

CURRICULUM VITAE

KENNETH R. LUTCHEN

EDUCATION

1977	University of Virginia	<i>B.S. Engineering Science</i>
1980	Case Western Reserve University	<i>M.S. Biomedical Engineering</i>
1983	Case Western Reserve University	<i>Ph.D. Biomedical Engineering</i>

EMPLOYMENT

2006-Present	Dean, College of Engineering	<i>Boston University – Boston, MA</i>
1998-2006	Chair, Biomedical Engineering	<i>Boston University – Boston, MA</i>
1998-Present	Professor of Biomedical Engineering	<i>Boston University – Boston, MA</i>
1991- 1998	Associate Professor of Biomed. Eng.	<i>Boston University – Boston, MA</i>
1985- 1998	Scientific Consultant	<i>M.I.T. Lincoln Laboratory - Lexington, MA</i>
10/91-11/91	Visiting Professor of Bioengineering	<i>University of Siena – Siena, Italy</i>
1984– 1991	Assistant Professor of Biomed. Eng.	<i>Boston University – Boston, MA</i>
1983– 1985	Technical Staff, Systems and Analysis	<i>M.I.T. Lincoln Laboratory - Lexington, MA</i>

PROFESSIONAL HONORS

2010 - 13	Elected President of American Institute for Medical and Biological Engineering
2010 - 15	NIH-NHLBI: Member, Respiratory Integrative Biology and Translational Research Study Section
2009	Case Western Reserve University, Distinguished Alumni Award for Biomedical Engineering Education
2008 -	Nominated, President of AIMBE (American Institute for Medical and Biological Engineering, declined due to other existing obligations)
2007 -	Visiting Board, Biomedical Engineering, University of Virginia
2007 -	Dean's Advisory Council, Case Western Reserve University
2007	Editorial Board, The Open Biomedical Engineering journal, Bentham Science Pub.
2006	Elected Vice President at Large and Board Member of AIMBE
2005 - 06	NIH Study Section: Biomedical Research Partnerships: Special Panel
2005	Elected Biomedical Engineering Professor of the Year
2005	Elected as Biomedical Engineering Society Fellow (Inaugural Class)
2004 -	NIH-Roadmap Study Section: Exploratory Centers in Interdisciplinary Research
2004	NSF Review Panel: Distinguished Teacher-Scholar Award
2003 - 06	NIH-NIGMS Biomedical Research and Research Training (BRT) Study Section
2003 - 07	Respiratory Structure-Function Program Committee, American Thoracic Society
2004	Elected Secretary/Treasurer and Executive Board Member of AIMBE
2002	Selected to Participate in Academic Leadership Program via Whitaker Foundation
2000 -	Whitaker Foundation Special Opportunities Award Review Panel
2000 -	Associate Editor, Annals of Biomedical Engineering
2000 - 01	Board of Directors, AIMBE
Elected 1999	Chair/Vice Chair AIMBE Academic Council
Elected 1999	AIMBE (American Institute for Medical and Biological Engineering) Fellow
Elected 1999	President, Council of Chairs of Biomedical Engineering and Bioengineering
Elected 1998	Treasurer, Council of Chairs in Biomedical Engineering and Bioengineering
1998 -	Whitaker Foundation Graduate Fellowship Review Committee
1998	NSF Review Panel, Engineering Research Center
1994 - 2000	NSF Review Panel, Biomedical Engineering and Aiding the Disabled
1993	Elected to Senior Member Status, Biomedical Engineering Society
1992 – 1995	Board of Directors, Biomedical Engineering Society
1994 – 1999	Editorial Board, Annals of Biomedical Engineering
1991 – 1996	Editorial Board, Mathematical Modeling, American Physiological Journal

ADVISORY BOARDS & COMMITTEES

2007 -	Visiting Committee, Biomedical Engineering, University of Virginia
2006 -	Scientific Advisory Board, Institute for Biomedical Imaging Science
2005 -	Dean's Advisory Council, Case Western Reserve University
2005	Advisory Committee, Biomedical Engineering, Marquette University
2005	Advisory Committee, College of Engineering, McMaster University
2002 -	Advisory Committee, College of Engineering, University of Vermont
2002 -	Scientific Advisory Board, Asthma Research Center, Brigham and Women's Hosp.
2002 - 07	Advisory Committee, Biomedical Engineering, University of Pittsburgh
2003 - 04	Visiting Committee, Biomedical Engineering, Arizona State University
2003 - 04	Advisory Board, Biomedical Engineering, College of New Jersey

KEY ACTIVITIES AS DEAN of ENGINEERING

- College of Engineering Ranking Improved from 50th to 42nd in US News and World Report and top 20 in Research Dollar Expenditures per faculty member.
- Established new Interdisciplinary Graduate Division of Materials Science and Engineering and new Division of Systems Engineering, each offering new Ph.D. and M.S. programs and supporting undergraduate minors, and each in partnership with the College of Arts and Sciences (Physics, Math, Chemistry and Computer Science), and the School of Management
- Restructured the College from four major departments and six majors to three major departments and two graduate divisions covering six accredited versions of undergraduate degrees, eight Ph.D. programs, and the capacity to minor in any existing engineering degree program.
- Introduced two new undergraduate concentrations: ***Energy Technologies and Environmental Engineering***, and ***Nanotechnology***. Concentrations designed accessible from any existing major and allow students access to cutting edge technology areas with degree acknowledgement
- Catalyzed partnership in NSF-ERC in Smart Lighting
- Coordinated new ***Clean Energy and Environmental Sustainability Initiative*** among College of Engineering, College of Arts and Sciences and School of Management
- Catalyzed new initiative with management school via external foundation funding to educate engineering students on how innovations become commercialized products
- Initiated substantial upgrade in culture, process and expectations for undergraduate student advising and mentoring
- Stimulated nearly 100% increase in engineering annual fund gifts, including largest percent increase in Engineering Annual Giving compared to any school/college at Boston University

MAJOR ACCOMPLISHMENTS AS CHAIR OF BIOMEDICAL ENGINEERING

- Department Graduate Ranking Improved from 18th to 7th in US News and World Report while graduate program doubled in size in 3 years.
- Department Undergraduate Ranking Improved from 20th to 8th in US News and World Report.
- Principal Investigator and chief architect of a \$14 million dollar Leadership Award from the Whitaker Foundation (with \$18 million match from BU), one of only three such awards ever given.
- Principal Investigator and chief architect of a \$5 million dollar Translational Biomedical Engineering Research Award from the Wallace H. Coulter Foundation, one of only nine such awards from 63 applicants. Includes \$10 million endowment in 5 yrs pending review of performance during Phase 1.
- Principal Investigator/Author on BME department's Renewal of NIH Pre-Doctoral Graduate Student Training Grant in Quantitative Biology and Physiology resulting in 60 Graduate Student years of research assistantships with full stipend and tuition.
- Recruited increase in primary faculty from 21 – 32, creating the largest BME department in the nation. Also recruited 5 additional faculty with joint appointments with School of Medicine and BME.
- Increase in new extramural funding from \$8 million - \$22 million/year from primary BME faculty.

- Created Industrial Advisory Board comprised Senior Vice Presidents representing broad spectrum of BME Industries raising \$180,000 for Summer Undergraduate Research Fellowships
- Increased (by personal nomination) AIMBE Fellows in the department from 1 to 12.

