

**CURRICULUM VITAE FOR ACADEMIC PROMOTION
The Johns Hopkins University School of Medicine**

February, 2004

Allan Gottschalk, M.D., Ph.D.

DEMOGRAPHIC INFORMATION

Current Appointments:

Associate Professor of Anesthesiology and Critical Care Medicine, Division of
Neuroanesthesiology and Critical Care
Center for Computational Medicine and Biology, Member

Personal Data:

Address:

Department of Anesthesiology and Critical Care Medicine, Meyer 8-134
Johns Hopkins Hospital
600 North Wolfe Street
Baltimore, MD 21287-7834

Phone: 410-955-2611

Fax: 410-614-7903

E-mail: agottschalk@jhmi.edu

Education and Training:

<u>Degree/Year</u>	<u>Institution</u>	<u>Discipline</u>
B.S./1978	Boston University	Biomedical Engineering
M.S./1983	University of Pennsylvania	Systems Engineering
M.S./1984	University of Pennsylvania	Biomedical Engineering
M.D./1984	University of Pennsylvania	Medicine
Ph.D./1992	University of Pennsylvania	Anatomy and Structural Biology (Neuroscience)
1984-1985	Presbyterian-University of Pennsylvania Medical Center, Intern,	Medicine
1985-1987	University of Pennsylvania, Resident, Department of Anesthesia	
1988-1989	University of Pennsylvania, Research Fellow, Department of Anesthesia	

Professional Experience:

<u>Positions</u>	<u>Institution</u>	<u>Dates</u>
Instructor in Anesthesia	University of Pennsylvania	1989-1990
Assistant Professor of Anesthesia	University of Pennsylvania	1990-2000
Sleep Center, Member	University of Pennsylvania	1991-2000
Vision Center, Member	University of Pennsylvania	1994-2000
Institute for Neuroscience, Member	University of Pennsylvania	1994-2000
Visiting Associate Professor of Anesthesiology and Critical Care Medicine	Johns Hopkins	2000-2001
Associate Professor of Anesthesiology and Critical Care Medicine, Division of Adult Anesthesiology	Johns Hopkins	2001-2002
Associate Professor of Anesthesiology and Critical Care Medicine, Division of Neuroanesthesiology and Critical Care	Johns Hopkins	2002-present

RESEARCH ACTIVITIES

Publications:

Peer reviewed

1. **Gottschalk A**, Buchsbaum G. Information theoretic aspects of color signal processing in the visual system. IEEE Transactions on Systems, Man, and Cybernetics. Special Issue on Sensory Communication, SMC-13/57, 864-873, 1983.
2. Buchsbaum G, **Gottschalk A**. Trichromacy, opponent color coding and optimum color information transmission in the retina. Proceedings of the Royal Society of London, B220 89-113, 1983.
3. Buchsbaum G, **Gottschalk A**. Chromaticity coordinates of frequency-limited functions. J Opt Soc Am A1 885-887, 1984.
4. Khoo MCK, **Gottschalk A**, Pack AI. Sleep induced periodic breathing and apnea: a theoretical study. J. Appl. Physiol. 70(5):2014-2024, 1991.
5. Ogilvie MD, **Gottschalk A**, Anders K, Richter DW, Pack AI. A network model of respiratory rhythmogenesis. Am. J. Physiol 263:R962-R975, 1992.
6. Pack AI, Cola MF, Goldszmidt A, Ogilvie MD and **Gottschalk A**. Correlation between oscillations in ventilation and frequency content of the electroencephalogram. J Appl Physiol 72(3):985-992, 1992.

