ROGER D. KAMM

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Curriculum Vitae

BRIEF NARRATIVE

A primary objective of Kamm's research has been the application of fundamentals in fluid and solid mechanics to better understand essential biological and physiological phenomena. Studies over the past thirty-five years have addressed issues in the respiratory, ocular and cardiovascular systems. More recently, his attention has focused on new areas, the molecular mechanisms of cellular force sensation, cell population dynamics, and the development of new microfluidic platforms for the study of cell-cell and cell-matrix interactions, especially in the context of metastatic cancer. Kamm has been a leader in bringing the fields of mechanics together with biology and chemistry; by exploring the ways in which single molecules transmit force through macromolecular networks and the resulting change in molecular binding or enzymatic activity; and by developing new cell culture methods that enable simultaneous study of multiple cell types communicating in a realistic microenvironment. This cumulative work has led to over 400 refereed publications. Recognition for his contributions is reflected in Kamm's election as Fellow to AIMBE, ASME, BMES, AAAS and the IFMBE. He is also the 2010 recipient of the ASME Lissner Medal and the 2015 recipient of the Huiskes Medal, both for lifetime achievements, the inaugural recipient of the Nerem Medal in 2018, the Shu Chien Award from the BMES, and is a member of the National Academy of Medicine and the National Academy of Engineering.

PROFESSIONAL EXPERIENCE:

1977	:	Instructor, M.I.T.
1977-1978	:	Lecturer and Research Associate in the Department of Mech. Engineering, M.I.T.
1978-1981	:	Assistant Professor of Mechanical Engineering, M.I.T.
1986-1987	:	Senior Visiting Scientist, University of Cambridge, Department of Applied Mathematics and Theoretical Physics. Visiting Fellow, Clare Hall, University of Cambridge.
1981-1988	:	Associate Professor of Mechanical Engineering, M.I.T.
1988-2010	:	Professor of Health Sciences and Technology, M.I.T. and Harvard University
1988-2011	:	Professor of Mechanical Engineering, M.I.T.
1992-1994	:	Co-Director: Program in Biomedical Engineering, M.I.T.
1994-2012	:	Associate Director, Center for Biomedical Engineering, M.I.T.
1995-2010	:	Lecturer on Medicine, Harvard Medical School
1998-	:	Professor of Mechanical Engineering and Bioengineering, M.I.T.
2005-2010	:	Germeshausen Professor of Mechanical and Biological Engineering, M.I.T.
2005-2008	:	Associate Head, Department of Mechanical Engineering, M.I.T.
2008- 2010:		Director, GEM4 Center@MIT
2010- 2011:		Singapore Research Professor of Biological and Mechanical Engineering, M.I.T.
2011-	:	Cecil and Ida Green Distinguished Professor of Biological and Mechanical Engineering, M.I.T.
2010-	:	Director, NSF Science and Technology Center on Emergent Behaviors of Integrated Cellular Systems
2018-	:	Professor Post Tenure

EDUCATION:

NORTHWESTERN UNIVERSITY, Evanston, Illinois
B.S. in Mechanical Engineering, June 1972
MASSACHUSETTS INSTITUTE OF TECHNOLOGY, Cambridge, MA
S.M. in Mechanical Engineering, August 1973 (Advisor: C. Forbes Dewey)
MASSACHUSETTS INSTITUTE OF TECHNOLOGY, Cambridge, MA

Ph.D. in Mechanical Engineering, May 1977 (Advisor: Ascher Shapiro)

HONORS and AWARDS:

