Harvard Medical School
Curriculum Vitae

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Place of Birth: Boston, Massachusetts, USA

Education

1980	B.A. *magna cum laude* Phi Beta Kappa	Chemistry	Wesleyan University Middletown, CT
1989	M.D.	Harvard/MIT Health Sciences & Technology Division	Harvard Medical School, Boston, MA
1989	Ph.D.	Biophysics Advisor: Keith W. Miller	Harvard University, Cambridge, MA

Postdoctoral Training

07/89-06/90	Intern	Medicine	Beth Israel Hospital, Boston, MA
07/90-02/93	Resident	Anesthesia	Massachusetts General Hospital, Boston, MA
03/93-03/95	Research Fellow	Neurobiology	Harvard Medical School & Massachusetts General Hospital, Boston, MA
07/93-06/94	Clinical Fellow	Anesthesia & Intensive Care	Shriner's Burns Institute, Boston, MA

Faculty Academic Appointments

03/93-12/96	Instructor	Anesthesia	Harvard Medical School, Boston, MA
01/97-10/03	Assistant Professor	Anesthesia	Harvard Medical School, Boston, MA
10/03-present	Associate Professor	Anesthesia	Harvard Medical School, Boston, MA
06/07-present	Member of HST Faculty	Health Sciences & Technology MD Program	Harvard and Massachusetts Institute of Technology, Boston, MA

Appointments at Hospitals/Affiliated Institutions

03/93-06/97	Assistant in Anesthesia	Department of Anesthesia, Critical Care and Pain Medicine (DACCPM)	Massachusetts General Hospital, Boston, MA
06/97-06/05	Assistant Anesthetist	Department of Anesthesia, Critical Care and Pain Medicine	Massachusetts General Hospital, Boston, MA
06/05-present	Associate Anesthetist	Department of Anesthesia, Critical Care and Pain Medicine	Massachusetts General Hospital, Boston, MA

Other Professional Positions

2003	Member	Faculty of 1000

Major Administrative Leadership Positions

Local

1995-1998	Course Director, “Five Minutes of Science” weekly education program	Department of Anesthesia and Critical Care, Massachusetts General Hospital, Boston, MA
1998-2002	Course Director, “Ten Minutes of Science” weekly education program	Department of Anesthesia and Critical Care, Massachusetts General Hospital, Boston, MA
2004-2012	Director & Steering Committee Chairman, Dept. of Anesthesia Grand Rounds weekly CME course.	Department of Anesthesia, Critical Care and Pain Medicine, Massachusetts General Hospital, Boston, MA

2007-present	Co-Director, Harvard Anesthesia Basic Science Research Training Grant (T32-GM007592)	Department of Anaesthesia, Harvard Medical School, Boston, MA
2007-present	Co-Director, HST 150-151 Principles of Pharmacology. Acting Director, 2008	Harvard/MIT Health Sciences and Technology Division of Harvard Medical School, Boston, MA

International

2004-2005	Symposium Co-Director: Anesthetic Mechanisms at GABAA Receptors	Seventh International Conference on Basic and Systemic Mechanisms of Anesthesia (MAC2005), Nara, Japan
2009-2010	Workshop Director and Moderator: Translating Molecular Discoveries into New General Anesthetics.	Eighth International Conference on Basic and Systemic Mechanisms of Anesthesia (MAC2010), Toronto, Canada
2014-2015	Symposium Director and Moderator: GABA-A Receptors and General Anesthesia	Ninth International Conference on Basic and Systemic Mechanisms of Anesthesia (MAC2015), Bonn, Germany
2014-2015	Workshop Director and Moderator: Extrasynaptic GABA-A Receptors and General Anesthesia.	Ninth International Conference on Basic and Systemic Mechanisms of Anesthesia (MAC2015), Bonn, Germany

Committee Service

Local

1995-	MGH Research Council 1995-	Massachusetts General Hospital, Boston, MA Member
1994-1995	Committee on non-clinical time allocation 1994-1995	Department of Anesthesia, Critical Care and Pain Medicine, Massachusetts General Hospital, Boston, MA Member
1994-1995	Committee on junior investigators 1994-1995	Department of Anesthesia, Critical Care and Pain Medicine, Massachusetts General Hospital, Boston, MA Member
1996-2008	Committee on Research	Department of Anesthesia, Critical Care and Pain Medicine, Massachusetts General

		Hospital, Boston, MA
	1996- 2008	Member
1999-2004	Premedical Advisory Committee	Massachusetts Institute of Technology, Cambridge, MA
	2001-2004	Member
1999-	Beecher/Mallincrodt Research Laboratories Executive Committee	Department of Anesthesia, Critical Care and Pain Medicine, Massachusetts General Hospital, Boston, MA
	1999-present	Member
1999-	HST Admission Committee	Harvard/MIT Health Sciences and Technology Division of Harvard Medical School, Boston, MA
	1999-2006	Member
	2007-present	Subcommittee Chair
2000-2001	Staff Recruitment & Retention Committee	Department of Anesthesia, Critical Care and Pain Medicine, Massachusetts General Hospital, Boston, MA
	2000-2001	Member
2003-2007	Quality Assurance Committee	Department of Anesthesia, Critical Care and Pain Medicine, Massachusetts General Hospital, Boston, MA
	2003-2007	Member
2004-present	Grand Rounds Steering Committee	Department of Anesthesia, Critical Care and Pain Medicine, Massachusetts General Hospital, Boston, MA
	2002-present	Member
	2004-2012	Chairman
2005-2007	Resident Recruitment Committee	Department of Anesthesia, Critical Care and Pain Medicine, Massachusetts General Hospital, Boston, MA
	2005-2007	Member
	2007-present	Ad hoc member
2007-present	Subcommittee Chair, Health Sciences and Technology MD program Committee on Admissions This does not count as a Major Administrative Leadership Position	Harvard/MIT Health Sciences and Technology Division of Harvard Medical School, Boston, MA

2008-2009	Taskforce on New Ventures & Opportunities	Department of Anesthesia, Critical Care and Pain Medicine, Massachusetts General Hospital, Boston, MA
	2008-2009	Member
2008-2010	Research Productivity Task Force	Department of Anesthesia, Critical Care and Pain Medicine, Massachusetts General Hospital, Boston, MA
	2008-2010	Member
2008-	Academic Advancement and Promotions Sub-committee on Associate Professors	Department of Anesthesia, Critical Care and Pain Medicine, Massachusetts General Hospital, Boston, MA
	2008-	Member
2009-2010	Division Chief Search Committee	Cardiac Thoracic & Vascular Anesthesia Massachusetts General Hospital, Boston, MA
	2009- 2010	Member
2010-present	DACCPM Research Council	Department of Anesthesia, Critical Care and Pain Medicine, Massachusetts General Hospital, Boston, MA
	2010-11	Chair, Subcommittee on Research Productivity and Bonus
	2010- present	Member (re-elected in 2012 and 2014)
	2011-12	Chair, Subcommittee on Research Trainee Compensation
2013-	MGH Research Safety Committee	Massachusetts General Hospital, Boston, MA
	2013 -	Member
2013-	MGH Research Safety Taskforce on Research Training	Massachusetts General Hospital, Boston, MA
	2013-	Member

National and International

2007-2010	Scientific Advisory Board	Association of University Anesthesiologists
	2007-2010	Member
2010-	Subcommittee on Anesthetic Action and Biochemistry	American Society of Anesthesiologists
	2010-2012	Member
	2012 - present	Chair

2010-	Subcommittee on Drug Disposition and Anesthetic Action 2010-	American Society of Anesthesiologists Member
2012-	Education Committee on Fundamentals of Anesthesiology 2012-	American Society of Anesthesiologists Member
2012-	Scientific Advisory Committee on Annual Meeting 2012-	American Society of Anesthesiologists Member

Professional Societies

1982-	Biophysical Society	Member
1987-	Massachusetts Medical Society	Member
1990-2010	American Society of Regional Anesthesia	Member
1990-	American Society of Anesthesiologists	Member
1993-96	American Association for the Advancement of Science	Member
1994-	International Anesthesia Research Society	Member
1998-	Association of University Anesthesiologists	Member (by election)
2004-	Society for Neuroscience	Member
2012-	American Society of Biochemistry and Molecular Biology	Member
2012-	International Society for Anesthetic Pharmacology	Member

Grant Review Activities

1998-	NIH 1998-	NIH Ad hoc Consultant Reviewer
2003-	GEMI Fund 2003-	GEMI Fund Ad hoc Consultant Reviewer
2005	Special Emphasis Panel ZGM1 BRT-1 on	NIGMS

	Loan Repayment Programs for Extramural Clinical and Pediatric Researchers 2005	 Ad hoc Member
2006	Special Emphasis Panel ZGM1-PPBC-6-AN 2006	NIGMS Ad hoc Member of P01 Site Visit Committee
2008	Special Emphasis Panel ZGR1-SBIB-E-04 2008	NIGMS Ad Hoc Reviewer for SAT/BTSS IRG
2008	Special Emphasis Panel ZGM1 PPBC-6 (AN) 2008	NIGMS Ad hoc Member of P01 Site Visit Committee
2009-2010	Grant Review for the Medical Research Council (MRC) of UK April, 2010	MRC Ad Hoc Review (1 Programme Grant)
2010-2015	Grant Review Committee—NIH Surgery Anesthesia & Trauma (SAT) May, 2010 May, 2011 Oct, 2011-June 30, 2015; 3 meetings per year	NIH-Center for Scientific Review Ad Hoc Committee Member (10 grants) Ad Hoc Committee Member (10 grants) Appointed Committee Member
2013 -	Mentored Research Award Committee April, 2013 May, 2015	International Anesthesia Research Society Ad hoc member 1 committee meeting Ad hoc member 1 committee meeting
2014	Special Emphasis Panel ZGM1 TWD-5 June, 2014-July, 2014	NIH-Center for Scientific Review Appointed Member for 2 T32 site visits and 1 committee meeting
2015	Special Emphasis Panel ZGM1 TWD-5 (PD) June, 2015-July, 2015	NIH-Center for Scientific Review Appointed Member for 1 T32 site visit, reviewer for an R13 proposal, and 1 committee meeting.

