

January 1, 2016

## CURRICULUM VITAE

**Name:** Michael M. Haglund, M.D., Ph.D., FAANS, FCS (ECSA)

**Address:** Distinguished Professor of Neurosurgery, Neurobiology,  
and Global Health with Tenure,  
Vice Chair Education, Department of Neurosurgery,  
Program and Training Director, Duke Neurosurgery,  
Co-Director, Ugandan Neurosurgery Training Program  
Surgical Director, Duke Epilepsy Center  
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### **Education:**

1980 B.S.	Pacific Lutheran University (magna cum laude) Tacoma, Washington (Chemistry)
1987 M.D.	University of Washington School of Medicine (with Honors), Seattle, Washington.
1988 Ph.D.	Physiology and Biophysics, University of Washington, Seattle, Washington.
2016 MACM	University of Southern California, Masters in Academic Medicine (Education), in progress, graduation on track for Summer 2016.

### **Academic Training:**

1981-83	Medical Student Research Trainee, Neurological Surgery, University of Washington
1983-88	Medical Scientist, Predoctoral Trainee, Department of Physiology and Biophysics, University of Washington, (Philip A. Schwartzkroin, PhD)

- 1987, June Visiting Scientist, Department of Physiology, University of Calgary, Alberta, Canada
- 1987-88 General Surgery Internship, University of Washington Affiliated Hospitals, Seattle, Washington
- 1988-92 Resident Physician, Department of Neurological Surgery, University of Washington Hospitals, Seattle, Washington
- 1988, 1990 Research Fellow in Neurobiology, Harvard Medical School, Boston, Massachusetts (Gary G. Blasdel, PhD, Visual Neuroscience Group led by David Hubel, MD)
- 1989-90 American Epilepsy Society, William Lennox Fellow
- 1989-90 Grass Foundation, Robert S. Morison Fellow
- 1990-92 American Association of Neurological Surgeons Research Foundation Fellow
- 1992-94 Klingenstein Fellow in the Neurosciences, Department of Neurobiology, Harvard Medical School, Boston, MA
- 1992-93 Senior Registrar, Atkinson Morley's Hospital, St. Georges Medical School, Wimbledon, London, England
- 1993-1994 Chief Resident, Department of Neurological Surgery, University of Washington, Seattle, Washington
- 1994-1995 Acting Instructor, Department of Neurological Surgery, University of Washington, Seattle, Washington
- 1995 Senior Epilepsy Surgery Fellow, Department of Neurological Surgery, University of Washington, Seattle, Washington (George A. Ojemann, MD)
- 1995-Dec 1996 Assistant Professor of Neurosurgery and Neurobiology, Duke University Medical School, Durham, North Carolina

Dec 1996-2005	Associate Professor of Neurosurgery and Neurobiology, Duke University Medical School, Durham, North Carolina
July 2002-present	Surgical Director, Duke Epilepsy Center, Duke University Medical Center
August 2005-2008	Associate Professor of Neurosurgery and Neurobiology with Tenure
Dec 2008-May 2011	Professor of Neurosurgery and Neurobiology with Tenure
May 2011-	Professor of Neurosurgery, Neurobiology, and Global Health with Tenure
December 2012-	Honorary Fellow of the College of Surgeons of Southern, Eastern, Central Africa, Fellowship Examiner (COSECSA)
July 2013-	Distinguished Endowed Professorship, Duke Surgery Professor of Neurosurgery, Duke University
April 2015-2018	Head External Examiner Fellowship in Neurosurgery, College of Surgeons of Southern, Eastern, and Central Africa (COSECSA).
August 2014-2016	Masters in Academic Medicine, University of Southern California

### **Awards and Honors:**

1976-80	Presidents' Scholarship, Pacific Lutheran University
1980	Phi Beta Kappa (Arete Society), Pacific Lutheran University
1981-83	University of Washington Medical Student Training Grants (x3)
1982	Epilepsy Foundation of America, Medical Student Fellowship
1983-87	National Institute of Health, Medical Scientist Training Program
1984-85	Poncin scholarship in Medical Research
1986	Alpha Omega Alpha Medical Society (junior election)
1987	M.D. with Honors, University of Washington School of Medicine
1988	Klingenstein Foundation Postdoctoral Fellowship
1988-89	Alberta Heritage Foundation Postdoctoral Fellowship
1989-90	American Epilepsy Society, William Lennox Fellowship
1989-90	Grass Foundation, Robert S. Morison Fellowship

1990	AANS meeting, 1st Place, Functional/Stereotaxic Poster
1990-92	American Association Neurological Surgeons, Research Foundation Fellowship
1992	AANS meeting, 1st Place, Functional/Stereotaxic Poster
1992-93	Epilepsy Foundation of America, Wilder Penfield Research Grant
1992-94	Klingenstein Fellow in the Neurosciences
1993	Preuss Resident Research Award, Joint Section on Tumors, Congress of Neurological Surgeons
1996-98	Dana Clinical Hypotheses Investigator
1996-98	Alfred Sloan Fellowship in the Neurosciences
2007	Uganda Citizenship Award, presented by President Yoweri Museveni and Dr. Stephen Mallinga, Minister of Health
2009	Martin Luther King Service Nominee, Duke University
2010	Duke Raleigh Hospital Community Physician of the Year
2010	Raleigh News and Observer "Tar Heel of the Week"
2012	Endowed Chair, Distinguished Duke Surgery Professor of Neurosurgery
2013	Leonard Palumbo Duke University Teaching and Mentoring Award, Duke University
2013	Distinguished Alumnus of the Year, Pacific Lutheran University
2014	Triangle Business Journal Heroes of Health Care Award
2015	Innovation Platform Award, Innovations in Academic Medicine, University of Southern California, Los Angeles
2015	Drs. Anvar and Pari Velji Global Health Education Faculty Award, Consortium of Universities for Global Health
2015	American Association of Neurological Surgeons: 2015 Humanitarian Award