Graduate Student Council Teaching Award (1983)
American Inst. of Medical and Biological Engineering (Founding Fellow) (1993)
Class of 1960 Award (for development of the Undergraduate Minor in Biomedical Engineering) (1999)
Everett Moore Baker Memorial Award for Excellence in Undergraduate Teaching (2001)
Cambridge/MIT Fellow (2001)
Eschbach Distinguished Visiting Scholar Award, Northwestern University (2002)
Fellow, American Society of Mechanical Engineering (2003)
Distinguished Lecturer in Biomechanics, Stanford University, (2004)
Fellow, Biomedical Engineering Society (2004)
Fellow, International Academy of Medical and Biological Engineering (2005)
Skalak Memorial Lecture, UC San Diego, (2007)
Midwest Mechanics Lecturer (2007-8)
Lissner Medal (for lifetime achievement), ASME Bioengineering Division (2010)
Fellow, American Academy for the Advancement of Science (2010)
Elected to the National Academy of Medicine (2010)
Honorary Member, American Venous Forum (2011)
Huiskes Medal, European Society of Biomechanics (2015)
Fred S. Grodins Keynote Lecture, U Southern California (2016)
Otto Schmidtt Distinguished Lecture, U Minnesota (2017)
Penner Lecture, UC San Diego (2017)
Nerem Medal (for education and mentoring), ASME Bioengineering (2018)
Shu Chien Award (for research excellence), BMES Cell and Molecular Bioengineering (2020)
Elected to the National Academy of Engineering (2023)

PROFESSIONAL SOCIETIES:

American Institute for Medical and Biological Engineering (Founding Fellow)
American Society for the Advancement of Science (Fellow)
American Society of Mechanical Engineering (Fellow)
Biomedical Engineering Society (Fellow)
Biophysical Society
International Federation for Medical and Biological Engineering (Fellow)

SELECTED OTHER PROFESSIONAL ACTIVITIES:

Biomedical Engineering Society; Chair, Awards Committee (1989-91)
Board of Directors (1994-1997) (2003-2007)
Publications Board, Member (2000-2006)
Chair (2004-2006)
ASME Journal of Biomechanical Engrg., Associate Editor (1990-1996)
NHLBI, NIEHS, NASA, NSF; Review Committees (1988-present)
Journal of Fluids and Structures, Associate Editor (1993-2005)
US National Committee on Biomechanics; (1997-2009)
Secretary (2000-2003)
Vice chair (2003-2006)
Chair (2006-2009)
World Council on Biomechanics (1998-present);
Vice chair (2002-2006)

Chair (2006-2010)
Conference Chair (2014)
External Review Board, City University of New York, Biomedical Engineering Doctoral Program (1999)
External Advisory Board, Northwestern University, Dept. of Biomedical Engineering (2000-2006)
Summer Bioengineering Conference, Conference Chair, 2001
Biomechanics and Modeling in Mechanobiology, Editorial Board, (2001-present)
External Review Board, Pennsylvania State University, Dept. of Biomedical Engineering (2003)
External Review Board, Duke University, Dept. of Biomedical Engineering (2003)
1st Annual Symposium on Frontiers in Biomechanics, Co-organizer, (2003)
Mechanics & Chemistry of Biosystems, Editorial Board (2003-present)
Hypertension & Microcirculation Study Section, NIH (2004-2008)
Expert Panel, *Strategy for the EuroPhysiome (STEP) project* (2006-2007)
External Advisory Board, *Simbios Center*, Stanford University (2006- 2010)
Chair (2008)
Co-organizer, *Summer Course on Molecular and Cell Biomechanics*, MIT (2006)
Co-organizer, *Summit of Experts in Biomechanics*, Keystone, CO (2007)
Advisory Board, Indian Institute of Technology, Kampur, (2007- 2008)
External Review Committee, UC Berkeley Bioengineering Dept., (2007)
Scientific Advisory Board, *VPH Network of Excellence* (2007- 2010)
Director, Global Enterprise for MicroMechanics and Molecular Medicine (GEM^4) (2007-2010)
Co-organizer, *The Cell as a Machine Workshop*, Arlington, VA (2007)
External Advisory Committee, Chilean Nanotechnology Initiative (2008)
Organizing Committee, 5th International Biofluids Symposium (2007)
Community Giving at MIT Campaign Committee (Chair, 2007-2009)
Scientific Advisory Board, CIBER BBN, Spain (2008-2013)
Scientific Advisory Board, Global Center of Excellence in Nano-Bioengineering, Sendai, Japan (2006-2012)
Chair, International Academy of Medical and Biological Engineering (2011-2014)
Current Editorial Boards: *Journal of Multiscale Modeling, Cellular and Molecular Bioengineering, Methods in Cell Science, Cellular and Molecular Bioengineering, Biomedical Engineering Letters, Journal Royal Society Interface*