Editorial Activities

Ad Hoc Reviewer

1988-	Biochemistry
1988-	Biochimica et Biophysica Acta
1994	American Journal of Physiology: Cell Physiology

1995-	Nature
1995-	Molecular Pharmacology
1995-	Alcoholism: Clinical and Experimental Research
1996-	Anesthesiology
1996-	Biophysical Journal
2004-	Journal of Neuroscience
2006-	Journal of Pharmacology and Experimental Therapeutics
2006-	BMC Anesthesiology
2006-	BMC Pharmacology
2006-	European Journal of Neuroscience
2010-	Journal of Biological Chemistry
2010-	PLOS One
2010-	Key Opinions in Pharmacology
2012-	FASEB Journal
2013-	Proceedings of the National Academy of Sciences
2014-	Neuropharmacology
2014-	Advances in Pharmacology

Other Editorial Roles

2013-	Associate Editor	*BMC Anesthesiology*
2015-	Section Editor	*BMC Anesthesiology*

Honors and Prizes

1980	Phi Beta Kappa	Wesleyan University	Academic Excellence
1980	Departmental High Honors	Chemistry Department, Wesleyan University	Academic Excellence
1980	Hawk prize	Wesleyan University	Undergraduate research
1980	American Chemical Society Award	Wesleyan University	Academic Excellence and Research
1989	James Tolbert Shipley prize	Harvard Medical School	Published research
1995	Fellowship Award	Medical Foundation/Charles King Trust	Early Research Career Development
2004	2003 Presidential Early Career Award for	The White House Office of Science and Technology	Research Grant and Career Development

Scientists and
Engineers (PECASE)

Report of Funded and Unfunded Projects

Funding Information

Past

1993-1994 A reverse pharmacological test for general anesthetic sites in the M2 region of the nicotinic acetylcholine receptor
FAER Starter Grant Award from the Foundation for Anesthesia Education and Research
Principal Investigator, $50,000
This grant used electrophysiology and site-directed mutagenesis to identify the binding site for general anesthetics in the alpha subunit of muscle type acetylcholine receptors.

1995-1996 Characterization of a general anesthetic site in the M2 region of the nicotinic acetylcholine receptor
Fellowship Award from the Medical Foundation/Charles King Trust
Principal Investigator, $30,000
This grant identified the binding site for general anesthetics in the pore of muscle type acetylcholine receptors.

1996-2001 Nicotinic receptor sites for alcohol actions
Scientist Development Award from National Institute on Alcohol Abuse and Alcoholism: K21-AA00206
Principal Investigator, $711,911
This grant mapped the binding site for alcohols in the pore of muscle type and neuronal acetylcholine receptors.

2003-2009 Volatile Anesthesia and the $GABA_A$ Receptor Gamma Subunit
Individual Research Award from the National Institute of General Medical Sciences: R01-GM66724
Principal Investigator, $1,300,000 (An extra 18 months of funding was granted when I received the 2003 PECASE)
This grant examined the role of the $GABA_A$ receptor gamma subunit in volatile anesthetic modulation and to map regions of the subunit that interact with anesthetic drugs.

2009-2014 Etomidate Analogues as Safer General Anesthetics
Individual Research Award from the National Institute of General Medical Sciences
Principal Investigator: D.E. Raines: R01- GM087316
Co-Investigator (10% effort), $1,765,875 direct costs
This project aims to develop novel anesthetics that retain etomidate's beneficial properties, but whose impact on steroid synthesis is greatly reduced.

2012-2013 Photo-reversal of general anesthesia
Sundry Funds
Co-investigator
This project used a photo-switchable propofol analog and demonstrated that UV light

could reverse anesthesia in Xenopus tadpoles, leading to a publication.

Current

1998-2019 General Anesthetic Sites on Ligand-Gated Ion Channels
National Institute of General Medical Sciences Program Project Grant Award (Director, K.W. Miller, MGH Dept. of Anesthesia)
P01-GM58448

(1998-2003) Principal Investigator on Project 3, $547,487
(2004-2009) Principal Investigator on Project 4: Anesthetic mechanisms on GABA Receptors ($716,698 direct costs) and co-PI on Protein Synthesis Core D ($160,473 direct costs).
(2009-2019) Principal Investigator (25%) on Project 3, ($877,440 direct costs) and co-PI (5%) on Protein Synthesis Core D ($1,007,230 direct costs).

(1998-2003) Project 3 of this grant aimed to examine the mechanism of volatile anesthetic and alcohol modulation in $GABA_A$ receptors from the mammalian brain, and to test the role of specific amino acids in anesthetic sensitivity.
(2004-2009) Project 4 of this grant aimed to examine the mechanism of etomidate and alcohol modulation in $GABA_A$ receptors from mammalian brain, and to test the role of specific amino acids in anesthetic sensitivity. Core D of this grant aimed to produce mammalian cell lines for high-level expression and biochemical purification of ligand-gated ion channel protein.
(2009-2019) Project 3 of this grant aims to determine the role of anesthetic-photolabeled $GABA_A$ receptor residues in the actions of potent intravenous anesthetics. Core D of this grant aims to produce mammalian cell lines for high-level expression and biochemical purification of ligand-gated ion channel protein for photolabeling.

2010-2018 General Anesthetic Sites in $GABA_A$ Receptor Subunit Interfacial Pockets
Individual Research Award from the National Institute of General Medical Sciences
R01- GM089745
Principal Investigator (40% effort), $1,446,485 direct costs
This project aims to define the molecular interactions of potent general anesthetics at transmembrane inter-subunit interfacial pockets on $GABA_A$ receptors.

2014-2015 Zebrafish Screening for General Anesthetics
Departmental Research Innovation Award
Principal Investigator , $10,000 direct costs
This project explores the use of zebrafish for high-throughput screening of novel anesthetic compounds.

Current Unfunded Projects

2010-present Transforming Resident Education in MGH Operating Rooms

Founder/Principal Designer of PORTAL (Platform for OR Teaching And Learning)
This is an educational program proposal aiming to improve resident education and

facilitate teaching and research on educational effectiveness in clinical settings where time for didactic educational goals can be extremely limited.

2014-present — Heartrate Response to Neuromuscular Block Reversal with Neostigmine

Principal Investigator
I initiated a data-mining project with DACCPM colleagues (Matthias Eikermann) to determine the frequency of, and factors associated with, severe bradycardia after neostigmine administration.

Report of Local Teaching and Training

Teaching of Students in Courses

Harvard Medical School Affiliated Courses:

1999-	HST150 Principles of Pharmacology: Assisting in the Anesthetic Pharmacology and Pharmacokinetics Lab Exercise groups of 5-6 HST 2nd year MD students	Massachusetts Institute of Technology 3hrs/year
2002	Senior Thesis Reader for MD candidate 1 Medical Student	Massachusetts Institute of Technology 8 hours
2005	Introduction to Clinical Medicine: OSCE Physician Examiner for Cardiovascular station 8 student examinees	Harvard-M.I.T. Health Sciences and Technology 3 hrs/year
2006	HST 150 Principles of Pharmacology: Drug-Receptor Interactions, Dose-Response Relationships 60 students (medical and graduate)	Massachusetts Institute of Technology 4 hrs/year
2007-present	HST 150 Principles of Pharmacology: Drug-Receptor Interactions, Dose-Response Relationships, Pharmacology of General Anesthetics 60 students (medical and graduate)	Massachusetts Institute of Technology 6 hrs/year
2007	HMS IN757: Principles of Pharmacology 17 students	Harvard Medical School 5 hrs/year
2007	HMS Introduction to the profession 10 students	Harvard Medical School 2 hrs/year

2011-present	HST 220 Introduction to Professional Life in Academic Medicine 1 HST MD or MD-PhD student per year	HMS/MIT 8 hrs/year

Regional:

2003-2005	Thesis Committee Member PhD candidate in Pharmacology, Scott Downing	Boston University School of Medicine 20 hours
2006-	Advanced Pharmacology Lecture on Pharmacology of General Anesthetics 10 graduate students	Boston University School of Medicine 3 hrs/year

National:

2005	Thesis Committee Member MD-PhD candidate in Physiology, Brian Jones	Dartmouth College 20 hours

Formal Teaching of Residents, Clinical Fellows and Research Fellows (post-docs)

1993	Arterial Blood Gases and Temperature CA-2/3 Anesthesia Residents & Faculty	Massachusetts General Hospital (Department of Anesthesia & Critical Care) 1 hour seminar talk (one time talk)
1994	Hypothermia: The Basics CA-2/3 Anesthesia Residents & Faculty	Massachusetts General Hospital (Department of Anesthesia & Critical Care) 1 hour seminar talk (one time talk)
1996 -	Mock Oral Board Examiner 4 Residents/year	Massachusetts General Hospital 6 hrs/year
1997-2000	The Cholinergic Nervous System and Drugs CA-1 Anesthesia Residents	Massachusetts General Hospital (Department of Anesthesia & Critical Care) 1 hour seminar talk/year
1998-99	Hypothermia: Clinical Update CA-2/3 Anesthesia Residents & Faculty	Massachusetts General Hospital (Department of Anesthesia & Critical Care) 1 hour seminar talk/year
2000	Dynamic alterations of the neuromuscular junction in the presence of relaxants CA-1/2/3 Anesthesia Residents & Faculty	Massachusetts General Hospital (Department of Anesthesia & Critical Care) 2 hour journal club discussion (one time talk)
2002	Hypothermia and its Anesthetic Impact	Massachusetts General Hospital

	CA-1/2/3 Anesthesia Residents & Faculty	(Department of Anesthesia & Critical Care) 1 hour seminar talk (one time talk)
2004 - present	Awareness During General Anesthesia: Uncertainties and Controversies CA-2/3 Anesthesia Residents & Faculty	Massachusetts General Hospital (Department of Anesthesia & Critical Care) 1 hour seminar talk every other year
2005 - present	Hypothermia and Its Anesthetic Impact/Lecture CA-2/3 Anesthesia Residents & Faculty	Massachusetts General Hospital (Department of Anesthesia & Critical Care) 1 hour seminar talk every other year

Clinical Supervisory and Training Responsibilities

1993 - present	Clinical Anesthesia Year-1 Tutorial for Residents	Massachusetts General Hospital 2 weeks/year full time (80-100 hours)
1993 - present	Operating Room Attending Physician/ Department of Anesthesia 60-70 residents/year	Massachusetts General Hospital 1-2 days/week 12 months/year + full on-call commitment
1993 - present	Clinical Teaching 1-2 HMS 3rd/4th year Med. Students/month	Massachusetts General Hospital 1-2 days/week
1993 - present	Clinical Anesthesia House-staff Advisor 1-2 Residents/year	Massachusetts General Hospital 6 hrs/year

Laboratory and Other Research Supervisory and Training Responsibilities

1995- present	Laboratory Research Supervision, Massachusetts General Hospital Department of Anesthesia & Critical Care	1-3 post-docs, students, and residents/year 10-15 hrs/week
1996 - present	Research Fellow Career Advisor/MGH Anesthesia Committee on Research	1-3 advisees 5-10 hrs/year
2007	FAER Summer Research Student Mentor	1 advisee 3 hrs/week
2009	International Medical Student Summer Research Mentor	1 advisee 3-6 hrs/week
2010 - 2011	Boston University Neurobiology Student Mentor	1 advisee 3 hrs/week
2010 - present	Summer Laboratory Research Interns	1 to 2 advisees 3 hrs/week x 10 weeks

Formally Supervised Trainees

1997-1999 Qing, Zhou, PhD/ current position unknown.
Supervision of postdoctoral laboratory research, resulting in multiple scientific publications.

