

Sean C. Mackey, M.D., Ph.D.

Chief, Division of Pain Medicine
 Redlich Professor, Anesthesiology, Perioperative & Pain Medicine
 Stanford University School of Medicine

Stanford University School of Medicine
 1070 Arastradero Road, Suite 200
 Palo Alto, CA 94304-1345

t: 650.498.6477 | f: 650.725.9642 | e: smackey@stanford.edu

CURRENT APPOINTMENTS

11/2012 – present	Redlich Professor	Stanford University School of Medicine, Department of Anesthesiology, Perioperative and Pain Medicine, Division of Pain Medicine, Neurosciences and (by courtesy) Neurology
09/2007 – present	Fellowship Program Director	Stanford University School of Medicine, Division of Pain Medicine
09/2007 – present	Chief	Stanford University School of Medicine, Division of Pain Medicine
01/2002 – present	Director & Founder	Stanford University School of Medicine, Systems Neuroscience and Pain Laboratory

PREVIOUS APPOINTMENTS

10/2015 – 12/2017	Clinic Chief (Interim)	Stanford Pain Management Center
11/2007 – 11/2012	Associate Professor	Stanford University School of Medicine, Department of Anesthesiology, Perioperative and Pain Medicine, Division of Pain Medicine, Neurosciences and (by courtesy) Neurology
03/2004 – 08/2007	Associate Director	Stanford University School of Medicine, Division of Pain Medicine
02/2000 – 07/2006	Director & Co-Founder	Stanford University School of Medicine, Department of Anesthesiology, Perioperative and Pain Medicine, Regional Anesthesia Services
07/1999 – 11/2007	Assistant Professor	Stanford University School of Medicine, Department of Anesthesiology, Perioperative and Pain Medicine, Division of Pain Medicine

EDUCATION AND TRAINING

07/1998 - 07/1999	Fellowship	Stanford University Medical Center, Division of Pain Medicine
07/1997 – 07/1998	Chief Resident	Stanford University Medical Center, Department of Anesthesiology, Perioperative and Pain Medicine
07/1996 - 07/1998	Residency	Stanford University Medical Center, Department of Anesthesiology, Perioperative and Pain Medicine
07/1995 – 07/1996	Internship	Tucson Hospitals Medical Education Program
12/1994	Ph.D.	University of Arizona (Electrical and Computer Engineering)
		<u>PhD Dissertation:</u> Mackey, Sean. A Thermodynamic Model of Radiofrequency Catheter Ablation for the Treatment of Cardiac Arrhythmias. N.p.: Pacing and Clinical Electrophysiology, 1996. Print.
05/1994	M.D.	University of Arizona
12/1986	M.S.E.	University of Pennsylvania (Bioengineering)
05/1986	B.S.E.	University of Pennsylvania (Bioengineering)

RESEARCH SUPPORT

9/2017 – 9/2022	PCORI – Contract Number not yet assigned PI: Beth Darnall CO-Investigator: Sean Mackey	Comparative Effectiveness of Pain Cognitive Behavioral Therapy and Chronic Pain Self- Management within the Context of Opioid Reduction
09/2015 – 06/2020	NIH R01HD082200 The Oregon Health Sciences University PI: Beth Darnall CO-Investigator: Sean Mackey	Maternal Chronic Pain: Risk for Pain and Poor Outcomes in Children
09/2015 – 05/2020	NIH R01AT008561 PI: Beth Darnall CO-Investigator: Sean Mackey	Single Session Pain Catastrophizing Treatment: Comparative Efficacy & Mechanisms
04/2015 – 03/2020	NIH K24DA029262 PI: Sean Mackey	Neuroimaging and Mentoring in Translational Pain Research

09/2013-09/2018	K23 DA035302 PI: Jennifer Hah Mentor: Mackey	Psychological Factors Contributing to Persistent Opioid Use After Surgery
09/2015 – 8/2020	K23 AT008477 PI: Jiang-Ti Kong Mentor: Mackey	Predicting Analgesic Response to Acupuncture - A Practical Approach
07/2015 – 6/2020	K99/R00 DA040154 PI: Katie Martucci Mentor: Mackey	The Impact of Opioids on Chronic Pain: Clinical Research and Career Training in Spinal Cord fMRI and Brain Reward Systems
09/2013-10/2016	P01 AT006651S1 PI: Sean Mackey	Sex/Gender-Specific Brain Risks for Prescription Opioids in Chronic Low Back Pain
09/2013-08/2014	NIH: 562197 PI: Sean Mackey	Limited Competition of MAPP DCC
08/2013-03/2018	R01 DA035484 PI: Tor Wager Co-Investigator: Sean Mackey	fMRI-Based Biomarkers for Multiple Components of Pain
07/2013-06/2018	T32 DA035165 PI: Sean Mackey	Interdisciplinary Research Training in Pain and Substance Use Disorders
03/2013-02/2016	P01 AT006651S2 PI: Sean Mackey	The Psychobiological and Neural Mechanisms of Pain Catastrophizing
09/2012-09/2015	HHSN 2712011200728P PI: Sean Mackey	Development of an Open-Source National Pain Registry
09/2012-08/2013	Stanford CME Grant PI: Sean Mackey	Safe Opioid Prescribing and Risk Evaluation and Mitigation Strategies (REMS)
2012-2014	Stanford BioX NeuroVentures Co-PI: Sean Mackey	Understanding and Preventing Neuropathic Pain
09/2011-05/2016	P01 At006651S1 PI: Sean Mackey	Stanford CAM Center for Chronic Back Pain Supplement
09/2011-02/2018	P01 AT006651 PI: Sean Mackey	Stanford CAM Center for Chronic Back Pain

07/2011-05/2016	K23 DA031808 PI: Kevin Johnson Mentor: Sean Mackey	Research Training Using TMS to Study Pain Processing in Long-Term Opioid Use
07/2011-06/2013	T32 Stanford Department of Anesthesia PI: Jiang-Ti Kong Mentor: Sean Mackey	Anesthesia Training Program in Biomedical Research
07/2011-06/2013	T32 Stanford Department of Anesthesia PI: Jennifer Hah Mentor: Sean Mackey	Anesthesia Training Program in Biomedical Research
2011	Pfizer Visiting Pain Professorship PI: Sean Mackey	Grant to support a Visiting Professorship for Dr. Michael Cousins
2010-2015	K24 DA029262 PI: Sean Mackey	Neuroimaging and Mentoring in Translational Pain Research
2010-2013	Stanford Institute for Neuro-Innovation and Translational Neurosciences Pilot Grant PI: Ian Carroll Co-Investigator: Sean Mackey	Determinants of Time to Pain Resolution Following Surgery: Complimentary Clinical & Preclinical Models
2010-2013	Stanford Institute for Neuro-Innovation and Translational Neurosciences Pilot Grant PI: Jarred Younger Co-Investigator: Sean Mackey	The Role of Pro-inflammatory Factors in Mediating the Negative Consequences of Chronic Opioid Use
09/2009-Forever	Chris Redlich Endowed Professorship PI: Sean Mackey	Endowed Funds for use by Division of Pain for research, teaching, related expenses
2009-2011	Rocky Mountain CRPS Foundation PI: Sean Mackey	Funds to support research related to Complex Regional Pain Syndrome
05/2009-04/2012	R21 DA026092 PI: Sean Mackey	Learned Control of Frontal and Limbic Systems via Real-Time fMRI
2008-2014	K23 DA25152 PI: Ian Carroll Mentor and Co-Investigator: Sean Mackey	Prescription Opioid Use, Misuse, and Pain in Post-Surgical Patients
2008-2014	U01 DK082316 Consortium PI: Sean Mackey	Central Mechanisms of Urological Pelvic Pain: Functional and Structural Analysis by MRI

2008-2011	Stanford BioX Grant PI: Sean Mackey	Development and Applications of Real-Time fMRI Technology
2008-2011	American Academy of Neurology Research Training Fellowship PI: Meredith Barad Mentor: Sean Mackey	Learned Control of Brain Activity in Chronic Pain Patients Using Real-Time fMRI
2008-2009	American Fibromyalgia Syndrome Association PI: Sean Mackey	Low-Dose Naltrexone in the Treatment of Fibromyalgia
2007-2009	K99/R00 DA023609 PI: Jarred Younger Mentor and Co-Investigator: Sean Mackey	Mechanisms of Opioid-Induced Hyperalgesia in Pain Patients: Examination via fMRI
2007-2008	Foundation for Anesthesia Education and Research-Mentored Research Training Grant PI: Ian Carroll Mentor: Sean Mackey	Mechanisms of Analgesic Response During IV Lidocaine Infusion in Neuropathic Pain Patients
01/2006-12/2012	R01 NS 053961 NIH NINDS PI: Sean Mackey	fMRI of Pain in the Human Spinal Cord
2006-2008	Eli Lilly Investigator Initiated Grant PI: Sean Mackey	Duloxetine: Functional MRI Neural Correlates of Efficacy in Patients with Chronic Low Back Pain
2006-2007	Arthritis Foundation-Fellowship Grant PI: Younger Mentor: Sean Mackey	Scientific Projects to achieve faster cure for types of arthritis
2005-2007	SBIR Phase II Fast Track Contract: Virtual Reality and Real Time fMRI PI: Christopher deCharms Consortium PI: Sean Mackey	Major goal of project to use combination of virtual reality and real time fMRI to significantly enhance patients ability to control activation in brain areas related to pain regulation
2004-2007	5 R44 NS050642-04 NIH NINDS PI: Christopher deCharms Consortium PI: Sean Mackey	Applications of Real Time fMRI-Phase II

2004-2006	Foundation for Anesthesia Education and Research- Research Starter Grant PI: Sean Mackey	Imaging Neural Systems in Complex Regional Pain Syndrome
2002-2004	5 R43 MH067290 NIMH PI: Christopher deCharms Co-Investigator: Sean Mackey	Applications of Real Time fMRI
2001-Forever	Dodie and John Rosekrans Pain Research Endowment Fund Director: Sean Mackey	This endowment used to support projects related to pain research
2001-2004	Oxnard Foundation Grant PI: Sean Mackey	Use of NMDA-Antagonists and Opiates in the Treatment of Fibromyalgia Using Validated Outcome Measurements and Functional Magnetic Resonance Imaging
2001-2004	Stanford Office of Technology Licensing Grant PI: Sean Mackey	Processing of Pain in the Human Central Nervous System: Analysis through Functional Magnetic Resonance Imaging
2000-Present	Cognitive Neurosciences Grant-Clark Center for Bioengineering PI: Sean Mackey	Advanced Imaging Techniques Applied to Pain Research- Functional Magnetic Imaging Of Human Spinal Cord and Brain
1999-2007	Department of Anesthesiology Research Grant PI: Sean Mackey	Development of a Human Neuropathic Pain Model and Determination of Effects of Intravenous Lidocaine on the Sensory and Affective Components of Pain
1999-2003	Department of Anesthesiology Research Grant PI: Sean Mackey	Interventional Magnetic Resonance Imaging Applied to Regional Anesthesia and Pain Medicine
1994	American College of Cardiology Research Grant PI: Sean Mackey	Electrical and Thermal Characterization of Radiofrequency Catheter Ablation
1991-1992	Alpha Omega Alpha Honor Society Research Fellowship PI: Sean Mackey	Transvenous Catheter Delivery of Electrical Energy to Ablate Arrhythmogenic Tissue in Patients with Arrhythmias

1990-1991	American Heart Association Fellowship PI: Sean Mackey	Characterization and Optimization of Radiofrequency Catheter Ablation for the Treatment of Cardiac Arrhythmias
1989-1994	NIH Short-Term Research Fellowship PI: Sean Mackey	Optimal Control of Transvenous Catheter Ablation in the Treatment of Tachyarrhythmias
	NIH Loan Repayment Program PI: Jarred Younger Mentor: Sean Mackey	

ADDITIONAL FUNDING

2010	Bill Cohen Gift	Gift to Support Research into Fibromyalgia Treatment
2008	Allergen Gift	Gift to Support Research in Botulinum Toxin for Chronic Pain
2006	Stanford Med Scholars Grant	Grant to Support Stanford Medical Student: Andrea Crowell, to Perform Research at SNAPL
2005	American Heart Association Medical Student Fellowship	AHA Grant to Foster Research for David Ludlow in the area of: The Effects of Botulinum Toxin in Lumbar Sympathetic Blocks for the Treatment of Peripheral Arterial Disease
2005	Allergen Educational Grant	Major Goal to Develop Web Based Pain Management Educational Materials for Community Physicians
2002-2003, 2006	VPUE Stanford Faculty Grants for Undergraduate Research	Major Goal to Provide funding support for Stanford University Undergraduate Students to work in SNAPL Investigating Pain Processing Using Functional MRI Techniques
1999	Glaxo Welcome Educational Grant	Major Goal to Develop Internet/Intranet Based Sources to Aid Medical Students, Residents, Faculty and Staff in