Current Advisory Boards: Imperial College, EPSRC Centre for Doctoral Training in Fluid Dynamics across Scales; EPSRC SofTMech Centre For Mathematics in Healthcare; Institute of Biological Engineering in Catalonia; NIH Human Islet Research Network; Single-cell cancer evolution in the clinic, Accelerator Award; NSF Center for Engineering Mechanobiology

PLENARY AND KEYNOTE INVITED LECTURES (since 2019)

Georgia Tech CMAT Symposium, Technologies and Standards in MPS, Atlanta, GA, 10/02/19
PSON Annual Symposium, Models of Metastasis to the Brain, Invited Lecture, Minneapolis, MN, 08/05/19
MPS of Neurological Disease. Invited Keynote, Tsinghua Workshop on Engineering and Manufacture of Living Systems, Beijing, China, October, 2019
Models of Diseases of the Brain, Invited Lecture, Euromech, Oxford, UK, September 2019
Models of Diseases of the Brain, Invited Lecture, CMBBE Computational Mechanics in Biology and Biomedical Engineering, New York, NY, August 2019
Models of Metastassis to the Brain, Tissue Engineering Consortium Workshop, Boston, MA, August 2019
MPS for Neurological Disease, Invited Speaker, IBEC Symposium, Barcelona, Spain, July 2019
MPS for Neurological Disease, Invited Plenary, European Organ on Chip Conference, Graz, Austria, July 2019
Microphysiological Systems for Neurological Disease, Invited Keynote, SelectBio Organ-on-Chip Congress, Rotterdam, June 2019
MPS for Neurological Disease, Invited Plenary, CMBE Computational Mechanics in Biomedical Engineering, Sendai, Japan, June 2019
Models of Metastasis to the Brain, Invited Keynote, 3D Models Oncology, Boston, MA, May 2019
Microphysiological Systems for Neurological Disease, Departmental Seminar, Virginia Tech, Blacksburg, VA, September 2019