1998-2000 Zhengsheng Qu, MD-PhD/ MGH Anesthesia Assistant Professor
I supervised Dr. Qu's CA-1 Tutorial and was his academic advisor during anesthesia residency. I helped him find employment as an anesthesiologist after residency.

1999 Chongqing Li, PhD/currently a research associate at Boston University.
Supervision of post-doctoral laboratory research, resulting in multiple scientific publications.

1999-2001 Edward Bittner, MD-PhD/ MGH Anesthesia Assistant Professor
I supervised Dr. Bittner's CA-1 Tutorial and was his academic advisor during anesthesia residency. I also directed him toward additional mentors in his academic career.

1999-2001 Qionglin Zhou, PhD/Research Associate, University of Massachusetts Medical Center
Supervision of post-doctoral laboratory research, resulting in multiple scientific publications.

1999-2001 Michaela Scheller, MD/Staff Anesthesiologist, Bonn Germany
Supervision of post-doctoral laboratory research, resulting in multiple scientific publications.

1999-2003 Jason Campagna, MD-PhD/ Currently VP at The Medicine's Company.
I supervised Jason's research on anesthetic mechanisms and helped him write two review articles, one of which was published in the NEJM. I also wrote letters of recommendation for him when he left MGH.

2000-2003 Mark Lovich, MD-PhD/ Currently Assistant Professor at Tufts Medical School/St. Elizabeth Hospital, Boston, MA
I supervised Dr. Lovich's CA-1 Tutorial and was his academic advisor during anesthesia residency. I wrote letters of recommendation for him and also directed him toward additional mentors in his academic career.

2002-2004 Dirk Ruesch, MD/Staff Anesthesiologist, Dept. of Anesthesia & Critical Care, Marburg, Germany
I supervised Dr. Ruesch's post-doctoral laboratory research, resulting in multiple scientific publications and a thesis required for academic advancement in Germany.

2002-2005 Huijun Zhong, PhD/Clinical Electrophysiologist, UCLA
Supervision of post-doctoral laboratory research, resulting in multiple scientific publications.

2002-2006 Qi Cheng, PhD/Research Scientist, Netherlands Kanker Instituut
Supervision of post-doctoral laboratory research, resulting in multiple scientific

publications.

2003-2006 George Mashour, MD-PhD/ Currently Associate Professor of Anesthesia, University of Michigan.
I co-wrote a review paper with George about mechanisms of anesthesia, and co-wrote a chapter on Anesthetic Pharmacology for a major textbook with him.

2005 Anna Condino/ Resident Physician, Hanover NH
I supervised Anna's summer undergraduate laboratory research, and wrote letters of recommendation supporting her applications to medical school

2005-2008 Victor Chin, MD/ Private Practice Anesthesiologist
I supervised Dr. Chin's Academic Project during anesthesia residency, helping him update a textbook chapter.

2006-2008 Ken Solt, MD/ Physician-Scientist at MGH
Supervision of laboratory research, resulting in multiple scientific publications.

2006-2009 Daniel Johnson, MD/ Assistant Professor of Anesthesia, University of Nebraska
I was Dr. Johnson's CA-1 tutorial and Faculty Advisor during Residency. I helped him find additional mentors toward an academic career and wrote letters of recommendation for him.

2006-2010 Rooma Desai, PhD/Research Instructor, MGH
Supervision of laboratory research, resulting in multiple scientific publications.

2006-2013 Deirdre Stewart, PhD/Currently on leave of absence
Supervision of laboratory research, resulting in multiple scientific publications.

2006-2014 Clemens Bergwitz, MD/Assistant Professor in Medicine, Yale University
Trained and supervised in research using Xenopus oocytes. I also co-sponsored a K08 in collaboration with Dr. Harald Jueppner, which was awarded in 2009.

2009- Lorenzo Berra MD / Assistant Professor, MGH
I supervised Dr. Berra during his CA-1 tutor and was his faculty advisor during residency. I also served on his T32 oversight committee during research fellowship.

2008-2009 Cosmin Guaran MD / Instructor in Critical Care, Memorial Sloan Kettering
I was Dr. Guaran's Faculty Mentor while he was a junior faculty at MGH, and helped him develop an academic focus for teaching and clinical work.

2008-2009 Hieu Nguyen, MS/Pharmacy Student
Supervision of laboratory research, resulting in multiple scientific publications.

2009 Elena Neumann, MD/Anesthesiologist, Germany
Training and supervision of laboratory research, contributed to a publication.

2009- Lorenzo Berra MD / Assistant Professor, MGH

I supervised Dr. Berra during his CA-1 tutor and was his faculty advisor during residency. I also served on his T32 oversight committee during research fellowship.

2009- Claudia Benkwitz MD-PhD/ Assistant Professor, Vanderbilt Medical Center
I advised Dr. Benkwitz on career development during her last year of residency, wrote letters of recommendation helping her obtain a fellowship position in Pediatric Anesthesia at Stanford. I also invited Dr. Benkwitz to co-author a chapter in a major textbook, helping to broaden her academic profile.

2010-2011 Gregory Guitchounts, BS/ Neurobiology PhD Student, Harvard Medical School
Directed Study, Training and supervision of laboratory research for Undergraduate Neurobiology major and honors thesis, contributed to a publication. Currently PhD candidate at HMS.

2011 Jonathan Wanderer, MD-PhD/ Assistant Professor of Anesthesia, Vanderbilt Medical Center
I supervised Jonathan for development and web design for DACCPM PORTAL and helped him prepare abstracts on this project for local and national meetings.

2011-2012 Marian Haburcak, PhD/ Postdoctoral Fellow
Supervision of laboratory research, resulting in multiple publications.

2011, 2012 Philip Dershwitz, BS/ Masters of Education candidate, Princeton University
Supervision of laboratory research & clinical exposure, contributed to publications.

2011, 2012, 2013- David Pierce, Trinity undergraduate student/Summer Undergraduate Research Intern/ Pre-doctoral Researcher
Supervision of laboratory research& clinical exposure, contributed to publications.

2011-2013 Mayo Hotta, BA. Research Assistant (MD student at USC as of 2013)
Supervision of laboratory research resulting in multiple publications. I also mentored Ms. Hotta in gaining clinical exposure, advised her and wrote letters of recommendation for her application to medical school. She enrolled in an MD program at USC in 2013.

2011-present Huajun (Jerry Feng), PhD. Research Assistant Professor, MGH

I supervised some of Dr. Feng's research resulting in multiple publications, and have provided assistance with grant-writing and career mentoring while he is working toward an independent research lab.

2012-2014 Alexis Ziemba, BA. Research Assistant
Supervision of laboratory research & clinical exposure, career advising, contributed to publications. I also wrote letters of recommendation supporting her applications to graduate school. As of Feb., 2015, she was accepted to two PhD programs.

2012-2014 Alex Stern, BS. Research Assistant
Supervision of laboratory research leading to multiple publications. I also mentored Alex by providing clinical exposure, predoctoral advising, and letters of recommendation to

medical school. As of Nov, 2014, he gained acceptance at USC and has applications pending at other programs.

2014-2015 Jennifer Dai, Summer Research Intern
I supervised Ms. Dai's laboratory research and provided career advice. I wrote recommendation letters for her application to a combined undergraduate/MD program.

2014-present Anahita Nourmahnad, BA Research Assistant

I supervise Ana's laboratory research & advise her in her quest to become a medical student. Her work will contribute to publications.