EDUCATION HONORS

2005	Biomedical Engineering <i>Professor of the Year</i>
2002	Keynote Speaker, NSF Workshop on Undergraduate and Design in Bioengineering
1999	Biomedical Engineering <i>Professor of the Year</i>
1998-	Who's Who Among American Teachers
1990	<i>Professor of the Year</i> , College of Engineering, Boston University
1988	Nominated for Metcalf Award for Excellence in Teaching, Boston University
1987	Faculty Appreciation Award, Biomedical Engineering, Boston University
1985	Created the Senior Design Project Program and Conference at Boston University - <i>Year course on How to Approach and Communicate Independent Technical Research and Design</i> - <i>Course serves as national model for BME programs and been presented at ASEE and NSF</i> - <i>Course engages Industry at Annual Conference: Day long oral talks attended by >150 outside guests and all BME faculty, seniors and many underclassmen.</i>

PUBLICATION SUMMARY

- 120 peer reviewed journal articles or book chapters published, in press, or submitted
- >160 proceedings and abstracts
- >50 invited talk at national and international universities and meetings

MAJOR RESEARCH AREAS

- Advanced application of mechanistic, morphometric, and anatomic based models for developing an integrated understanding of the structure-function relations in the lung with emphasis on the role of smooth muscle and inflammation on static and dynamic lung function in asthma.
- Image-based Computational models of integrated lung function for personalized medicine
- Development of novel measurement, monitoring and signal processing techniques that provide new insights on the structural airway and tissue conditions of the healthy and diseased lung.
- Advancing new paradigms and technologies for mechanical ventilation base on fundamental biological principals so as to improve diagnostic and therapeutic applications. Emphasis on role of mechanical stress on ventilator induced lung injury and function.
- Advancing linear and nonlinear sensitivity and systems identification science to evaluate the efficacy of applying models to physiological data with emphasis on structural lung models.
- Understanding the origins of linear and nonlinear properties of physiological systems.

SELECTED RECENT FUNDING HISTORY AS PRINCIPAL INVESTIGATOR

- ***R01: Factors Determining Hyperresponsiveness in Intact Airways***
Agency: **National Institute of Health**
Duration of Grant: 4/01/10 – 3/31/14
Total Costs: \$1,913,235; 6th Percentile (pending)
- ***Kern Entrepreneurship Education Network***
Agency: **Keen Foundation**
Duration of Grant: 7/1/08 – 6/30/10
Total Costs: \$50,000
- ***Training Program in Quantitative Biology and Physiology***
Agency: **National Institute of Health**
Duration of Grant: 7/1/06 – 6/30/11
Total Costs: \$3,934,158
- ***R01: Airway Reactivity and Heterogeneity in Asthma***
Agency: **National Institute of Health**
Duration of Grant: 2/15/05 – 1/31/11
Total Costs: \$2,228,512
- ***Translational Research Partnership in Biomedical Engineering***
Agency: **The Wallace H. Coulter Foundation**
Duration of Grant: 1/1/05 – 1/1/10
Total Costs: \$2,900,000
Grant will Accelerate Transition of Basic BME Research to Clinical Application via Collaboration between Biomedical Engineering and Boston University Medical Center
- ***R33: Developing of Airway Imaging Using HP 3He MRI (sub contract)***
Agency: **National Institute of Health**
Duration of Grant: 05/1/04 – 04/30/07
Total Costs: \$345,000
- ***Cell and SubCellular Based Biomedical Engineering***
Agency: **The Whitaker Foundation**
Duration of Grant: 7/1/01 – 6/30/06
Total Costs: \$ 32,845,047, Amount Awarded from Whitaker Foundation: \$14,000,000
Grant Enhanced Education and Research in Biomedical Engineering at the Charles River and Medical School Campuses of Boston University
- ***Training Program in Quantitative Biology and Physiology***
Agency: **National Institute of Health**
Duration of Grant: 7/1/01 – 6/30/06
Total Costs: \$1,279,098
- ***A New Paradigm in Mechanical Ventilation***
Agency: **National Science Foundation: GOALI**
Duration of Grant: 7/1/00 – 6/30/04
Total Costs: \$382,847
- ***R01: Role of Inflammation on Airway Constriction in Asthma***
Agency: **National Institute of Health**
Duration of Grant: 4/1/99 – 3/31/04
Total Costs: \$1,248,259
- ***Nonlinear Systems Identification for Tracking the Mechanical and Structural Status of the Lungs***
Agency: **National Science Foundation**
Duration of Grant: 9/1/97 – 8/30/00
Total Costs: \$311,180

PROFESSIONAL ORGANIZATIONS

- Engineering Deans Institute, ASEE
- American Institute for Medical and Biological Engineering (AIMBE)
- Biomedical Engineering Society (Senior Member)
- IEEE Engineering in Medicine and Biology Society
- American Thoracic Society
- American Physiological Society
- American Society of Engineering Education

PROFESSIONAL SERVICE

Professional Societies and Conferences

- Engineering Deans Institute of ASEE
 - Chair of Planning Committee, 2009 Annual Meeting *“Engineering Education in the 21st Century”*
- AIMBE
 - Vice President
 - Executive Board: Secretary/Treasurer
 - Chair, Academic Council
 - Board of Directors
 - Nominating Committee
 - Fellows Selection Sub-Committee on Education
- Biomedical Engineering Society
 - 2007 Long Range Planning Committee
 - 2005 Track Chair, Pulmonary Bioengineering
 - 2003 Track Chair, Pulmonary Bioengineering
 - 2001 Track Chair, Respiratory Systems Engineering
 - 2000 Session Chair, Dynamics in Lung Function
 - 1998 Track Chair, Cardiopulmonary Engineering
 - 1996 Session Chair, Airways, Tissues and Cell Mechanics Sessions
 - 1995 Track Chair, Cardiopulmonary Eng. & New Frontiers in BME,
 - 1995 Co-Chair of Entire Fall BMES Meeting at Boston University
 - 1994 Session Chair, Respiratory Modeling
 - 1993 Session Chair, Respiratory Mechanics I and Respiratory Mechanics II
 - 1992-1995 Board of Directors
 - 1992 Co-coordinator of Cardiopulmonary Track at BMES Fall Conference
 - 1989-1991 Chairman, Student Affairs Committee
 - 1987-1988 Member, Program Committee
 - 1985- Faculty Advisor for Student Chapter
- IEEE – Engineering in Medicine and Biology Society
 - 1987 Respiratory Track Coordinator at IEEE-EMBS Conference
 - 1987 Session Chairman at IEEE-EMBS Conference
 - 1987 Student Professional Awareness Conference (SPAC) Coordinator
 - 1985- Faculty Advisor for Student Chapter
- American Physiological Society
 - 1991-1996 Editorial Board for Modeling Methodology Forum
- American Thoracic Society
 - 2006 – 2007 Chair, Nomination Committee for Respiratory Structure Function Assembly
 - 2003 – 2006 Respiratory Structure Function Program Committee
 - 1991 Chair of Lung Mechanics Session
 - 1992 Member of RSP Study Section

Journals Reviewer (several including)

- Journal of Applied Physiology
- ASME Journal of Biomedical Engineering
- Journal of Clinical Investigation
- Journal of Acoustical Society of America
- Annals of Biomedical Engineering
- IEEE Transactions in Biomedical Engineering
- American Journ. Of Resp. Crit. Care Medicine
- European Journal of Respiratory Research

Grant Agency Reviewer

- National Science Foundation:
 - Review Panels Biomedical Engineering Division
 - Review Panel Engineering Research Center
 - Review Panel Distinguished Teacher and Scientist
- National Institute of Health:
 - Biomedical Research Partnerships
 - Ad Hoc: Respiratory and Applied Physiology Study Sect.
 - Roadmap: Centers for Interdisciplinary Research
 - Ad Hoc; Respiratory and Integrated Systems Physiology.
 - NIGMS Biomedical Research Training Study Section
- Medical Research Council of Canada:
 - Ad Hoc Reviewer
- Whitaker Foundation:
 - Graduate Fellowship Review Committee
 - Special Opportunities Award Review / Site Visitor
 - Leadership & Development Award Review / Site Visitor
- European MUIR :
 - External Reviewer for Research Grants.