Microphysiological Systems for Neurological Disease, Invited Lecture, Technical University of Vienna, Departmental Seminar, Vienna, Austria, June 2019
Models for Metastasis to the Brain, Invited Lecture, Marie Curie Institute Summer Course on Physical of Cancer, Paris, June 2019
Microphysiological Systems for Neurological Disease, Departmental Seminar, Invited Lecture, UCF, Orlando, May 2019
Microphysiological Systems for Neurological Disease, Invited Lecture, UMD, Departmental Seminar, College Park, MD, March 2019
Modeling Angiogenesis Across Synthetic Membranes,Delaware, Invited Lecture, Gore, Orlando, April 2019
Models for Metastasis to the Brain, Invited Lecture, MD Anderson, Houston, TX, March 2019
Microphysiological Systems for Neurological Disease, Invited Lecture, University College London, Departmental Seminar, London, January 2019
Models for Metastasis to the Brain, Invited Lecture, Crick Institute, London, January 2019
Tsinghua Top Talks, Microphysiological Models for Disease, Invited Lecture, Beijing, China, October 2019
Tsinghua, Microphysiological Systems for Neurological Disease, Invited Lecture, Departmental Seminar, Beijing, China, October 2019
Microphysiological Systems for Neurological Disease, Invited Lecture, Yonsei University, Departmental Seminar, Seoul, Korea, October 2019
Microphysiological Systems for Neurological Disease, Invited Lecture, Korea U, Departmental Seminar, Seoul, Korea, October 2019
Microphysiological Systems for Neurological Disease, Invited Lecture, KAIST, Departmental Seminar, Seoul, Korea, October 2019
The Key Roles of Mechanics in Metastasis Investigated Using Microphysiological Systems. Mechanics/Genomics Seminar Series, January 2021
Models of neurological disease. Lehigh University. Mechanical Engineering. Invited Lecture. February 2021.
Models of neurological disease. Cambridge University, Biophysics. Invited Lecture. February 2021.
Microphysiological systems: Probing Neurological disease. LabRoots. Invited Lecture. February 2021.
Microphysiological systems: Probing neurological disease. Alnylam. Invited Lecture. March 2021.
Models of neurological disease using a physiologically-realistic blood-brain barrier model. Organ-on-a-chip e-Symposium. UK. Keynote. April 2021.
Models of the microvascular system inclouding applicatons to neurological disease and metastasis to the brain. Pfizer. Invited Lecture. April 2021.
Microphysiological systems to model neurological function and disease. Columbia University – Tissue Talks. Invited. May 2021.
Neurovascular Model of the BBB and Alzheimer's disease. Cure Alzheimer's Fund, BBB / Neurovascular Model Meeting. June 2021.
The promise of multicellular engineered living systems. M-CELS Workshop. Keynote. June 2021.
Organ-specific models of barrier function. SelectBio Conference on Barrier Function, Rotterdam. Invited. July 2021.
Microphysiological systems to model cancer and neurological diseases. AbbVie –Complex in vitro models BIG meeting. Invited. September, 2021.
A multi-functional MPS platform: Applications to modeling the blood-brain barrier & subcutaneous delivery. PREDICT 3D Tissue Models. Invited. September 2021.
3D blood-brain barrier models from primary or iPSC-derived cells and their characterization. Discovery on Target – 3D Cellular Models. Invited. September 2021.
Models to understand human neurological diseases. Institute Lecture Series, IIT Roorkee, India. Invited. October, 2021,
Microfluidic models of vascular barrier function and its role in neurological disease. Invited. October, 2021.
New in vitro vascular models to investigate biodistribution. Invited. DMDG Virtual Biologics Symposium, November, 2021.
Microfluidic models of vascular barrier functions and its role in neurological disease. Select Bio, Organoids and Organs-on-Chips conference. December 2021.
The use of microphysiological systems in studying tumor progression and metastasis. Notre Dame, March 2022

Microphysiological Models for Neurological Disease. Keystone Symposium: Engineering Multi-Cellular Living Systems, April 2022
A self-assembled model of the blood-brain barrier. Building networks: engineering in vascular biology. May 2022
Microphysiological models of neurological disease. Nanotechnology in Medicine III: Enabling Next Generation, May 2022
Models of neurological disease: Technologies and applications. Engineering Multi-Cellular Systems: EMBL-IBEC Conference, June 2022
New in vitro vascular models to investigate biodistribution. APV Workshop on Protein Aggregation and Immunogenicity, June 2022
In vitro neurovascular models for health and disease. Miniature Brain Machinery Retreat, University of Illinois Beckman Institute, June 2022
Vascular and Lymphatic Barrier Function in the Brain and Subcutaneous Compartments. NE-ADME Conference, Novartis, June 2022
Immune-competent and patient-derived models of the vascularized tumor microenvironment. GRC: Signal Transduction by Engineered Extracellular Matrices, July 2022
The treacherous journey of a circulating tumor cell to the site of metastasis. Global Cancer Consortium, September 2022
Microphysiological Models for Neurological Disease. JSME Frontier Symposium, Plenary Lecture, December 2022
Perfusable microfluidic models to study vasculogenesis, angiogenesis and vascular remodeling in vitro. Boston Angiogenesis Meeting. Keynote Lecture, January, 2023