Formal Teaching of Peers (e.g., CME and other continuing education courses)

No presentations below were sponsored by outside entities

2002	How Anesthesia Works Harvard CME: "Anesthesia Review & Update"	Single lecture Boston, MA
2011	Transforming Resident Education in MGH Operating Rooms--A Proposal MGH Anesthesia Faculty Workshop	Single lecture Boston, MA
2011	Micro-course Development Workshop MGH Anesthesia Faculty Workshop	Single lecture Boston, MA
2012	Micro-course Development Workshop-II MGH Anesthesia Faculty Workshop	Single lecture Boston, MA
2012	Depth of Anesthesia Monitoring HMS CME "Anesthesia Review & Update: Innovation and Transformation in Anesthesiology"	Single lecture Boston, MA
2013	Ultrasound for Peripheral Vascular Access MGH DACCPM Faculty Workshop	Single lecture Boston, MA
2015	Depth of Anesthesia Monitoring HMS CME "Anesthesia Review & Update"	Single lecture Boston, MA

Local Invited Presentations

No presentations below were sponsored by outside entities

1992 Hypothermia: The Basics / MGH Anesthesia Grand Rounds
MGH Anesthesia & Critical Care, Boston, MA

1994 Site-directed mutations alter receptor sensitivity to Anesthetics / Research Update 10 minute lecture
MGH Department of Anesthesia & Critical Care, Boston, MA

1995 "Hydrophobicity of a receptor site modulates sensitivity to anesthetics / Research Update 10 minute lecture
MGH Department of Anesthesia & Critical Care, Boston, MA

1995 Fatheads vs. Meatheads--The molecular mechanism of Anesthesia / MGH Anesthesia Grand Rounds
MGH Anesthesia & Critical Care, Boston, MA

1995 Ion Channels and General Anesthesia / MGH Anesthesia Grand Rounds
MGH Anesthesia & Critical Care, Boston, MA

2000 Molecular Mechanisms of Anesthesia: A Search for Sites / MGH Anesthesia Grand Rounds
MGH Anesthesia & Critical Care, Boston, MA

1996 Autosomal dominant frontal lobe epilepsy and a nicotinic receptor mutation / Research Update 10 minute lecture
MGH Department of Anesthesia & Critical Care, Boston, MA

1997 Anesthetic Interactions with Ion Channels / MGH Pediatric Surgery & Anesthesia Conference Series
MGH Pediatric Surgery, Boston, MA

1997 "Interactions of Non-anesthetics with the nicotinic receptor pore / Research Update 10 minute lecture
MGH Department of Anesthesia & Critical Care, Boston, MA

1998 Photo-activated irreversible inhibition of nAChR by a designed anesthetic, 3- diaziryl-octanol / Research Update 10 minute lecture
MGH Department of Anesthesia & Critical Care, Boston, MA

1998 Hydrophobic Scanning Mutagenesis Maps an Alcohol Site / Research Update 10 minute lecture
MGH Department of Anesthesia & Critical Care, Boston, MA

1999 Hydrophobic Scanning Mutagenesis Maps an Anesthetic Site / Research Update 10 minute lecture
MGH Department of Anesthesia & Critical Care, Boston, MA

2000 A second subsite for alcohols in the nAChR pore / Research Update 10 minute lecture
MGH Department of Anesthesia & Critical Care, Boston, MA

2001 Two gain-of-function mutations in $GABA_A$Rs cause different effects on rapid kinetic behavior / Research Update 10 minute lecture
MGH Department of Anesthesia & Critical Care, Boston, MA

2001 Effects of halogenated and non-halogenated volatile anesthetics on mIPSCs from cultured neurons / Research Update 10 minute lecture

MGH Department of Anesthesia & Critical Care, Boston, MA

2002 Using chimeras to locate regions of GABA-A receptor subunits that influence anesthetic sensitivity / Research Update 10 minute lecture
MGH Department of Anesthesia & Critical Care, Boston, MA

2004 Awareness During General Anesthesia: Uncertainties and Controversies / MGH Anesthesia Grand Rounds
MGH Department of Anesthesia & Critical Care, Boston, MA

2005 A Fem-Sciatic Block / MGH Anesthesia Case Conference Series
MGH Anesthesia & Critical Care

2006 Irreversible functional effects on GABA-A receptors following photo-modification with azi-etomidate / Research Update 10 minute lecture
MGH Department of Anesthesia & Critical Care, Boston, MA

2007 Etomidate: Clinical and Molecular Pharmacology / MGH Anesthesia Grand Rounds
MGH Department of Anesthesia & Critical Care, Boston, MA

2008 B-Aware vs. B-Unaware: A Journal Club / MGH Anesthesia Grand Rounds
MGH Department of Anesthesia & Critical Care, Boston, MA

2010 New General Anesthetics for Future Clinical Challenges / MGH Anesthesia Grand Rounds
MGH Department of Anesthesia & Critical Care, Boston, MA

2009 Etomidate: Clinical and Molecular Pharmacology / BWH Dept. of Anesthesia & Critical Care Grand Rounds
BWH Department of Anesthesia & Critical Care, Boston, MA

2010 Toward Improved General Anesthetics / MGH Anesthesia Summer Research Series
MGH Department of Anesthesia & Critical Care, Boston, MA

2011 Identifying Molecular Sites of General Anesthetic Drug Action / MGH Anesthesia Summer Research Series
MGH Department of Anesthesia & Critical Care, Boston, MA

2013 $GABA_A$ Receptors and the Molecular Mechanisms of Anesthesia / BWH Dept. of Anesthesia & Critical Care Grand Rounds
BWH Dept of Anesthesia Critical Care & Pain, Boston, MA

Report of Regional, National and International Invited Teaching and Presentations

Invited Presentations and Courses

Regional

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

1993 Hydrophobic mutations in the M2 domain of nicotinic ACh receptors modulate n-alcohol

blocking potencies / Tufts Medical School Pharmacology Research Seminar
Tufts Medical School, Boston, MA

2002 How Anesthesia Works / Tufts Medical School/New England Medical Center Department of Anesthesia Grand Rounds
New England Medical Center, Boston, MA

2003- Advances in General Anesthetic Pharmacology / Pharmacology Research Seminar Lecture & Discussion
Boston University Medical School, Boston, MA

2011 New General Anesthetics for Future Clinical Challenges / UMass Medical Center Dept of Anesthesia Grand Rounds
UMass Medical Center, Worcester, MA

National

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

1995 Ion Channels and General Anesthetics / SUNY at Stony Brook Dept. of Anesthesia Grand Rounds
State University of New York at Stony Brook, Stony Brook, NY

1995 Hydrophobic mutations in the M2 domain of nicotinic ACh receptors modulate n-alcohol blocking potencies / SUNY at Stony Brook Dept. of Anesthesia Research Seminar
State University of New York at Stony Brook, Stony Brook, NY

1995 Spinal Cooling for Thoracoabdominal Aneurysm Repair / SUNY at Stony Brook Dept. of Anesthesia Clinical Conference
State University of New York at Stony Brook, Stony Brook, NY

1995 Hydrophobic mutations in the M2 domain of nicotinic ACh receptors modulate n-alcohol blocking potencies / Researcy Symposium Speaker (selected abstract)
Annual Meeting of the Biophysical Society, San Francisco, CA

1999 Nicotinic receptors and Ethanol / Research Symposium presentation (selected abstract)
Annual Meeting of the Research Society on Alcoholism, Santa Barbara, CA

1999 How do pore domain mutations in ligand-gated ion channels alter ethanol actions? / Research Symposium Speaker (selected abstract)
American Society for Biochemistry and Molecular Biology Fall Symposium on Ethanol and Cell Signaling, Lake Tahoe, CA

1999 Molecular Mechanism of General Anesthesia: A Search for Sites / Washington University Dept of Anesthesia Grand Rounds
Washington University, St. Louis, MI

1999 A hydrophobic photolabel inhibits nicotinic receptors through a two-step mechanism / Washington University Dept of Anesthesia Research Seminar
Washington University, St. Louis, MI

1999 Some of My Clinical Errors / Washington University Dept of Anesthesia Clinical Seminar
Washington University, St. Louis, MI

2000 Molecular Mechanisms of General Anesthesia / TTUSM Lubbock Depts. of Anesthesia & Pharmacology combined Grand Rounds
Texas Tech University School of Medicine, Lubbock, TX

2000 TID inhibition of nicotinic ACh receptors: Correlating binding with function / TTUSM Lubbock Depts. of Anesthesia Research Seminar
Texas Tech University School of Medicine, Lubbock, TX

2000 Rapid Patch Superfusion: Halothane Actions in Wild-type and Mutant $\alpha1\beta2\gamma2$ GABA-A receptors / Research Program Speaker (selected abstract)
Association of University Anesthetists Annual Meeting, Salt Lake City, UT

2000 General anesthetic effects on the α-S270I mutation in $\alpha_1\beta_2\gamma_{2L}$ $GABA_A$ receptors / Research Oral Abstract (selected abstract)
Annual Meeting of the American Society of Anesthesiologists, San Francisco, CA

2001 Molecular Mechanisms of General Anesthesia / Univ. Penn. Dept. of Anesthesia Grand Rounds
University of Pennsylvania, Philadelphia, PA

2001 GABA receptor M2 mutations differentially alter molecular kinetics and GABA sensitivity / Univ. Penn. Dept. of Anesthesia Research Seminar
University of Pennsylvania, Philadelphia, PA

2002 Regions of the $GABA_A$ receptor gamma subunit affecting sensitivity to volatile agents / Oral Abstract Session (selected abstract)
Annual Meeting of the American Society of Anesthesiologists, Orlando, FL

2004 Interpreting the impact of $GABA_A$ receptor structural modifications using an allosteric co-agonist mechanism for etomidate actions / Oral Abstract Session (selected abstract)
Association of University Anesthetists Annual Meeting, Sacramento, CA

2007 Etomidate: Clinical and Molecular Pharmacology / Vanderbilt University Dept. of Anesthesia Grand Rounds
Vanderbilt University School of Medicine and Health Sciences, Nashville, TN

2007 Impact of Cys vs. Trp Mutation at Etomidate-labeled Methionines on $\alpha1$ and $\beta2$ GABAA Receptor Subunits / Oral Abstract Session (selected abstract)
Annual Meeting of the American Society of Anesthesiologists, San Francisco, CA

2007 Mentoring: People, Values, and Events that Influenced My Career in Research / FAER Symposium Lecture/Discussion leader (invited)
ASA/FAER Symposium on Research Careers, San Francisco, CA

2009 Molecular Approaches to Improving General Anesthetics / Vanderbilt University Dept. of Anesthesia Grand Rounds
Vanderbilt University School of Medicine and Health Sciences, Nashville, TN

2011 New General Anesthetics for Future Clinical Challenges / Washington University Dept. of Anesthesia Research Division Seminar
Washington University St. Louis School of Medicine, St. Louis, MI

2012 New General Anesthetics for Future Clinical Challenges / UCSF Dept. of Anesthesia Grand Rounds
University of California San Francisco, San Francisco, CA

2013 $GABA_A$ Receptor βN265 is a Determinant of Etomidate Binding and Efficacy / Oral Abstract Session
American Society of Anesthesiology Annual Meeting, San Francisco, CA

2015 Molecular Targets of General Anesthetics- Speaker for Symposium on "The Diversity of Anesthetic Mechanisms: Bottom-Up and Top-Down Approaches"
American Society of Anesthesiology Annual Meeting, San Diego, CA

International

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

1997 Nicotinic channel interactions with anesthetics and non-anesthetics / Research Symposium Lecture (invited)
5th International Meeting on Molecular and Cellular Mechanisms of Anesthesia, Calgary, Alberta, Canada

1997 How to apply non-anesthetics in electrophysiological experiments / Workgroup Lecture/Discussion (invited)
5th International Meeting on Molecular and Cellular Mechanisms of Anesthesia, Calgary, Alberta, Canada

2001 Ligand-gated ion channel pore domains and anesthetics / Research Symposium Lecture (invited)
6th International Meeting on Molecular and Basic Mechanisms of Anesthesia, Bonn, Germany

2001 Irreversible inhibition of nicotinic ACh receptors by photo-incorporation of anesthetic 3-azi-octanol / Workshop Lecture/Discussion (invited)
6th International Meeting on Molecular and Basic Mechanisms of Anesthesia, Bonn, Germany

2004 Mechanisms of General Anesthesia / Invited Symposium Talks (x 3)
Provincial Anesthesia Conferences, Shanghai, Xuchou, and Nanjing, Peoples Republic of China.