FACULTY COMMITTEES

- President's Inauguration Committee, 10th President of Boston University
- College of Engineering Executive Committee
- Dean Search Committee, College of Engineering
- University NCAA Review Committee
- Faculty Advisor for Student Chapter of IEEE Engineering in Medicine and Biology Society
- Faculty Advisor for Student Chapter of Biomedical Engineering Society
- Department of Biomedical Engineering Graduate Committee, *Chairman*
- College of Engineering Graduate Committee
- Engineering College Student Conduct Committee, *Chairman*
- Engineering Computer Committee
- Engineering Professional Practice (co-op) Committee
- Department of Biomedical Engineering Undergraduate Committee
- Department of Biomedical Engineering Planning Committee
- Department Ph.D. Qualifier Exam Committee
- Faculty Advisor to Engineering Dormitory Floor

TEACHING, COURSE, AND CURRICULUM DEVELOPMENT

Courses* (*Self Developed)

- BE 467* **Product Design, Development, Marketing and Entrepreneurship in Biomedical Engineering** (Created Course)
Combined 2-credit course taught primarily by Industry and Management School to all BME Seniors and 1st year graduate students to introduce students to the world of bench-to-bedside in industry or self-initiated companies. Taught in coordination with Senior Project courses below.
- BE465* **Senior Project: Senior technical/research project** (Created Course)

- BE466* Responsible for teaching written and oral technical communication skills at level of project proposal and how to approach independent research.
Senior Project: Senior technical/research project (Created Course)
Responsible for teaching written and oral technical communication skills at level of final project and how to approach independent research.
- BE740* **Parameter Estimation and Systems Identification**
Self developed upper-graduate course with applications primarily in Biomedical Engineering.
- BE402 **Control Systems in Biomedical Engineering**
Junior/Senior level with laboratory
- SC411 **Electronics I:** Junior level course in electronics.
- SC412 **Electronics II:** Junior/Senior level class in electronics and signals

Curriculum Development

- 1993 Designed new Post-B.S. and Post-M.S. Ph.D. program in Biomedical Engineering
- 1985 Created of Senior Design Project Program and Conference
"How to Approach and Communicate Independent Technical Research and Design"
- 1985 **Creator of "Annual Biomedical Engineering Senior Project Conference"**
Conference attended by industry, hospitals, alumni, and other universities. Average > 100 outside industry/research guests per year at conference.
Conference now entering its 19th year
- 2003 Created: **Product Design, Development, Marketing and Entrepreneurship in Biomedical Engineering**

SUPERVISION OF STUDENTS AND POST-DOCTORAL SCIENTISTS

Graduate Student Supervision

- Recent Ph.D. Students (as Primary Advisor)
Qin Zhang, Ph.D., Principal Scientist, Medtronics, Inc.
David Kaczka, M.D., Ph.D.: Assistant Professor, Johns Hopkins University
Cortney Henderson, Ph.D. Post-Doctoral Fellow, Univ. California at San Diego
Nora Tgavelekos, Ph.D., Senior Scientist, General Electric Corporation
Carissa Bellardine, Ph.D., Staff Scientists, Medtronics Corporation
Derek Affonce, Ph.D., Development Engineer, Primaira, LLC
Yang-S Tseng, Ph.D. , Staff Scientist, Local Company in Boston
Adam Laprad, Ph.D., Currently in my Laboratory
- Primary Advisor for 14 Masters students, Thesis Committee for 18 Masters Students

Senior Projects Supervised

- 49 students
- 1995, 2005 winner of Most Outstanding Biomedical Engineering Senior Project of the Year

Post-Doctoral Scientist Supervised

- David Westwick, Ph.D.: Currently Assistant Professor, University of Calgary
- Gianluca Nucci, Ph.D: Currently Research Scientist, Padova University
- Adam Polack, Ph.D: Current Chair of Electronic Met, Wroclaw Univ. of Technology, Poland.
- Raffaele L. Delaca, Ph.D: Currently, Assistant Professor, Polytechnic Institute of Milan
- Baoshon, MA, Ph.D: Currently, Post-Doctoral Scientist UC San Diego
- Deokiee Chon, Currently, Post-Doctoral Scientist in my laboratory

PUBLICATIONS

Articles Published or In Press

1. Lutchen, K.R., F.P. Primiano, Jr., and G.M. Saidel. A nonlinear model combining pulmonary mechanics and gas concentration dynamics. *IEEE: Trans. Biomed. Eng.* (29), 629-641, 1982.
2. Lutchen, K.R. and G.M. Saidel. Sensitivity analysis and experimental design techniques: application to nonlinear dynamic lung models. *Comp. and Biomed. Res.* (15), 434-454, 1982.
3. Lutchen, K.R., G.M. Saidel, and J.G. Horowitz. Nonuniform mechanics and gas mixing in normal human lungs: inadequacies of parallel compartment models. *Advances in Bioengineering*, Amer. Soc. Mech. Eng., 473-476, 1983.
4. Lutchen, K.R., G.M. Saidel, F.P. Primiano, Jr., J.G. Horowitz, and E.C. Deal. Mechanics and gas distribution in normal and obstructed lungs during tidal breathing. *Amer. Rev. Respir. Dis.* (130), 974-979, 1984.
5. Swidwa, D.M., H.D. Montenegro, M.D. Goldman, K.R. Lutchen, and G.M. Saidel. Helium-oxygen breathing in severe chronic obstructive pulmonary disease. *Chest* (87), 790-795, 1985.
6. Jackson, A.C. and K.R. Lutchen. Modeling of respiratory system impedances in dogs. *J. Appl. Physiol.* 62:414-420, 1987.
7. Lutchen, K.R. and G.M. Saidel. Evaluation of mechanical parameters in multi-compartment models applied to normal and obstructed lungs during tidal breathing *IEEE: Trans. Biomed. Eng.* vol. 33 (9), 878-887, 1986.
8. Lutchen, K.R. and A.C. Jackson. Statistical measures of parameter estimates from models fit to respiratory impedance data: emphasis on joint variabilities. *IEEE: Trans. Biomed. Eng.* vol. 33 (11), 1000-1010, 1986.
9. Lutchen, K.R. and A.C. Jackson. Reliability of parameter estimates from models applied to respiratory impedance data: importance of higher frequencies. *J. Appl. Physiol.* 62:403-413, 1987.
10. Jackson, A.C., K.R. Lutchen, and H.L. Dorkin. Inverse modeling of dog airway and respiratory system impedances. *J. Appl. Physiol.* 62:2273-2282, 1987.
11. Dorkin, H.L., K.R. Lutchen, and A.C. Jackson. Human input impedance from 4-200 Hz: Physiological and modeling implications. *J. Appl. Physiol.* 64(2), 1988.
12. Lutchen, K.R. Optimal selection of frequencies for estimating parameters from respiratory impedance data. *IEEE Trans. Biomed. Eng.* 35(8). 1988.
13. Lutchen, K.R., Z. Hantos, A.C. Jackson. Importance of low frequency impedance data for reliably quantifying parallel inhomogeneities of respiratory mechanics. *IEEE Trans. Biomed. Eng.* 35 (6), pp. 472-481, 1988
14. Lutchen, K.R. Use of sensitivity and optimal experiment design for estimating mechanical parameters in respiratory system models. In Modeling and Control in Biomedical Systems, ed. C. Cobelli, L. Mariani, Pergamon Press, New York, 473-478, 1989.
15. Lutchen, K.R. and Jackson, A.C., Effects of tidal volume and methacholine on low frequency total respiratory impedance in dogs. *J. Appl. Physiol.* 68, 2128-2138, 1990.