PATENTS

United States Patent 4,446,747 Kamm May 8, 1984
Method and apparatus for testing lip pressure applied to a smoking article and for calibrating the pressure testing apparatus
United States Patent 5,954,745 Gertler and Kamm, September 21, 1999
Catheter-filter set having a compliant seal
(patent rights to Embolic Protection, Inc., subsequently purchased by Boston Scientific)
United States Patent 6,117,087 Kamm, et al. September 12, 2000
Method and apparatus for noninvasive assessment of a subject's cardiovascular system
United States Patent 6,605,053 Kamm, et al. August 12, 2003
Conduit designs and related methods for optimal flow control
Provisional patent application, Borenstein et al., October 6, 2009.
Improvements to three-dimensional microfluidic platforms and methods of use thereof
United States Patent 9,121,847, Kamm et al., September 1, 2015
Three-dimensional microfluidic platforms and methods of use thereof
United States Patent 9,261,496, Asada et al., February 16, 2016
Device for High Throughput Investigations of Multi-Cellular Interactions
United States Patent 9,446,031, Ragunath et. al., September 20, 2016
Compositions and Methods for Neovascularization
United States Patent 10,767,149, Kamm and Uzel., 2020
Microfluidic Device for Three Dimensional and Compartmentalized Coculture of Neuronal and Muscle Cells, with Functional Force Readout

COMPANIES FOUNDED

2000 **CardioVascular Technologies** (with Dr. Jonathan Gertler) Developing vascular filtration systems for carotid angioplasty. Technology ultimately purchased by Boston Scientific.
2012 **AIM Biotech** (with Dr. Seok Chung) Developing microfluidic systems for heterotypic, 3D cell culture and drug screening for metastatic cancers.

CURRENT RESEARCH SUPPORT

For an up-to-date list, see:
https://grantome.com/search?q=@author%20%20Roger%20Kamm

Sponsors: Takeda, Eisai, Merck KGaA Serrona, Visterra 12/01/2022
Industry consortium on neurovascular models
The goal of the project is to create an in vitro experimental platform to model the blood-brain barrier and it's role in neurodegenerative diseases

Sponsors: Amgen, Roche, Novartis, Boehringer-Ingelheim 12/01/2021-11/31/2022
Industry consortium on subcutaneous delivery of therapeutic molecules
The goal of the project is to create an in vitro experimental platform that can be used to model the injection of drugs into the subcutaneous space in order to predict their bioavailability.

U54 CA261694-01 (MPI: Kamm and Shenoy) 09/01/2021-06/31/2026
Mechanical determinants of organ-selective metastatic colonization, dormancy and outgrowth
In this U54 MetNet Center, we will integrate mechanical, genomic and ultrastructural information during metastatic organ colonization and identify mechanical mechanisms of tumor cell fate decisions and identify pathways and potential therapeutic strategies to eliminate tumor cells prior to metastasis.

5 U01 EB029132-03 (PI: Griffith) 09/01/2019 – 06/01/2024
Microvascular Permeability, Inflammation, and Lesion Physiology in Endometriosis: A Microphysiological Systems Approach
The goal is to build lesions from patient samples, using microfluidic devices to model the local microvascular and recruitment of immune cells, and to then evaluate how the lesions respond in situ to both established and experimental therapies.

Sponsor: Welcome Leap HOPE (PI: Weiss) 05/01/2021- 06/01/2024
Vascularized Immunocompetent Programmable Organoids (VIP Organoids)
Our objective is to create a novel multi-organoid system comprising several biological components all derived from genetically engineered human induced pluripotency stem cells (hiPSCs) assembled to create vascularized and lymphatically connected liver and immune cell organoids (self-organized 3D tissues) contained within a multi-chamber microfluidic platform.

R01-NS-121078-01 (MPI: Kamm and Choi) 05/01/2021-04/31/2026
Human 3D Neuro-Vascular Interaction and Meningeal Lymphatic Models with Application to Alzheimer's Disease
The goal is to create a comprehensive model of AD focusing on key interactions and the role of the BBB and meningeal lymphatics impairment in Aβ clearance to gain a deeper understanding of underlying mechanisms and identify biomarkers of disease.

RESEARCH INTERESTS

Microfluidic systems for homeotypic or heterotypic cell culture
- Developing new methods to study emergent behavior of cell populations
- Studies of stem cell differentiation, axon guidance and metastatic disease in novel microfluidic platforms.

In vitro models and drug screening for metastatic cancer
- Developing 3D, multi-cell type cultures for intravasation and extravasation
- Drug screening platforms for intermediate throughput screens and patient derived explants.