2005 Equilibrium and Kinetic Monod-Wyman-Changeux Models for $GABA_A$ Receptor

Modulation by Etomidate / Research Symposium co-Chair and Lecturer (invited)
Seventh International Conference on Basic and Systemic Mechanisms of Anesthesia (MAC2005), Nara, Japan

2010 Allosteric Modulation of $GABA_A$ Receptors by General Anesthetics / Research Symposium Lecture (invited)
Eighth International Conference on Basic and Systemic Mechanisms of Anesthesia (MAC2010), Toronto, Canada

2010 Translating Mechanistic Insights into Improved General Anesthetics. Workshop speaker
Eighth International Conference on Basic and Systemic Mechanisms of Anesthesia (MAC2010), Toronto, Canada

2015 Structure-Function Mapping of Allosteric Agonist (Anesthetic) Sites in $GABA_A$ receptors
Research Symposium Lecture (invited)
Ninth International Conference on Basic and Systemic Mechanisms of Anesthesia (MAC2015), Bonn Germany

2015 Interfacially Selective Anesthetics as Probes of Extrasynaptic GABA-A Subunit Arrangement. Workshop speaker
Ninth International Conference on Basic and Systemic Mechanisms of Anesthesia (MAC2015), Bonn Germany

2015 GABA-A Receptors and the Molecular Mechanisms of Anesthesia / Invited Lecture
Institute of Biochemistry and Molecular Medicine, Bern, Switzerland

Report of Clinical Activities and Innovations

Current Licensure and Certification

1990 Diplomate of the National Board of Medical Examiners
1993 Massachusetts Medical License
1993 DEA controlled substances certificate
1993 Massachusetts controlled substances certificate
1994 American Board of Anesthesiology Certification
2009 American Board of Anesthesiology Recertification (voluntary)

Practice Activities

1993-	Clinical Anesthesia: My practice includes procedures on critically ill patients, emergency surgery, multi-trauma patients, colorectal, thoracic, neurosurgical, and major vascular cases.	Main OR, Massachusetts General Hospital	Staff/Attending managing between 5 and 20 anesthetics per week (1-2 day per week, supervising 1-2 anesthesia residents, CRNAs, or directly delivering care) plus full call.
2004-present	Clinical Staff Administrator	Operating Rooms, Massachusetts General	Responsible for resource allocation, triage, and system-wide

	Hospital, Boston, MA	communication to maintain activities of over 80 operating rooms.

Clinical Innovations

Use of Laryngeal Mask Airway for Tracheal Surgery	In 1993, I introduced the use of the Laryngeal Mask Airway as a minimally-invasive tool for airway management and access during reconstructive surgery on the upper trachea. This innovation occurred during my residency in 1993 and resulted in a clinical case report.
Awareness During General Anesthesia Guidelines	In 2004, in response to a JCAHO Sentinel Alert on Awareness During General Anesthesia (ADGA), I led a team of QA committee members in developing guidelines for 1) preoperative screening for ADGA risk, 2) perioperative management of high-risk patients, 3) post-operative screening for ADGA, and 4) post-operative consult services for detected events.
DACCPM PORTAL: **P**latform for **OR** **T**eaching **A**ND **L**earning	In 2010, I proposed an innovative approach to facilitate and improve educational interactions between clinical anesthesia residents and faculty supervisors working in the MGH operating rooms. I designed PORTAL as a web repository for faculty-created clinically applicable microcourses that residents could select and review before a subsequent structured educational interaction for learning assessment & reinforcement. I supervised construction of the website and led several faculty workshops to help others design and create microcourses. The site was implemented in 2011 and remains in use by MGH anesthesia residents/faculty.

Report of Technological and Other Scientific Innovations

2009 PCT/US09/38872: Etomidate Analogues with Improved Pharmacokinetic and Pharmacodynamic Properties

This patent describes the synthesis and potential benefits of rapidly-metabolized analogs of etomidate for sedation and general anesthesia. The proof-of-principle intravenous anesthetic drug (MOC-etomidate) demonstrates the potential to improve safety for elderly and critically ill patients requiring general anesthesia, and may also improve efficiency in outpatient settings by accelerating emergence from general anesthesia. This drug was co-developed by Drs. Douglas Raines, Shakut Husain, Keith Miller, Joseph Cotten, and myself. My contribution was in design of the drug and testing for modulation of $GABA_A$ receptors and adrenolytic activity in an in vitro assay.

2010 PCT/US10/41379: Etomidate Analogues with Reduced Inhibition of Adrenal Cortical Steroid Synthesis

This patent describes the synthesis and potential benefits of novel analogs of etomidate for sedation and general anesthesia. The proof-of-principle compound, carboetomidate, demonstrates that molecules with the same shape as etomidate may maintain the attractive features of etomidate as an anesthetic (hemodynamic stability, less respiratory depression) while eliminating its deleterious effects on adrenocortical sterioid synthesis. These intravenous anesthetic drugs have the potential to improve safety for elderly and critically

ill patients requiring general anesthesia or long-term sedation. This drug was co-developed by Drs. Douglas Raines, Shakut Husain, Keith Miller, Joseph Cotten, Greg Cuny, and myself. My contribution was in design of the drug and testing for modulation of $GABA_A$ receptors and adrenolytic activity in an in vitro assay.

Report of Education of Patients and Service to the Community

Activities

Those activities below sponsored by outside entities are so noted and the sponsor(s) is(are) identified.

Educational Material for Patients and the Lay Community

Educational material or curricula developed for non-professional students

2010	General Anesthetic Mechanisms in Ligand Gated Ion Channels	Directed Study Syllabus with 50 citations

Report of Scholarship

Publications

Peer reviewed publications in print or other media

Research Investigations:

1. Forman SA Verkman AS Dix, JA, Solomon AK. Interaction of phloretin with the anion transport protein of the red blood cell membrane. Biochim. Biophys Acta 1982;689:531-538. PMID: 7126563

2. Ackerman JR, Forman SA, Hossain M, Kohler BE. s-cis Octatetraene: photoproduction and spectroscopic properties Journal of Chemical Physics 1984;80:39-44.

3. Ackerman JR, Forman SA, Katz L, Kohler BE, Wu CT. Photochemical site conversion: octatetraene in n-octane. Journal of Chemical Physics 1984;81:3387-3392.

4. Forman SA Verkman AS, Dix JA, Solomon AK. n-Alkanols and halothane inhibit red cell anion transport and increase band 3 conformational change rate. Biochemistry 1985;24:4859-4866. PMID: 4074663

5. Forman SA, Firestone LL, Miller KW. Is agonist self-inhibition at the nicotinic acetylcholine receptor a nonspecific action? Biochemistry 1987;26:2807-2814. PMID: 3038165

6. Forman SA, Miller KW. High acetylcholine concentrations cause rapid inactivation before desensitization in nicotinic acetylcholine receptors from Torpedo. Biophysical Journal 1988;54:149-158. PMID: 3416024

7. Forman SA, Miller KW. Procaine rapidly inactivates acetylcholine receptor from Torpedo and competes with agonist for inhibition sites. Biochemistry 1989;28:1678-1685. PMID: 2719927

8. Forman SA, Righi DL, Miller KW. Ethanol increases agonist affinity for nicotinic receptors from Torpedo. Biochimica et Biophysica Acta 1989;987:97-103. PMID: 2597688

9. Roth SH, Forman SA, Braswell LM, Miller KW. Actions of pentobarbital enantiomers on nicotinic cholinergic receptors. Molecular Pharmacology 1989;36:874-880. PMID: 2481226

10. Wood SC, Forman SA, Miller KW. Short chain and long chain alkanols have different sites of action on nicotinic acetylcholine receptors from Torpedo. Molecular Pharmacology 1991;39:332-328. PMID: 1706469

11. Alifimoff JK, Bugge B, Forman SA, Miller KW. Stereoselectivity of channel inhibition by secondary alkanol enantiomers at nicotinic acetylcholine receptors. Anesthesiology 1993;79:122-128. PMID: 7688196

12. Forman SA, Miller KW, Yellen G. A discrete site for general anesthetics on a postsynaptic receptor. Molecular Pharmacology 1995;48:574-581. PMID: 7476881

13. Eckhardt WR, Forman SA, Denman W, Grillo HC, Muehrcke D. Another use for the Laryngeal Mask Airway- Tracheoplasty for Tracheopathica Osteoplastica. Anesthesia & Analgesia 1995;80:622-624.