Stanford University Department
of Anesthesia

RSDSA Foundation

Rainin Foundation

STUDY SECTION REVIEWER

2008-2012, 2016

National Institute on Drug Abuse, Career Award
Scientific Review Committee

Canada Institutes of Health Research, Medical
Research Council

SCHOLARSHIPS/AWARDS

2017

American Academy of Pain Medicine, Pain
Medicine Fellowship Award

2017

American Academy of Pain Medicine,
Distinguished Service Award

2016

Wilbert E. Fordyce Clinical Investigator Award
for Excellence in Clinical Pain Scholarship,
American Pain Society

2015

National Institute of Health, Director's Award for
Leadership Role on National Pain Strategy

2008, 2012

American Pain Society, Clinical Center of
Excellence Award

2002, 2004, 2006-2018

Top Doctors in America published in "Guide to
Top Doctors"

2011-2012

Institute of Medicine Committee on Advancing
Pain Research, Care, and Education

2012

American Academy of Pain Medicine Presidential
Commendation, Recognizing Role in Institute of
Medicine Committee on Relieving Pain in America

2012

Top 1% Pain Medicine Physicians in America, US
News & World Report Guide to Top Doctors

2010

Ellis Cohen Achievement Award, Stanford
Department of Anesthesia

2003

Stanford Department of Anesthesia, Teacher of the
Month

1994	Yuma Friends of Arizona Health Sciences Center Young Investigator Award
1994	American Federation for Clinical Research Medical Student Award
1994	University of Arizona MD/PhD Academic Scholarship
1994	Van Winkle Award for Excellence in Surgical Research
1994	Upjohn Medical Student Research Superstar Award
1994	1 st Place Medical Student Research Competition, AHSC
1994	Honors and Awards Committee Research Award, AHSC
1992	Yuma Friends of Arizona Health Sciences Center Young Investigator Award
1987	GTE Electrical Engineering Scholarship
1981-1983	Mildred P. Coitner Academic Scholarship

PATENTS

01/26/2004	US2005072433	Toxin Induced Sympathectomy: Mackey, S., Carroll, I., Clark, D.
11/17/1998	US05837001	Radio Frequency Energy Delivery System for Multipolar Electrode Catheters: Mackey, S.

PEER REVIEWED PUBLICATIONS

1. Martucci, K., Mackey, S. Neuroimaging of Pain: Human Evidence and Clinical Relevance of Central Nervous System Processes and Modulation. *Anesthesiology* 2018; XXX:00-00 (accepted).
2. Darnall, B., Ziadni, M., Roy, A., Kao, M.C., Sturgeon, J., Cook, K., Lorig, K., Burns, J., Mackey, S. Comparative Efficacy and Mechanisms of a Single-Session Pain Psychology Class in Chronic Low Back Pain: Study Protocol for a Randomized Controlled Trial. *Trials*, 06 March 2018, doi.org/10.1186/s13063-018-2537-3 (accepted).
3. Gaertner, M., Kong, JT., Scherrer, K., Foote, A., Mackey, S., Johnson, K. Advancing Transcranial Magnetic Stimulation Methods for Complex Regional Pain Syndrome: An Open-Label Study of Paired Theta Burst and High-Frequency Stimulation. *Neuromodulation* 2018, DOI:10.1111/ner.12760, January 2018 (accepted).

4. Carriere, J., Sturgeon, J., Yakobov, E., Kao, M., Mackey, S., Darnall, B. The impact of perceived injustice on pain-related outcomes: A combined model examining the mediating roles of pain acceptance and anger in a chronic pain sample. *Clin J Pain*, January 2018 (accepted).
5. Fishman, S.M., Carr, D.B., Hogans, B., Cheatle, M., Gallagher, R.M., Katzman, J., Mackey, S., Polomano, R., Popescu, A., Rathmell, J.P., Rosenquist, R.W., Tauben, D., Beckett, L., Li, Y., Mongoven, J.M., Young, H.M. Scope and Nature of Pain and Analgesia-Related Content of the United States Medical Licensing Examination (USMLE). *Pain Medicine*, 2018; 0: 1–11 doi: 10.1093/pm/pnx336.
6. National Academy of Medicine (NAM Special Publication), Authors is alphabetical order: Adams, S., Blanco, C., Chaudhry, H., Chen, H., Chou, R., Christopher, M., Harris, P., Levin, S., Mackey, S., McCance-Katz, E., Moore, P., Rathmell, J., Rieder, T., Twillman, B. First, Do No Harm - Marshaling clinician leadership to counter the opioid epidemic. Washington, DC, 2017, *NAM.edu*.
7. Sutcliffe S, Jemielita T, Lai HH, Andriole GL, Bradley CS, Clemens JQ, Gallop R, Hooton TM, Kreder KJ, Krieger JN, Kusek JW, Labus J, Lucia MS, Mackey S, Naliboff BD, Robinson NA, Rodriguez LV, Stephens-Shields A, van Bokhoven A, Wolin KY, Yan Y, Yang CC, Landis JR, Colditz GA, and the MAPP Research Network. A case-crossover study of urologic chronic pelvic pain syndrome flare triggers in the MAPP Research Network. *J Urology*, December 2017. Accepted.
8. Hah, J., Mackey, S., Schmidt, P., McCue, R., Humphreys, K., Trafton, J., Efron, B., Clay, D., Sharifzadeh, Y., Ruchelli, G. Goodman, S., Huddleston, J., Maloney, W., Dirbas, F., Shrager, J., Costouros, J., Curtin, C., Carroll, I. Effect of Perioperative Gabapentin on Postoperative Pain Resolution and Opioid Cessation in a Mixed Surgical Cohort: A Randomized Trial. *JAMA Surgery*, 2017, December, doi:10.1001/jamasurg.2017.4915.
9. Weber, K., Parrish, T., Bernadel-Huey, O., Sentis, A., Wang X., Mackey, S. Thermal Stimulation alters Cervical Spinal Cord Functional Connectivity in Humans. *Neuroscience* 2017.
10. Sturgeon, JA, Ziadni, M., Darnall, B, Mackey SC. Pain catastrophizing, perceived injustice, and pain intensity impair life satisfaction through differential patterns of physical and psychological disruption. *International Journal of Behavioral Medicine* 2017 September 05. DOI 10.1016/j.jpain.2016.01.066.
11. Kutch, J, Ichesco, E, Hampson, J, Labus, J, Farmer, M, Martucci, K, Ness, T, Deutsch, G, Apkarian, A, Mackey, S, Klumpp, D, Schaeffer, A, Rodriguez, L, Kreder, K, Buchwald, D, Andriole, G, Lai, H, Mullins, C, Kusek, J, Landis, R, Mayer, E, Clemens, J, Clauw, D, Harris, R, for MAPP Research Network. Brain signature and functional impact of centralized pain: a multidisciplinary approach to the study of chronic pelvic pain (MAPP) network study. *Pain*, October 2017, 158 (2017) 1979-1991.
12. Sturgeon, JA, Hah, J, Sharifzadeh, Y, Middleton, SK, Rico, T, Johnson, K, Mackey SC. Predictors of Daily Pain Medication Use in Individuals with Recurrent Back Pain. *International Journal of Behavioral Medicine* 2017 September 05. DOI 10.1007/s12529-017-9686-8.
13. Davis, K. D., Flor, H., Greely, H. T., Iannetti, G. D., Mackey, S., Ploner, M., Pustilnik, A., Tracey, I., Treede, R. D. and Wager, T. D. Brain imaging tests for chronic pain: medical, legal and ethical issues and recommendations. *Nat Rev Neurol*. 2017. p. 624-638.
14. Karayannis, NV, ...Mackey, S. Psychological features and their relationship to movement based subgroups in people with low back pain. *Archives of Physical Medicine and Rehabilitation* (accepted August 2017).
15. Darnall, BD, Sturgeon, JA, Cook, KF, Taub, CJ, Roy, A, Burns, JW, Sullivan, M, Mackey, SC. Development and validation of a daily pain catastrophizing scale. *Journal of Pain – American Pain Society* 2017, 18(9):1139-1149.
16. Sun, EC, Bateman, BT, Memtsoudis, SG, Neuman, MD, Mariano, ER, Baker, LC., Lack of Association Between the Use of Nerve Blockade and the Risk of Postoperative Chronic Opioid Use

Among Patients Undergoing Total Knee Arthroplasty: Evidence from the MarketScan Database. *Anesth Analg*, 2017 Apr 19. PMID: 28430692.

17. Harris, R., Mackey, S. Brain signature and functional impact of centralized pain: a Multi-disciplinary Approach to the Study of Chronic Pelvic Pain (MAPP) Network Study. *PAIN* PAIN-D-17-00056 (accepted).
18. Tran, P., Sturgeon, J. A., Nilakantan, A., Foote, A., Mackey, S. and Johnson, K. (2017), Pain Catastrophizing Mediates the Relationship Between Trait Happiness and Depressive Symptoms in Individuals with Current Pain. *J Appl Behav Res*. doi:10.1111/jabr.12069.
19. Hah, J, Sturgeon, J, Zocca, J, Sharifzadeh, Y, Mackey, S, Factors associated with prescription opioid misuse in a cross-sectional cohort of patients with chronic non-cancer pain. *Journal of Pain Research*, 2017, May 3. 2017:10 979-987
20. Kent, M., Tighe, P., Belfer, I., Brennan, T., Bruehl, S., Brummett, C., Buckenmaier, III, C., Buvanendran, A., Cohen, R., Desjardins, P., Edwards, D., Fillingim, R., Gewandter, J., Gordon, D., Hurley, R., Kehlet, H., Loeser, J., Mackey, S., McLean, S., Polomano, R., Rahman, S., Raja, S., Rowbotham, M., Suresh, S., Schachtel, B., Schreiber, K., Schumacher, M., Stacey, B., Stanos, S., Todd, K., Turk, D., Weisman, S., Wu, C., Carr, D., Dworkin, R., Terman, G., The ACTION-APS-AAPMPain Taxonomy (AAAPT) Multidimensional Approach to Classifying Acute Pain Conditions. *The Journal of Pain*, Vol 18, No 5 (May), 2017 and *Pain Medicine* 2017; 0; 1-12 doi: 10.1093
21. Harden, N.R., Maihofner, C., Abousaad, E., Vatine, J.J., Kirsling, A., Perez, R., Kuroda, M., Brunner, F., Stanton-Hicks, M., Marinus, J., van Hilten, J.J., Mackey, S., Birklein, F., Schlereth, T., Mailis-Gagnon, A., Graciosa, J., Connolly, S.B., Dayanim, D., Massey, M., Frank, H., Livshitz, A., Bruehl, S. A Prospective, Multi-site, International Validation of the CRPS Severity Score (CSS). *PAIN*, D-14-15525R1 2017.
22. Taub, C.J., J.A. Sturgeon, K.A. Johnson, S.C. Mackey and B.D. Darnall, Effects of a Pain Catastrophizing Induction on Sensory Testing in Women with Chronic Low Back Pain: A Pilot Study. *Pain Res Manag*, 2017. 2017: p. 7892494.
23. Kutch, J.J., J.S. Labus, R.E. Harris, K.T. Martucci, M.A. Farmer, S. Fenske, C. Fling, E. Ichesco, S. Peltier, B. Petre, et al., Resting-State Functional Connectivity Predicts Longitudinal Pain Symptom Change In Urologic Chronic Pelvic Pain Syndrome: A Mapp Network Study. *Pain*, 2017.
24. Karayannis, N.V., J.A. Sturgeon, M. Chih-Kao, C. Cooley and S.C. Mackey, Pain interference and physical function demonstrate poor longitudinal association in people living with pain: a PROMIS investigation. *Pain*, 2017.
25. Curtin, C.M., D. Kenney, P. Suarez, V.R. Hentz, T. Hernandez-Boussard, S. Mackey and I.R. Carroll, A Double-Blind Placebo Randomized Controlled Trial of Minocycline to Reduce Pain After Carpal Tunnel and Trigger Finger Release. *J Hand Surg Am*, 2017. 42(3): p. 166-174.
26. Sun EC, Dixit A, Humphreys K, Darnall BD, Baker LC, Mackey S. Association between concurrent use of prescription opioids and benzodiazepines and overdose: retrospective analysis. *BMJ*. 2017 Mar 14;356:j760. doi: 10.1136/bmj.j760.
27. Huang L, Kutch JJ, Ellingson BM, Martucci KT, Harris RE, Clauw DJ, Mackey S, Mayer EA, Schaeffer AJ, Apkarian AV, Farmer MA. Brain white matter changes associated with urological chronic pelvic pain syndrome: multisite neuroimaging from a MAPP case-control study. *Pain*. 2016 Dec;157(12):2782-2791
28. Stephens-Shields AJ, Clemens JQ, Jemielita T, Farrar J, Sutcliffe S, Hou X, Landis JR; MAPP Research Network. Symptom Variability and Early Symptom Regression in the MAPP Study: A Prospective Study of Urological Chronic Pelvic Pain Syndrome. *J Urology*. 2016 Nov;196(5):1450-1455. doi: 10.1016/j.juro.2016.04.070. Epub 2016 Apr 27.