7. **Gottschalk A.** Optimal image representation in early vision, Doctoral Dissertation, Department of Anatomy, University of Pennsylvania Medical School, University Microfilms, Ann Arbor MI, 1992.
8. Pack AI, **Gottschalk A.** Mechanisms of ventilatory periodicities. *Annals of Biomedical Engineering*, Special Issue in Honor of Dr. Fred Grodins, 21:537-544, 1993.
9. Kadish RE, **Gottschalk A.** A complication of fiberoptic intubation. *Anesthesia and Analgesia* 76:1375-1376, 1993.
10. **Gottschalk A,** Edwards M. A simple device to permit capnography during ventilation for laryngoscopy. *Anesthesiology* 79:620-621, 1993.
11. **Gottschalk A,** Ogilvie MD, Richter DW, Pack AI. Computational aspects of the respiratory pattern generator. *Neural Computation* 6:56-66, 1994.
12. **Gottschalk A,** Silverberg M. An unexpected finding with pulse oximetry in a patient with hemoglobin Köln. *Anesthesiology* 80:474-476, 1994.
13. ASTM Standard test method for determining laser resistance of the shaft of tracheal tubes. ASTM F-29, Annual Book of ASTM Standards, pp 1497-1506, 1994.
14. ISO, Guide on airway management during laser surgery of upper airway. ISO TR-11991 Technical Report, 1995.
15. **Gottschalk A,** Bauer M, Whybrow PC. Evidence for chaotic mood variation in bipolar disorder. *Archives of General Psychiatry* 52:947-959, 1995.
16. ASTM Standard specification for labeling and marking of cuffed and uncuffed tracheal tubes and related treatments intended for use during laser surgery. ASTM F-29 Standard F1242, Annual Book of ASTM Standards, pp 566-575, 1997.
17. **Gottschalk A.** An alternate use for jet ventilation in the management of the difficult airway. *Canadian J. Anaesthesia* 44:3, 337-340, 1997.
18. **Gottschalk A,** Mirza N, Weinstein G, Edwards MW. Capnography during jet ventilation. *Anesth Analg* 85:155-9, 1997.
19. Thaler E, **Gottschalk A,** Samaranayake R, Lanza D, Kennedy DW. Anesthesia in endoscopic sinus surgery. *Am J Rhinology* 11:409-413, 1997.

20. **Gottschalk A**, Bauer MS, Whybrow, PC. Reply to: Low dimensional chaos in bipolar disorder? Archives of General Psychiatry, 55:275-276, 1998.
21. **Gottschalk A**, Smith DS, Jobes DR, Kennedy SK, Lally SE, Noble VE, Grugan KF, Seifert HA, Cheung A, Malkowicz SB, Gutsche BB, Wein AJ. A randomized trial of preemptive epidural analgesia in recovery from radical prostatectomy. JAMA, 279:1076-1082, 1998.
22. **Gottschalk A**, Heiman-Patterson T, deQuevedo II, R, Quinn PD. General anesthesia for a patient with centronuclear (myotubular) myopathy. Anesthesiology, 89:1018-1020, 1998.
23. **Gottschalk A**, Smith DS, Malkowicz SB, Wein AJ. Preemptive analgesia for prostatectomy JAMA 280:517-518, 1998.
24. Maldjian JA, **Gottschalk A**, Patel RS, Pincus D, Detre J, Alsop D. Mapping of secondary somatosensory cortex activation induced by vibrational stimulation: an fMRI study. Brain Research 824:291-295, 1999.
25. Maldjian JA, **Gottschalk A**, Patel RS, Detre J, Alsop D. The sensory somatotopic map of the human hand at 4 Tesla. Neuroimage 10:55-62, 1999.
26. **Gottschalk A**, Hyzer MC, Geer RT. A comparison of human and machine based predictions of successful weaning from mechanical ventilation. Medical Decision Making 20:160-169, 2000.
27. **Gottschalk A**. Seeking an integrated model of anesthetic action. Re: Relevant concentrations of inhaled anesthetics for in vitro studies of anesthetic mechanisms. Anesthesiology 95:1536-1537, 2001.
28. **Gottschalk A**. Derivation of the visual contrast response function by maximizing information rate. Neural Computation, 14: 527-542, 2002.
29. Chalian AA, Kagan SH, Goldberg AN, **Gottschalk A**, Dakunchak A, Weinstein GS, Weber RS. Design and impact of intraoperative pathways for head and neck resection and reconstruction. Archives Otolaryngology Head and Neck Surgery 128:892-896, 2002.
30. Ochroch EA, **Gottschalk A**, Augostides J, Carson KA, Kent L, Malayaman N, Kaiser LR, Aukburg SJ. A randomized study of long-term pain and activity during recovery from major thoracotomy using thoracic epidural analgesia. Anesthesiology 97:1234-1244, 2002.