14. Forman SA, Thiele E, & Yellen G. Alternative mechanism for pathogenesis of an inherited epilepsy by a nicotinic AChR mutation. Nature Genetics 1996;13:396. PMID: 8696332

15. Forman SA. Homologous mutations on different subunits cause unequal but additive effects on n-alcohol block in the nicotinic receptor pore. Biophysical Journal 1997;72:2170-2179. PMID: 9129819

16. Forman SA, Raines DE. Nonanesthetic volatile drugs obey the Meyer-Overton correlation in two molecular protein site models. Anesthesiology. 1998;88:1535-1548. PMID: 9637648

17. Bergwitz C, Klein P, Kohno H, Forman SA, Juppner H. Identification, functional characterization, and developmental expression of two nonallelic parathyroid hormone (PTH)/PTH-related peptide receptor isoforms in Xenopus laevis (Daudin). Endocrinology 1998; 139: 723-32. PMID: 9449646

18. Forman SA, Zhou Q. Novel modulation of a nicotinic receptor channel mutant reveals that the open state is stabilized by ethanol. Molecular Pharmacology. 1999;55:102-108. PMID: 9882703

19. Husain SH, Forman SA, Kloczewiak MA, Addona GH, Olsen RW, Pratt MB, Cohen JB, Miller KW. Synthesis and properties of 3,3-diaziryl-octan-1-ol, a photoactivable general anesthetic. Journal of Medicinal Chemistry 1999;42:3300-3307. PMID: 10464016

20. Forman SA. A hydrophobic photolabel inhibits nicotinic acetylcholine receptors via open-channel block following a slow step. Biochemistry. 1999;38:14559-14564. PMID: 10545178

21. Forman SA, Zhou Q. Nicotinic receptor pore mutations create a sensitive inhibitory site for ethanol. Alcoholism: Clinical & Experimental Research. 2000;24:1363-1368. PMID: 11003201

22. Zhou, QL, Zhou Q, Forman SA. The n-alcohol site in the nicotinic receptor pore is a hydrophobic patch. Biochemistry. 2000;39:14920-14926. PMID: 11101308

23. Scheller M, Forman SA. Butanol effects on GABA concentration-responses in human α1β2γ2L GABA-A receptors with a mutation at α1S270. Neuroscience Letters. 2001;297:179-182. PMID: 11137757

24. Scheller M, Forman SA. The γ subunit determines whether a mutation at α1S270 alters anesthetic-induced left shift in α1β2γ2L GABAA receptors. Anesthesiology 2001;95:123-31. PMID: 11465549

25. Raines DE, Claycomb RJ, Scheller M, Forman SA. Nonhalogentated alkane anesthetics fail to potentiate agonist actions of two ligand-gated ion channels. Anesthesiology 2001;95:470-477. PMID: 11506122

26. Raines DE, Claycomb RJ, Forman SA. Nonhalogenated anesthetic alkanes and perhalogenated nonimmobilizing alkanes inhibit α4β2 neuronal nicotinic acetylcholine receptors. Anesthesia & Analgesia 2002;95:573-577. PMID: 12198040

27. Scheller M, Forman SA. Coupled and uncoupled gating and desensitization effects by pore domain mutations in GABA-A receptors. Journal of Neuroscience 2002;22:8411-8421. PMID: 12351715

28. Raines DE, Claycomb RJ, Forman SA. Modulation of GABA-A receptor function by nonhalogenated alkane anesthetics: The effects on agonist enhancement, direct activation, and inhibition. Anesthesia & Analgesia 2003;96:112-118. PMID: 12505935

29. Husain SS, Ziebell MR, Ruesch D, Hong F, Arevalo E, Kosterlitz, A, Olsen RA, Forman SA, Cohen JB, Miller KW. 2-(3-Methyl-3H-diaziren-3-yl)ethyl 1-(1-phenylethyl)-1H-imidazole-5-carboxylate: A stereoselective derivative of the anesthetic etomidate for photolabeling ligand-gated ion channels. Journal of Medicinal Chemistry 2003;46:1257-1265. PMID: 12646036

30. Ruesch D, Zhong H, Forman SA. Gating allosterism at a single class of etomidate sites on α1β2γ2L GABAA receptors accounts for both direct activation and agonist modulation. Journal of Biological Chemistry 2004;279:20982-20992. PMID: 15016806

31. Ruesch D, Forman SA. Classical benzodiazepines modulate the open-close equilibrium in α1β2γ2L gamma-aminobutyric acid type-A receptors. Anesthesiology 2005;102:783-92. PMID: 15791108

32. Arevalo E, Chiara DC, Forman SA, Cohen JB, and Miller KW. Gating-enhanced accessibility of hydrophobic sites within the transmembrane region of the nicotinic acetylcholine receptor's delta subunit: A time-resolved photolabeling study. Journal of Biological Chemistry 2005;280:13631-13640 (10.1074/jbc.M413911200). PMID: 15664985

33. Husain S, Solt K, Cheng Q, Arevalo E, Raines D, Forman SA, Olsen RE, Cohen JB, Miller KW. Synthesis Of Trifluoromethylaryl Diazirine And Benzophenone Derivatives Of Etomidate That Are Potent General Anesthetics And Effective Photolabels For Probing Sites On Ligand-Gated Ion Channels. Journal of Medicinal Chemistry 2006;49:4818-25. PMID: 16884293

34. Forman SA, Zhou QL, Stewart DS. Photo-activated 3-Azioctanol Irreversibly Desensitizes Muscle Nicotinic ACh Receptors via Interactions at αE262. Biochemistry 2007;46:11911-11918. PMID: 17910479

35. Solt K, Ruesch D, Forman SA, Davies PA, Raines DE. Differential Effects of Serotonin and Dopamine on Human 5-HT3A Receptor Kinetics: Interpretation within an Allosteric Model. J. Neuroscience 2007;27(48):13151-13160. PMID: 18045909

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37. Jaureguiberry G, Carpenter TO, Forman SA, Jueppner H, Bergwitz D. A novel missense mutation in SLC34A3 that causes HHRH identifies threonine 137 as an important determinant of sodium-phosphate co-transport in NaPi-IIc. Am J Renal Physiol 2008;295:F371-9 PMID: 18480181.

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42. Desai R, Ruesch D, Forman SA. γ-amino Butyric Acid Type A Receptor Mutations at β2N265 Alter Etomidate Efficacy while Preserving Basal and Agonist-dependent Activity. Anesthesiology 2009 (Oct);111:774-84. NIHMS139297, PMC2798018, PMID: 19741491.

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45. Husain S, Stewart D, Hamouda AK, Li SG, Kelly E, Dostolova Z, Zhou X, Cotten JF, Raines DE, Olsen RW, Cohen JB, Forman SA, and Miller KW. p-Trifluoromethyldiazirinyl-etomidate: a potent photoreactive general anesthetic derivative of etomidate that is selective for ligand-gated cationic ion channels. J. Med. Chem. 2010 (Sep);53(17):6432-44. NIHMS298792, PMC20704351, PMID: 20704351.

46. Stewart DS, Savechenkov PY, Dostolova Z, Chiara DC, Ge R, Raines DE, Cohen JB, Forman SA,

Bruzik KS, and Miller KW. p-(4-Azipentyl)-propofol: A Potent Photoreactive General Anesthetic Derivative of Propofol. J. Med Chem. 2011(Dec 8);54(23):8124-35. NIHMS435272, PMC3580944, PMID: 22029276

47. Ge RL, Pejo E, Haburcak M, Husain SS, Forman SA, and Raines DE. Pharmacological Studies of Methoxycarbonyl Etomidate's Carboxylic Acid Metabolite. Anesthesia & Analgesia 2012 (Aug);115:305-8. NIHMS335149, PMC22052979, PMID: 22052979.

48. Rusch D, Neumann E, Wulf H, and Forman SA. An Allosteric Co-agonist Model for Propofol Effects on α1β2γ2L GABAA Receptors. Anesthesiology 2012 (Jan);116:47-55. NIHMS338631, PMC3261780, PMID: 22104494.

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50. Pierce DW, Pejo E, Raines DE and Forman SA. Carboetomidate Inhibits Alpha4/Beta2 Neuronal Nicotinic Acetylcholine Receptors at Clinically Relevant Concentrations. Anesthesia & Analgesia 2012;115:70-2. NIHMS369068, PMID: 22543065, PMC3381859.

51. Savechenkov PY, Zhang X, Chiara DC, Stewart DS, Ge R, Zhou X, Raines DE, Cohen JB, Forman SA, Miller KW, Bruzik KS (2012) Allyl m-Trifluoromethyldiazirine Mephobarbital: An Unusually Potent Enantioselective and Photoreactive Barbiturate General Anesthetic. J Med Chem 2012 (Jul 26);55:6554-65. NIHMS448946, PMID 22734650, PMC3717557.

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53. Stewart DS, Hotta M, Desai R, Liu A, Forman SA. State-Dependent Etomidate Occupation of its Allosteric Agonist Sites Measured in a Cysteine-Substituted GABAA Receptor. Mol Pharm 2013;83(6):1200-8. NIHMS475105, PMID 23525330, PMC3657098.

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55. Feng H, Jounaidi Y, Haburcak M, Yang X, Forman SA. Etomidate Produces Similar Allosteric Modulation in αβδ and αβγ GABAA Receptors. Br J Pharmacol 2014 Feb;171(3):789-98 PMID 24199598, PMC3969089.

56. Dostalova Z, Zhou X, Liu A, Zhang X, Zhang Y, Desai R, Forman SA, Miller KW. Human α1β3γ2L Gamma-Aminobutyric Acid type A Receptors: High-level Production and Purification in a Functional State. Protein Sci. 2014 Feb;23(2):157-66 PMID 24288268, PMC3926741.

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Other Peer Reviewed Publications:

Proceedings of Meetings:

1. Miller KW, Braswell LM, Firestone LL, Dodson BA, **Forman SA**. General anesthetics act both specifically and non-specifically on acetylcholine receptors. In: S.H. Roth & K.W. Miller, eds. Molecular and Cellular Mechanisms of Anesthetics. Plenum Publ. Corp.; 1986. p. 125-137.

2. Miller KW, Firestone LL, **Forman SA**. General anesthetic and specific effects of ethanol on acetylcholine receptors. In: E. Rubin, ed. Alcohol and the Cell. New York Acad. Sci; 1987. p. 71-87. PMID: 2440361

3. Miller KW, Wood SC, **Forman SA**, Bugge B, Hill AG, Abadji V. The nicotinic acetylcholine receptor in its membrane environment. In: E. Rubin, S.H. Roth & K.W. Miller, eds. Molecular and Cellular Mechanisms of Alcohols and Anesthetics. Annals N.Y. Acad. Sci; 625:600-615. PMID: 1711816

4. **Forman SA**. Direct interactions of anesthetics and nonanesthetics with the nicotinic acetylcholine receptor pore. Toxicology Letters. 1998;100-101:169-178. PMID: 10049138

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3. **Forman SA**, Flood P, Raines DE. Nicotinic Channels and Anesthetics. In: Antognini JF, Carstens E, Raines DE, eds. Neural Mechanisms of Anesthesia. Totowa, NJ: Humana Press; 2003. p. 283-297.