29. Von Korff, M., Scher, A. I., Helmick, C., Carter-Pokras, O., Dodick, D. W., Goulet, J., Hamill-Ruth, R., LeResche, L., Porter, L., Tait, R., Terman, G., Veasley, C., & Mackey, S. (2016). United States National Pain Strategy for Population Research: Concepts, Definitions, and Pilot Data. *J Pain*, 17(10), 1068-1080. doi:10.1016/j.jpain.2016.06.009
30. Martucci, K. T., & Mackey, S. C. (2016). Imaging Pain. *Anesthesiol Clin*, 34(2), 255-269. doi:10.1016/j.anclin.2016.01.001
31. Hamilton, J. P., Glover, G. H., Bagarinao, E., Chang, C., Mackey, S., Sacchet, M. D., & Gotlib, I. H. (2016). Effects of salience-network-node neurofeedback training on affective biases in major depressive disorder. *Psychiatry Res*, 249, 91-96. doi:10.1016/j.psychres.2016.01.016
32. Darnall, B. D., Scheman, J., Davin, S., Burns, J. W., Murphy, J. L., Wilson, A. C., Kerns, R. D., Mackey, S. C. Pain Psychology: A Global Needs Assessment and National Call to Action PAIN MEDICINE. *Pain Medicine*, 2016 Feb;17(2):250-63. doi: 10.1093/pm/pnv095.
33. Alger JR, Ellingson BM, Ashe-McNalley C, Woodworth DC, Labus JS, Farmer M, Huang L, Apkarian AV, Johnson KA, Mackey SC, Ness TJ, Deutsch G, Harris RE, Clauw DJ, Glover GH, Parrish TB, Hollander Jd, Kusek JW, Mullins C¹⁵, Mayer EA; MAPP Research Network Investigators. Multisite, multimodal neuroimaging of chronic urological pelvic pain: Methodology of the MAPP Research Network. *Neuroimage Clin.*, 2016 Jan 6;12:65-77. doi: 10.1016/j.nicl.2015.12.009. eCollection 2016.
34. Sturgeon JA, Carriere JS, Kao MJ, Rico T, Darnall BD, Mackey SC. Social Disruption Mediates the Relationship Between Perceived Insult and Anger in Chronic Pain: A Collaborative Health Outcomes Information Registry Study. *Ann Behav Med.* 2016 Dec;50(6):802-812
35. Jiang Y, Oathes DJ, Hush J, Darnall BD, Charvat M, Mackey S. Perturbed Amygdalar Connectivity with the Central Executive and Default Mode Networks in Chronic Pain. *Pain.* 2016 Sep;157(9):1970-8. doi: 10.1097/j.pain.0000000000000606
36. Sun EC, Jena AB, Kao MC, Darnall BD, Baker LC, Mackey SC. Incidence of and Risk Factors for Chronic Opioid Use Among Opioid Naïve Patients in the Perioperative Period. *JAMA Intern Med.* 2016 Sep 1;176(9):1286-93. doi: 10.1001/jamainternmed.2016.3298.
37. Bruhl S, Maihöfner C, Stanton-Hicks M, Perez R, Vatine J, Brunner F, Birklein F, Schlereth T, Mackey S, Mailis-Gagnon A, Livshitz A, Harden N. Complex Regional Pain Syndrome (CRPS): evidence for warm and cold subtypes in a large prospective clinical sample. *Pain.* 2016 Aug;157(8):1674-81. doi: 10.1097/j.pain.0000000000000569.
38. Bhandari R, Huestis S, Darnall BD, Mackey SC. Pediatric-Collaborative Health Outcomes Information Registry (Peds-CHOIR): A Data Management Platform to Guide Pediatric Pain Research and Treatment at the Group and Individual Levels. *Pain.* 2016 Sep;157(9):2033-44. doi: 10.1097/j.pain.0000000000000609
39. Dixon, E. A., Benham, G., Sturgeon, J. A., Mackey, S., Johnson, K. A., & Younger, J. (2016). Development of the Sensory Hypersensitivity Scale (SHS): a self-report tool for assessing sensitivity to sensory stimuli. *J Behav Med.* doi:10.1007/s10865-016-9720-3
40. O'Reilly-Shah, V., Mackey S, Survalytics: An Open-Source Cloud-Integrated Experience Sampling, Survey, and Analytics and Metadata Collection Module for Android Operating System Apps *JMIR MHealth and UHealthThe*; 4 (2): 17-26
41. Carroll, I. R., Hah, J. M., Barelka, P. L., Wang, C. K., Wang, B. M., Gillespie, M. J., McCue, R., Younger, J. W., Trafton, J., Humphreys, K., Goodman, S. B., Dirbas, F. M., & Mackey, S. C. (2015). Pain Duration and Resolution following Surgery: An Inception Cohort Study. *Pain Med*, 16(12), 2386-2396. doi:10.1111/pme.12842

42. Deer, T. R., Levy, R. M., Verrills, P., Mackey, S., & Abejon, D. (2015). Perspective: Peripheral Nerve Stimulation and Peripheral Nerve Field Stimulation Birds of a Different Feather. *Pain Medicine*, *16*(3), 411-412.
43. Farmer, M. A., Huang, L., Martucci, K., Yang, C. C., Maravilla, K. R., Harris, R. E., Clauw, D. J., Mackey, S., Ellingson, B. M., Mayer, E. A., Schaeffer, A. J., Apkarian, A. V., & Network, M. R. (2015). Brain White Matter Abnormalities in Female Interstitial Cystitis/Bladder Pain Syndrome: A MAPP Network Neuroimaging Study. *J Urol*, *194*(1), 118-126. doi:10.1016/j.juro.2015.02.082
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NON-PEER REVIEWED PUBLICATIONS

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6. European Journal of Pain
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8. PLOS Biology
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GRAND ROUNDS, INVITED/VISITING LECTURES

2018

1. Kauai Pain Conference, Invited Speaker, The Physician's Role in the Opioid Crisis, The Future of Pain Care at a National Level, Lihue, HI, February 2018

2017

2. Kauai Pain Conference, Invited Speaker, Neuroimaging and Pain, Pain as a National Health Problem, Lihue, HI, February 2017
3. University of North Carolina School of Medicine, Visiting Professor and Grand Rounds Speaker, Pain as a Public Health Problem: Lessons from the IOM Pain Report and National Pain Strategy Report, Learning Health Systems: A New Dawn in Personalized Pain and Perioperative Care and Real-World Discovery Research, Chapel Hill, NC, March 2017
4. Duke University School of Medicine, Visiting Professor, Brain Based Biomarkers for Pain: Objective Measures of Pain or a Journey Down the Rabbit Hole? Durham, NC, March 2017
5. AAPM 2017 Annual Meeting, Moderator and Invited Speaker, Pain Psychology Task Force: Behavioral Pain Management Training for Health Care Professionals, Overview & Update on Collaborative Health Outcomes Information Registry (CHOIR): Clinical Treatment Lessons Learned from Analysis of the Data, Pain Medicine Journal & NIH: How to Succeed as an Academic Clinical Pain Researcher, The Career of a Clinician Scientist in Pain Research from the Early Stages to Senior Investigator, Orlando, FL, March 2017
6. 2017 Neuromodulation Society of Australia and New Zealand 12th Annual Scientific Meeting, Invited Speaker, Functional Neuroimaging of Pain, Panel Discussion: Mechanisms of Action, Debate: The Neuromodulated Human will Become Common Place by 2030, Adelaide, S. Australia, April 2017
7. 2017 Australian Pain Society 37th Annual Scientific Meeting, Invited Speaker, Brain Based Biomarkers of Acute and Chronic Pain, Learning Health Systems: A New Dawn in Personalized Pain Care and Real-World Discovery Research, Adelaide, S. Australia, April 2017
8. 2017 Society for Acupuncture Research Annual Symposium, Invited Speaker, Clinical/Policy Research on the Role of Acupuncture in Mainstream Medicine, San Francisco, CA, April 2017
9. International Anesthesia Research Society, International Science Symposium 2017, Panelist: Functional Neuroimaging of Pain, Affect and Cognition, Washington, DC, May 2017
10. American Psychiatric Association (APA) 2017 Annual Meeting, Invited Speaker, In the Wake of the CDC Opioid Guidelines and the National Pain Strategy: Treating the Patient With Pain and Addiction, San Diego, CA, May 2017

11. International Neuromodulation Society (INS) 13th World Congress, Invited Speaker, Lecture #1: Imaging Pain in the Brain, Lecture #2: Learning Health Systems: A New Dawn in Personalized Pain Care and Real-World Discovery Research, Edinburgh, Scotland, May 2017
12. Oregon Health & Science University (OHSU), Invited Speaker, Learning Health Systems: A New Dawn in Personalized Pain Care and Real-World Discovery Research, Portland, OR, June 2017
13. University of Kansas Health System, Invited Grand Rounds Speaker, Learning Health Systems: A New Dawn in Personalized Pain Care and Real-World Discovery Research, Kansas City, MO, October 2017
14. Stanford University, Virtual Reality Conference, Invited Speaker, Advances in Pain Management, Palo Alto, CA, October 2017
15. Annual Meeting of Israel Pain Society (IPS), Invited Speaker, Lecture #1: Brain Based Biomarkers for Pain: Objective Measures of Pain or a Journey Down the Rabbit Hole? Lecture #2: Learning Health Systems: A New Dawn in Personalized Pain Care and Real-World Discovery Research, Eilat, Israel, November, 2017
16. U.S. Department of Health and Human Services (HHS), Invited Speaker at HHS Opioid Symposium, How Data can lead to Insights in Understanding the Opioid Epidemic and in Considering Novel Solutions, Washington, DC, December 2017

2016

1. Pediatric Pain National/International Registry Communication Meeting, Invited Speaker, CHOIR System Presentation and Discussion, Toronto, Canada, February 2016
2. AAPM Annual Meeting, National Pain Strategy, Invited Speaker: 1. A Comprehensive Population Health Level Strategy for Pain, 2. The National Pain Strategy: Implications for Interdisciplinary Pain Care, 3. Naltrexone for Treatment of Fibromyalgia, 4. Best Pain Care at Lower Cost: CHOIR as a Model Platform for Learning Health System. Realizing the Institute of Medicine's Vision of Learning Health System, Palm Springs, CA, February 2016
3. Special Committee on Aging, Invited Speaker to testify to Congress, Opioids and Aging, Washington, DC, February 2016
4. Kauai Pain Conference, Invited Speaker, 1. The Strain in Pain Lies Mainly in the Brain: Neuroimaging & Pain, 2. A National Plan to Transform Pain Prevention, Care and Education, Kauai, Hawaii, March 2016
5. American Pain Society Annual Meeting, Invited Speaker, 1. Getting your research funded, 2. Transforming Care of Persons with Back Pain: Next Steps in Implementing the Recommendations of the National Pain Strategy, 3. Learning Health Systems: A New Dawn in Personalized Pain Care and Real-World Discovery Research, 4. Measurement Based Pain Management for Best Care at Lowest Cost, Austin, TX 2016
6. Health Matters 2016, Invited Speaker, Management of Chronic Pain: Getting to the Root of Persistent Pain, Stanford CA, May 2016
7. American Psychiatric Association 2016, Invited Speaker, An Update on Diagnostic and Assessment Considerations for the Treatment of Comorbid Opioid Addiction and Chronic Pain, Atlanta, GA, May 2016
8. Association of University Anesthesiologists 63rd Annual Meeting, Poster Presentation, Collaborative Health Outcomes Information Registry (CHOIR): Open Source Platform for a Learning Health System and Informing Therapeutic Development, San Francisco, CA, May 2016
9. 2016 Annual Meeting and International Science Symposium IARS, Invited Speaker, Imaging for Chronic Pain: Can We Improve Patient Outcomes? San Francisco, CA, May 2016