#### **Professional Societies, Affiliations, and Directorships:**

1981-2015	Society for Neuroscience
1987-present	Alpha Omega Alpha Medical Honor Society
1988-1996	United States Naval Reserve, MC, Lieutenant Commander
1988-present	Congress of Neurological Surgeons
1989-present	American Epilepsy Society
1993-1995	President, Scientific Advisory Board, Optimedx, Inc.
1994-present	American Association of Neurological Surgeons
May 1999	American Board of Neurological Surgery, Board Certification
2001-2004	Board of Directors, Raleigh First Assembly of God
2003-present	Executive Council, Triangle Christian Medical Dental Association

2003-present	Neurosurgical Society of America
2004-2006	Board of Directors, Blue Ridge Community Services
2004-2014	Board of Elders, Raleigh First Assembly of God
2006-2007	Director, Alpha Omega Scholarship Fund
2006-2013	Director, Special Interest Group, Epilepsy Surgery, American Epilepsy Society
2007-present	Board of Directors, Christian Life Ministries, Kampala, Uganda
2007-present	Executive Board, FIENS: Foundation for International Education in Neurological Surgery
2007-2011	Director, Operating in Eloquent Cortex, Practical Course, Congress of Neurological Surgeons Annual Meeting
2007-2011	Duke Global Health Institute, Affiliate Member
2007-2010	Executive Board Member, Duke Global Health Institute
2007-present	Duke Global Health PLUS (Placement of Life-giving Useable Surplus) Operations Committee
2007-present	Duke Global Health PLUS Steering Committee
2007-2015	Committee Chairman, Duke Global Surgery Committee, Department of Surgery, Duke University Medical Center
2008-present	Program Director, Duke Neurosurgery Training Program, Duke University Medical Center
2008-present	Duke Global Health Residency Admissions Committee
2009-present	Board of Directors, Madaktari Africa, East African Neurosurgery
2009-present	Program Co-Director Uganda Neurosurgery Training Program
2009-present	Senior Society of Neurological Surgeons
2009-2019	American Board of Neurological Surgeons, MOC
2010-2012	Program Co-Director Rwanda Neurosurgery Training Program
2012-2013	Scientific Program Chair, Senior Society of Neurological Surgeons, Boston, MA, 2013.
2012- 2014-	Distinguished Endowed Professorship, Duke University Spine Co-management Operations and Planning Chair, Duke University Spine Center
2015-2018	Head External Examiner Neurosurgery, College of Surgeons of Eastern, Central and Southern Africa (COSECSA)

**Grant Support:****Faculty in Neurosurgery and Neurobiology: Duke University Medical Center (direct costs):**

2015-2016	P.I. Bass Foundation Fellowship, Brain and Society: Improving Outcomes in Neurosurgical Patients in Uganda.	<b>\$40,000</b>
2015-2016	P.I. Nuvasive Research Grant, Division of Global Neurosurgery and Neuroscience.	<b>\$ 150,000</b>
2014-2017	P.I. Graduate Medical Education Innovation Grant, Duke GME, Professionalism in Neurosurgery.	<b>\$ 65,000</b>
2014-2015	P.I. <b>Burden of Surgical Disease in Uganda</b> , Duke Global Health Institute, Innovation Field Grant.	<b>\$ 25,000</b>
2014-2017	P.I. Graduate Medical Education Innovation Grant, Duke GME, Patient Visitor Relations.	<b>\$ 75,000</b>
2011-2015	P.I. Graduate Medical Education Grant, Duke GME, Innovations in Neurosurgery: Physician-Patient Relationships, Difficult Neurosurgical Conversations.	<b>\$ 115,000</b>
2009-2015	<b>Co-investigator</b> , N.I.H. R01 (P.I. Daryl Hochman, Ph.D.) Neocortical hemodynamics during epileptic activity in primates and humans.	<b>\$1,850,000</b>
2008-2011	P.I. Graduate Medical Education Grant, Duke GME, Innovations in Neurosurgery Training.	<b>\$ 70,000</b>
2008-2012	<b>Co-P.I.</b> Synthes Spine, Cervical Spine Surgery Outcome Study,	<b>\$ 120,000</b>
2007-2011	<b>Co-investigator</b> , N.I.H. R21 (P.I. Sandra Serafini, Ph.D.), Multi-modality word-finding in neurosurgical language mapping.	<b>\$ 650,000</b>
2007-2015	P.I. Synthes Spine Collaborative Grant: Building Spine Surgical Capacity in Uganda.	<b>\$ 330,000</b>
2007-2012	P.I. Integra Neuroscience Grant: Building Biomedical Engineering and Nursing Training for New Mulago Hospital, Kamapala, Uganda	<b>\$ 37,500</b>

2007-2009	P.I. Duke University Chancellor Victor Dzau, Duke Global Health Institute Grant for Building Surgical Capacity in Uganda.	\$ 100,000
2007-2009	P.I. Sponsored Research Grant, NeuroPharmaTherapeutics: Evaluation of novel antiepileptic compounds in primate model.	\$ 600,000
2004-2006	P.I. N.I.H. R21, Evaluation of optical imaging for seizure localization.	\$ 385,000
2003-2005	Co-P.I. N.I.H. R21, Optical imaging of functional and epileptiform activity;	\$ 450,000
1995-2001	P.I. N.I.H., Career Investigator Development Award; Michael M. Haglund, sponsor: James O. McNamara M.D.; Optical imaging of epileptiform activity; Department of Surgery (Neurosurgery); Duke University Medical Center,	\$ 421,000
1996-1998	P.I. Sloan Fellowship, Alfred P. Sloan Foundation, nominated by Dale Purves, Chairman of Neurobiology, Duke University Medical Center,	\$ 35,000
1996-1998	P.I. Dana Clinical Hypotheses in the Neuroscience Research Program; Imaging Brain Diseases to Develop New Therapies; Noninvasive optical imaging of functional activity in neocortex; Duke University Medical Center,	\$ 100,000
<b>Total Duke Faculty Grant support (direct costs):</b>		<b>\$5,618,500</b>