4. **Forman SA** and Miller KW. Anesthetic sites and allosteric mechanisms of action on Cys-loop ligand-gated ion channels. Canadian J. Anesthesia 2011 (Jan);58:191-205. PMID: 21263301. PMCID: PMC3108180

5. **Forman SA**. Clinical and Molecular Pharmacology of Etomidate. Anesthesiology 2011 (Mar); 114(3):695-707. NIHMS298797, PMID 21263301.

6. **Forman SA** and Stewart, D. Mutations in the GABA(A) Receptor that Mimic the Allosteric Ligand Etomidate. In: Allostery: Methods and Protocols. Methods in Molecular Biology v.796, Fenton AW, ed. 2012;796:317-33. NIHMS377428, PMID: 22052498.

7. **Forman SA**, Chiara DC, and Miller KW. Anesthetics Target Interfacial Transmembrane Sites in Nicotinic Acetylcholine Receptors. Neuropharmacology Epub Oct 11, 2014. pii: S0028-3908(14)00365-7. doi: 10.1016/j.neuropharm.2014.10.002.. PMID 25316107, PMC4394016 [Available on 2016-04-12].

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1. **Forman SA**, Miller KW, Raines DE. Interactions of general anesthetics with membranes. In: J.F. Biebuyck, C. Lynch III, M. Maze, L.J. Saidman, T.L Yaksh, W.M. Zapol, eds. Anesthesia: Biologic Foundations. Philadelphia: Lippincott-Raven; 1997. p. 5-18.

2. **Forman SA**, Culley DJ. Administration of General Anesthesia. In: Hurford WE, Bailin MT, Davison JK, Haspel KL, Rosow C, eds. Clinical Anesthesia Procedures of the Massachusetts General Hospital 5th edition. Philadelphia: Lippincott-Raven; 1998. p. 223-232.

3. **Forman SA**. Molecular Bases of Anesthesia (Book review). Anesthesia & Analgesia. 2001;93:806-7.

4. Mashour GA, **Forman SA**, Campagna J. Mechanisms of general anesthesia: from molecules to mind. In: Schlack W, ed. Best Practice & Research: Clinical Anaesthesiology. Oxford, UK: Elsevier; 2005. Vol. 19: pp 349-364. PMID: 16013686.

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6. Raines, DE, **Forman SA**. Molecular Mechanisms of Anesthesia. In: *The Harvard Electronic Anesthesia Library* (CD-ROM), Bailin M, Bergeron B, Dershwitz M, eds. Philadelphia: Lippincott-Raven Publishers; 2001.

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9. **Forman SA**. Awareness During General Anesthesia: Concepts and Controversies. Seminars in Anesthesia, Perioperative Medicine and Pain. 2006;25:211-218.

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12. **Forman SA**, Chou J, Strickharz GR, Lo EH. Pharmacology of GABAergic and Glutamatergic Neurotransmission (Chapter 11). In: Golan D, Tashjian A, Armstrong EJ, Armstrong AW, eds. Principles of Pharmacology: The Pathophysiologic Basis of Drug Therapy. 2nd Edition. Lippincott Williams & Wilkins; 2007. p. 163-183.

13. Chin VE, **Forman SA**. General Anesthetics and Molecular Mechanisms of Unconsciousness. International Anesthesia Clinics 2008;46:43-53. PMID: 18617817.

14. **Forman SA** and Mashour G. Chapt 37: Pharmacology of Inhalational Anesthetics. In: Longnecker D, Brown D, Newman M, and Zapol W, eds. Anesthesiology. New York, NY: McGraw Hill Medical; 2008. p. 739-766.

15. **Forman SA**. Chapter 1: Pharmacodynamic Principles of Drug Action. In: Evers A, Maze M, Kharasch E, eds. Anesthetic Pharmacology, 2nd Edition. Cambridge, UK & New York NY: Cambridge University Press; 2010. p. 1-16. (ISBN 978-0-521-89666-5)

16. **Forman SA**. Molecular Approaches to Improved General Anesthetics. Anesthesiology Clinics of North America. 2010 (Dec);28:761-71. NIHMS234106, PMC2990980, PMID 21074751.

17. Vanderweyde T, Bednar MM, **Forman SA**, Wolozin B. Iatrogenic Risk Factors for Alzheimer's Disease: Surgery and Anesthesia. Journal of Alzheimer's Disease. 2010 (July);22:S91–S104. PMID: 20858967.

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22. **Forman SA** and Ishizawa Y. Chapter 26: Inhaled Anesthetic Uptake, Distribution, Metabolism & Toxicity. In: Miller RD, Cohen NH, Eriksson LI, Flesher LA, Wiener-Kronish JP, Young WL, eds. Miller's Anesthesiology 8th Edition. Philadelphia, PA: Elsevier Saunders; 2015. p. 638-69.

23. **Forman SA**, Miller KW, Talmor D, Hickey P, Strichartz G, Wiener-Kronish J. Research at the Harvard Anesthesia Departments. Anesthesiology 2014, Dec;121(6);1141-3. PMID 25299744 PMC in process.

Letters to the Editor:

1. Campagna JA, Miller KW, **Forman SA**. In Reply (Re: The mechanisms of inhaled anesthetic actions. The New England Journal of Medicine. 2003;348:2110-2124). The New England Journal of Medicine 2003;349:909-10.

2. **Forman SA**. A Paradigm Shift from Biophysical to Neurobiological: The Fading Influence of Claude Bernard's Ideas about General Anesthesia (RE: Perouansky M. 2012;117:465-74) Anesthesiology. 2013 Apr;118(4):984-5. PMID: 23511525, PMC3740740.

Professional educational materials or reports, in print or other media

1. **Forman SA.** Drug-Receptor Binding. Printed lecture notes for HST 150: Principles of Pharmacology. Audience is 2nd year medical (HST) students--material used as lecture notes. (Available to enrollees at Harvard eCommons).

2. **Forman SA**. Drug-Receptor Binding. PowerPoint slides for HST 150: Principles of Pharmacology. Audience is 2nd year medical (HST) students-- material distributed electronically to accompany notes and lecture. (Available to enrollees at Harvard eCommons).

3. **Forman SA.** Pharmacology of General Anesthetics. Printed lecture notes for HST 150: Principles of Pharmacology. Audience is 2nd year medical (HST) students--material used as lecture notes. (Available to enrollees at Harvard eCommons).

4. **Forman SA**. Pharmacology of General Anesthetics. PowerPoint slides for HST 150: Principles of Pharmacology. Audience is 2nd year medical (HST) students-- material distributed electronically to accompany notes and lecture. (Available to enrollees at Harvard eCommons).

5. **Forman SA.** Cholinergic Pharmacology. Printed lecture notes for HST 150: Principles of Pharmacology. Audience is 2nd year medical (HST) students--material used as lecture notes. (Available to enrollees at Harvard eCommons).

6. **Forman SA**. Cholinergic Pharmacology. PowerPoint slides for HST 150: Principles of Pharmacology. Audience is 2nd year medical (HST) students-- material distributed electronically to accompany notes and lecture. (Available to enrollees at Harvard eCommons).

7. **Forman SA**. The HST Admissions Interview Process. PowerPoint slides. Audience is faculty and students participating in HST admissions interviews.

8. **Forman SA.** Nitrous Oxide and Airspaces. Printed handout (4 pages) with citations covering

biophysical concepts related to airspace expansion and sequelae associated with clinical use of nitrous oxide. Audience is clinical anesthesia residents.
http://sharepoint.partners.org/mgh/ARE/Portal%20Project/Forms/AllItems.aspx?RootFolder=%2Fmgh%2FARE%2FPortal%20Project%2FForman%2FNitrous%20oxide%20modules

9. **Forman SA.** Awareness During General Anesthesia. Printed handout (5 pages) with citations covering concepts related to intraoperative awareness, strategies for reducing incidence, and management of cases where it occurs. Audience is clinical anesthesia residents.
http://sharepoint.partners.org/mgh/ARE/Portal%20Project/Forms/AllItems.aspx?RootFolder=%2Fmgh%2FARE%2FPortal%20Project%2FForman&FolderCTID=0x012000A880313D84B2624CA12507208B06A1B9&View={5DE6F758-9E31-481F-A249-64F550386EB2}

10. **Forman SA.** Thoracic epidurals for abdominal surgery. Printed handout (12 pages) with citations covering evidence for and against use of epidurals, details on placement and perioperative management techniques. Audience is clinical anesthesia residents.
http://sharepoint.partners.org/mgh/ARE/Portal%20Project/Forms/AllItems.aspx?RootFolder=%2Fmgh%2FARE%2FPortal%20Project%2FForman%2FCombined%20Epidural%20and%20General%20Anesthesia%20for%20Abdominal%20Surgery

11. **Forman SA.** Sevoflurane, Fresh Gas Flows, and Renal Function. Printed handout (5 pages) with citations and hyperlinks covering evidence related to the renal toxicity of sevoflurane breakdown products (compound A) in laboratory animals and humans, and clinical data pertaining to the use of sevoflurane. Audience is clinical anesthesia residents.
http://sharepoint.partners.org/mgh/ARE/Portal%20Project/Forms/AllItems.aspx?RootFolder=%2Fmgh%2FARE%2FPortal%20Project%2FForman%2FSevoflurane%20Modules

12. **Forman SA.** Post-operative Nausea & Vomiting and Rational Prophylaxis. Printed handout (6 pages) with citations covering risk factors for PONV, assessment tools, and effective prophylactic strategies in clinical settings. Audience is clinical anesthesia residents.
http://sharepoint.partners.org/mgh/ARE/Portal%20Project/Forms/AllItems.aspx?RootFolder=%2Fmgh%2FARE%2FPortal%20Project%2FForman%2FPONV

13. **Forman SA.** Ultrasound Basics for Peripheral Vascular Cannulations. PowerPoint slideshow covering basic ultrasound theory, and emphasizing positioning (of patient, clinician and ultrasound monitor) and geometric factors that facilitate identification of peripheral vascular structures and ultrasound-guided cannulations. Audience is clinical anesthesia residents.
http://sharepoint.partners.org/mgh/ARE/Portal%20Project/Forms/AllItems.aspx?RootFolder=%2Fmgh%2FARE%2FPortal%20Project%2FForman%2FUltrasound%20Basics.