10. WIP Congress 2016, Invited Speaker and Moderator, Pain Assessment and Clinical Outcomes: Collaborative Health Outcomes Information Registry (CHOIR): Open Source Platform for Measuring Health Outcomes and a Learning Based System, New York, NY, May 2016
11. European Pain School, Invited Professor, 1. Delivering a cultural transformation in pain prevention, care, education and research, 2. The strain in pain lies mainly in the brain: lessons learned from the neuroimaging of pain, Sienna, Italy, June 2016
12. NUIG mHealth Conference, Invited Speaker, Precision Surgical Care: Collaborative Health Outcomes Information, Registry (CHOIR) as a Perioperative Learning Health System and Platform to Deliver Targeted, Internet-based Health Interventions, Galway, Ireland, June 2016
13. Summer Pain Meeting – UNE, Invited Speaker, Learning Health Systems: A New Dawn in Personalized Pain Care and Real-World Discovery Research Presentation, Portland, ME, August 2016
14. Pain Week, Invited Speaker, In the Wake of the CDC Opioid Guidelines and The National Pain Strategy: Leveraging Pain Psychology and Platforms to Address the National Pain and Opioid Crises, Las Vegas, NV, September 2016
15. Stanford Medicine X, Invited Panelist, The Opioid Crisis Special Session, Palo Alto, CA, September 2016
16. 16th World Congress on Pain, Invited Speaker and Session Organizer, Neuroimaging Refresher Course, Imaging as a Biomarker for Pain, Neuroimaging Based Biomarkers of Acute and Chronic Pain, Realizing the US Institute of Medicine's Vision of Learning Health Systems for Pain Management, Yokohama, Japan, September 2013
17. ASA Annual Meeting, Invited Speaker, Pain Outcomes and Learning Health Systems: Delivery of Best Pain Care at Lower Cost, Chicago, IL, October 2016
18. James E. Eckenhoff Lectureship, Visiting Professor, Learning Health Systems: A New Dawn in Personalized Care and Real-World Discovery Research, Philadelphia, PA, November 2016
19. ASRA 2016 Pain Medicine Meeting, Moderator, Ask the Expert Interactive Session: Measuring Pain Data Outcomes and How This Influences Reimbursement. Invited Speaker, Imaging in Pain/Functional Brain Imaging in Pain: Overview and Clinical Significance, San Diego, CA, November 2016
20. 55th ACNP Annual Meeting, Study Group Speaker, Shared Solutions for Prescription Opioid Abuse and Pain, Hollywood, FL, December 2016

2015

1. Stanford University Parents' Weekend, Invited Speaker: The Strain in Pain Lies Mainly in the Brain, Palo Alto, CA, February 2015
2. PAP Summit (Programs and Policy, Integrated Healthcare Association), Invited Speaker, Patient-Reported Outcome Measures: What Will It Take To Realize The Promise? San Francisco, CA, March 2015
3. 1st Annual Kauai Pain Meeting, Invited Speaker, 1. When Does Acute Pain Become Chronic? 2. fMRI and Diagnosing Chronic Pain, Kauai, Hawaii, March 2015
4. AAPM Annual Meeting, Invited Speaker, 1. Understanding and Treating Neuropathic Pain, 2. National Pain Strategy Task Force: A Strategy to Transform Pain Prevention, Care, Education and Research, 3. Collaborative Health Outcomes Information Registry (CHOIR): Status and Update, National Harbor, MD, March 2015
5. American Pain Society's 34th Annual Scientific Meeting, Invited Speaker, 1. Perturbed Connectivity of the Amygdala and its Subregions with the Central Executive and Default Mode Networks in Chronic Pain, 2. National Pain Strategy Session, Palm Springs, CA, May 2015

6. UF Pain Research and Intervention Center of Excellence, Brain Imaging Biomarkers for Pain: Scientific Ethical and Legal Implications, Gainesville, FL, May 2015
7. INS 12th World Congress (International Neuromodulation Society), Invited Speaker, 1. Machine Learning Approaches for the Detection of Acute and Chronic Pain: Promises and Limitations, 2. fMRI, 3. The Current Practices: Functional Neuroimaging and the Use of Modulation, 4. Poster Presentation Collaborative Health Outcomes Information Registry (CHOIR): Open Source Cloud-Based Platform to Generate and Support Learning Healthcare Systems Montreal, Canada, June 2015
8. 21st Annual Meeting of the Organization for Human Brain Mapping, Invited Speaker/Organizer, 1. Identification of brain imaging biomarkers for pain, 2. New Developments and Horizons for Spinal Cord fMRI, Honolulu, Hawaii, June 2015
9. PAINS Project, Invited Speaker, Overview of the NPS planning process and major elements – Interagency Pain Research Coordinating Committee, Washington, DC, June 2015
10. Trigeminal Neuralgia Association of Australia, Invited Speaker, Rewiring the Brain to Ease Pain, Sydney, Australia, August 2015
11. University of California, San Francisco, Grand Rounds/Invited Speaker, 1. National Pain Strategy, 2. Collaborative Health Outcomes Information Registry (CHOIR): Open Source Learning Health System Platform to Deliver Best Care at Lower Cost, 3. Biomarkers, San Francisco, CA, October 2015
12. International Pelvic Pain Society (IPPS) Annual Meeting 2015, Invited Speaker, 1. Best Pain Care at Lower Cost: CHOIR as a Model Platform for Learning Health System, 2. Collaborative Health Outcomes Information Registry: Open Source Learning Health Systems Platform, 3. System To Enhance Patient Experience (STEPx): Network of patient experience touch points revealed by Bayesian network reconstruction suggests targets for intervention, San Diego, CA, October 2015
13. ASA Annual Meeting 2015, Invited Speaker, Refresher Course Lecture, Best Pain Care at Lower Cost: CHOIR as a Model Platform for Learning Health System, San Diego, CA, October 2015
14. ASRA 14th Annual Pain Medicine Meeting, Invited Speaker, 1. Best Pain Care at Lower Cost: CHOIR as a Model Platform for Learning Health Systems and Pain Registries, 2. Cognitive and Emotional Regulation of Pain: Lessons Learned from Neuroimaging of Pain, 3. Imaging safety and anatomic correlations: assimilating the information and limiting patient risk: functional brain imaging in pain-overview and clinical significance, Miami, FL, November 2015
15. Medical College of Wisconsin, Visiting Professorship, 1. CHOIR: Open Sources Platform for Measuring Health Outcomes and a Learning Based System, 2. Brain Imaging Biomarkers for Pain: Objective Detection of Pain or a Journey Down the Rabbit Hole? Milwaukee, WI, December 2015
16. American College of Neuropsychopharmacology, Invited Speaker, rt-fMRI Neurofeedback: Are We There Yet? Hollywood, FL, December 2015

2014

1. American Academy of Pain Medicine Annual Meeting, Invited Speaker, 1. Essential Tools for Treating the Patient in Pain: What Every Primary Care and Pain Specialist Needs to Know, 2. Design and Implementation of an Open Source Pain Registry, 3. NIH Grant Writing: a Principal Investigator's Perspective, 4. The Essentials of Acute Pain Medicine, Phoenix, AZ, March 2014
2. NIH Pain Consortium, Research Standards for Chronic Low Back Pain, Bethesda, MD, May 2014
3. American Pain Society Annual Meeting, Invited Speaker, National and International Pain Registries: Analysis and Use of Practice-based Evidence, Tampa, FL, May 2014

4. American Psychiatry Association Annual Meeting, Invited Speaker, 1. Diagnostic and Assessment Considerations for the Treatment of Comorbid Opioid Addiction and Chronic Pain, 2. NIH NIDA Pain Consortium - Research Standards for Chronic Low Back Pain, 3. National and International Pain Registries: Analysis and Use of Practice-based Evidence, 4. Overview of the Treatment of Acute and Chronic Pain in the Patient with a History of Addiction, New York, NY, May 2014
5. PAINWEEK, Invited Speaker, 1. The Brain in Pain, 2. Neuropathic Pain, 3. The Psychology of Opioids, Las Vegas, NV September 2014
6. Napa Pain Conference, When Acute Pain Becomes Chronic, Napa, CA, September 2014
7. IASP Meeting, 15th World Congress on Pain, Invited Speaker, Brain-based Classification Algorithms for Acute and Chronic Pain, Buenos Aires, Argentina, October 2014
8. Acute Pain SIG Satellite Symposium, 1. Big data meets acute pain: where are the opportunities? 2. The new US National Pain Strategy, Buenos Aires, Argentina, October 2014
9. ASA Annual Conference, The Strain in Pain Lies Mainly in the Brain: Lessons Learned from the Neuroimaging of Pain, New Orleans, LA, October 2014
10. ASRA Pain Meeting, Invited Speaker, 1. Neuroimaging Based Pain Detection, 2. Brain Imaging Biomarkers for Pain: Objective Detection of Pain or a Journey Down the Rabbit Hole? San Francisco, CA, November 2014
11. ACR/ARHP Meeting, Invited Speaker, Treatment Considerations in Chronic Pain, Boston, MA, November 2014

2013

1. American Society of Anesthesiology Conference on Pain Management, Invited Speaker, *Pain: What to Report & Monitor*, Las Vegas, NV, January 2013
2. American Academy of Pain Medicine Annual Meeting, Invited Speaker, 1. Essential Tools for Treating the Patient in Pain, 2. Functional Neuroimaging of Chronic Pain: Promises and Pitfalls, 2. National Institutes of Health (NIH) Pain Research: Optimizing Funding Through Grant Writing, Fort Lauderdale, FL, April 2013
3. American Academy of Pain Medicine Annual Meeting, Invited Speaker, *Functional Neuroimaging of Chronic Pain: Promises and Pitfalls*, Fort Lauderdale, FL, April 2013
4. American Academy of Pain Medicine Annual Meeting, Invited Speaker, *NIH Pain Research: Optimizing Funding Through Grant Writing*, Fort Lauderdale, FL, April 2013
5. American Association of Neurological Surgeons Annual Meeting, Invited Speaker, *Neuroimaging and Pain*, New Orleans, LA, April 2013
6. International Anesthesia Research Society Annual Meeting, Invited Speaker, *Neuroimaging-Based Pain Detection: Objective Measure of Pain or a Journey Down the Rabbit Hole?*, San Diego, CA, May 2013
7. American Pain Society Annual Meeting, NCCAM Pre-Conference Symposium, Invited Speaker, *Centers for Excellence for Research on CAM for Pain (CERC)*, New Orleans, LA, May 2013
8. American Pain Society Annual Meeting, Invited Speaker, *Objective Measures of Pain: Scientific, Legal & Ethical Considerations*, New Orleans, LA, May 2013
9. American Psychiatric Association Annual Meeting, Invited Speaker, *Overview of the Treatment of Acute & Chronic Pain in the Patient with a History of Addiction*, San Francisco, CA, May 2013

10. Neuropathy Action Foundation Annual Meeting, Invited Speaker, *Neuropathic Pain & Treatments*, Los Angeles, CA, June 2013
11. International Neuromodulation Society 11th World Congress, Invited Speaker, *Neuroimaging on the Future Treatment of Pain and Headache*, Berlin, Germany June 2013
12. NAF Neuropathy Meeting, Invited Speaker, Neuropathic Pain and Pain Treatments, Los Angeles, CA, June 2013
13. Trigeminal Neuralgia Association Australia, Neuroimaging of Pain, Neuropathic Pain Treatments, Queensland, Australia, August, 2013
14. PainWeek, Invited Speaker, *Understanding and Treating Neuropathic Pain, Opening Windows to the Brain: Lessons Learned from Neuroimaging of Pain*, Las Vegas, NV, September 2013
15. 4th Annual Aspen Brain Forum, Translational Neurotechnology Meeting, Invited Speaker, *Brain Imaging Biomarkers for Pain*, Aspen, CO, September 2013
16. California Society of Interventional Pain Physicians, Invited Speaker, *The Strain in Pain Lies Mainly in the Brain: Lessons Learned from Neuroimaging*, Palos Verdes, CA, September 2013
17. AAPM&R Meeting, Invited Speaker, 1. Neuroplasticity in Pain: What We Know From Experience With Amputation, 2. Neuroimaging of Pain, National Harbor, MD, October 2013
18. American Academy of Physical Medicine and Rehabilitation Annual Meeting, Invited Speaker, Neuroimaging of Pain, San Diego, CA, October 2013
19. American Society of Anesthesiologists, Invited Speaker, *Neuroimaging of Pain*, San Francisco, CA, October 2013
20. American College of Rheumatology Annual Meeting, Invited Speaker, *Future Perspectives for Persistent Pain Management*, San Diego, CA, October 2013
21. Northern California Association of Pain Psychologists, Invited Speaker, *The Strain in Pain Lies Mainly in the Brain: Lessons Learned from Neuroimaging of Pain*, San Francisco, CA, November 2013
22. Penn Pain Symposium, Invited Speaker, *Neuroimaging Based Pain Detection: Objective Measure of Pain or a Journey Down the Rabbit Hole?* Philadelphia, PA, December 2013.