**Resident in Neurological Surgery Grant Support: University of Washington:**

1993-95	P.I. University of Washington-Optimedx Research Grant, Michael M. Haglund; Optical imaging of rat somatosensory cortex using infra-red illumination; Department of Neurological Surgery, University of Washington,	\$ 205,000
1993-94	P.I. Washington Technology Center, University of Washington; Michael M. Haglund; Phase II Initiative grant; Infrared human imaging system for identification of tumors and their margins;	

Department of Neurological Surgery, University of Washington,  
\$ 45,000

- 1992-94** P.I. Klingenstein Foundation; Michael M. Haglund; Fellowship in the Neurosciences; Optical imaging of functional activity in monkey visual and human cortex; Department of Neurobiology, Harvard Medical School and Department of Neurological Surgery, University of Washington, \$ 100,000
- 1992-93** P.I. Epilepsy Foundation of America; Michael M. Haglund; Wilder Penfield Research Grant; Optical imaging of human higher cognitive function; Department of Neurological Surgery, University of Washington, \$ 30,000
- 1992-93** P.I. Washington Technology Center, University of Washington; Michael M. Haglund; Phase I Initiative grant; Human imaging system for tumor identification, Department of Neurological Surgery, University of Washington, \$ 28,000
- 1990-92** P.I. American Association of Neurological Surgeons; Michael M. Haglund, (sponsor: Gary G. Blasdel, Ph.D.); Research Foundation Fellowship; Optical imaging of epileptiform activity in monkey and human cortex; Department of Neurobiology, Harvard Medical School and Department of Neurological Surgery, University of Washington, \$ 70,000
- 1989-90** P.I. Grass Foundation, Michael M. Haglund, (sponsor: Gary G. Blasdel, Ph.D.); Robert S. Morison Fellowship; Optical imaging of onset and spread of epileptiform activity; Department of Neurobiology, Harvard Medical School, \$ 60,000
- 1989-90** P.I. American Epilepsy Society; Michael M. Haglund, (sponsor: Gary G. Blasdel, Ph.D.); Lennox Postdoctoral Fellowship; Optical imaging of chronic epileptic foci in monkey visual cortex; Department of Neurobiology, Harvard Medical School, \$ 25,000
- 1988-89** P.I. Klingenstein Foundation; Michael M. Haglund, (sponsor: Gary G.



	Blasdel, Ph.D.); Postdoctoral Fellowship; Optical imaging of epileptic activity in monkey visual cortex; Department of Neurobiology, Harvard Medical School,	\$
21,000		
1988-89	P.I. Alberta Heritage Foundation; Michael M. Haglund, (sponsor: Gary G. Blasdel, Ph.D.); Postdoctoral Fellowship; Video imaging of epileptic activity in hippocampal slices. Department of Neurobiology, Harvard Medical School,	\$ 50,000

**Medical/Graduate student, University of Washington School of Medicine:**

1983-87	N.I.H., Medical Scientist Training Program, GM07266; Chairman dissertation committee: Philip A. Schwartzkroin, Ph.D.; Department of Physiology and Biophysics, University of Washington,	\$ 60,000
1983	University of Washington; Medical Student Research Training Grant; sponsor: Philip A. Schwartzkroin, Ph.D.; Developmental changes in Na,K pump activity in the immature hippocampus,	\$ 2,000
1982	Epilepsy Foundation of America; Medical Student Fellowship; sponsor: Philip A. Schwartzkroin, Ph.D.; Regulation of extra-cellular potassium in the onset of seizures in immature hippocampal slices,	\$ 2,500
1982	University of Washington, Medical Student Research Training Grant; sponsor: Philip A. Schwartzkroin, Ph.D.; Spontaneous seizure-like episodes of the immature hippocampus,	\$
2,000		
1981	University of Washington, Medical Student Research Training Grant; sponsor: Philip A. Schwartzkroin, Ph.D.; Mechanisms underlying epileptiform activity,	\$ 2,000
<b>Total Resident/Graduate Student Grant support (direct costs):</b>		<b>\$1,258,900</b>
<b>Total Career Funding (direct costs):</b>		<b>\$6,877,400</b>

**Patents:**

1. Hochman DW and **Haglund MM**. United States Patent 5,438,989. Solid tumor, cortical function, and nerve tissue imaging methods and device, 1995.
2. Hochman DW and **Haglund MM**. United States Patent 5,465,718. Solid tumor, cortical function, and nerve tissue imaging methods and device, 1995.
3. Hochman DW and **Haglund MM**. United States Patent 5,699,798. Method for optically imaging solid tumor tissue, 1997.
4. Hochman DW and **Haglund MM**. United States Patent 5,845,639. Optical imaging methods, 1998.
5. Hochman DW and **Haglund MM**. United States Patent 6,161,031. Optical imaging methods, 2000.
6. Hochman DW and **Haglund MM**. United States Patent 6,196,226. Methods and apparatus for optically imaging neuronal tissue and activity, 2001.
7. Hochman DW and **Haglund MM**. United States Patent 6,233,480. Methods and apparatus for optically imaging neuronal tissue and activity, 2001.
8. Hochman DW and **Haglund MM**. United States Patent 6,241,672. Method and apparatus for optically imaging solid tumor tissue, 2001.

**Ad hoc reviewer:**

National Institutes of Health, Clinical Neuroscience and Disease (CND) Study Section

National Institutes of Mental Health, study section

National Institutes of Health, Division of Respiratory Physiology

Neurosurgery

World Neurosurgery

Journal of Neurovascular Disease, Editorial Advisory Board

Epilepsia

Journal of Neuroscience

Cerebral Cortex

Brain Research

Journal of Neurosurgery

Journal of Neurophysiology

American Journal of Physiology

NeuroImage

Electroencephalography and Clinical Neurophysiology

Developmental Neuroscience

CURE Epilepsy Research Foundation

**Primary Mentoring Undergraduates, Medical Students, Residents, and Postdoctoral Fellows:**

**Undergraduate Students:**

- 1996-1998: Peter Weller B.Sc.: entered medical school
- 1999-2001: Anna Kwanvig, B.Sc.: entered Ph.D. program, Johns Hopkins
- 2000-2002: Fernando Boschini, B.A.: entered medical school
- 2008-2010: Ryan Doberstein, B.Sc.: entered medical school
- 2009-2011: Michael Delong, B.Sc.: entered medical school