16. Lutchen, K.R.; Guirdenella,C; and Jackson, A.C.. Inability to separate airway from tissue properties using input impedance in humans. *J. Appl. Physiol.* 68, 2403-2412, 1990.
17. Lutchen, K.R.; Habib, R.H; Dorkin,H.L.; and Wall, M.. Relation of respiratory impedance to a multibreath nitrogen washout in healthy, asthmatic and cystic fibrosis subjects. *J. Appl. Physiol.* 68, 2139-2149, 1990.
18. Lutchen, K.R. Sensitivity analysis of respiratory parameter uncertainties: Impact of criterion function form and constraints. Modeling Methodology Forum, *J. Appl. Physiol* 69(1), 766-775, 1990.
19. Lutchen, K.R.; Costa, K.D.; Physiological behavior of lumped parameters estimated from respiratory impedance data: use of forward inverse modeling. *IEEE Trans. Biomed. Eng.* 11, 1076-1086, 1990.
20. Jackson, A.C. and Lutchen, K.R. Physiological basis for resonant frequencies in respiratory impedances in dogs. *J. Appl. Physiol* 70: 1051-1058, 1991
21. Davis, K.A.; Lutchen, K.R. Respiratory impedance spectral estimation for digitally created random noise. *Annls Biomed. Eng.* 19, 179-195, 1991
22. Davis, K.A.; Lutchen, K.R. Time series versus Fourier transform methods for estimation of respiratory impedance spectra. *Int. J. Biomed. Comput.* 27, 261-276, 1991.
23. Lutchen, K.R. Impact of joint variability, weighting, and parameter nonlinearities on impedance parameter estimates. *Eur. Respir. Rev.* (1) rev 3, 210-215, 1991
24. Habib, R., and Lutchen, K.R. Moment analysis of a multibreath nitrogen washout based on an alveolar gas dilution number. *Amer. Rev. Resp. Dis.* 144:513-519, 1991.
25. Barnas, G.M., D. Stamenovic, K.R. Lutchen, and C.F. Mackenzie. Lung and chest wall impedances in dog in the normal range of breathing: effects of frequency and tidal volume. *J. Appl. Physiol.* (1), 87-93, 1992.
26. Lutchen, K.R. and A.C. Jackson. Confidence bounds on respiratory mechanical properties estimated from transfer vs input impedance in humans versus dogs. *IEEE Trans. Biomed. Eng.* (39) 6, 644-651, 1992.
27. Barnas, G.M., D. Stamenovic, and K.R. Lutchen. Lung and chest wall impedances in the normal range of breathing: effects of pulmonary edema. *J. Appl. Physiol.* 73(3), 1049-1056, 1992.
28. Suki, B. and K.R. Lutchen. Pseudorandom signals to estimate apparent transfer and coherence functions of nonlinear systems: applications to respiratory mechanics. *IEEE Trans. Biomed. Eng.* 39(11), 1142-1151, 1992
29. Lutchen, K.R., J.R. Everett and A.C. Jackson. Influence of frequency range and input impedance on interpreting the airways tissue separation implied from transfer impedance *J. Appl. Physiol.* 73(3), 1089-1099, 1993.
30. Lutchen, K.R., K. Yang., D. W. Kaczka, B. Suki. Optimal ventilation waveforms for estimating low frequency respiratory impedance in healthy and diseased subjects. *J. Appl. Physiol.* 75(1):478-488, 1993.
31. Stamenovic, D., K.R. Lutchen, and G.M. Barnas. An alternative model of the respiratory tissue viscoplasticity. *J. Appl. Physiol.* 75 (3):1062-1069, 1993.
32. Lutchen, K.R. , D. W. Kaczka, B. Suki, G.M. Barnas, G. Cevenini, and P. Barbini,. Low frequency respiratory mechanics using ventilator-driven forced oscillations. *J. Appl. Physiol.* 75(6): 2549-2560, 1993.
33. Barbini, P., G. Cevenini, K. Lutchen, and M. Ursino. Estimating respiratory mechanical parameters of ventilated patients: A critical study in the routine intensive care unit. *Med. Biolog. Comput.* (32): 153-160, 1994.

34. Lutchen, K.R., B. Suki, D. Kaczka, Q. Zhang, Z. Hantos, B. Daroczy, F. Petak. Direct use of mechanical ventilation to measure respiratory mechanics associated with physiological breathing conditions. *Eur. Respir. Rev.* 19: 198-202, 1994.
35. Hantos, Z. F. Petak, A. Adamicza, B. Daroczy, B. Suki, and K.R. Lutchen. Optimum ventilator waveform for the estimation of respiratory impedance: an animal study. *Eur. Respir. Rev.* 19: 191-197., 1994.
36. Barnas, G.M., P. Harinath, M. Green, B. Suki, D.W. Kaczka, and K.R. Lutchen. Influence of waveform and analysis technique on lung and chest wall properties in the physiological range. *Respir. Physiol.* 96: 331-344, 1994.
37. Lutchen, K.R., B. Suki, and Q. Zhang. Optimal design of inputs for identifying linear and nonlinear pulmonary mechanical properties. (review article) *IFAC Symposium on Modeling and Control in Biomedical Systems.*, 521-526, 1994
38. Suki, B. A-L Barabasi, and K.R. Lutchen. Lung tissue viscoelasticity: a mathematical framework and its molecular basis. *J. Appl. Physiol.* 76(6), 2749-2759, 1994.
39. Lutchen, K.R., B. Suki, Q. Zhang, F. Petak, B. Daroczy, and Z. Hantos. Airway and tissue mechanics during physiological breathing and bronchoconstriction in dogs. *J. Appl. Physiol.* 77(1), 373-385, 1994.
40. Christini, D.J., F.M. Bennett, K.R. Lutchen, H.M. Ahmed, J.M. Hausdorff, and N. Oriol. Linear and nonlinear time series modeling of heart rate dynamics. *IEEE Trans. Biomed. Eng.* vol 42, No. 4, 411-415,1995.
41. Kaczka, D.W., B. Suki, G.M. Barnas, K.R. Lutchen, Assessment of time-domain analysis for estimation of low frequency respiratory mechanical properties and impedance spectra. *Annl. Biomedical Eng.* 23: 135-151, 1995.
42. Christini, D.J., A. Kulkarni, S. Rao, E. Stutman, F.M. Bennett, J.M. Hausdorff, N. Oriol, K.R. Lutchen, Influence of autoregressive model parameter uncertainty on spectral estimates of heart rate dynamics. *Annl. Biomedical Eng.* 23:127-134, 1995.
43. Suki, B., Q. Zhang., and K.R. Lutchen. Relationship between frequency and amplitude dependence in the lung: a nonlinear block-structured modeling approach. *J. Appl. Physiol.* 79(2), 660-671, 1995.
44. Zhang, Q., B. Suki, and K.R. Lutchen. An extended harmonic distortion index to quantify system nonlinearities from broadband inputs: application to lung mechanics. *Annl. Biomedical Eng.* 23: 672-681, 1995.
45. Suki, B., F. Petak, A. Adamicza, Z. Hantos, and K.R. Lutchen. Partitioning of airway and lung tissue properties from lung input impedance: comparison of in situ and open chest conditions. *J. Appl. Physiol.* 79(2): 660-671, 1995.
46. Lutchen, K.R., J.L. Greenstein, B. Suki. How inhomogeneities and airway walls affect frequency dependence and separation of airway and tissue properties. *J. Appl. Physiol.* 80(5), 1696-1707, 1996.
47. Lutchen, K.R., Z. Hantos, F. Petak, A. Adamicza, B. Suki. Airway inhomogeneities contribute to apparent lung tissue resistance during constriction. *J. Appl. Physiol.* 80(5), 1841-1849, 1996.
48. Jackson, A.C., K.M. Neff, H.L. Dorkin, and K.R. Lutchen. Interpretation of respiratory impedance measurements of healthy infants. *Pediatric Pulmonology.* 22:364-375, 1996.
49. Suki, B., H. Yuan, Q. Zhang, and K.R. Lutchen. Partitioning of lung tissue response and inhomogeneous airway constriction at the airway opening. *J. Appl. Physiol.* 82: 1349-1359, 1997.