2012

1. University of Texas Arlington, Keynote Speaker, *Opening Windows to the Brain: Lessons Learned from Neuroimaging of Pain*, Arlington, TX, February 2012
2. World Institute of Pain Annual Meeting, Invited Speaker, *The Strain in Pain Lies Mainly in the Brain*, Miami, FL, February 2012
3. American Association of Orthopedic Surgeons, Invited Speaker, *Opioids for Pain Management, 2012 State of the Art*, San Francisco, CA, February 2012
4. Nevada Psychiatric Association 17th Annual Psychopharmacology Conference, Invited Speaker, *Substance Abuse: Treating Co-morbid Chronic Pain and Opioid Addiction*, Las Vegas, NV, February 2012
5. American Academy of Pain Medicine Annual Meeting, Invited Speaker, *Understanding and Treating Neuropathic Pain*, Palm Springs, CA, February 2012
6. American Academy of Pain Medicine Annual Meeting, Invited Speaker, *Pain Outcomes: What to Measure and Why*, Palm Springs, CA, February 2012
7. American Academy of Pain Medicine Annual Meeting, Invited Speaker, *Pain Research*, Palm Springs, CA, February 2012

8. American Academy of Pain Medicine Annual Meeting, Invited Speaker, *Optimizing Funding Through Grant Writing*, Palm Springs, CA, February 2012
9. American Pain Society Annual Meeting, Invited Speaker, *Virtual Reality & Pain Management*, Honolulu, HI, May 2012
10. American Pain Society Annual Meeting, Invited Speaker, *Brain Correlates of Temporal Summation and Conditioned Pain Modulation*, Honolulu, HI, May 2012
11. Oscher Center for Integrative Medicine, Invited Speaker, *Opening Windows to the Brain: Lessons Learned from the Neuroimaging of Pain*, San Francisco, CA, May 2012
12. FDA Chronic Pain Workshop, Invited Speaker, *Neuroimaging Biomarkers for Pain*, Washington, DC, May 2012
13. California Society of Industrial Medicine & Surgery Annual Meeting, Invited Speaker, *Neuroimaging of Pain*, San Diego, CA, June 2012
14. American Psychological Association Annual Meeting, Invited Speaker, *The Strain in Pain Lies Mainly in the Brain*, Orlando, FL, August 2012
15. Napa Pain Conference, Invited Speaker, *When Acute Pain Becomes Chronic: What We Know and How We Can Prevent It*, Napa, CA, September 2012
16. Napa Pain Conference, Invited Speaker, *Opioids: The Good, The Bad, and The Ugly*, Napa, CA, September 2012
17. Reflex Sympathetic Dystrophy Syndrome Association Conference, Invited Speaker, *Opening Windows to the Brain: Lessons Learned from the Neuroimaging of Pain*, Scottsdale, AZ, September 2012
18. Department of Defense Pain Care Symposium, Invited Speaker, *Neurobiology of Pain*, San Diego, CA, September 2012
19. Pain Therapeutics Summit, Invited Speaker, *Neuroimaging Based Pain Detection: Findings and Applications*, San Jose, CA, October 2012
20. American Society of Anesthesiology Annual Meeting, Invited Speaker, *Evaluating Pain Outcomes*, Washington DC, October 2012

2011

1. Washington University, Visiting Professor, Grand Rounds: *Opening Windows to the Brain: Lessons Learned from Neuroimaging of Pain*, St. Louis, MO, January 2011
2. Washington University, Visiting Professor, *The Strain in Pain Lies Mainly in the Brain*, St. Louis, MO, January 2011
3. American Academy of Pain Medicine Annual Meeting, Invited Speaker, *When Acute Pain Becomes Chronic*, Washington, DC, March 2011
4. American Academy of Pain Medicine Annual Meeting, Invited Speaker, *NIH Grant Writing from a Principle Investigator's Perspective*, Washington, DC, March 2011
5. California Society of Anesthesiologists, Invited Speaker, *Perioperative Patient on Chronic Opioids*. San Jose, CA, May 2011
6. American Psychiatric Association Annual Meeting, Invited Speaker, *Update on Treatment of Comorbid Opioid Addiction and Chronic Pain*. Honolulu, HI, May 2011
7. American Pain Society Annual Meeting, Invited Speaker, *Unraveling the Progression of Acute to Chronic Pain: New Research and Clinical Perspectives*. Austin, TX, May 2011

8. California Society of Interventional Pain Physicians Annual Meeting, Invited Speaker, Santa Barbara, CA, June 2011
9. International Brain Mapping & Intraoperative Surgical Planning Society World Congress, Invited Speaker, *Spinal fMRI and Detection of Pain: Recent Advances in Neuroimaging*. San Francisco, CA, June 2011
10. Neuropathy Action Foundation Annual Meeting, Invited Speaker, *Neuropathic Pain & Pain Treatments*. Sacramento, CA, June 2011
11. Walter Reed Army Medical Center, Grand Rounds, *Opening Windows to the Brain: Lessons Learned From the Neuroimaging of Pain*. Washington, DC, June 2011
12. National Marfan Foundation Symposium, Invited Speaker, Portland, OR, July 2011
13. Arizona Pain Society Annual Meeting, Invited Speaker, *The Strain in Pain Lies Mainly in the Brain*. Paradise Valley, AZ, September 2011
14. PAINWeek Conference, Invited Speaker, *Neuroimaging of Pain*. Las Vegas, NV, September 2011
15. PAINWeek Conference, Invited Speaker, *Opioids: The Good, the Bad and the Ugly*. Las Vegas, NV, September 2011
16. Western Occupational Health Conference, Invited Speaker, *Managing Opioids: Practice Guidelines, Appropriate Use of Drug Testing, Narcotic Contracts & Weaning*. Las Vegas, NV, September 2011
17. Napa Pain Conference, Invited Speaker, Napa, CA, September 2011
18. National Naval Medical Center Pain Symposium, Invited Speaker, *Neurobiology of Pain*. Washington, DC, September 2011
19. Western Pain Society Annual Meeting, Invited Speaker *Functional Neuroimaging of Pain*. Eugene, OR, September 2011
20. Breakthrough In Neurologic Therapies Conference, Invited Speaker, *Current Concepts in Chronic Pain Management*. San Francisco, CA, October 2011
21. Chinese Pain Society Annual Meeting, Invited Speaker, Shenzhen, October 2011
22. National Center for Complementary and Alternative Medicine Distinguished Lecture, Invited Speaker, *Opening Windows to the Brain: Lessons Learned from the Neuroimaging of Pain*. Washington, DC, November 2011
23. North American Neuromodulation Society Annual Meeting, Invited Speaker, *Neuroimaging of Pain*. Las Vegas, NV, December 2011
24. University of California San Francisco Pain Group, Invited Speaker, *Pain & Neuroimaging*. San Francisco, CA, December 2011

2010

1. American Academy of Pain Medicine 26th Annual Meeting, Invited Speaker, *Mechanisms & Neuroplasticity of Pain: Clinical Implications*, San Antonio, TX, February 2010
2. American Academy of Pain Medicine 26th Annual Meeting, Invited Speaker, *Human Brain Activity Identifies The Presence or Absence of Pain*, San Antonio, TX, February 2010
3. American Academy of Pain Medicine 26th Annual Meeting, Invited Speaker, *The NIH Review Process*, San Antonio, TX, February 2010
4. American Academy of Pain Medicine 26th Annual Meeting, Symposium Chair, *Introduction to NIH Grants*, San Antonio, TX, February 2010

5. Stanford 23rd Annual Anesthesia Update, Invited Speaker, *The Perioperative Patient on Chronic Opioids*, Big Sky, MT, February 2010
6. Stanford 23rd Annual Anesthesia Update, Invited Speaker, *The Challenges of Complex Regional Pain Syndrome*, Big Sky, MT, February 2010
7. University of Pennsylvania, Invited Speaker, *Central Pain Systems: Lessons From Functional Neuroimaging*, Philadelphia, PA, March 2010
8. American Academy of Neurology 62nd Annual Meeting, Invited Speaker, *How Functional Neuroimaging Will Transform the Diagnosis and Treatment of Central Neuropathic Pain Conditions*, Toronto, April 2010
9. Spring Pain Research Conference, Invited Speaker, *Prefrontal Cortical Systems in Low Back Pain Versus Generalized Anxiety Disorders*, Grand Cayman, April 2010
10. American Pain Society 29th Annual Meeting, Invited Speaker, *Virtual Reality & Pain Management*, Baltimore, MD, May 2010
11. American Pain Society 29th Annual Meeting, Symposium Chair, *Mechanisms & Neuroplasticity of Pain: Clinical Implications*, Baltimore, MD, May 2010
12. Potomac Center for Medical Education Symposium, Invited Speaker, *Mechanisms & Neuroplasticity of Pain: Clinical Implications*, Baltimore, MD, May 2010
13. American Psychiatric Association 163rd Annual Meeting, Invited Speaker, *Overview of the Treatment of Acute and Chronic Pain in the Patient with a History of Addiction*, New Orleans, LA, May 2010
14. Washington State Pharmacists Association Annual Meeting, Invited Speaker, *Addressing Regional Needs in the Management of Chronic Pain: A Focus on Opioid Misuse, Abuse, and Diversion*, Coeur d'Alene, ID, June 2010
15. Western Pain Society Annual Meeting, Invited Speaker, *Functional Imaging of Pain*, Seattle, WA, June 2010
16. Neural Interfaces Conference Chronic Pain Symposium, Invited Speaker, *Functional Imaging of Pain*, Long Beach, CA, June 2010
17. Case Western University, Visiting Professor, Grand Rounds, *Windows into the Brain: Lessons Learned about Pain From Neuroimaging*, Cleveland, OH, July 2010
18. International Association for the Study of Pain 13th World Congress on Pain, Invited Speaker, *CRPS: Where Are We Today?*, Montreal, August 2010
19. Irish Pain Society 10th Annual Scientific Meeting, Invited Speaker, *Fibromyalgia: Is This A Brain Problem?*, Dublin, September 2010
20. Walter Reed Army Medical Center, Waging War On Pain: New Strategies to Improve Pain Care for Military & VA Personnel, Invited Speaker, *Neurobiology of Pain*, Washington, DC, September 2010
21. American Association of Neuromuscular & Electrodiagnostic Medicine 57th Annual Meeting, Invited Speaker, *Pain in the Central Nervous System: What Have We Learned from Neuroimaging*, Quebec City, October 2010
22. American Society of Anesthesiologists Annual Meeting, Invited Speaker, *When Acute Pain Becomes Chronic: Mechanisms, Prevention & Treatment*, San Diego, CA, October 2010
23. American Society of Anesthesiologists Annual Meeting, Invited Speaker, *What Are the Outcomes We Need to Measure in Pain Medicine?* San Diego, CA, October 2010
24. Texas Pain Society Annual Meeting, Invited Speaker, *fMRI: Brain Re-Mapping - The Pain, It is Plain, Is Mainly in the Brain?* Austin, TX, October 2010
25. American Society of Regional Anesthesia Annual Pain Meeting, Invited Speaker, *Opening Windows to the Brain: Lessons Learned from Neuroimaging of Pain*, San Antonio, TX, November 2010

26. American Society of Regional Anesthesia Annual Pain Meeting, Invited Speaker, *How I Treat Neuropathic Pain*, San Antonio, TX, November 2010
27. American Society of Regional Anesthesia Annual Pain Meeting, Invited Speaker, *Polypharmacy in the Pain Clinic*, San Antonio, TX, November 2010
28. North American Neuromodulation Society Annual Meeting, Invited Speaker, *Fibromyalgia: Is This A brain Problem?* Las Vegas, NV, December 2010
29. NIH Pain & Musculoskeletal Disorder: Translating Scientific Advances into Practice Symposium, Invited Speaker, *Functional Neuroimaging Techniques in Pain*, Bethesda, MD, December 2010