**Medical and Graduate students:**

- 1997-1998: David Walker M.D.: Neurosurgery Residency, Washington University
- 1997-1998: Scott Stephens M.D.: Radiology Residency, Duke University
- 1998-2000: Ty J. Olson M.D.: Neurosurgery Residency, Columbia University
- 1999-2001: Carlos Bagley M.D.: Neurosurgery Residency, Johns Hopkins University
- 2002-2004: Travis Moyer M.D.: Neurosurgery Residency, University of Michigan
- 2008-2012: June Tibaleka B.Sc.: 4th year medical student, Duke University
- 2009-2011: Brian Christie B.Sc.: Neuroradiology Fellowship, Duke University
- 2009-2014: Jacob Bagley B.Sc.: Neurosurgery Residency, Oregon Health Sciences
- 2011-2014: Lauren Simpson B.Sc.: Neurosurgery Residency, University of Michigan
- 2012-2017: Anthony Fuller, B.Sc.: 2nd year medical student  
and Masters in Global Science, Duke Global Health Institute student
- 2012-2015: Tu Tran, Masters Global Science, Duke Global Health Institute student
- 2014-2016: Brittany Zick, Masters Global Science, Duke Global Health Institute
- 2014-2015: Elizabeth Emau, Masters Global Science, Duke Global Health Institute
- 2014-2016: Jihad Abeldijor, Masters Global Science, Duke Global Health Institute
- 2015-2017: Shem Opolot, Masters Global Science, Duke Global Health Institute
- 2015-2017: Joseph Incorvia, Masters Global Science, Duke Global Health Institute
- 2015-2017: Benjamin Kuo, Masters Global Science, Duke Global Health Institute

**Neurosurgery Residents:**

- 1996-1998: Joseph Koen M.D.: Optical Imaging Research
- 2002-2005: Ken Little M.D.: Optical Imaging Research
- 2007-2011: Stephen Parker M.D., MPH: Duke Global Health Residency
- 2011-2013: Ryan Owens M.D.: Duke Neurosurgical Simulation Laboratory
- 2015-2021: Jacqueline Corley, MD, Global Health in East Africa
- 2015-2021: Alexa Bramell, MD, PhD, Global Health East Africa

**Postdoctoral Fellows:**

- 1998-2002: Rok Cerne, M.D., Ph.D.: Glaxo Smith Kline Pharmaceuticals
- 2002-2007: Sandra Serafini, Ph.D.: Assistant Professor, Duke University

**Bibliography:****Original Reports:**

1. **Haglund MM** and Schwartzkroin PA. Seizure-like spreading depression in immature rabbit hippocampus in vitro. **Dev. Brain Research 14**: 51-59, 1984.
2. **Haglund MM**, Stahl WL, Kunkel DD, and Schwartzkroin PA. Developmental and regional differences in the localization of Na,K-ATPase activity in the rabbit hippocampus. **Brain Research 343**: 198-203, 1985.
3. Schwartzkroin PA and **Haglund MM**. Spontaneous rhythmic activity in epileptic human and normal monkey temporal lobe. **Epilepsia 27**: 526-537, 1987.
4. **Haglund MM**. Developmental mechanisms which underlie seizures and spreading depression in the immature rabbit hippocampus. PhD dissertation, Department of Physiology and Biophysics, University of Washington, 1988.
5. Burchiel KJ, Clarke HD, **Haglund MM** and Loeser JD. Long-term efficacy of microvascular decompression in trigeminal neuralgia. **J Neurosurgery 69**: 35-38, 1988.
6. **Haglund MM**, Schumacher J, and Loeser JD. Lumbar spinal stenosis: an annotated bibliography. **Pain 35**: 1-37, 1988.
7. Ojemann GA, Creutzfeldt O, Lettich E and **Haglund MM**. Neuronal activity in human lateral temporal cortex related to short-term memory, naming, and reading. **Brain 111**: 1383-1403, 1988.
8. Schwartzkroin PA, Kunkel DD, Mueller AL and **Haglund MM**. Developmental electrophysiology of rabbit hippocampus, in **Problems and Concepts in Developmental Neurophysiology**, eds. P. Kellaway and J. Noebels, Raven Press, pp 225-246, 1989.
9. **Haglund MM** and Schwartzkroin PA. Control of spreading depression in immature rabbit hippocampal slices by IPSPs and the Na<sup>+</sup>, K<sup>+</sup> pump. **J. Neurophysiol. 63**: 225-239, 1990.
10. LeRoux PD, **Haglund MM**, Mayberg MR, and Winn HR. Symptomatic cerebral vasospasm following tumor resection. **Surg Neurol 36**: 25-31, 1991.

11. LeRoux PD, Berger MS, **Haglund MM**, Pilcher WH, and Ojemann GA. Resection of intrinsic tumors from nondominant face motor cortex using stimulation mapping. **Surg Neurol.** 36: 44-48, 1991.
12. Ojemann GA, Ojemann JG, **Haglund MM**, Holmes M, and Lettich E. Visually related activity in human temporal cortical neurons. in **The Functional Organization of Human Visual Cortex**, eds. B. Gulyas, D. Ottoson, and P. Roland, Pergamon Press, Oxford, pp 279-290, 1992.
13. **Haglund MM** and Blasdel GG. Video imaging of neuronal activity, in **Monitoring Neuronal Activity: A Practical Approach**, ed. JA Stamford, Oxford Univ. Press, Oxford, pp 85-114, 1992.
14. **Haglund MM**, Berger MS, Kunkel DD, Franck JE, Ghatan S, and Ojemann GA. Changes in GABA and somatostatin in epileptic cortex associated with low-grade gliomas, **J Neurosurgery** 77: 209-216, 1992.
15. LeRoux PD, **Haglund MM**, Newell DW, Grady, MS, and Winn HR. Intraventricular hemorrhage in blunt head trauma: analysis of 43 cases. **Neurosurgery** 31: 678-685, 1992.
16. **Haglund MM**, Ojemann GA, and Hochman DW. Optical imaging of epileptiform and functional activity from human cortex. **Nature** 358: 668-671, 1992.
17. LeRoux PD, **Haglund MM**, and Harris, AB. Thoracic disc disease: Experience with the transpedicular approach in twenty consecutive patients. **Neurosurgery** 33: 58-67, 1993.
18. **Haglund MM** and Ojemann GA. Extratemporal resections in eloquent cortex, **Neurosurgery Clinics of North America** 4: 283-292, 1993.
19. **Haglund MM** and Ojemann LM. Seizure outcome in patients undergoing temporal lobe resections for epilepsy. **Neurosurgery Clinics of North America** 4: 337-344, 1993.
20. Berger MS, Ghatan S, **Haglund MM**, Ojemann GA, and Dobbins J. Epileptic foci associated with low-grade gliomas, **J Neurosurgery** 79: 62-69, 1993.
21. **Haglund MM**, Ojemann GA, Lettich E, Bellugi U, and Corina D. Dissociation of cortical and single unit activity in spoken and signed languages. **Brain and Language** 44: 19-27, 1993.