50. Kaczka, David. W., E.P. Ingenito, B. Suki, and K.R. Lutchen. Partitioning of airway and lung tissue resistance in humans: effects of bronchoconstriction. *J. Appl. Physiol* 82: 1531-1541, 1997.
51. Suki, B., F. Petak, A. Adamicza, B. Daroczy, K.R. Lutchen, and Z. Hantos. Airways and lung tissues are more sensitive to methacholine in closed chest than in open chest dogs. *Resp. Physiol* 1997.
52. Lutchen, K.R. and H. Gillis. The relation between airway morphometry and lung resistance and elastance during constriction: A modeling study. *J. Appl. Physiol.* 83 (4), 1997.
53. Yuan, H. B. Suki, and K.R. Lutchen. Sensitivity analysis for evaluating nonlinear models of lung mechanics. *Annls. Of Biomedical Eng.* 26: 230-241, 1998
54. Zhang, Q., B. Suki, D. Westwick, and K.R. Lutchen Factors affecting kernal estimation: emphasis on lung tissue viscoelasticity. *Annls. Of Biomedical Eng.* 26: 103-116, 1998.
55. Lutchen, K.R. A. Sullivan, F.T. Arbogast, B.R. Celli, and A.C. Jackson. Use of transfer impedance measurements for clinical assessment of lung mechanics. *Amer. J. of Resp. and Crit. Care Medicine.* 157, 435-446, 1998.
56. Westwick, D., B. Suki, and K.R. Lutchen. Sensitivity analysis of kernal estimates: implications to identification of nonlinear physiological systems. *Annls. Of Biomedical Eng.* 26, 488-501, 1998..
57. Zhang, Q., K.R. Lutchen, B. Suki. A frequency domain approach to nonlinear and structure identification for long memory systems: application to lung mechanics. *Annls. Of Biomedical Eng.* 27: 1-13, 1999.
58. Suki, B. A.M. Alencar, M.K.Sujeer, KR Lutchen, JJ Collins, J.S.Andrade, EP Ingenito, S. Zapperi, and H.E. Stanley. Tuning noise for optimal mechanical ventilation. *Nature* 393, 127-128, 1998.
59. Kaczka, D.W., E.P. Ingenito, E. Israel, and K.R. Lutchen. Airway and tissue mechanics in asthmatics: effects of albuterol *Amer. J. of Resp. and Crit. Care Medicine* 159: 169-178, 1999.
60. Yuan, H. D.T. Westwick, E. P. Ingenito, K.R. Lutchen, and B.Suki. Parametric and nonparametric nonlinear system identification of lung tissue strip mechanics. *Annls. Of Biomedical Eng.* 27(4), 548-562, 1999.
61. Gillis, H., and KR Lutchen. How heterogeneous bronchconstriction affects ventilation and pressure distributions in human lungs: a morphometric model. *Annls. Of Biomedical Eng.* 27: 14-22, 1999.
62. Gillis, H.L. and K.R. Lutchen. Airway remodeling in asthma amplifies heterogeneous smooth muscle shortening causing hyperresponsiveness. *J. Appl. Physiology* 86:2001-2012, 1999.
63. Kaczka, D.W. E.P. Ingenito, and K.R. Lutchen. A technique to determine inspiratory impedance during mechanical ventilation: implications for flow limited patients. *Annls. Of Biomedical Eng.* 27: 340-355, 1999.
64. Yuan, H., S. Kononov, F.S.A. Cavalcante, K.R. Lutchen, E. Ingenito, and B. Suki. Effects of collagenase and elastase on the mechanical properties of lung tissue strips. *J. Appl. Physiology* 89:3-14, 2000.
65. Westwick, D.T., and K.R. Lutchen Fast orthogonal identification on nonlinear systems using impicit basis expansion.. *Annals Biomedical Eng.* 28: 2000.
66. Kaczka, D.W., E.P. Ingenito, S.C. Body, S.E. Duffy, S.J. Mentzer, M.M. DeCamp, and K.R. Lutchen. Effects of PEEP and lung volume reduction surgery on inspiratory lung impedance in patients with chronic obstructive pulmonary disease. *Journal of Applied Physiology* 90: 1833 – 1841, 2001.

67. Lutchen, K.R., D.W. Kaczka, E. Israel, B. Suki, E.P. Ingenito. Airway constriction pattern is a central component of asthma severity: the role of deep inspirations. *Amer. J. of Resp. and Crit. Care Medicine* 164: 207-215, 2001.
68. Sakai, Hiroaki, E.P. Ingenito, R. Mora, S. Abbay, F. Cavalcante, K.R. Lutchen, and B. Suki. Hysteresivity of the lung and tissue strip in the normal rat: effects of heterogenities. *J. Appl. Pbhysiology* 91: 737-747, 2001.
69. Latorurelle, J.C., and H.L. Gillis, K.R. Lutchen. Exact morphometric modeling of rat and human lungs for predicting mechanical impedance. *Respiration Physiology* 127: 75-85, 2001.
70. Jenson, A., H. Atilah, B. Suki, E. Ingenito, Lutchen K.R. Airway caliber in healthy subjects and asthmatics: effects of deep inspirations and bronchial challenge. Highlighted Topics: Signal transduction in Smooth Muscle: *J. Appl. Physiol.* 91: 506-515, 2001.
71. Barbini, P. G. Cevenini, F. Bernardi, M.R. Massi, and K.R. Lutchen. Influence of inspiratory-expiratory ratio on total resistance estimate in simulated mechanical ventilation, *Medicon* 2001.
72. Arold, Stephen P., Mora, Rene, Lutchen, K.R., Ingenito, Edward P., Suki, Bela. Variable Tidal Volume Ventilation Improves Lung Mechanics and Gas Exchange In a Rodent Model of ALI. *Am. J. Respir. Crit. Care Med.* 165, 366-371, 2002.
73. Dellaca, R.L., A. Aliverti, K.R. Lutchen, A. Pedotti. Spatial distribution of human respiratory systems transfer impedance. *Annl. Biomedical Eng.* 31, 121-131, 2003.
74. Nucci, G., B. Suki, and K.R. Lutchen. Modeling airflow-related shear stress during heterogeneous constriction and mechanical ventilation. *J. Appl. Physiol.* 85:348-356, 2003.
75. Polak, Adam G., Lutchen, K.R. Some A computational model for forced expiration from asymmetric and normal lungs. *Annl. Biomed. Eng.* 31: 1-17, 2003.
76. Henderson, A.C., H. Atilah, E.P. Ingenito, E. Israel, B. Suki, and K.R. Lutchen. Highlighted Topics: Airway Hyperresonsiveness: From Molecules to Bedside: Selected Contribution: How does airway inflammation modulate asthmatic airway reactivity? An antigen Challenge study. *J. Appl. Physiol.* 95:873-882, 2003.
77. Tgavalekos, N., J.G. Venegas, B. Suki, K.R. Lutchen. A three dimensional computational model of the lung: relationship between structure, function and imaging. *Annl. Biomed. Eng.* 31, 363-373, 2003.
78. Black, L.D., K. Jung, H. Atilah, E.P. Ingenito, E. Israel, K.R. Lutchen. Tracking of airway caliber using total respiratory versus airway resistance in healthy and asthmatic subjects.. *J. Appl. Physiol.* 95:511-519, 2003.
79. Suki, B. S.P. Arold., A. Alencar, K.R. Lutchen, and E.P. Ingenito. Noisy ventilation improves lung function. Unsolved Problems of Noise and Fluctuations: UPoN 2002: edited by S.M. Bezrukov, AIP Conference Proceedings, Vol. 665, pp. 1- 8. Melville, New York. 2003.
80. Arold SP, Suki B, Alencar AM, Lutchen KR, Ingenito EP. Variable Ventilation Induces Endogenous Surfactant Release in Normal Guinea Pigs. *Am J Physiol Lung Cell Mol Physiol* 285, L370-L375, 2003.
81. Suki, B., K.R. Lutchen, E.P. Ingenito. *Pulmonary Perspective*: On the progressive nature of pulmonary emphysema: roles of proteases, inflammation, and mechanical forces. *Am. J. Respir. Crit. Care Med.* 168: 516-521, 2003.
82. Brewer. K.K., H. Sakai, A.M. Alencar, A. Majumdar, S.P. Arold, K.R. Lutchen, E.P. Ingenito, and B. Suki. Effects of in vivo elastase treatment on lung and alveolar wall hysteretic behavior in rats . *J. Appl. Physiol.* 95:1926-1936, 2003.