31. **Gottschalk A**, Ochroch EA: Preemptive analgesia - what do we do now? *Anesthesiology* 98:280-281, 2003.
32. **Gottschalk A**, Haney P. Computational aspects of anesthetic action in simple neural models. *Anesthesiology* 98:548-564, 2003.
33. **Gottschalk A**, Ochroch EA. Multimodal analgesia is here to stay. *Drugs* 64:629-630, 2004.

Non-peer reviewed

1. Pashayan AG, Wolf G, **Gottschalk A**, Keon T, Crowley J, DeRichmond A, Virag R: Standard guide for airway management during laser operations on the upper airway. *Anesthesia Patient Safety Foundation Newsletter* 8:13-16, 1993.

Book Chapters

1. Palmer LA, **Gottschalk A**, Jones J. Fundamental constraints on the estimation of simple cell receptive fields in visual cortex. In: Advanced Methods of Physiological Systems Modeling, VZ Marmarelis (ed), Biomedical Simulating Resource, Los Angeles, 1987.
2. Pack AI, **Gottschalk A**, Goldszmidt A, Kola M. Sleep state and periodic ventilation. In: Modeling the Respiratory System, Khoo M.C.K. (ed), Plenum Press, New York, pp. 181-192, 1989.
3. **Gottschalk A**, Geitz KA, Richter DW, Ogilvie MD, Pack AI. Nonlinear dynamics of a model of the central respiratory pattern generator. In: Control of Breathing and Its Modeling Perspective, Honda Y, Miyamoto Y, Konno K, Widdicombe JD (eds), Plenum Press, New York, pp. 51-56, 1992.
4. **Gottschalk A**. Optimal image representation early vision. In: *Computation in Neurons and Neural Systems*, Eeckman, F (ed), Kluwer, Norwell, MA, pp. 85-90, 1994.
5. Geitz KAE, **Gottschalk A**. The role of feedback in respiratory amplitude and frequency modulation. In: The Neurobiology of Computation, Bower J (Ed), Kluwer, Norwell, MA, pp. 209-214, 1995.
6. Geitz KAE, Richter DW, **Gottschalk A**. The influence of chemical and mechanical feedback on ventilatory pattern in a model of the central respiratory pattern

- generator. In: Modeling and Control of Ventilation, Semple SJG, Adams L (eds), Plenum Press, New York, pp. 23-28, 1995.
7. **Gottschalk A**, Khoo MCK, Pack AI. Multiple modes of periodic breathing during sleep. In: Modeling and Control of Ventilation, Semple SJG, Adams L (eds), Plenum Press, New York, pp. 105-110, 1995.
 8. **Gottschalk A**. Information based limits on synaptic growth in Hebbian models. In: Computational Neuroscience Trends in Research, 1997, J. Bower (ed.), Plenum, New York, pp. 309-313, 1997.
 9. **Gottschalk A**. Head and Neck Surgery. In: Subspecialty Care, S. Muravchick, ed. Atlas of Clinical Anesthesiology, Vol 4, R.D. Miller, Ed., pp. 9.1 - 9.24, 1998.
 10. **Gottschalk A**. A Hebbian algorithm that balances information rate and neural resource consumption. In: Computational Neuroscience: Trends in Research, 1998, J Bower (ed.), Plenum, New York, pp. 391-396, 1998.
 11. **Gottschalk A**, Ochroch EA. Is preemptive analgesia clinically effective? In: Evidence-Based Practice of Anesthesia, L Fleisher (ed.), WB Saunders, Philadelphia, PA, Chap. 69, pp. 433-440, 2004.

Other Media

1. **Gottschalk A**: Anesthetic complications of sinonasal surgery in: Cottle International Rhinology Centennial, CWE Conference Video: Mt. Laurel, New Jersey, 1997.
2. Surgical Management of Sinusitis (Video) Am Academy of Otorrhinolaryngology, 1998.

