoplastic tissues during hyperthermia: a lumped parameter model," *J. Thermal Biology,* **4**:157-164 (1979).
13. G. Tzeghai and R.K. Jain, "A semi-empirical model for cell kill kinetics during hyperthermia," *J. Thermal Biology*, **4**:257-258 (1979).
14. I.B. Ivanov and R.K. Jain, "Formation and thinning of thin liquid films," *Dynamics and Instability of Fluid Interfaces,* edited by T.S. Sorensen, Springer-Verlag, New York, pp 120-139 (1979).
15. R.K. Jain, I.B. Ivanov, C. Maldarelli and E. Ruckenstein, "Instability and rupture of thin liquid films," *Dynamics and Instability of Fluid Interfaces*, edited by T.S. Sorensen, Springer-Verlag, New York, pp 140-167 (1979).
16. I.B. Ivanov, R.K. Jain, P. Somasundaran and T.T. Traykov, "The role of surfactants on the coalescences of emulsion droplets," *Solution Chemistry of Surfactants*, edited by K.A. Mittal, Plenum Press, New York, Volume 2, pp 817-840 (1979).
17. H.P. Sien, and R.K. Jain, "Intratumour temperature distributions during hyperthermia," *J. Thermal Biology*, **5**:127-130 (1980).
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