2009

1. American Academy of Pain Medicine Annual Meeting, Invited Speaker, *Functional Imaging in CRPS*, Honolulu, HI, January 2009
2. Yale University, Visiting Professor, Grand Rounds, New Haven, CT, February 2009
3. Stanford 22nd Annual Anesthesia Update, Invited Speaker, *Neuropathic Pain: Current*
4. *Mechanisms and Treatments*, Big Sky, MT, February 2009
5. Stanford 22nd Annual Anesthesia Update, Invited Speaker, *Abuse of Prescription Pain Meds*
6. *and How to Stay Out of Trouble While Prescribing Them*, Big Sky, MT, February 2009
7. Stanford 22nd Annual Anesthesia Update, Invited Speaker, *When Acute Pain Becomes Chronic*
– *What Do We Know and How Can We Prevent It?*, Big Sky, MT, February 2009
8. Society for Urodynamics and Female Urology Annual Meeting, Invited Panelist, *Cortical*
9. *Restructuring in Patients with Chronic Pain*, Las Vegas, NV, February 2009
10. Google Tech Talk Seminar Series, Invited Speaker, *The Strain in Pain Lies Mainly in the Brain*,
11. Mountain View, CA, March 2009
12. Western Pain Society Annual Meeting, Invited Speaker, *Functional Imaging of Pain*,
13. Englewood, CO, April 2009
14. American Pain Society 28th Annual Meeting, Invited Speaker, *Cognitive Aspects of Pain*, San
15. Diego, CA, May 2009
16. University of Pittsburgh, Visiting Professor, *The Strain in Pain Lies Mainly in the Brain: Lessons*
17. *Learned from Functional Neuroimaging*, Pittsburgh, PA, May 2009
18. National Institutes of Health, Invited Speaker, *The Strain in Pain Lies Mainly in the Brain: What*
19. *Have We Learned from the Neuroimaging of Pain?*, Bethesda, MD, May 2009
20. Integrative Pain Medicine Course, Invited Speaker, *Viewing the Brain in Pain through*
Neuroimaging: Understanding and Treating Neuropathic Pain, San Francisco, CA, July 2009
21. Southwestern Medical Center, Visiting Professor, Grand Rounds, Dallas, TX, September 2009
22. Annual Innovations in Pain Management Symposium, Invited Speaker, *Introduction to Pain Management*,
23. Palo Alto, CA, October 2009
23. University of California, Irvine, Visiting Professor, Grand Rounds, Irvine, CA, November 2009

24. 12th Annual International Conference on the Mechanisms & Treatment of Neuropathic Pain, Invited Speaker, *Brain Mechanisms of Neuropathic Pain*, San Francisco, CA, November 2009
25. American Society of Regional Anesthesia & Pain Medicine 2009 Annual Pain Meeting, Invited Speaker, *Can Imaging Identify Analgesics for Chronic Pain; Opioids: The Good, the Bad and the Ugly*, San Antonio, TX, November 2009
26. North American Neuromodulation Society 13th Annual Meeting, Invited Speaker, *Fibromyalgia – Is This a Brain Problem?; Functional Imaging of CRPS*, Las Vegas, NV, December 2009

2008

1. Neuroscience Institute at Stanford, Lecture for First Year Students, *The Strain in Pain Lies Mainly in the Brain*, Stanford, CA, January 2008
2. Stanford Neuroscience, Behavior & Cognition Journal Club, Stanford, CA, January 2008
3. Stanford Department of Anesthesia Senior Resident Lecture Series, *Acute Pain Management*, Stanford, CA, February 2008
4. Stanford Department of Neurology Resident Lecture Series, *Overview of Pain Systems and Management*, Stanford, CA, February 2008
5. Stanford University School of Medicine 21st Annual Anesthesia Update, Invited Speaker, *Update on Regional Anesthesia*, Big Sky, MT, February 2008
6. Stanford University School of Medicine 21st Annual Anesthesia Update, Invited Speaker, *Current Concepts in Perioperative Pain Management*, Big Sky, MT, February 2008
7. Stanford University School of Medicine 21st Annual Anesthesia Update, Invited Speaker, *The Strain in Pain Lies Mainly in the Brain*, Big Sky, MT, February 2008
8. Stanford University School of Medicine 21st Annual Anesthesia Update, Invited Speaker, *Opioids: The Good, the Bad, and the Ugly*, Big Sky, MT, February 2008
9. Stanford Department of Anesthesia, ANES 202 Anesthesiology & Pathophysiologic Implications for the Perioperative Patient, *Pain Management in the 21st Century*, Stanford, CA, February 2008
10. Stanford University School of Medicine, Med School 101 Lecture to High School Students, Stanford, CA, February 2008
11. Stanford Department of Anesthesia, Resident Journal Club, *Pain Management*, Stanford, CA, March 2008
12. Stanford Neuroscience, Behavior & Cognition Scholarly Concentration Journal Club, Stanford, CA April 2008
13. American Pain Society Annual Meeting, Invited Speaker, *Biofeedback: Past, Present and Future*, Tampa, FL, May 2008
14. Stanford Center for Education 2nd Annual Innovations with Pain Management Course, Invited Speaker, *Introduction and Overview of Pain Management*, Palo Alto, CA, August 2008
15. Stanford Center for Education 2nd Annual Innovations with Pain Management Course, Invited Speaker, *Current Research/Future Trends*, Palo Alto, CA, August 2008
16. International Association for the Study of Pain 12th World Congress on Pain, Invited Speaker, Pain Info Exchange Symposium, *What Neuroimaging Reveals About Pain*, Glasgow, August 2008
17. 12th Congress of the European Federation of Neurological Sciences, Invited Speaker, Pain Info Exchange Symposium, *Illuminating our Understanding of Pain*, Madrid, August 2008

18. University of California San Diego, Visiting Professor, *The Strain in Pain Lies Mainly in the Brain*, San Diego, CA, September 2008
19. University of California San Diego, Visiting Professor, *Cortical Changes in Neuropathic Pain*, San Diego, CA, September 2008
20. Massachusetts General Hospital, Visiting Professor, Grand Rounds, Boston, MA, September 2008
21. Stanford Hospital & Clinics CME 3rd Annual Focus on Complex Care for Case Managers, Invited Speaker, *Pain Management*, Stanford, CA, September 2008
22. Stanford Hospital & Clinics Community Lecture Series, Invited Speaker, *The Strain in Pain Lies Mainly in the Brain*, Stanford, CA, September 2008
23. Stanford University Sleep Grand Rounds, Invited Speaker, *The Strain in Pain Lies Mainly in the Brain: Lessons Learned Through Neuroimaging*, Stanford, CA, September 2008
24. California Society of Physical Medicine & Rehabilitation, Invited Speaker, *Fibromyalgia: From Mechanisms to Treatment*, San Jose, CA, October 2008
25. Stanford Health Library Community Lecture, Invited Speaker, *The Strain in Pain Lies Mainly in the Brain: Lessons Learned Through Neuroimaging*, Stanford, CA, October 2008
26. Stanford University Sleep Clinic, Grand Rounds, *The Strain in Pain Lies Mainly in the Brain: Lessons Learned Through Neuroimaging*, Stanford, CA, October 2008
27. American Society of Anesthesiologists Annual Meeting, Invited Speaker, *Evaluating Outcomes in Pain Medicine*, Orlando, FL, October 2008
28. American Society of Anesthesiologists Annual Meeting, Forum Moderator, How Do I Treat Neuropathic Pain and Complex Regional Pain Syndrome, Orlando, FL, October 2008
29. Science Writers New Horizons in Science Conference, Invited Speaker, *The Strain in Pain Lies Mainly in the Brain*, Stanford, CA, October 2008
30. Wake Forest University Advances in Physiology and Pharmacology in Anesthesia and Critical Care, Invited Speaker, *Brain Imaging and Pain Perception*, Sulphur Springs, WV, November 2008
31. Stanford Center for Law & The Biosciences, Neuroimaging, Pain & The Law Conference, Invited Speaker, *The Neuroscience of Pain*, Stanford, CA, December 2008
32. North American Neuromodulation Society Annual Meeting, Invited Speaker, *Neural Circuits of Pain*, Las Vegas, NV, December 2008
33. North American Neuromodulation Society Annual Meeting, Invited Speaker, *Clinical Trial Designs*, Las Vegas, NV, December 2008

2007

1. University of Washington, 25th Annual Bonica Visiting Professor, *Changing Pain in the Brain*, Seattle, WA, March 2007
2. Emory University, *Pain and the Brain – What has Neuroimaging Taught Us?*, Steamboat Springs, CO, February 2007
3. Emory University, *Neuropathic Pain*, Steamboat Springs, CO, February 2007
4. Emory University, *Current Concepts in Perioperative Pain Management*, Steamboat Springs, CO, February 2007
5. Emory University, *New Ideas for Regional Anesthesia in Extremity*, Steamboat Springs, CO, February 2007

6. American Academy of Pain Medicine Annual Meeting, Invited Speaker, *Neuroimaging of the Brain: Changes Due to CRPS*, New Orleans, LA, February 2007
7. Santa Clara Valley Medical Center, Neuroscience Grand Rounds, *The Strain in Pain Lies Mainly in the Brain*, San Jose, CA, March 2007
8. National Institutes of Health, Invited Speaker, *Emotional and Cognitive Factors in Pain*, Bethesda, MD, April 2007
9. American Pain Society Annual Meeting, Invited Speaker, *Opening Windows Into the Brain: Advances in Neuroimaging of Pain*, Washington, DC, May 2007
10. Marin Pain Consortium, Invited Speaker, *Pain and the Brain – What Have We Learned from Neuroimaging?*, Mill Valley, CA, May 2007
11. Juvenile/Adolescent CRPS Consensus Conference, Invited Speaker, *fMRI Imaging CRPS in Adults*, Stanford, CA, May 2007
12. National Marfan Foundation National Conference, Invited Speaker, *Adult Pain Management*, Stanford, CA July 2007
13. Stanford Department of Anesthesia Grand Rounds, *Changing Pain in the Brain*, Stanford, CA, August 2007
14. Stanford Reunion Homecoming, Classes Without Quizzes, *The Strain in Pain Lies Mainly in the Brain*, Stanford, CA, October 2007
15. American Society of Anesthesiologists Annual Meeting, Invited Speaker, *Evaluating Outcomes in Pain Medicine*, San Francisco, CA, October 2007
16. American Society of Anesthesiologists Annual Meeting, Invited Speaker, *Cervicogenic Headache: More Than Just a Pain in the Neck*, San Francisco, CA, October 2007
17. Johns Hopkins University School of Medicine, *Cases and Conversations: A Fibromyalgia Workshop*, Marina del Rey, CA, October 2007
18. IASP 10th International Conference on the Mechanisms & Treatment of Neuropathic Pain, Invited Speaker, *Mechanisms and Treatment of Chronic Low Back Pain*, Salt Lake City, UT, November 2007
19. Stanford Department of Neurosurgery Grand Rounds, *Pain and the Brain: What Has Neuroimaging Taught Us?*, Stanford, CA, November 2007
20. Lockheed Martin Palo Alto Colloquium, Invited Speaker, *The Strain in Pain Lies Mainly in the Brain*, Palo Alto, CA, November 2007

2006

1. American Academy of Pain Management National Conference, *Functional Neuroimaging of Pain*, San Diego, CA, January, 2006
2. UCSF Pain Symposium, Invited Speaker, *Psychopharmacology of Pain Management*, San Francisco, CA, January, 2006
3. San Jose Regional Medical Center, Grand Rounds, *Neuropathic Pain*, San Jose, CA, January, 2006
4. Stanford Internal Medicine Department, Grand Rounds, *Pain and the Brain – What has Neuroimaging Taught Us?*, Stanford, CA, March 2006
5. American Society of Pain Educators, CME, *Pain Mechanisms: The Basis for Optimizing Outcomes*, Los Angeles, CA, May, 2006
6. Good Samaritan Hospital, Grand Rounds, *Neuropathic Pain*, San Jose, CA, May, 2006

7. American Pain Society Meeting, Invited Speaker, *Pain and the Brain: What Has Neuroimaging Taught Us?* Talk broadcast nationally to 4,000 physicians, San Antonio, TX, May, 2006
8. American Pain Society Meeting, Invited Speaker, *Prevalence and Pathophysiology of Chronic Pain*, San Antonio, TX, May 2006
9. California Society of Industrial Medicine Annual Meeting, *The Strain in Pain Lies Mainly in the Brain*, Lake Tahoe, NV, June 2006
10. Los Gatos Community Hospital, Grand Rounds, *Multidisciplinary Pain Management*, Los Gatos, CA, August 2006
11. American Association Physicians Indian Origin, Guest Speaker, *What has Neuroimaging Taught us About Pain and the Brain?* Newark, CA, August 2006
12. Swedish Hospital Annual Pain Management Symposium, Invited Speaker, *Pain and the Brain – Functional Studies and Potential New Therapies*, Seattle, WA, September 2006
13. UCSF Pain Group, Invited Speaker, *Neuroimaging and Pain: Results from the Spinal Cord to the Brain*, San Francisco, CA, September 2006
14. American Society of Anesthesiologists Annual Meeting – Refresher Course, Outcomes in Pain Management, Chicago, October 2006
15. Johns Hopkins, Visiting Professorship, *Pain and the Brain – What has Neuroimaging Taught Us?*, Baltimore, MD, October, 2006
16. American Society of Pain Educators, CME, *Pain Mechanisms: The Basis for Optimizing Outcomes*, Palo Alto, CA, November 2006
17. American Society of Regional Anesthesia and Pain Medicine Annual Meeting, *Neuroimaging of Pain*, San Francisco, CA, November 2006
18. North American Neuromodulation Society Annual Meeting, *Functional Brain Imaging: Neural Circuitry of Pain, Movement Disorders, and Psychiatric Disorders*, Las Vegas, NV, December 2006
19. Stanford Department of Otolaryngology/Head and Neck Surgery, Grand Rounds, *Pain and the Brain: Insights through Neuroimaging*, Palo Alto, CA, December 2006