Cell mechanics, molecular mechanics, and mechanotransduction
- Cytoskeletal mechanics and computational modeling of cell deformations and force transmission through the cell.
- Measurements of intracellular strain fields due to forces applied by adherent beads.
- Transduction of mechanical signals by protein conformational changes using both experimental and computational approaches.

Cardiovascular tissue engineering

Using the methods of microfluidics and the concepts of combined biophysical control and biochemical control of cell function to develop microvascular beds in vitro.

Application of these technologies to the development of "organ mimics" for drug testing and toxicity screening.

Neurological diseases

Design of microfabricated systems for the control of neural stem cell differentiation.

Studies of migration and axonal growth in three-dimensional matrices using computational models and microfluidic platforms

PAPERS IN REFEREED JOURNALS

For an up-to-date list, see:
https://scholar.google.com/citations?hl=en&user=tUpRgKwAAAAJ&view_op=list_works&authuser=1&sortby=pubdate

1. Dewey, C.F., Kamm, R.D., and Hackett, C.D. An acoustic amplifier for the detection of atmospheric pollutants. Appl. Phys. Lett. 23(11):633-635, 1973.
2. Kamm, R.D. Detection of weakly absorbing gases using a resonant opto-acoustic method. J. Appl. Phys. 47(8): 3550-3558, 1976. J. Fluid Mech. 95(1): 1-78, 1979.
4. Thirsk, R.B., Kamm, R.D., and Shapiro, A.H. Changes in venous blood volume produced by external compression of the lower leg. Medical and Biological Engineering and Computing 18(5): 650-656, 1980.
5. Slutsky, A.S., Drazen, J.M, Ingram, R.H., Jr., Kamm, R.D., Shapiro, A. H., Fredberg, J.J., Loring, S.H. and Lehr, J. Effective pulmonary ventilation with small-volume oscillations at high frequency. Science 209: 609-610, 1980.
6. Kececioglu, I., McClurken, M.E., Kamm, R.D., and Shapiro, A.H., Steady supercritical flow in collapsible tubes. Part I: Experimental observations. J. Fluid Mech. 109:367-389, 1981.
7. McClurken, M.E., Kececioglu, I., Kamm, R.D., and Shapiro, A.H. Steady supercritical flow in collapsible tubes. Part II: Theoretical studies. J. Fluid Mech. 109: 415, 1981.
8. Lueptow, R.M., Karlen, J.M., Kamm, R.D., and Shapiro, A.H. Circulatory model studies in external cardiac assist by counter-pulsation. Cardiovascular Research 15: 443-455, 1981.
9. Rossing, T.H. Slutsky, A.S., Lehr, J.L., Drinker, P.A., Kamm, R.D., and Drazen, J.M. Tidal volume and frequency dependence of CO2 elimination by high frequency ventilation. NEJM 305(23): 1375-1397, 1981.
10. Slutsky, A.S., Kamm, R.D., Rossing, T.H., Loring, S.H., Lehr, J. Shapiro, A.H. Ingram, R.H., Jr., and Drazen, J.M. CO2 elimination in dogs of high frequency (2-30 Hz), low tidal volume ventilation. Effects of frequency, tidal volume and lung volume. J. Clin. Invest. 68: 1475-1484, 1981.
11. Kamm, R.D. Bioengineering studies of periodic external compression as prophylaxis against deep vein thrombosis. Part I: Numerical studies. J. Biomech. Eng. 104(2): 87-95, 1982.
12. Olson, D.A., Kamm, R.D., and Shapiro, A.H. Bioengineering studies of periodic external compression as prophylaxis against deep vein thrombosis. Part II: Experimental studies on a simulated leg. J. Biomech. Engineering, 102(2): 96-104, 1982.
13. Rossing, T.H., Slutsky, A.S., Ingram, R.H., Jr., Kamm, R.D., Shapiro, A.H., and Drazen, J.M. CO2 elimination by high frequency oscillations in dogs - effects of histamine infusion. J. Appl. Physiol.: Respir. Environ. Exercise Physiol. 53: 1256-1262, 1982.
14. Jan, D.L., Kamm, R.D., and Shapiro, A.H. Filling of partially- collapsed compliant tubes. J. Biomech. Eng. 105: 12-19, 1983.
15. Johnson, M.C., and Kamm, R.D. The role of Schlemm's canal in aqueous outflow from the human eye. Invest. Ophthalmol. Vis. Sci. 24: 320-325, 1983.
16. Joshi, C.H., Kamm, R.D., Drazen, J.M, and Slutsky, A.S. An experimental study of gas exchange in laminar oscillatory flow. J. Fluid Mech. 133: 245-254, 1983.
17. Battaglioli, J.L. and Kamm, R.D. Measurements of the compressive properties of scleral tissue. Invest. Ophthalmol. Vis. Sci. 25: 59-65, 1984.
18. Kamm, R.D., Drazen, J.M., and Slutsky, A.S. High frequency ventilation. Critical Reviews in Biomedical Engineering 9: 347-379, 1984.