83. Black, L.D., A.C. Henderson, H. Atileh, E. Israel, E.P. Ingenito, and K.R. Lutchen. Relating maximum airway dilation and subsequent reconstruction to reactivity in human lungs. *J. Appl. Physiol.* 96:1808-1814, 2004.
84. Kaczka, D.W. and K.R. Lutchen Servo-controlled pneumatic pressure oscillator for respiratory impedance measurements and high frequency ventilation. *Annl. Biomed. Eng.* 32: 596-608, 2004
85. Dellacà R.L., L. Black, H. Atileh, A. Pedotti and K. R. Lutchen. Effects of posture and bronchoconstriction on low frequency input and transfer impedances in humans. *J. Appl. Physiol.* 97:119-129, 2004.
86. Satoro, I., E.P. Ingenito, S. Arold, H. Parameswaren, N. Tgavalekos, K.R. Lutchen, and B. Suki. Tissue heterogeneity in the mouse lung: effects of elastase treatment. *J. Appl. Physiol.* 97:204-212, 2004.
87. Bai, T.R., Bai, T.R., Bates, J.H., Brusasco, V., Camoretti-Mercado, B., Chitano, P., Deng, L.H., Dowell, M., Fabry, B., Ford, L.E., Fredberg, J.J., Gerthoffer, W.T., Gilbert, S.H., Gunst, S.J., Hai, C.M., Halayko, A.J., Hirst, S.J., James, A.L., Jansses, L.J., Jones, K.A., King, G.G., Lakser, O.J., Lambert, R.K., Lauzon, A.M., Lutchen, K.R., Maksym, G.N., Meiss, R.A., Mijailovich, S.M., Mitchell, H., Mitchell, R.W., Mitzner, W., Murphy, T.M., Pare, P.D., Schellenberg, R.R., Seow, C.Y., Sieck, G.C., Smith, P.G., Smolensky, A.V., Solway, J., Stephens, N.L., Stewart, A.G., Tang, D.D., and Wang, L.. Proposed nomenclature for describing the length-force relation and its changes in airway smooth muscle. *J. Appl. Physiol.* 97: 2029-2034, 2004
88. Bates, J, C. Irvin, V. Brusasco, J. Drazen, J. Fredberg, S. Loring, D. Eidelman, M. Ludwig, P. Macklem, J. Martin, J. Milic-Emili, Z. Hantos, R. Hyatt. S. Lai-Fook, A. Leff, J. Solway, K. Lutchen, B. Suki, W. Mitzner, P. Pare, N. Pride, P. Sly. The use and misuse of Penh in animal models of lung disease. *Am. J. Resp. Cell and Molecular Bio.* 31: 373-374, 2004.
89. Ito, S., E.P. Ingenito, K.K. Brewer, L.D. Black, H. Parameswaran, K.R. Lutchen, and B. Suki. Mechanics, nonlinearity, and failure strength of lung tissue in a mouse model of emphysema: possible role of collagen remodeling. *J. Appl. Physiol.* 98: 503-511, 2005.
90. B. Suki, S.Ito, D. Stamenovic K.R. Lutchen, E. P. Ingenito,. Biomechanics of the lung parenchyma: critical roles of collagen and mechanical forces. Highlighted Topic; Invited Review: *J. Appl. Physiol.* 98: 2005
91. Bellardine, C.L., E.P. Ingenito, A. Hoffman, F. Lopez, W. Sandborn, B. Suki, K.R. Lutchen. Relating heterogeneous mechanics to gas exchange function during mechanical ventilation. *Annl. Biomed. Eng.* 33(5) 626-641 2005.
92. Bates, J.H.T and K.R. Lutchen. The interface between measurement and modeling of peripheral lung mechanics. *Respiratory Physiology and Neurology*. Special Issue 148: 153-164, 2005.
93. Lutchen, K.R. and E.J. Berbari. White Paper: Rationale, goals, and approach for education of biosystems and biosignals in undergraduate biomedical engineering degree programs *Annl. Biomed. Eng.* 34: 248-253, 2006.
94. Hoffman, A., M. Mazan, L. Tsai, E. Ingenito, C. Bellardine, A. Bell, and K. Lutchen. Pulmonary function tests versus computed tomography in sheep with experimental emphysema. *Experimental Lung Research*, 31: 1-16, 2005.
95. Mullally, W., M. Betke. C.L. Bellardine, and K.R. Lutchen. Locally switching between cost functions in iterative non-rigid registration. *Computer Vision for Biomedical Image Applications: 367 - 377 Lecture Notes in Computer Science, Springer-Verlag GmbH Vol. 3765, 2005 .*
96. Majumdar, A., A. M. Alencar, S.V. Buldyrev, Z. Hantos, K.R. Lutchen, H.E. Stanley, and B. Suki. Relating airway diameter distributions to regular branching asymmetry in the lung. *Physical Review Letters* . 2005.

97. Ingenito, I. L. W. Tsai¹, S. J. Mentzer, M. T. Jaklitsch, J. J. Reilly¹, K.R Lutchen, M. Mazan, and A. Hoffman. Respiratory Impedance following Bronchoscopic or Surgical Lung Volume Reduction for Emphysema. *Respiration* 72:406-417, 2005
98. Tgavalekos N., M. Tawhai, R. S. Harris, G. Mush, M. Vidal-Melo, J Venegas , K. R. Lutchen. Identifying airways responsible for heterogeneous ventilation and mechanical dysfunction in asthma: An image-functional modeling approach. *J. Appl. Physiol.* 99:2388-2397, 2005
99. Bellardine C.L., A. Hoffman, L. Tsai, E. P. Ingenito, S. Arold¹, K. R. Lutchen, and B. Suki. Comparison of variable and conventional ventilation in a sheep saline lavage lung injury model. *Critical Care Medicine.* 34 (2) 439-445, 2006.
100. Satoru Ito, Arnab Majumdar, Hiroaki Kume, Kaoru Shimokata, Keiji Naruse, Kenneth R. Lutchen, Dimitrije Stamenović, and Béla Suki. Viscoelastic and dynamic nonlinear properties of airway smooth muscle tissue: roles of mechanical force and the cytoskeleton. *Am. Journ. of Physiology* 290, 1227-1237, 2006.
101. Ma, B and K.R. Lutchen. An anatomically based hybrid computational model of the human lung and its application to low frequency oscillatory mechanics. *Annl. Biomedical Eng.* 34, No. 11; 1691-1704, 2006
102. Affonce, D.A and K.R. Lutchen. New perspectives on the mechanical basis for airway hyperreactivity and hypersensitivity in asthma. *J. Appl. Physiol.* 101: 1710-1719, 2006.
103. Henderson, A.C., E.P. Ingenito, M. I. Moy, J.J. Reilly, E.S. Salcedo, Bela Suki and K.R. Lutchen. Dynamic lung mechanics in late-stage emphysema before and after lung volume reduction surgery. *Respiratory Physiology and Neurobiology.* 155(3), 234-242; 2007.
104. Satoru Ito, Kenneth R. Lutchen, and Béla Suki. Effects of heterogeneities on the partitioning of airway and tissue properties in normal mice *J Appl Physiol*; 102: 859 – 869, 2007.
105. Bellardine C.L., A.M. Hoffman, L. Tsai, E.P. Ingenito, D.W. Kaczka, B.A. Simon, B. Suki, and K.R. Lutchen, Relationship between dynamic respiratory mechanics and disease heterogeneity in sheep lavage injury. *Critical Care Medicine.* 35: 2007.
106. An SS, Bai TR, Bates JHT, Black JL, Brown RH, Brusasco V, Chitano P, Deng L, Dowell M, Eidelman DH, Fabry B, Ford LE, Fredberg JJ, Gerthoffer WT, Gilbert SH¹², Gunst SJ, Halayko AJ, Ingram RH¹⁶, Irvin CG, James AL, Janssen LJ, King G, Knight DA, Lauzon AM, Lakser OJ, Ludwig MS, Lutchen KR, Maksym GN, Martin JG, Mauad T, McParland BE, Mijailovich SM, Mitchell HW, Mitchell RW, Mitzner W, Murphy TM, Paré PD, Pellegrino R, Seow CY, Smith PG, Solway J, Schellenberg RR, Silveira PS, Stephens NL, Sterk PJ, Stewart AG, Tang DD, Tepper RS, Wang L. Airway smooth muscle dynamics: a final common pathway of airway obstruction in asthma. *European Respiratory Journal* 29; 834-860. 2007..
107. Tgavalekos, Nora T., G. Musch R. S. Harris, M. F. Vidal Melo, T. Winkler, T. Schroeder, R. Callahan, K. R. Lutchen and J. G. Venegas Relationship between airway narrowing, patchy ventilation and lung mechanics in asthmatics. *Europ. Resp. Journal.* 29: 1174-1181, 2007.
108. Bellardine C.L., A.M. Hoffman, L. Tsai, E.P. Ingenito, D.W. Kaczka, B.A. Simon, B. Suki, and K.R. Lutchen. Impact of mechanical ventilation during heterogeneous lung injury: Insights from CT-based image functional modeling *Annl. Biomed. Eng.* 36 (6), 980-991, 2008
109. Tzeng, Yang-Sheng , E. Hoffman, J. Cook-Granroth, J. Gereige, J. Mansour, G. Washko, M. Cho, E. Stepp, K.R. Lutchen, M. Albert. Investigation of hyperpolarized ³he mri utility in examining human airway diameter behavior in asthma through comparison with high-resolution computed tomography. *Academic Radiology* 15: 7990808, 2008.