2005

1. Stanford Department of Orthopedics, Division of Hand Surgery, Invited Speaker, *Complex Regional Pain Syndrome*, January 2005
2. UCSF Memory and Aging Group, Grand Rounds, *The Strain in Pain is Felt Mainly in the Brain – The Imaging of Pain Processing*, January 2005
3. Stanford Department of Anesthesia/Medical College of Wisconsin Annual Anesthesia Meeting, Invited Speaker, *Current Concepts in Perioperative Pain Management*, Copper Mountain, Colorado, February 2005
4. Stanford Department of Anesthesia/Medical College of Wisconsin Annual Anesthesia Meeting, Invited Speaker, *New Ideas in Regional Anesthesia for Extremity Surgery*, Copper Mountain, Colorado, February 2005
5. Stanford Department of Anesthesia, Grand Rounds, *Chronic Pain Management – An Overview and Update on Multidisciplinary Treatment*, March 2005
6. Pain Management CME Lecture, *Chronic Pain Management – Focus on Multidisciplinary Treatment and Opiates*, Hayward CA, April, 2005
7. Northern California Orthopedics Association Annual Meeting, Invited Speaker, *Current Concepts in Perioperative Management for the Orthopedic Surgeon*, Aptos, CA, May 2005

8. Association for University Anesthesiologists, *Control of Brain Activation and Pain Perception Through Real-Time fMRI Feedback*, Baltimore, MD, May 2005
9. Kaiser Annual Pain Management Symposium, *Chronic Pain Management: A Focus on Multidisciplinary Treatment and Opiates*, Stockton, CA June 2005
10. Stanford Department of Surgery, Invited Speaker, *Perioperative Pain Management*, Stanford CA, August 2005
11. American Society of Pain Educators Annual Meeting, Keynote Speaker, *Pain: A Focus on Central Sensitization*, August 2005
12. Stanford Pain and Palliative Care Conference, Invited Speaker, *Pain Clinic Referrals and Outpatient Interventions*, Stanford, CA, September 2005
13. Swedish Hospital Annual Pain Management Symposium, Invited Speaker, *Opiates – The Good, The Bad and The Really Ugly*, September 2005
14. American College of Surgeons Annual Conference, Invited Speaker, *Perioperative Pain in the Anticoagulated Patient*, San Francisco, CA, October 2005
15. Stanford Neurology Grand Rounds, *Functional Neuroimaging of Pain*, Stanford, CA, October, 2005
16. American Society of Regional Anesthesia and Pain Medicine, Invited Speaker, *Outcomes in Pain Management*, Miami, FL, November 2005
17. American Medical Association Science Writers Conference, Featured Speaker, *Improving Quality of Life when Battling Diabetic Peripheral Neuropathy*, Washington, DC, November 2005

2004

1. Stanford University Neurosciences Institute, Invited Speaker – Meet the Press, *Chronic Pain – Seeking a Solution in the 21st Century*, March 2004
2. American Academy of Orthopedic Surgeons Annual Meeting, Invited Speaker, *Chronic Pain Management – Focus on Opiates*, San Francisco, CA, March 2004
3. Oregon Health Sciences Center, Grand Rounds, *The Imaging of Pain Processing*, Portland, OR, April 2004
4. Stanford Department of OB/GYN, Grand Rounds, *Perioperative Pain Management*, April 2004
5. University of Wisconsin, Visiting Professorship, Madison WI, April 2004
6. *Chronic Pain Management – Focus on Interdisciplinary Treatment and Opiates*
7. *The Strain in Pain is Felt Mainly in the Brain – The Imaging of Pain Processing*
8. American Pain Society Meeting, Invited Speaker – Psychosocial Data Blitz, *Augmented Control of Brain Activity and Pain Through Real Time fMRI Feedback*, Vancouver, Canada, May 2004
9. Marin General Hospital Pain Management Symposium, Invited Speaker, *Chronic Pain Management – Focus on Multidisciplinary Treatment and Opiates*, Marin, CA, May 2004
10. Stanford Annual Physical Therapy Conference, *Complex Regional Pain Syndrome*, May 2004
11. Santa Clara Valley Medical Center Department of Urology, Grand Rounds, *Perioperative Pain Management for the Urologic Surgeon*, San Jose, CA May 2004
12. Emory University Department of Anesthesia, Visiting Professor, May 2004
13. *Current Concepts in Perioperative Pain Management*
14. *The Strain in Pain is Felt Mainly in the Brain – The Imaging of Pain Processing*

15. Invited Speaker, Functional imaging and the neural systems of chronic pain
16. , Atlanta Georgia, May 2004
17. California Society of Industrial Medicine, Invited Speaker, Chronic Pain Management – Focus on Multidisciplinary Treatment and Opiates, San Diego, CA June 2004
18. University of Utah Pain Management, Grand Rounds, *An Update on Neuroimaging of Pain*, Salt Lake City, Utah, September 2004
19. Latter Day Saints Hospital, Invited Speaker, *Chronic Pain Management – Focus on Coxibs and Opiates*, Salt Lake City, Utah, September 2004
20. Bay Area Podiatry Association, Invited Speaker, *Perioperative Pain Management*, Los Gatos, CA, September 2004
21. Stanford University Community Lecture Series, *Pain in the Brain: Novel Treatments Made Possible by Neuroimaging*, November 2004

2003

1. University of Utah Pain Management Center, *Functional Neuroimaging of Pain Processing*, Grand Rounds, Salt Lake City, UT, February 2003
2. McKay General Hospital, Grand Rounds, *Current Concepts in Chronic Pain Management*, Utah, February 2003
3. Stanford Brain Research Center, Invited Speaker, *The Imaging of Pain Processing – Future Directions in Pain Research*, Stanford, CA, March 2003
4. California Society of Industrial Medicine, Invited Speaker, *Management of Chronic Pain – Focus on Opiates*, July 2003
5. John Muir Hospital, Grand Rounds, *The Strain in Pain Lies Mainly in the Brain – Insights into Chronic Pain through Functional Neuroimaging*, August 2003
6. American College of Rheumatology (ACR) Annual Meeting, Invited Speaker for Advances in Rheumatology Symposium, *Mechanisms of Inflammatory Pain*, Orlando, Florida, November 2003
7. Marin General Hospital Annual Pain Symposium, Invited Speaker, Multimodal Perioperative Pain Management, December 2003

2002

1. Education for Physicians on End-of-life Care, Invited Speaker, *Management of Chronic Pain*, San Mateo, California, January 2002
2. Mercy San Juan Hospital, Grand Rounds, *Management of Patients in Acute Pain*, Mercy, California, January 2002
3. Pain Management Symposium, *Perioperative Management of Pain*, Sacramento, California, January 2002
4. American Academy of Pain Medicine (AAPM) Annual Meeting, Invited Speaker, *Acute Pain Management*, February 2002
5. Stanford Department of Anesthesia, Grand Rounds, *Advanced Imaging Techniques for Pain Research*, March 2002
6. Education for Physicians on End-of-life Care, Invited Speaker, *Current Concepts in Chronic Pain Management*, San Mateo, California, March 2002

7. Société Internationale de Chirurgie Orthopédique et de Traumatologie (SICOT), Keynote Speaker *Perspectives in Pain for the Orthopaedic Surgeon – Optimizing the Management of Surgical Pain : Recent Advances and Current Trends*, San Diego, CA, August 2002
8. Swedish Medical Center Annual Medical Meeting, Invited Speaker, *The Strain in Pain Lies Mainly in the Brain: The Imaging of Pain Processing*, Seattle, WA, 2002
9. New York Post Graduate Assembly (PGA) Annual Anesthesia Meeting, *Perioperative Pain: Novel Approaches to Management*, New York, NY, December 2002

2001

1. Stanford University Department of Urology, Grand Rounds, *Perioperative Pain Management of the Urologic Patient*, January 2001
2. Travis Air Force Base, January 2001
3. Department of Surgery, Grand Rounds, *Current Concepts in Perioperative Pain Management*
Department of Orthopedic Surgery, Invited Speaker, *Acute Pain Management for Orthopedic Patients*
4. Department of Anesthesiology, Invited Speaker, *Multimodality Perioperative Pain Management*
5. Stanford University Department of Internal Medicine, *Current Concepts in Chronic Pain Management*, March 2001
6. Palo Alto VA Hospital Department of Internal Medicine, *Multidisciplinary Chronic Pain Management*, April 2001
7. Pain Management Symposium, *Perioperative Orthopedic Pain Management*, Lake Tahoe, Nevada, March 2001
8. Queens Medical Center Department of Obstetrics and Gynecology, Grand Rounds, *Multimodality Perioperative Pain Management*, Hawaii, April 2001
9. Stanford University Annual Hand Physical Therapy Symposium, Invited Speaker, *Management of the Patient with Complex Regional Pain Syndrome*, Stanford, California, June 2001
10. Pain Symposium, *Current Concepts in Perioperative Pain Management*, Stockton, California, July 2001
11. Pain Management Symposium, *Multimodality Perioperative Pain Management*, Modesto, California, July 2001
12. San Mateo Medical Center, Grand Rounds, *Current Strategies in Acute Pain Management*, July 2001
13. Kern Hospital Department of Anesthesiology Grand Rounds, *Perioperative Pain Management Techniques*, August 2001
14. Pain Symposium, Multimodality Acute Pain Management, Walnut Creek, California, September 2001
15. Stanford University Annual Hand Physical Therapy Symposium, Invited Speaker, *Management of Patients with Complex Regional Pain Syndrome*, Stanford, California, October 2001
16. Tacoma Valley Medical Center, Grand Rounds, *Current Concepts in Perioperative Pain Management*, Tacoma, Washington, October 2001
17. Pain Management Symposium, *Acute Pain Management*, Tacoma, Washington, October 2001
18. Pain Management Symposium, *Mechanistic Approach to Neuropathic Pain Management*, Oakland California, November 2001
19. Santa Clara County Medical Center, Grand Rounds, *Current Strategies in Perioperative Pain Management*, Santa Clara, California, November 2001

20. American College of Rheumatology (ACR) Annual Meeting, Invited Speaker for Advances in Rheumatology Symposium, *Perioperative Pain Management*, San Francisco, California, November 2001
21. Stanford University Pain Management Symposium, Stanford, California, December 2001 *Acute Pain Management Physiology of Pain*

2000

1. Continuing Medical Education, Invited Speaker, *Management of Pain Using NSAIDs and Cox-2 Inhibitors*, Menlo Park, CA April 2000
2. Stanford University Annual Hand Physical Therapy Symposium, Invited Speaker, *Complex Regional Pain Syndrome*, Stanford, California, June 2000
3. Oregon Health Sciences Center, Invited Speaker, *Management of Acute Pain*, Portland Oregon, September 2000
4. Spokane Washington VA Medical Center, Invited Speaker, *Management of Acute and Chronic Pain*, Spokane, Washington, September 2000
5. Stanford University Department of Neurosurgery, Grand Rounds, *Current Concepts in Acute Pain Management*, October 2000
6. UC Davis Department of Orthopedics, Grand Rounds, *Management of Acute Pain in Orthopedic Patients*, Davis, California, November 2000
7. UC Davis Department of Physical Medicine and Rehabilitation, Invited Speaker, *Physiology and Pharmacology of Pain Management*, Davis, California, November 2000
8. UC Davis Department of Anesthesiology, Invited Speaker, Division of Pain Management, *Multimodality Acute Pain Management*, Davis, California, November 2000
9. Pain Management Symposium, Invited Speaker, *New Concepts in the Management of Acute Pain*, Los Gatos, California, December 2000
10. Stanford University Department of Orthopedics Annual Research Forum, Keynote Speaker, *Multimodality Pain Management and Rehabilitation in Orthopedic Patients*, December 2000
11. Continuing Medical Education, Invited Speaker, *Current Concepts in the Management of Acute Pain*, San Francisco, California, December 2000

1991-1997

1. Arizona Health Sciences Center Student Research Forum, *An Automated Data Analysis and Collection System for Measuring Isolated Atrial Contractility*, May 1991 (Second Prize, 11th Annual Medical Student Research Forum, 1991)
2. American Federation for Clinical Research Western Regional Conference, *An Automated Data Analysis and Collection System for Measuring Isolated Atrial Contractility* Carmel, CA, February 1992
3. American Federation for Clinical Research National Conference, *An Automated Data Analysis and Collection System for Measuring Isolated Atrial Contractility* Baltimore, MA, May 1992
4. Arizona Health Sciences Center Student Research Forum, Featured Speaker, *Characterization and Optimization of Radiofrequency Catheter Ablation for the Treatment of Cardiac Arrhythmias*, May 1992
5. American Heart Association National Conference, *Delivery of Radiofrequency Energy to All Four Poles of a Catheter Increases Lesion Size*, New Orleans, Louisiana, October 1992