22. **Haglund MM**, Ojemann GA, and Blasdel GG. Optical imaging of bipolar cortical stimulation. *J Neurosurgery* 78: 785-793, 1993.
23. Ojemann GA and **Haglund MM**. Optical imaging of human cortical function and intrinsic tumors. *Neurosurgeons* 14: 450-452, 1994.
24. **Haglund MM**, Grady MS, Kanev PM, Pavlin EG, Mayberg TA, and Winn HR. Rapid Infusion System for neurosurgical procedures in the treatment of massive intraoperative hemorrhage. *J Neurotrauma*, 11: 623-627, 1994.
25. **Haglund MM**, Ojemann GA, Schwartz TH, and Lettich E. Neuronal activity in human lateral temporal cortex during serial retrieval from short-term verbal memory, *J Neuroscience* 14: 1507-1515, 1994.
26. **Haglund MM**, Berger MS, Shamseldin MS, and Ojemann GA. Cortical localization of temporal lobe language sites in patients with gliomas. *Neurosurgery* 34: 567-576, 1994.
27. **Haglund MM**, Hochman DW, Spence AM, and Berger MS. Enhanced optical imaging of rat gliomas and tumor margins. *Neurosurgery*, 35: 930-940, 1994.
28. Temkin NR, **Haglund MM**, and Winn HR. Complications of post-traumatic seizures, in *Neurotrauma*, eds. RJ Narayan, JE Wilberger, Jr., JT Povlishock, McGraw-Hill, 1995.
29. Temkin NR, **Haglund MM**, and Winn HR. Causes, prevention, and treatment of post-traumatic epilepsy. *New Horizon* 3: 518-522, 1995.
30. Madsen JR, Adelson PD, and **Haglund MM**. The future of pediatric epilepsy surgery: Signposts and science. *Neurosurgery Clinics of North America* 6: 589-597, 1995.
31. **Haglund MM**, Moore AJ, Bell BA, Marsh H, and Uttley D. Outcome after repeat lumbar microdiscectomy. *British J Neurosurgery* 9: 487-495, 1995.
32. Temkin N, **Haglund MM**, and Winn HR. Post-traumatic epilepsy, in *Neurological Surgery*, edition 4, ed J R Youmans, WB Saunders, Philadelphia, 1996.

33. **Haglund MM**. Optical imaging of epileptiform activity, in **Epilepsy: A Comprehensive Textbook**, pp. 1073-1079, 1996. Eds. J Engel, Jr and TA Pedley, Raven Press, New York.
34. Schwartz TH, Ojemann GA, **Haglund MM**, and Lettich E. Cerebral lateralization of single-unit activity during naming, reading, and line-matching, **Cerebral Cortex**, submitted, 1996.
35. **Haglund MM**, Berger MS and Ojemann GA. Functional localization: Cortical Stimulation mapping, in **Intraoperative Neuroprotection** 201-215, 1996. Editor R Andrews, Williams and Wilkins.
36. Temkin N, **Haglund MM**, and Winn HR. Prevention and Treatment of post-traumatic epilepsy, in **New Horizons: The Science and Practice of Acute Medicine**, 1996. Eds. RM Chestnut and DS Prough, Williams and Wilkins.
37. **Haglund MM**, Berger MS, and Hochman DW. Enhanced optical imaging of human gliomas and tumor margins. **Neurosurgery**, 38: 308-317, 1996.
38. Schwartz TH, Ojemann GA, **Haglund MM**, and Lettich E. Cerebral lateralization of neuronal activity during naming, reading and line-matching. **Brain Res Cogn Brain Res** 4: 263-273, 1996.
39. Gabriel EM, and **Haglund MM**. Neuropsychiatric complications after temporal lobe limbic system surgery. **Neuroimaging Clinics of North America** 7: 155-164, 1997.
40. **Haglund MM**. Overview of functional imaging. **Neurosurgery Clinics of North America** 8: 287-291, 1997.
41. **Haglund MM**. Intraoperative optical imaging of epileptiform and functional activity. **Neurosurgery Clinics of North America** 8: 413-420, 1997.
42. Friedman HS, Kokkinakis DM, Pluda J, Friedman AH, Cokgor I, **Haglund MM**, Ashley DM, Rich J, Dolan ME, Pegg AE, Moschel RC, McLendon RE, Kerby T, Herndon JE, Bigner DD, Schold SC Jr. Phase I trial of O6-benzygluanine for patients undergoing surgery for malignant glioma. **J Clinical Oncology** 16: 3570-3575, 1998.
43. Friedman HS, McLendon RE, Kerby R, Dugan M, Bigner SH, Henry AJ, Ashley DM, Krischer J, Lovell S, Rasheed K, Marchev F, Seman AJ, Cokgor I, Rich J, Stewart E, Colvin OM, Provençale JM, Bigner DD, **Haglund MM**, Friedman AH and Modrich PL. DNA mismatch repair and O6-alkylguanine-DNA alkyltransferase analysis and

response to Temodar in newly diagnosed malignant glioma. **J. Clinical Oncology 16:** 3851-3857, 1998.