Invited Reviews, Editorials:

1. **Gottschalk A**. Preemptive analgesia - An ounce of prevention may still be worth a pound of cure. *Journal of Pain (formerly Pain Forum)*, 1:85-88, 2000.
2. **Gottschalk A**, Smith DS. New concepts in acute pain therapy: preemptive analgesia, Invited review. *American Family Physician*, 63:1979-1984, 2001.
3. **Gottschalk A**, Wu CL, Ochroch EA. Current treatment options for acute pain, Invited Review. *Expert Opinion on Pharmacotherapy*, 3:1599-1611, 2002

4. **Gottschalk, A.** Does preemptive analgesia have long-term benefits on quality-of-life? MD Consult - Pain Medicine, www.mdconsult.com, 2002
5. **Gottschalk A.** Update on preemptive analgesia. Techniques in Regional Anesthesia and Pain Management, 7:116-121, 2003.
6. Ochroch EA, Mardini IA, **Gottschalk A.** The role of NSAIDs in preemptive analgesia. Invited Review. Drugs, 63:2709-2723, 2003.
7. Ochroch EA, **Gottschalk A.** Impact of pain and its management for thoracic surgical patients. Chest Surgery Clinics of North America In Press, 2004.
8. **Gottschalk A,** Wu CL. New concepts in acute pain therapy, Invited Review. Home Health Care Consultant, Submitted for Publication, 2003.

Extramural Sponsorship:

Adaptive Information Processing and Control in the Nervous System, 1990-91,
BRSB University of Pennsylvania, \$6,000, PI

Hartford Foundation Fellowship, 87387-3G, 1990-91, \$22,000.00

Nonlinear Dynamics of Periodic Breathing and Sleep Apnea. 1990-1991, American Lung Association, \$15,000.00, PI

Cerebral Blood Flow SPECT Imaging and Somatosensory Plasticity, 1993, Clinical Research Center, University of Pennsylvania, \$12,000

The Role of Anesthetic Technique in Recovery From Major Cancer Surgery, 1993, Small Grant Program for Clinical Resource Management and Clinical Quality Improvement, \$15,000, PI.

Optimal Image Representation in the Primary Visual Cortex, 1994-1997, NIH, 1-RO-1-EY10915 NIH, TDC \$418,921 PI (50%).

Functional MRI Evaluation of Central Nervous System Plasticity in Man, 1994, University of Pennsylvania Research Foundation, \$3,360.

Vision Research Center Core Grant, 9/01/95-8/31/00, NIH, EY01583, TDC \$1,150,000, Co-PI, PI: Paul Liebman

A Randomized Trial of Preemptive Epidural Analgesia on Long-term Recovery from Thoracotomy, 1998, University of Pennsylvania School of Medicine Pilot Grant for Patient-Oriented Research, \$20,000, PI.

Optimal Image Representation in the Primary Visual Cortex, 1998-2002, NIH, 1-RO1-EY10915, TDC \$585,357, Current Year DC \$133,135, PI (50%).

The Impact of Preemptive Analgesia on Pain and Recovery from Major Surgery in Women: Pilot Studies, 2000, FOCUS on the Health of Women Clinical Investigator Award, \$5,000, PI.

Impact of Preemptive Analgesia on Recovery From Surgery, 2000-2003, NIH, 1-RO1-NS41865, TDC \$520,227 First Year DC \$233,544, PI (30%).

The Long-Term Impact of Epidural Analgesia on Pain and Recovery from Major Thoracotomy: Pilot Study, 2001, Blaustein Foundation, Johns Hopkins Medical Institutes, \$26, 660.

Computational Models of Anesthetic Action, 2002-2003, Pittsburgh Supercomputing Center, IBN020001P, 3000 Service Units (\$7,500)

Computational Neurobiology of Anesthetic Action, 2003-2008, NIH, TDC \$1,250,000, PI (50%), Submitted 3/1/04.

Teaching:

Classroom Instruction

Systems Neuroscience, Lecturer, Color Vision, 1993

Neurobiology of Sleep and Circadian Rhythms, Lecturer, Computational and Theoretical Aspects of Rhythmogenesis, 1992, 1993,1994.

Neuroscience, Lecturer, Pain, 1994, 1999, 2000.

Preemptive Analgesia, Where Do We Currently Stand, Resident Lecture, 2002

Electrical Safety, Resident Lecture 2000, 2001, 2002, 2003

Electrical and Fire Safety, Anesthesia Technicians, 2000, 2002

Clinical Instruction

Operating supervision of anesthesia residents and medical students rotating on anesthesia.

Supervisor anesthesia resident education for Urologic Surgery and Head and Neck Surgery, 1990-2000.