19. Solway, J., Gavriely, N., Kamm, R.D., Drazen, J.M., Ingram, R.H., Khoo, M.C.K., Brown, R., and Slutsky, A.S. Intra-airway gas mixing during HFV. J. Appl. Physiol.: Respirat. Environ. Exercise Physiol. 56: 343-354, 1984.
20. Drazen, J.M., Kamm, R.D., and Slutsky, A.S. High frequency ventilation. Physiological Reviews. 64(2): 505-543, 1984.
21. Khoo, M.C.K., Slutsky, A.S., Drazen, J.D., Solway, J, Gavriely, N., and Kamm, R.D. Gas mixing during high frequency ventilation: An Improved model. J. Appl. Physiol.: Respirat. Environ. Exercise Physiol. 57(3): 493-506, 1984.
22. Akhavan, R., and Kamm, R.D. Pressure excursions during oscillatory flow in a branching network of tubes. J. Appl. Physiol.: Respirat. Environ. Exercise Physiol. 57(3): 665-673, l984.
23. Kamm, R.D., Collins, J., Whang, J., Slutsky, A.S., and Greiner, M. Gas transport in a network of branching tubes. J. Biomech. Engineering. 106: 315-320, 1984.
24. Kamm, R.D., Measurements of lip pressure exerted on a cigarette during normal smoking. Behavior Research Methods, Instruments, & Computers, 17(3):379-384, 1985.
25. Venegas, J.G., Custer, J., Kamm, R.D., and Hales, C.A., A relationship for gas transport during high frequency ventilation in dogs. J. Appl. Physiol.: Respirat. Environ. Exercise Physiol. 59(4): 1539-1547, 1985.
26. Johnson, M., Ethier, C.R., Kamm, R.D., Grant, W.M., Epstein, D.L., and Gaasterland, D. The Flow of Aqueous Humor through Micro-Porous Filters. Investigative Ophthalmology and Visual Science, 27: 92-97, 1986.
27. Ethier, C.R., Kamm, R.D., Palaszewski, B.A., Johnson, M., and Richardson, T.M. Calculations of flow resistance in the juxtacanalicular meshwork. Investigative Ophthalmology and Visual Science, 27: 1741-1750, 1986.
28. Kamm, R.D., Butcher, R., Froelich, J., Johnson, M., Salzman, E., Shapiro, A., and Strauss, H.W. Optimization of parameters of external pneumatic compression for prophylaxis against deep vein thrombosis: radionuclide gated imaging studies. Cardiovascular Research, 20(8): 588-596, 1986.
29. Watson, J.W., Burwen, D.R., Kamm, R.D., Brown, R., and Slutsky, A.S. Effect of flow rate on blood gases during constant flow ventilation in dogs. American Review of Respiratory Diseases, 133: 626-629, 1986.
30. Johnson, M. and Kamm, R.D. Numerical studies of steady flow dispersion at low Dean number in a gently curving tube. J. Fluid Mech., 172: 329-345, 1986.
31. Kamm, R.D., Bullister, E.T., and Keramidas, C. The effect of a turbulent jet on gas transport during oscillatory flow. J. Biomech. Engrg. 108: 266-272, 1986.
32. Kimmel, E., Kamm, R.D., and Shapiro, A.H. A cellular model of lung elasticity. J. Biomech. Engrg. 109: 126-131, 1987.
33. Elad, D., Kamm, R.D., and Shapiro, A.H. Choking phenomena in a lung- like model. J. Biomech. Engrg. 109: 1-9, 1987.
34. Paloski, W.H., Slosberg, R.B., and Kamm, R.D. Effects of gas properties and waveform asymmetry on gas transport in a branching tube network. J. Appl. Physiol., 62(3); 892-901, 1987.
35. Watson, J., Kamm, R.D., Burwen, D., Brown, R., Ingenito, E., and Slutsky, A.S. Gas exchange during constant flow ventilation with different gases. Am. Rev. of Respir. Dis., 136: 420-425, 1987.
36. Salzman E.W., McManama, G.P., Shapiro, A.H., Robertson, L.K., Donovan, A.S., Blume, H.W., Sweeney, J. Kamm, R.D., Johnson, M. and Black, P. Effect of optimization of hemodynamics on fibrinolytic activity and antithrombotic efficacy of external pneumatic calf compression. Annals of Surgery, 206(5): 636-641, 1987.
37. Johnson, M., Kamm. R.D., Ethier, C.R., and Pedley, T. Scaling laws and the effects of concentration polarization on the permeability of hyaluronic acid. PhysicoChemical Hydrodynamics, 9(3/4): 427-441, 1987.
38. Ingenito, E., Kamm, R.D., Watson, J.W. and Slutsky, A.S. A model of constant flow ventilation in a dog lung. J. Appl. Physiol. 64(5): 2150-2159, 1988.
39. Pedley T. and Kamm, R.D. The effect of secondary motion on axial transport in oscillatory tube flow. J. Fluid Mech., 193: 347- 367, 1988.
40. Elad, D., Kamm, R.D. and Shapiro, A. Tube law for the intrapulmonary airway. J. Appl. Physiol. 65(1): 7-13, 1988.
41. Elad, Kamm, R.D. and Shapiro, A. Mathematical simulation of forced expiration. J. Appl. Physiol. 65(1): 14-25, 1988.