44. **Haglund MM**, Ojemann GA and Berger MS. Functional mapping of motor, sensory and language cortex during intracranial tumor removal. In **Textbook of Stereotactic and Functional Neurosurgery**, eds PL Gildenberg and RR Tasker, McGraw-Hill, New York, pp. 955-962, 1998.

45. Friedman HS, Petros WP, Friedman AH, Schaaf LJ, Kerby T, Lawyer J, Parry M, Houghton PJ, Lovell S, Rasheed K, Cloughsey T, Stewart ES, Colvin OM, Provenzale JM, McLendon RE, Bigner DD, Cokgor I, **Haglund MM**, Rich J, Ashley D, Malczyn J, Elfring GL and Miller LL. Irinotecan therapy in adults with recurrent or progressive malignant glioma. **J. Clinical Oncology 17:** 1516-1525, 1999.

46. **Haglund MM** and Walker DH. Optical imaging for localization of cortical activity. In **Advanced Neurosurgical Navigation**, eds. E. Alexander III and RJ Maciunas, **Thieme**, pp. 209-216, 1999.

47. Macknik SL and **Haglund MM**. Optical images of visible and invisible precepts in the primary visual cortex of primates. **PNAS 96:** 15208-15210, 1999.

48. Macknik SL, Martinez-Conde S and **Haglund MM**. The role of spatiotemporal edges in visibility and visual masking. **PNAS 97:** 7556-7560, 2000.

49. McKhann GM 2<sup>nd</sup>, Schoenfeld-McNeill J, Born DE, **Haglund MM**, and Ojemann GA. Intraoperative hippocampal electrocorticography to predict the extent of hippocampal resection in temporal lobe epilepsy surgery. **J Neurosurgery 93:** 44-52, 2000.

50. Friedman HS, Pluda J, Quinn JA, Ewesuedo RB, Long L, Friedman AH, Cokgor I, Colvin OM, **Haglund MM**, Ashley DM, Rich JN, Sampson JH, Pegg AE, Moschel RC, McLendon RE, Provenzale JM, Stewart ES, Tourt-Uhlig S, Garcia-Turner AM, Herndon JE 2<sup>nd</sup>, Bigner DD, and Dolan ME. Phase I trial of carmustine plus O6-benzylguanine for patients with recurrent or progressive malignant glioma. **J Clinical Oncology 18:** 3522-3528, 2000.

51. Schwartz TH, **Haglund MM**, Lettich E, and Ojemann GA. Asymmetry of neuronal activity during extracellular microelectrode recording from left and right human temporal lobe neocortex during rhyming and line-matching. **J Cognitive Neuroscience 12:** 803-812, 2000.



52. Cerne R, and **Haglund MM**. Electrophysiological correlates to the intrinsic optical signal in the rat neocortical slice. **Neuroscience Letters** 317: 147-150, 2002.
53. Speciale AC, Pietrobon R, Urban CW, Richardson WJ, Helms CA, Major N, Enterline D, Hey L, **Haglund MM**, and Turner DA. Observer variability in assessing lumbar spinal stenosis severity on magnetic resonance imaging and its relation to cross-sectional spinal canal area. **Spine** 27: 1082-1086, 2002.
54. Quinn JA, Pluda J, Dolan ME, Delaney S, Kaplan R, Rich JN, Friedman AH, Reardon DA, Sampson JH, Colvin OM, **Haglund MM**, Pegg AE, Moschel RC, McLendon RE, Provenzale JM, Gururangan S, Tourt-Uhlig S, Herndon JE 2<sup>nd</sup>, Bigner DD, and Friedman HS. Phase II trial of carmustine plus O6-benzylguanine for patients with nitrosourea-resistant recurrent or progressive malignant glioma. **J Clinical Oncology** 20: 2277-2283, 2002.
55. Munana KR, Vitek SM, Tarver WB, Saito M, Skeen TM, Sharp NJ, Olby NJ, and **Haglund MM**. Use of vagal nerve stimulation as a treatment for refractory epilepsy in dogs. **J American Veterinary Medical Association** 221: 977-983, 2002.
56. Borel CO, McKee A, Parra A, **Haglund MM**, Solan A, Prabhakar V, Sheng H, Warner DS, Niklason L. A possible role for vascular cell proliferation in cerebral vasospasm following subarachnoid hemorrhage. **Stroke** 34: 427-433, 2003.
57. **Haglund MM**, Hochman, DW. Optical imaging of epileptiform activity in human neocortex. **Epilepsia** 45 (Suppl 4): 43-47, 2004.
58. **Haglund MM**, Hochman, DW. Furosemide and mannitol suppression of epileptic activity in the human brain. **J Neurophysiol.** 94(2):907-18, 2005.
59. **Haglund, MM**, Hochman, DW. Imaging of intrinsic optical signals in primate cortex during epileptiform activity. **Epilepsia** 48 Suppl 4:65-74, 2007.
60. Serafini, S., Gururangan, S., Friedman, A., **Haglund MM**. Distinct and overlapping cortical areas for bilingual naming and reading using cortical stimulation– case report. **J Neurosurgery: Pediatrics**, 2008.
61. **Haglund MM**, Meno JR, Hochman DW, Ngai AC, Winn HR. Correlation of intrinsic optical signal, cerebral blood flow, and evoked potentials during activation of rat somatosensory cortex. **J Neurosurgery.** 2008 Oct; 109 (4):654-63. (2008).