Editor and Principal author Anesthesia Resident Teaching Manual for Urology and Otorhinolaryngology 1993 (revised 1995 and 1999).

Clinical Preceptor for new Hopkins Residents, 2002-2004

CME Instruction

Anesthetic Considerations for Laser Surgery of the Airway, November 17, 1990, Invited Speaker, Robert D. Dripps Memorial Conference, University of Pennsylvania, Department of Anesthesia, Philadelphia, Pennsylvania

Safe Anesthesia for Laser Surgery, November 17, 1991, Robert D. Dripps Memorial Conference, University of Pennsylvania, Department of Anesthesia, Philadelphia, Pennsylvania

Anesthesia Techniques for Laser Surgery, and Gaining Proficiency with the Jet Ventilator - A Hands On Experience, October 24, 1992, Invited Speaker, Annual Anesthesia Seminar, Department of Anesthesiology, The Medical Center at Princeton, Princeton, New Jersey

Understanding Airway Obstruction and Sleep Apnea, November 14, 1993, Invited Speaker, Robert D. Dripps Memorial Conference, Department of Anesthesia, University of Pennsylvania, Philadelphia, Pennsylvania

Monthly Lectures to Anesthesia Residents (Jet Ventilation, Pitfalls in Management of the Airway, Anesthetic Considerations for Laser Surgery of the Airway or Airway Management: Case Studies), 1989-1999.

Monthly Lectures to Medical Students rotating in Anesthesiology, (Acute Pain Management or Managing the Sedated Airway), 1997-1999

Annual Lectures to Otorhinolaryngology Residents (Acid-Base Physiology or Physiology and Pharmacology of the Airway), 1992-1999.

Relieving Urologic Pain, Grand Rounds Department of Urology, 1996

Managing the Difficult Airway, Grand Rounds, Department of Otorhinolaryngology, 1997

Dynamics of Neural (Re)Organization, Grand Rounds, Department of Neurosurgery, 1999

Information, Spikes, and Connectivity: Striking a Balance in Early Vision, Department of Bioengineering, 2002

Physiology and Pharmacology of Breathing and the Airway: Using Physiology to Stay Out of Trouble, Grand Rounds, Department of Anesthesiology, 2002

Fire and Electrical Safety, Anesthesia Technicians Course, Department of Anesthesiology, 2001, 2002

Electrical Safety in the Operating Room, Resident Lecture, Department of Anesthesiology, 2000, 2001, 2002, 2003

Preemptive Analgesia: Current Status, Resident Lecture, Department of Anesthesia, 2002

Dynamics of Neural (Re)Organization, Neuroscience Critical Care Division, Department of Anesthesiology, 2002

Analgesia for Major Spinal Surgery, Department of Orthopedics, 2002

Mechanism(s) of General Anesthetic Action, Resident Lecture, Department of Anesthesiology, 2003

What Anesthetics Do to the Brain, Neuro Critical Care Division, 2004

Mentoring:

Advisees

Kurt A. E. Geitz (Doctoral Dissertation in Biomedical Engineering pending), Boston Scientific Corporation

James Li, M.D., Angeline Li, M.D., Michael Rodericks, M.D., Mark Bono, M.D., Mark Loeve, M.D. (Anesthesia Resident Advisees)

E. Andrew Ochroch, M.D., Assistant Professor of Anesthesia, University of Pennsylvania (Faculty Mentor for NIH Physician Scientist Award)

Matthew Sexton, B.S., M.S., Doctoral Program, Department of Physics, University of Minnesota

Paul M. Haney, B.S., Doctoral Program, Department of Physics (Computational Physics), University of Texas at Austin

Charles (Alex) Padgett, B.S., Doctoral Program, Computer Science, University of Maryland

Justin Domke, B.S., Doctoral Program, Computer Science, University of Maryland

Guilherme Roshke, B.S., School of Law (Computer/Information Law) Georgetown University

Matthew G. Sexton, M.S., Doctoral Program, Department of Physics, University of Minnesota

Thesis Committees

Daniel E. Wollman, M.D., Ph.D., (Neuroscience) The effects of GABA blockade on stimulus selectivity and receptive field structure in cat striate cortex, 1996, Committee Member.