110. Laprod, A. and K.R. Lutchen. Respiratory impedance measurements for assessment of lung mechanics: focus on asthma. Review Article. *Respiratory Physiology and Neurobiology*. 163: 64-73, 2008.
111. LaPrad, A.S., West, A.R., Noble, P.B., Lutchen, K.R., and Mitchell, H.W.; Maintenance of airway caliber *in-vitro* by deep inspiration and tidal strains. *J. Appl. Physiol*, 195:479-485, 2008.
112. Tzeng, Y-S, J, Gereige, J. Mansour, N. Shah, X. Zhou, G. Washko, E. Stepp, M. Cho, J. B. Szender, S. Z. Sani, E. Israel, K. Lutchen, M. Albert. The difference in ventilation distribution and ventilation heterogeneity between asthmatic and healthy subjects quantified from hyperpolarized ³He MRI. *J. Appl. Physiol* 106:813-822, 2009.
113. Mullally, W. M. Betke, M. Albert, and K.R. Lutchen. Explaining Clustered Ventilation Defects via a Minimal Number of Airway Closure Locations. *Annls of Biomedical Engineering*. 37: 286-300, 2009.
114. Ma, B. and K.R. Lutchen. CFD Simulation of Aerosol Deposition in an Anatomically Based Human Large-Medium Airway Model. *Annals of Biomedical Engineering*. 37: 271-285, 2009.
115. Campana, L., J. Kenyon, S. Zhalehdoust-Sani, Y-S. Tzeng, Y. Sun, M Albert, K.R. Lutchen. Probing Airway Conditions Governing Ventilation Defects in Asthma via Hyperpolarized MRI Image Functional Modeling *J. Appl. Physiol* 106:1293-1300, 2009.

Books and Book Chapters

1. Béla Suki and Kenneth R. Lutchen , “*Lung tissue viscoelasticity: from extracellular matrix complexity to constitutive equations*”; Handbook of Biomedical Engineering, 2005.
2. Lutchen, K.R. and B. Suki, “*Understanding Pulmonary Mechanics Using the Forced Oscillation Technique: Emphasis on Breathing Frequencies*” Chpt. 15, pgs 227-253 in Bioengineering Approaches to Pulmonary Physiology, Plenum Press, Edited by Michael Khoo, 1996.
3. Lutchen, K.R., and H.F. Voigt, Guest Editors, Abstracts for 1995 BMES Meetings. *Annals of Biomedical Engineering*, Vol. 23, No. 4, 1995.

Articles Submitted

1. Mendonça Davis, N.T., J. Kenyon, G. T O’Connor, and K. R Lutchen. Quantifying airway dilation defect as a marker of airway hyperresponsiveness. *Amer. J. of Resp. and Crit. Care Medicine* (in preparation)
2. LaPrad, A., T. Szabo, B. Suki, and K.R. Lutchen. Tidal stretches do not modulate responsiveness of intact airways in-vitro. *J. Appl. Physiology* (submitted)
3. Hamakawa, H., E. Bartolak-Suki, H. Parameswaran, A. Majumdar¹, K. R. Lutchen, B. Suki Structure-function relations in an elastase-induced mouse model of emphysema

INVITED TALKS

“**Synthesizing Imaging and Structural Models to Probe Airways and Airway Structures Responsible for Asthma**” Keynote Speaker 1st International Conference on Mathematical and Computational Biomedical Engineering; June 29 – July 1, 2009, Swansea, UK

“**Creating and Educational Experience for Engineers: Focus on Bioengineering**” Key Speaker, 3rd Annual Engineering Science Education Conference, University of Toronto, Jan. 18, 2008.

“The Forced Oscillation Technique in Asthma” Scientific Symposium on Oscillation Mechanics of the Respiratory System: Basic Research to Clinical Application. American Thoracic Society, San Francisco, CA, May 21, 2007.

Airway Hyperreactivity: From Whole Lung to Isolated Airways and Smooth Muscle and Back Again”. Symposium on the Pathophysiology of Asthma, Antigua, November 20-22, 2006

“Understanding Structure vs Function Relations in Asthma: How the Whole Emerges from the Sum of the Parts”. McGowan Institute for Regenerative Medicine, Univ. of Pittsburgh, October 5, 2006

“Structure-Function Relations Governing Airway Hyperreactivity in Asthma”. Dept. Biomedical Engineering, Mayo Clinic, Rochester, MN August 18, 2006

“The Coulter Foundation Translational Research Partnership in Biomedical Engineering at Boston University: Catalyzing and Accelerating Innovation”. Mass. Medical Society (MassMEDIC) Conference: Working with Academic Research Institutions. May 25, 2006.

“Multi-scale Image Functional Modeling of the Lung”. Dept. Biomedical Engineering, Case Western Reserve University, Keynote Speaker for Alumni Reunion Weekend for BME, Oct. 15, 2005..

“Integrating Multi-Scale Modeling with Imaging to Distill Structure-Function Relations in Asthma”. Dept. Biomedical Engineering, University of Pennsylvania, Philadelphia, PA, Sept. 22, 2005.

“The Coupling Between Airway Smooth Muscle Length and Lung Volume”. Workshop on Airway Smooth Muscle: From Cell to Organ”, American Thoracic Society, May 2005.

“Probing the Origins of Airway Dysfunction in Asthma via Multi-scale Image Functional Modeling”. Biomedical Engineering, Tufts University, April 8, 2005.

“Building an Exciting Biomedical Engineering Department”. Plenary Talk, Whitaker Foundation Educational Summit, Lansdowne Center, Washington, March 6, 2005.

“Multiscale Image Functional Modeling of the Lung: From Basic Science to Clinical Practice in Asthma and Respiratory Distress Syndrome”. Biomedical Engineering, Univ. of California Irvine. Irvine, CA, Feb. 2005.

“Heterogeneity and Integrated Lung Function in Asthmatic Humans: Is the whole greater than the sum of the parts” Symposium on Lung Reactivity and Structure, American Thoracic Society Meeting, Orlando, FL, May 26, 2004.

Understanding the Integrative Structure-Function Pathology of Asthma: Inflammation to Clinical Phenotype” Dept. Molecular and Cellular Biology, Goldman School of Dentistry, Boston, MA., Jan. 29, 2004.

“The Interface Between Computational Modeling of the Lung and Clinical Practice” Vermont Lung Center, University of Vermont, Nov. 18, 2003.

“Airway Hyperreactivity and Heterogeneity: Is the Whole greater than the sum of the parts?” Flow Volume Underworld, Grand Isle, Vermont, Sept. 11, 2003.

“The Mechanical Phenotype of Asthma: Airway Inflammation, Heterogeneity, and Airway Reactivity” Dept. Bioengineering, Politecnico di Milano, Milano, Italy. April 2, 2003.

“Heterogeneity of Airway Constriction and Airway Hyperreactivity in Asthma” Plenary Talk, 20th Veterinary Comparative Respiratory Society, Boston, MA, October 4, 2002.

“Heterogeneity and Lung Function: Airway and Tissue Disease” Department of Anesthesiology, Johns Hopkins University. July 10, 2002.

“Where is the locus of the functional defect in asthma?: Tracking Airway Diameter and Smooth Muscle Stretch In Situ”. Department of Biomedical Engineering, University of Virginia, September, 28, 2001.