62. Tolner EA, Hochman DW, Hassinen P, Otáhal J, Gaily E, **Haglund MM**, Kubová H, Schuchmann S, Vanhatalo S, Kaila K. Five percent CO(2) is a potent, fast-acting inhalation anticonvulsant. *Epilepsia*. 2010 Sep 30.
63. **Haglund MM**, Kiryabwire J, Parker S, Zomorodi A, Macleod D, Schroeder R, Muhumuza M, Merson M. Surgical Capacity Building in Uganda Through Twinning, Technology, and Training Camps. *World J Surg*. 2011 Apr 13.
64. Karikari IO, Nimjee SM, Hodges TR, Cutrell E, Hughes BD, Powers CJ, Mehta AI, Hardin C, Bagley CA, Isaacs RE, **Haglund MM**, Friedman AH. Impact of tumor histology on resectability and neurological outcome in primary intramedullary spinal cord tumors: a single-center experience with 102 patients. *Neurosurgery*. 2011 Jan;68(1):188-97; discussion 197. PMID: 21099707
65. Reynolds RM, Boswell E, Hulette CM, Cummings TJ, **Haglund MM**. *J Neurosurg Spine*. 2011 Dec;15(6):625-9. Epub 2011 Sep 2. PMID: 21888480
66. Lavine M, **Haglund MM**, Hochman DW. Dynamic linear model analysis of optical imaging data acquired from the human neocortex. *J Neurosci Methods*. 2011 Aug 15;199(2):346-62. Epub 2011 May 27. PMID: 21640137
67. **Haglund MM**. Optical imaging of visual cortex epileptic foci and propagation pathways. *Epilepsia*. 2012 Jun;53 Suppl 1:87-97. PMID: 22612813
68. Fontanella AN, Schroeder T, Hochman DW, Chen RE, Hanna G, **Haglund MM**, Secomb TW, Palmer GM, Dewhirst MW. Quantitative mapping of hemodynamics in the lung, brain, and dorsal window chamber-grown tumors using a novel, automated algorithm. *Microcirculation*. 2013 [Epub ahead of print] PMID: 23781901
69. Serafini S, Clyde M, Tolson M, **Haglund MM**. Multimodality word-finding distinctions in cortical stimulation mapping. *Neurosurgery*. 2013 Jul;73(1):36-47. PMID: 23615091
70. Serafini S, Komisarow JM, Gallentine W, Mikati MA, Bonner MJ, Kranz PG, **Haglund MM**, Grant G. 24961623 Reorganization and stability for motor and language areas using cortical stimulation: case example and review of the literature. *Brain Sci*. 2013 Nov 26;3(4):1597-614. doi: 10.3390/brainsci3041597. PMID: 24961623
71. Babu R, Thomas S, Hazzard MA, Friedman AH, Sampson JH, Adamson C, Zomorodi AR, **Haglund MM**, Patil CG, Boakye M, Lad SP. Worse outcomes for patients undergoing brain tumor and cerebrovascular procedures following the ACGME resident duty-hour restrictions. *Journal of Neurosurgery* 121:2, 262-276. . Online publication date: 1-Aug-2014. PMID: 24926647

72. Babu R, Thomas S, Hazzard MA, Lokhnygina YV, Friedman AH, Gottfried ON, Isaacs RE, Boakye M, Patil CG, Bagley CA, **Haglund MM**, Lad SP. Morbidity, mortality, and health care costs for patients undergoing spine surgery following the ACGME resident duty-hour reform. *Journal of Neurosurgery: Spine* 0:0, 1-14. PMID: 24995600
73. Hatef J, Adamson C, Obiga O, Taremwa B, Ssenyojo H, Muhumuza M, **Haglund M**, Schroeder K Central Nervous System Tumor Distribution at a Tertiary Referral Center in Uganda. *World Neurosurg.* 2014 Jun 19. pii: S1878-8750(14)00586-5. doi: 10.1016/j.wneu.2014.06.040. [Epub ahead of print] PMID: 24953304
74. Tran TM, Fuller AT, Kiryabwire J, Mukasa J, Muhumuza M, Ssenyojo H, **Haglund MM**. Distribution and characteristics of severe traumatic brain injury at Mulago National Referral Hospital in Uganda. *World Neurosurg.* 2014 Dec 18. pii: S1878-8750(14)01399-0. doi: 10.1016/j.wneu.2014.12.028. [Epub ahead of print] PMID: 25529531
75. Butler E, Tran T, Fuller A, Makumbi F, Luboga S, Kisakye S, **Haglund M**, Chipman J, Galukande M. Burden of Surgical Conditions in Uganda: Pilot Study of a Population-Based Survey in Wakiso District, Uganda. In Press *Surgery* 2015.
76. Fuller A, Tran T, Muhumuza, M, **Haglund MM**. Building Neurosurgical capacity in low and middle income countries. Published online: November 3, 2015, *eNeurologicalSci.* June 2016.
77. Fuller A, Butler E, Tran T, Makumbi F, Luboga S, Muhumuza C, Chipman J, Groen R, Gupta S, Kushner A, Galukande M, Haglund M. Surgeons Overseas Assessment of Surgical Need (SOSAS) Uganda: update for household survey. *World Journal of Surgery* 2015 Dec, 39(12): 2900-7.

## Abstracts

1. **Haglund MM** and Schwartzkroin PA. Spontaneous seizure episodes in immature rabbit hippocampus. *Clinical Research*, 30(1): 66, 1982.
2. **Haglund MM** and Schwartzkroin PA. Presence of IPSPs protects against seizure activity. University of Washington Medical Student Research Colloquium, September, 1982.
3. Schwartzkroin PA and **Haglund MM**. Seizure generation in hippocampal slices from immature rabbit. *Soc. Neuroscience*, 8: 1017, 1982.