Elliot D. Menschik, M.D., Ph.D. (Neuroscience), Cholinergic neuromodulation in hippocampal function and disease: from single-cell biophysics to network simulations, 1999, Committee Memb

Editorial Activities:

Journal Peer Review Activities

Journal of Applied Physiology

American Journal of Physiology

Anesthesiology

Biological Psychiatry

Archives of Psychiatry

International Journal of Neuroscience

Journal of Neuroscience

Medical Decision Making

Head and Neck

American Academy of Family Physicians, Home Study Monograph Series

NeuroImage

Psychological Assessment

IEEE Transactions on Systems, Man, and Cybernetics

Neural Networks

JAMA

Anesthesiology and Pain Management Evaluation Board of the Faculty of 1000
Medicine, Pain Management - Acute Clinical

CLINICAL ACTIVITIES

Certification:

License, Department of Health and Mental Hygiene, Maryland (2000, #D0056111)

Diplomate, American Board of Anesthesiology (1990, #17965)

Service Responsibilities:

2000-2002 Division of Adult Anesthesiology
2002-Present Division of Neurosurgical Anesthesiology

ORGANIZATIONAL ACTIVITIES

Institutional Administrative Appointments (at University of Pennsylvania):

Laser Committee, Member, 1991 - 2000
Standing Committee on Academic Integrity, 1994-1996
Admissions Committee, Combined Degree Program, School of Medicine, 1995-1999
Steering Committee, Medical Faculty Senate, 1998 - 2000

Institutional Administrative Appointments (at Johns Hopkins):

Research Committee, Department of Anesthesiology, 2001-Present
Operating Room Triad - Urology, 2004-Present

Professional Societies:

ASTM (American Society for Testing and Materials) Subcommittee F29.02.10 -
Airway Hazards During Laser Surgery
ISO (International Standards Organization) TC 121 SC 2 "Standard Guide for
Airway Management during Laser Operations of the Upper Airway",
Delegate, 1992
American Association for the Advancement of Science
Institute of Electrical and Electronics Engineers
American Society of Anesthesiologists
Maryland Society of Anesthesiologists
International Anesthesia Research Society
Association for Research in Vision and Ophthalmology (ARVO)
Association of University Anesthesiologists
Society for Neuroscience

Advisory Committees, Review Groups:

Outside Reviewer for NIH Study Section VISB 2/98, 6/98, 10/98
Special Study Section Reviewer (VISA) 3/01
International Consultative Council, Ateneo Project, Surgical Andean Group

RECOGNITION

Awards, Honors:

Membership in Tau Beta Pi (Engineering Honor Society), 1977
Harold C. Case Scholar, Boston University, 1977,

Graduated Summa Cum Laude, Boston University, 1978

Lewis B. Flexner Prize in Neurobiology, Institute of Neuroscience, University of Pennsylvania, 1983

Listed in *Who's Who in Science and Engineering*

Listed in *Who's Who in Medicine and Healthcare*

Listed in Best Doctors

Listed in *Baltimore Magazine*, Best Docs

Invited Talks, Panels:

The Generation and Maintenance of the Respiratory Rhythm, April 25, 1989,
Visiting Professor, Departments of Anesthesiology and Physiology and
Biophysics, University of Washington, Seattle, Washington

Some Lessons from the Study of Ventilatory Control During Sleep, March 19, 1990,
Visiting Professor, Department of Anesthesiology, Mayo Clinic, Rochester,
Minnesota

Theoretical Aspects of a Network Model of Respiratory Rhythmogenesis, May 21,
1990, Panel on Nonlinear Aspects of Respiratory Control, American Thoracic
Society, Boston, MA.

Sleep and Anesthesiology, Anesthetic Considerations for Laser Surgery of the
Airway, and Neurophysiologic and Dynamic Aspects of Respiratory Control,
October 10-11, 1991, Visiting Professor, Department of Anesthesia, Health
Sciences Center, State University of New York at Stony Brook, Stony
Brook, New York

Anesthesia for Otorhinolaryngology, December 3, 1991, Visiting Professor,
Department of Anesthesia, Sacred Heart Hospital, Allentown, Pennsylvania

Anesthetic Considerations/Management of the Patient with Sleep Apnea, October
13, 1992, Visiting Professor, Department of Anesthesia, Washington Hospital
Center, Washington, D.C.