14. **Forman SA.** Micro-course Development I: PowerPoint slideshow and handout for faculty members detailing a proposed structure for content for a new OR educational platform (***Anesthesia PORTAL*** = Platform for Operating Room Teaching And Learning).
http://sharepoint.partners.org/mgh/ARE/Portal%20Project/Forms/AllItems.aspx?RootFolder=%2Fmgh%2FARE%2FPortal%20Project%2FForman&FolderCTID=0x012000A880313D84B2624CA12507208B06A1B9&View={5DE6F758-9E31-481F-A249-64F550386EB2}

15. **Forman SA**. Micro-course Development II: Document for faculty members detailing procedures for developing educational content for ***Anesthesia PORTAL***.
http://sharepoint.partners.org/mgh/ARE/Portal%20Project/Forms/AllItems.aspx?RootFolder=%2Fmg

h%2FARE%2FPortal%20Project%2FForman&FolderCTID=0x012000A880313D84B2624CA12507208B06A1B9&View={5DE6F758-9E31-481F-A249-64F550386EB2}

16. **Forman SA.** Epidural Opioid Pharmacokinetics and Analgesia Mechanisms. Microcourse including handout accompanying two papers aimed at improving resident understanding of epidural opioid mechanisms and the clinical implications. http://sharepoint.partners.org/mgh/ARE/Portal%20Project/Forms/AllItems.aspx?RootFolder=%2Fmgh%2FARE%2FPortal%20Project%2FForman%2FEpidural%20Opioid%20Pharmacokinetics%20and%20Analgesia%20Mechanisms

17. **Forman SA.** Etomidate: Drug of the Past or the Future? Microcourse including handout accompanying review paper and optional material focusing on etomidate anesthetic mechanisms, adrenal toxicity, and new derivatives that aim to reduce toxicity. http://sharepoint.partners.org/mgh/ARE/Portal%20Project/Forms/AllItems.aspx?RootFolder=%2Fmgh%2FARE%2FPortal%20Project%2FForman%2FEtomidate%20-%20Drug%20of%20the%20Past%20or%20the%20Future

18. **Forman SA.** Extubation. Microcourse including review paper on extubation risks, and protocol for extubation of tube exchanger device. http://sharepoint.partners.org/mgh/ARE/Portal%20Project/Forms/AllItems.aspx?RootFolder=%2Fmgh%2FARE%2FPortal%20Project%2FForman%2FExtubation

19. **Forman SA.** Neuromuscular Blocker Combinations: Drug Synergy. Microcourse including 5-page handout and several journal articles aimed at improving resident knowledge of drug interactions. http://sharepoint.partners.org/mgh/ARE/Portal%20Project/Forms/AllItems.aspx?RootFolder=%2Fmgh%2FARE%2FPortal%20Project%2FForman%2FNMB%20Synergy

20. **Forman SA.** The Safety Factor of Neuromuscular Transmission: Physiological and Pharmacological Importance. Microcourse including 5-page handout and several journal articles aimed at improving resident knowledge of neuromuscular monitoring and muscle relaxant dosing. http://sharepoint.partners.org/mgh/ARE/Portal%20Project/Forms/AllItems.aspx?RootFolder=%2Fmgh%2FARE%2FPortal%20Project%2FForman&FolderCTID=0x012000A880313D84B2624CA12507208B06A1B9&View={5DE6F758-9E31-481F-A249-64F550386EB2}

21. **Forman SA.** PACU Waitlist: How to Bypass the PACU. Microcourse including 5 page handout reviewing OR flow dynamics, MGH systems for patient management, how to evaluate patients for floor-readiness, and how to coordinate a PACU bypass when warranted. http://sharepoint.partners.org/mgh/ARE/Portal%20Project/Forms/AllItems.aspx?RootFolder=%2Fmgh%2FARE%2FPortal%20Project%2FForman&FolderCTID=0x012000A880313D84B2624CA12507208B06A1B9&View={5DE6F758-9E31-481F-A249-64F550386EB2}

Thesis

1. **Forman SA.** Photolysis of all-trans octatetraene at 4° C [Undergraduate Honors Thesis in Chemistry]. Middletown, Connecticut: Wesleyan University, 1980. 186pp.

2. **Forman SA.** Inhibition of cation channel function at the nicotinic acetylcholine receptor from Torpedo: agonist self-inhibition and anesthetic drugs [PhD Dissertation]. Cambridge, Massachusetts: Harvard University, 1989. 262 pp.

Abstracts, Poster Presentations and Exhibits Presented at Professional Meetings

1. Dershwitz P, Dostolova Z, Parker K, Haburcak M, Miller KW, **Forman SA**. αE432: A Novel *Torpedo* Nicotinic Acetylcholine Receptor Azi-octanol Photolabel Site. Abstract S-422. IARS Annual Meeting, Boston, MA, May 2012.

2. Haburcak M, Stewart DS, Jounaidi Y, **Forman SA**. Anesthetic Effects on $GABA_A$ Receptors Containing β3 Subunits are Quantitatively Similar to Receptors Containing β2. Abstract S-421. IARS Annual Meeting, Boston, MA, May 2012.

3. Feng HJ, Jounaidi Y, **Forman SA**. Modulation of δ-Subunit-containing $GABA_A$ Receptors by Etomidate Depends on Subunit Arrangement. Abstract S-427. IARS Annual Meeting, Boston, MA, May 2012.

4. Wanderer J, Baker KH, **Forman SA**. Platform for Operating Room Teaching And Learning (PORTAL): Development of a New Education Paradigm. IARS Annual Meeting, Boston, MA, May 2012.

5. Feng HJ, Jounaidi Y, **Forman SA**. Modulation of δ-Subunit-containing $GABA_A$ Receptors by Etomidate Depends on Subunit Arrangement. Abstract S-427. Biophysical Society Annual Meeting, Philadelphia, PA, Feb 2013.

6. Stern AT, Winkler T, **Forman SA**. Global Kinetic Modeling of $GABA_AR$ Macrocurrents Based on Allosteric Principles. American Society of Anesthesiologists Annual Meeting. San Francisco, CA. Oct. 12-15, 2013.

7. Stern AT, Winkler T, **Forman SA**. Global Kinetic Modeling of $GABA_AR$ Macrocurrents Based on Allosteric Principles. Society for Neuroscience Annual Meeting. San Diego, CA. Nov. 9-13, 2013.

8. Feng HJ, **Forman SA**. Etomidate Binding Sites Exert Asymmetric Allosteric Effects in αβδ $GABA_A$ Receptors. Society for Neuroscience Annual Meeting. San Diego, CA. Nov. 9-13, 2013.

9. Ziemba A, Haburcak M, Stewart DS, Jounaidi Y, **Forman SA**. Etomidate and Propofol Interactions with Cysteine-Substituted Residues on $GABA_A$ Receptor β3-M2 and β3-M3 Domains. Society for Neuroscience Annual Meeting. San Diego, CA. Nov. 9-13, 2013.

Narrative Report **(limit to 500 words)**

My effort is distributed in research (75%), clinical activities (20%) and administration/education (5%).

My area of excellence is laboratory research, focusing on molecular mechanisms of general anesthesia. I am an internationally recognized leader in research on how and where anesthetics affect neurotransmitter-gated ion channels and have lectured widely on these topics. I developed innovative equipment for flexible "artificial synapse" experiments, which demonstrated novel drug mechanisms. I developed new structure-function strategies for studying agonist-receptor interactions. I was the first investigator to provide solid evidence for anesthetic binding sites in ligand-gated ion channels. I introduced quantitative

mechanistic models for etomidate and propofol actions at $GABA_A$ receptors that accurately predicted the number of drug sites per receptor. This mechanistic framework is informing our efforts at mapping sites where potent anesthetics (etomidate, propofol, barbiturates, and neuroactive steroids) act. I direct creation of cell lines that inducibly express affinity-tagged ion channels at unprecedented levels for molecular studies and biochemical purification. I also helped design new anesthetics with improved clinical properties, particularly for the growing populations of elderly and critically ill patients. One of these entered clinical trials in 2014. I am also initiating studies to exploit zebrafish as an organism for screening general anesthetics and studying mechanisms. Since 1993, my research has been continuously funded by foundation and NIH grants.

My educational contributions are in operating rooms, classrooms, and major textbooks. I tutor new anesthesia residents each year. In the MGH ORs, I supervise and teach trainees the science and art of anesthesiology. I designed and spearheaded a new DACCPM educational program (DACCPM **P**latform for **O**perating **R**oom **T**eaching **A**nd **L**earning) to facilitate resident education using web-based tools. I deliver lectures for HST 150: Principles of Pharmacology and co-direct the course with Prof. Carl Rosow. In 2008, I directed the course while Dr. Rosow was on medical leave. I have authored chapters for major textbooks, including "Principles of Pharmacology" (Golan et al, eds) "Anesthesiology" (Longnecker et al, eds), "Miller's Anesthesia (Miller et al, eds)," "Anesthetic Pharmacology" (Evers et al, eds), "Anesthesia: Biologic Foundations" (Yaksh et al, eds), and "Clinical Anesthesia Procedures of the MGH."

My supporting activities include participation in local and national committees: subcommittee chair for HST MD admissions for many years; chairing an ASA scientific abstract committee; co-director of the Harvard Anesthesia Research Training Grant (T32); service as a standing member on the Surgery Anesthesia Trauma IRG at NIH. I also serve as an ad hoc grant reviewer for NIH, MRC (United Kingdom) and various foundations. I am an Associate Editor at *BMC Anesthesiology* and review manuscripts for numerous research journals. I mentor postdoctoral research fellows and junior staff interested in basic research. I also serve as a staff administrator in the MGH main OR.

In summary, I have made important contributions to basic research, am recognized as an international expert, and contribute to medical education at local, national, and international levels. I also contribute as a member and leader of the academic community through other activities.