42. Kimmel, E., Kamm, R.D. and Shapiro, A.H. Numerical solutions for steady and unsteady flow in a model of the pulmonary airways. J. Biomech. Engrg. 110:292-298, 1988.
43. Kamm, R.D. Toward improved methods of high frequency ventilation: a study of gas transport mechanisms. Acta Anaesthesiologica Scand. 33, Suppl. 90: 51-57, 1989.
44. Kamm, R.D. and Schroter, R.C. Is airway closure caused by a liquid film instability? Respir. Physiol., 75: 141-156, 1989.
45. Ethier, C.R., Kamm, R.D., Johnson, M., Pavao, A.F., and Anderson, P.J. Further studies on the flow of aqueous humor through microporous filters. Invest. Ophthalmol. 30: 739-746, 1989.
46. Ethier, C.R. and Kamm, R.D. Mass transfer during rate-limited Langmuir adsorption in a pore. PhysicoChemical Hydrodynamics, 11(2): 205-217, 1989.
47. Ethier, C.R. and Kamm, R.D. The hydrodynamic resistance of filter cakes. J. Membrane Science, 43: 19-30, 1989.
48. Ethier, C.R. and Kamm, R.D. Flow through partially gel-filled channels. PhsicoChemical Hydrodynamics, 11(2): 219-227, 1989.
49. Jan, D.L., Shapiro, A.H. and Kamm, R.D. Some features of oscillatory flow in a model bifurcation. J. Appl. Physiol. 67(1): 147-159, 1989.
50. Kamm, R.D. and Pedley, T.J. Flow in collapsible tubes: A brief review. J. Biomech. Engrg. 111: 177-179, 1989.
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