Anesthesia Considerations for Laser Surgery of the Airway, Department of
Anesthesia, August 9, 1993, Visiting Professor, Arnot Ogden Medical
Center, Elmira, New York

Sleep Breathing, and Anesthesia, Department of Anesthesia, September 22, 1993,
Visiting Professor, University of Wisconsin - Madison Medical School,
Madison, Wisconsin.

Optimal Information Processing In Early Vision: Linking Theory and Neurobiology,
October 5, 1993, Visiting Professor, Rockefeller University, New York, New
York

Long-Term Organization of Mood In Bipolar Disorder, November 13, 1993 Invited
Speaker, Dynamical Systems in the Neurosciences, Multiscale Time and
Space Coherence in Brain Function, Satellite Symposium of the Annual
Meeting of the Society for Neuroscience, Washington, DC

- Modes of Periodic Breathing in the Elderly, May 21, 1994, Invited Presentation, Hartford Foundation Research Poster Session, AGS/AFAR Annual Meeting, 1994
- A Computational Approach to the Regulation of Respiratory Rhythm, October 21, 1994, Invited Speaker, Laboratory of Neural Control, National Institutes of Health, Bethesda, Maryland
- The Pursuit of Respiratory Instability In Man, March 2, 1995, Invited Speaker, Modeling Neurophysiologic Systems: Challenges and Opportunities: Oak Ridge National Laboratory, Washington, DC
- Central Respiratory Pattern Generation: Why Things Can Sometimes Go Terribly Wrong, February 29, 1996, Visiting Professor, Department of Anesthesia, Massachusetts General Hospital, Boston, Massachusetts
- The Pursuit of an Integrated Model of Central Respiratory Pattern Generator and Control, April 24, 1996, Visiting Professor, Department of Physiology and Biophysics, University of South Florida, Tampa, Florida
- Anesthetic Complications of Sinonasal Surgery, June 7, 1997, Invited Speaker, Cottle International Rhinology Centennial, Philadelphia, Pennsylvania
- Control of Ventilation and the Airway: Using Physiology to Stay Out of Trouble and Neural (Re)Organization and Its Implications for Anesthetic Practice, November 5-6, 1997, Visiting Professor, Department of Anesthesiology and Critical Care Medicine, Johns Hopkins University, Baltimore, Maryland
- Update on Preemptive Analgesia, April 16, 1999, Visiting Professor, Department of Anesthesia, The Reading Hospital and Medical Center, Reading, Pennsylvania
- Preemptive Analgesia: How Can We Make It Work?, August 23, 1999, Panelist, International Association for the Study of Pain, 9th World Congress on Pain, Vienna, Austria
- Information, Spikes, and Connectivity: Striking a Balance in Early Vision; Neural (Re)Organization and Its Implications for Anesthetic Practice, October 21-22, 1999, Visiting Professor, Department of Anatomy and Neurobiology and Department of Anesthesia, Washington University, St. Louis, Missouri
- Preemptive Analgesia: Where Do We Currently Stand?; Neural (Re)Organization and Its Implications for Anesthetic Practice, December 1-2, 1999, Visiting Professor, Department of Anesthesiology, University of Washington, Seattle Washington
- Preemptive Analgesia: Where Do We Currently Stand?, January 5, 2000, Visiting Professor, Department of Anesthesiology, Mayo Clinic, Rochester, Minnesota.
- Preemptive Analgesia: Where Do We Currently Stand?, January 12, 2000, Visiting Professor, Department of Anesthesiology, University of Wisconsin, Madison, Wisconsin
- Preemptive Analgesia: Where Do We Currently Stand?, January 20, 2000, Visiting Professor, Department of Anesthesiology and Critical Care Medicine, Johns Hopkins University, Baltimore, Maryland.

Computational/Theoretical Aspects of Anesthetic Action in Simple Neural Models;
Preemptive Analgesia: Where Do We Currently Stand?, Visiting Professor,
November 1, 2001, Departments of Biophysics and Anesthesiology and
Critical Care Medicine, University of Pittsburgh, Pittsburgh, Pennsylvania.
Preemptive Analgesia: What Do We Do Now? March 5, 2003, Department of
Anesthesiology, Greater Baltimore Medical Center, Baltimore, Maryland