6. Yuma Friends of Arizona Health Sciences Center, Keynote Speaker, *Radiofrequency Catheter Ablation as a New Treatment for Cardiac Arrhythmias*, March 1993
7. American Heart Association National Conference, *RF Power Losses in the Energy Delivery System During Ablation*, Atlanta, Georgia, November 1993
8. American Heart Association National Conference, *Frequency Dependent Impedance Measurements: An Indicator of Catheter Contact*, Atlanta, Georgia, November 1993
9. Arizona Health Sciences Center Student Research Forum, *A Thermodynamic Model of Radiofrequency Catheter Ablation for the Treatment of Cardiac Arrhythmias*, May 1994 (First Prize, 14th Annual Medical Student Research Forum, 1994)
10. Pacing and Cardiac Electrophysiology National Conference, *Tip Temperature is not an Indicator of Myocardial Temperature*, Boston, March, 1995
11. Western Anesthesia Residents Conference, *Choosing a DLT: Is There a Racial Difference in Airway Size?*, Universal City, California, April 1997
12. Western Anesthesia Residents Conference, *Magnetic Resonance Therapy Guided Stellate Ganglion Block*, April 1997 (Finalist)
13. American Society of Anesthesiologists, *Choice and Placement of DLTs in Asian Patients*, October, 1997
14. Bard, Electrophysiology Division, *New Directions in Radiofrequency Catheter Ablation* Billerica, MA, October 1997
15. California Society of Anesthesiologists, *Magnetic Resonance Therapy Guided Stellate Ganglion Block*, San Francisco, CA June 1998
16. Mackey, S., Sze, D., Gaeta, R., *Magnetic Resonance Therapy Guided Regional Blockade for Pain Management* American Society of Anesthesiologists, October 1999

TEACHING ACTIVITIES

2011-2018	Medical School Course	Neurobiology NEN 206; Somatosensation and Pain
2011-2016	Medical School Course	Human Health & Disease 223; Opioids 1 & 2
2009, 2011-2016	Medical School Course	Human Health & Disease 223; Local Anesthetics
2009-2015	Medical School Course	Anesthesia 202; Pain Management in the 21 st Century
2007, 2011-2016	Medical School Course	Neurobiology of Disease NEN 205; Neurobiology of Pain
2006	Class	Human Biology 100; Pain & the Brain
2006	Class	Psychology 202; Cognitive Neuroscience; Functional Neuroimaging of Pain
2006	Medical School Course	Spinal Cord. Neurosciences Lab

2004-Present	Fellowship	Post-Doctoral Research
2003-2011	Fellowship	Graduate Students
2003-2005	Class	Resident Refresher Course. Dept. of Anesthesia
2002-2005	Class	Upper Extremity Regional Blocks
2002		Department of Anesthesia; Stanford School of Medicine, Call Committee
2002	Class	Chronic Pain Management
2001-2002	Class	Pharmacology for Pain Management-Neuropathic Agents. Dept. of Physical Medicine and Rehabilitation
2000- Present	Medical School Course	Anesthesia Medical Student Clerkship #304A; Acute Pain
2000- Present	Class	IASP Pain Management Fellow Lecture Series
2000-2013	Fellowship	Faculty, Pain Management Fellowship
2000-2006	Fellowship	Founder & Director, Regional Anesthesia Program, Department of Anesthesiology
2000-2005	Class	Lower Extremity Regional Blockade
2000	Class	Current Concepts in Acute Pain Management
2000	Class	Current Concepts in Acute Pain Management. Dept. of General Surgery
2000	Class	Lumbar Sympathetic Blockade-A Review
1999-2006	Class	Annual Regional Anesthesia Workshop
1999-2000	Class	Complex Regional Pain Syndrome

1999	Class	Outcomes in Spinal Cord Stimulation
COMMITTEES		
2017	Panelist at Workshop – Advancing Therapeutic Development for Pain and Opioid Use Disorders through Public-Private Partnerships	National Academies of Sciences, Engineering, and Medicine, (NASEM) / NIH
2017, 2018	Board Member	Association of Pain Program Directors (APPD)
2017	Member	American Society of Anesthesiologists Committee on Research (ASA)
2017	Oversight Committee	Analgesic, Anesthetic, and Addiction Clinical Trial Translations, Innovations, Opportunities, and Networks (ACTION)
2017	Committee Member	National Academy of Medicine, Marshaling Physician Leadership to Counter the Opioid Epidemic
2016-2017	Working Group Member to add Pain questions to National Health Interview Survey	Centers for Disease Control and Prevention (CDC)
2016	Testimony to Senate Special Committee on Aging – Pain and Opioids	National Academy of Medicine
2015-2016	Immediate Past-President	American Academy of Pain Medicine
2014-2015	President	American Academy of Pain Medicine
2014-2016	Member	NIH Healthy People 2020 Chronic Pain Workgroup
2014	Member	Healthy People 2020 Pain Task Force
2013	Chair	Department of Anesthesia; Stanford School of Medicine, Faculty & Development and Mentoring Committee

2013-Present	Member	National Comprehensive Cancer Network, Adult Cancer Pain Committee
2013-2016	Co-Chair	Prevention and Care Working Group; National Pain Strategy Task Force NPSTF
2012-Present	Member	Department of Anesthesia; Stanford School of Medicine, Finance Committee
2012-2013	Member	NIH Pain Consortium Chronic Low Back Pain Research Task Force
2012-2013	Member	NIH Interagency Pain Research Coordinating Committee
2012-2016	Co-Chair	Oversight Committee; National Pain Strategy Task Force NPSTF
2012	Co-Chair	American Academy of Pain Medicine Annual Meeting
2012	Member	FDA Chronic Pain Workshop
2011-2013	Vice President Scientific Affairs	American Academy of Pain Medicine
2010-2011	Committee Member & Author	IOM (Institute of Medicine) 2011 Committee on Advancing Pain Research, Care, and Education
2009-Present	Member	American Academy of Pain Medicine CME Oversight Committee
2009-Present	Member	American Academy of Pain Research Committee
2009-2015	Member	American Academy of Pain Medicine Executive Committee
2009-2011	Member	American Pain Society Nominating Committee
2008-2015	Director at Large	American Academy of Pain Medicine
2008-Present	Member	Department of Anesthesia; Stanford School of Medicine,

		Appointments & Promotions Committee
2008-Present		Association of Pain Program Directors
2008-2009		California Neuropathy Task Force
2008	Board of Directors	International Association of Pain Clinic Guidelines Taskforce
2007-Present		California Department of Workers Compensation
2007-Present		American Society of Anesthesiology Pain Directors
2007-Present		American Society of Anesthesiology Pain Committee
2007		NHLBI Workshop on Sickle Cell Disease Sub-Committee on Pain
2005-Present		Department of Anesthesia; Stanford School of Medicine, Research Committee
2005-2012		Stanford University, American Society of Anesthesiology; Continuing Education
2005-2008		Stanford University, Electronic Medical Record Committee
2005-2006		Stanford University, Clinical Commitment Committee
2004-Present		Stanford University, Neuroscience Committee
2004-2005		Stanford University, Deep Venous Thrombosis Committee
2003-Present		Department of Anesthesia; Stanford School of Medicine, Governance Committee
2003-2010		Stanford University, Medical School Committee

2002		Department of Anesthesia; Stanford School of Medicine, Call Committee
2000		Department of Anesthesia; Stanford School of Medicine, Incentive Committee
1999-Present		Department of Anesthesia; Stanford School of Medicine, Residency Selection Committee
1999-2006		Department of Anesthesia; Stanford School of Medicine, Information Technology Committee
1997-1998		Stanford University Medical Center; General Medical Education Committee
1996-1998		Department of Anesthesia; Stanford School of Medicine, Education Committee
1992-1994	Founding Member	University of Arizona, MD/PhD Committee

MEMBERSHIPS

American Society of Anesthesiologists
 American Pain Society
 American Society of Regional Anesthesia and Pain Medicine
 American Academy of Pain Medicine
 National Academy of Medicine
 International Association for the Study of Pain
 International Anesthesia Research Society
 California Society of Anesthesiologists
 Institute of Electrical and Electronic Engineers
 Eta Kappa Nu (Electrical Engineering Honor Society – Founder Univ Arizona Chapter)
 Society for Neuroscience

LICENSES

Diplomat - Pain Medicine Subspecialty, American Board of Anesthesiologists 2000, Recertified 2010
 Diplomat of American Board of Anesthesiologists 1999, Recertified 2009
 California Medical License A055270
 DEA BM4962848
 ACLS Certification 2009

LANGUAGES

Computer Languages: C, Visual Basic, Pascal, FORTRAN

Web Sites Developed and Administered

<http://paincenter.stanford.edu/> - Developed and maintain Stanford Pain Management Center Web Site

<http://snapl.stanford.edu/> - Developed and maintain Stanford Systems Neuroscience & Pain Lab Web Site

<http://anesthesia.stanford.edu/> - Developed and maintain an internal Stanford Department of Anesthesia web site focused on resident, faculty, and staff education

<http://anesthesia.stanford.edu/regionalanesthesia> - Developed and maintain internal Stanford site focused on the principles and practices of regional anesthesia

PUBLIC & PROFESSIONAL SERVICES

1997-2000	Board of Medical Directors	Interplast
1991-1993	Co-Founder & President, University of Arizona	MD/PhD Club, College of Medicine
1987-1993	Founding Member, University of Arizona	Etta Kappa Nu, Electrical Honor Society

OTHER EMPLOYMENT AND CONSULTING

Member - Board of Directors, Acoustic Technologies Inc., 1997-2006.

A company whose goal is to bring medical technologies to market and provide an environment to pursue innovative research.

Project Leader/Consultant to IREF Inc., San Francisco, CA., 1996 – 1998. Co-investigator with Dr. Christina Mora-Mangono on project to develop multimodality neurological monitoring system. Development of a system will to study the effects of cardiac surgery and anesthesia on neurologic and psychiatric outcomes in patients. Supervise engineers, manage budget, coordinate purchasing, conduct experiments, analyze and prepare data for publication.

Owner and Founder - Altech Consultants, Sunnyvale, California, 1987-Present Operate an engineering consulting company specializing in medical electronics, computer systems and their integration to medical instrumentation. Designed hardware and software, operated day to day business including accounting, subcontracted work, negotiated with clients, delegated assignments, developed consulting plans.

Principal Investigator/Consultant to C.R. Bard Inc., 1987 - 1998. Directed several projects using radiofrequency catheter ablation to treat cardiac arrhythmias at the Department of Internal Medicine, Section of Cardiology, Tucson, Arizona. Work focused on the treatment and cure of atrial fibrillation. These projects include determining optimal delivery parameters for delivery of radiofrequency energy, computer modeling of ablation energy and its effect on the myocardium, characterizing energy losses in delivery system, and determining temperatures within myocardium during ablation. Write protocols, obtain grants, manage budget, coordinate purchasing, coordinate and supervise multiple studies, supervise engineers and medical students, conduct experiments, analyze and prepare data for publication and presentation at national conferences.

Research Assistant/Electrical Engineer - University Medical Center - Department of Anesthesiology, Tucson, Arizona. 1987-93. Designed and built automated system to measure contractility effects of anesthetic agents

on guinea pig heart tissue *in vitro*. Assisted with anesthesia, delivery and monitoring during bovine artificial heart (Jarvik 7) replacement.

Research Associate/Biomedical Engineer - PhiladelphiaVA Hospital, Department of Pulmonary Medicine, Philadelphia, Pennsylvania. 1985-86.

Principal Investigator - Designed automated system to determine thoracoabdominal configuration in patients with COPD.

Co-investigator - Designed protocol and implemented study to determine optimal flow parameters in jet nebulizers delivering bronchodilator agents to patients with COPD.

Research Engineer/Technician - La Jolla Technology, La Jolla, California, 1985. Performed feasibility study on electrical stimulation for soft tissue healing. Initiated design and development of microprocessor-based muscle stimulator/TENS. Assisted development of devices to promote osteogenesis in non-unions through the use of electrical stimulation. Conducted experiments for the University Of Pennsylvania Orthopedic Research Department to test these devices.

VOLUNTEER ACTIVITIES

1997	Thailand	Volunteer Trips
1989, 2009-2011	Chicago, Illinois	American Pain Society
1988-1993	Tucson, Arizona	University Medical Center, Section of Cardiology
1987-1991	Tucson, Arizona	University Medical Center, Department of Anesthesiology
1985-1986	Philadelphia, Pennsylvania	VA Hospital, Department of Pulmonary Medicine