“Senior Design in Biomedical Engineering.” Moderator and Key Speaker, Special NSF Panel on Undergraduate Design in Bioengineering, National Science Foundation, Arlington, VA, June 28-29, 2001.

“Structure/Function Relationships in the Lung Associate with Asthma.” Biomedical Science and Engineering Seminar Series, Shriners Burns Hospital of Mass General Hospital, Boston, MA, March 20, 2001.

“An Engineering Systems Approach to Probing Lung Structure and Function in Asthma.” Biomedical Engineering Department, Bucknell University, Lewisberg, PA, February 22, 2001.

“Combining Systems Engineering and Structural Modeling to Understand Asthma.” Marquette University, Biomedical Engineering, February 9, 2001.

“Structure-Function Relations Governing Airway Hyperactivity in Asthma” Flow Volume Underworld, Genoa, Italy, September 4, 2000.

“Probing Structure-Function Relations in the Lung Using Forced Oscillations” Center for Sleep Disorders, Harvard Medical School, Brookline, MA, June 12, 2000.

“Computational Challenges to Probing Structural and Integrative Lung Phenotypes” Invited Speaker at Computational Challenges in the Post-Genomic Age Conference in San Francisco, CA May 11, 2000.

“Morphological Modeling of Lungs: The virtual Human Project” National Academy of Sciences, Washington, DC., October 28, 1999.

“The Respiratory Mechanic” Invited lecturer for short course in oscillatory mechanics. University of Vermont, Burlington Vermont, October 24 and 25, 1999.

“Computational Advances in Morphometric Lung Models for Probing Structure-Function Relations in Lung Pathophysiology” Life Science and Computational Physics Sections of Oak Ridge National Laboratory, Oak Ridge, TN, July 13, 1999.

“Monitoring of Lung Mechanics During Mechanical Ventilation” Mallinckrodt, Inc. San Diego, CA, April 22, 1999

“How Important is the Pattern of Constriction in Establishing the Phenotype of Asthma” Pulmonary Division, Vancouver Hospital, Canada, April 29, 1999.

“Probing Structure-Function Relations in the Lung: Implications on the Role of Inflammation in Asthma and on Lung Volume Reduction Surgery” Department of Biomedical Engineering, University of Virginia, Charlottesville, VA, Oct 1, 1998.

“From Research to Academics: Can a Research Institution train Senior Engineering Students for Independent Work at the Next Level?” National Science Foundation PI Conference for Undergraduate and Graduate Design Projects. Key Speaker, June 24, 1998

"On the Role of Heterogeneous Constriction in Establishing Lung Mechanical Function During Asthma" Harvard School of Public Health, Boston, MA, February 17, 1998.

"Novel Methods to Track Lung Mechanical Properties During Breathing: Applications to Outpatient Asthma and Intubated Surgical Patients" Boston Children's Hospital, Boston, MA. May, 1997.

"Lung Mechanics During Breathing: New techniques That Permit Inference on Lung Structural Status". Biotechnology and Bioengineering Research Center. University of Pittsburgh, December 13, 1996.

"Structural Origins of Changes in Resistance and Elastance in Diseased Lungs and Who Cares?" Meakin's Christie Laboratories of McGill University, Montreal, Quebec, Canada., September 10, 1996.

"Assessment of Lung Mechanics During Mechanical Ventilation" Nellcor Puriton Bennett Co, San Diego, CA, April 9, 1996.

"How to Make Airways Look Like Tissues". Meakin's Christie Laboratories of McGill University, Montreal, Quebec, Canada., October 17, 1995.

"Linear and Nonlinear Identification of Lung Mechanics". Dept. of Biomedical Engineering; McGill University, Montreal, Quebec, Canada., October 18, 1995..

"The Forced Oscillation Technique for Probing Pulmonary Physiology" Portion of short course in Bioengineering Approaches to Pulmonary Physiology., Sponsored by the Biomedical Engineering Resource at USC. Seattle, WA, May 1995.

"BME Senior Project Design Program" Senior Design Workshop at Fall 1994 Biomedical Engineering Society Meeting, Tempe, Arizona. Sponsored by NSF and Whitaker Foundation. October 14, 1994

"A Capstone Senior Project as Part of an Integrated Design Experience for Biomedical Engineering Undergraduates" Amer. Soc. Eng. Educ., Edmonton, Canada, June, 1994

"Separating Airway and Tissue Mechanics In-Situ Using an Optimal Ventilator Waveform" Pulmonary Division of Baylor Medical Center, Houston, TX, March 1994.

"Optimal Input Design to Evaluate Linear and Nonlinear Mechanical Properties of the Airways and Respiratory Tissues" Key Speaker in Session on Respiratory Mechanics Systems Identification. *IFAC Modeling and Control in Biomedical Systems.*, Galveston, TX, March 1994.

"Frequency and amplitude dependence of lung mechanical properties during bronchoconstriction and under physiological breathing conditions". Symposium on New Approaches to Evaluation of Lung and Chest Wall Function. *American Thoracic Society Meetings, San Francisco, CA* 1993.

"Direct Use of Mechanical Ventilation to Measure Respiratory Mechanics Associated With Physiological Breathing." Workshop on "Mechanical Airway Impedance, sponsored by Forced Respiratory Oscillation Group, Zeist, Netherlands, March 9, 1993.

"Respiratory Impedance From Low to High Frequencies: Physiological, Modeling and Clinical Implications". University of Siena, Siena, Italy. Nov. 6, 1991.

"Evaluation of Respiratory Mechanics at Low frequencies with Time and Frequency Domain Processing". Workshop on Asthma: Mechanics Mediators and Morphology, sponsored by the Centers for Excellence at the Meakin's Christie Laboratories of McGill University, Montreal, Quebec, Canada., May 26, 1991.

"Sensitivity of Respiratory Impedance to Peripheral Airway Disease as Implied from Nitrogen Washout and Low Frequency Data". Pulmonary Research Dept., University Ziekenhuizen Leuven, Belgium June 21, 1990.

"Respiratory Impedance Parameter Uncertainty Issues". Workshop on "Mechanical Airway Impedance, sponsored by Forced Respiratory Oscillation Group, Antwerp, Belgium, June 18-19, 1990.

"Low Frequency Impedance of the Dog Respiratory System". Respiratory Research Laboratory, Boston University, Boston, MA, April, 1989.

"Issues When Modeling of Respiratory Impedance." Department of Biomedical Engineering, Worcester Polytechnic Institute, Worcester, MA, Feb. 22, 1989.

"Inverse Modeling of the Respiratory Mechanical System: Application to Forced Oscillation Data from Humans." Department of Biomedical Engineering, University of Virginia, Charlottesville, VA, September 24, 1987.

"Forced Oscillations of the Respiratory System from 4-200 Hz." Harvard School of Public Health, Cambridge, MA, April 10, 1985.

"Preparing and Giving an Oral Presentation of Scientific Research." Given to NSF High School Research Program students. Department of Physics, Boston University, August 3, 1990.

PATENTS/SOFTWARE LICENSES

- TRAJ2: Ground-Based Radar Simulation Software, M.I.T. Lincoln Laboratory Software Center
- "Infant Respiratory Impedance Measuring Apparatus and Methods Using Forced Oscillations", Patent number: 5,318,038
- "Enhanced Ventilation Waveform Device for Mechanical Ventilators," Patent number: 6,435,182
- "Variable Peak Pressure Ventilation Method and System" Patent Number 6,907,881
- Provisional: "Pneumatically-Driven Oscillatory Flow Generator
- Provisional: "System and Method for Setting Positive End Expiratory Pressure During Mechanical Ventilation Based on Dynamic Lung Function"

CONSULTING

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|----------------|--|---|
| • 1985-1998 | Systems and Analysis
Simulation of and sensitivity analysis of various detection systems | <i>M.I.T. Lincoln Laboratory,
Lexington, MA</i> |
| • 1996-Present | Nellcor Puritan Bennett/Mallinckrodt
Diagnostic lung mechanics from patient ventilators | <i>San Diego, CA</i> |
| • 1990, 1991 | Department of Anesthesiology
Low Frequency Mechanics in the Canines | <i>University of Maryland</i> |