4. **Haglund MM**. Immature hippocampal brain slices: mechanisms underlying seizure activity. Research Society of Neurological Surgeons of North America, 1983.
5. **Haglund MM** and Schwartzkroin PA. Mechanisms in hippocampal CA3 region which protect against spreading depression. Soc. Neuroscience, 9: 908, 1983.
6. **Haglund MM**. University of Washington Neurological Study Unit: Mechanisms underlying Leao's spreading depression and anoxic depolarization shifts. February, 1984.
7. **Haglund MM**. Mechanisms underlying acupuncture analgesia. Graduate School of University of Washington, Ph.D. General Exam in Physiology and Biophysics. April, 1984.
8. **Haglund MM**. A new in vitro model for studying mechanisms underlying seizure episodes. Society of University Neurosurgeons Meeting. May, 1984.
9. **Haglund MM** and Schwartzkroin PA. Role of the Na/K pump and of extracellular potassium in excitability of immature hippocampal slices. Soc. Neuroscience 10: 550, 1984.
10. **Haglund MM** and Schwartzkroin PA. Spontaneous rhythmic synchronous events in human epileptic brain and normal monkey hippocampus. Soc. Neuroscience 11: 1320, 1985.
11. **Haglund MM** and Blasdel GG. Video imaging of neuronal activity in hippocampal slices. American Association of Neurological Surgeons, 57: 241, 1989.
12. Blasdel GG and **Haglund MM**. Bicuculline-induced disruption of optically determined ocular dominance bands in macaque striate cortex. Soc. Neuroscience 15: 799, 1989.
13. LeRoux PD, Berger MS, **Haglund MM**, Pilcher W, and Ojemann GA. Use of stimulation motor mapping in the region of intrinsic tumors from face motor cortex. American Association of Neurological Surgeons, 58: 401, 1990.
14. **Haglund MM**, Lettich E, and Ojemann GA. Long-term potentiation of neuronal activity in human temporal lobe. American Association of Neurological Surgeons, 58: 363, 1990.

15. **Haglund MM**, Clarke H, Marrivella K, and Harris AB. CT scanning with intravenous angiography as a screening technique in evaluation of diffuse cord enlargement. *Neurology* 40: 122P, 1990.
16. **Haglund MM**, Ojemann GA, Cawthon DA and Lettich E. Neuronal changes in human left temporal lobe. *Soc. Neuroscience* 16: 779, 1990.
17. **Haglund MM**, Berger MS, Franck JE, Kunkel DD, and Ojemann GA. GABA and somatostatin changes in tumor-surround cortex. *American Association of Neurological Surgeons*, 59: 515, 1991.
18. **Haglund MM** and Blasdel GG. Role of GABAergic activity in the generation of upper layer ocular dominance columns in monkey striate cortex. *Soc. Neuroscience* 17: 1088, 1991.
19. **Haglund MM**, Ojemann GA, and Blasdel GG. Video imaging of bipolar cortical stimulation. *Epilepsia* 32 (Suppl 3): 22, 1991.
20. **Haglund MM**, Ojemann GA, Lettich E, and Hochman DW. Optical imaging of functional activity from human cortex. *American Association of Neurological Surgeons*, 60: 277, 1992.
21. Hochman DW and **Haglund MM**. Optical imaging of intrinsic signals in monkey visual and human cortex. *Soc. Neuroscience* 18: 583, 1992.
22. **Haglund MM** and Hochman DW. Optical imaging of functional activity from human cortex. *Soc. Neuroscience* 18: 583, 1992.
23. **Haglund MM**. Optical imaging techniques: Applications to epilepsy research. Invited Speaker, Investigator's Workshop-- American Epilepsy Society Annual Meeting. *Epilepsia* 33 (Suppl 3): 1, 1992.
24. **Haglund MM**, Berger MS, Spence AM, and Hochman DW. Optical imaging of tumors in rat and human gliomas. *British J Neurosurgery* 7: 158, 1993.
25. **Haglund MM**, Berger MS, Shamseldin M, and Ojemann GA. Cortical organization of temporal lobe language sites in patients with gliomas. *J Neurosurgery* 78: 372-373A, 1993.

26. **Haglund MM**, Berger MS, Spence AM, and Hochman DW. Intraoperative optical imaging of tumor grade and margins in rat and human gliomas. *Neurosurgery* 33: 785, 1993.
27. **Haglund MM**, Ojemann GA, and Hochman DW. Optical imaging of cognitive activity in human right and left temporal lobes. *Soc. Neuroscience* 19: 1284, 1993.
28. Hochman DW, Berger MS, Spence AM, and **Haglund MM**. In vivo high-resolution optical imaging of neuronal and tumor tissue in rats and humans. *Soc. Neuroscience* 19: 1072, 1993.
29. **Haglund MM**, LeRoux PD, Lettich E, and Ojemann GA. Surgical treatment of intractable epilepsy involving Rolandic cortex. *Epilepsia* 34 (suppl 6): 40, 1993.
30. **Haglund MM** and Blasdel GG. Optical imaging of acute epileptic foci in monkey visual cortex. *Epilepsia* 34 (suppl 6): 21, 1993.
31. **Haglund MM**, Ojemann GA, Hochman DW. Optical imaging of human cognitive activity. *J Neurosurgery* 80: 389A, 1994.
32. **Haglund MM**, Moore AJ, Marsh H, and Uttley D. Long-term outcome after repeat lumbar microdiscectomy. *American Association of Neurological Surgeons*, 62: 493, 1994.
33. **Haglund MM**. Optical imaging of human epileptiform and cognitive function. *Congress of Neurological Surgeons, Joint Section on Functional Neurosurgery*, *Neurosurgery* 35: 556, 1994.
34. Hochman DW, Ojemann GA, **Haglund MM**. Optical imaging reveals alternating positive and negative changes during cognitive or sensory evoked cortical activity in awake humans. *Soc. Neuroscience* 20: 5, 1994.
35. **Haglund MM**, Hochman DW, Meno J, and Winn HR. Mechanisms underlying the intrinsic signal during optical imaging of rat somatosensory cortex. *Soc. Neuroscience* 20: 1264, 1994.
36. **Haglund MM**, Born DE, and Ojemann GA. Surgical outcome and correlation with pathological changes in the treatment of epilepsy. *Neurosurgery* 37:598, 1995.
37. **Haglund MM**, Ojemann GA, and Hochman DW. Correlation of optical imaging and electrical stimulation mapping in human language cortex. *Soc. for Neuroscience* 21:1467, 1995.

38. **Haglund MM**, Born DE, and Ojemann GA. Relationship of interictal electrocorticography to surgical outcome in the treatment of epilepsy. *Epilepsia* 36(suppl) 148, 1995.
39. **Haglund MM**. Future of functional mapping using optical imaging. *Epilepsia* 38 (suppl 6): 21, 1996.
40. Cody RF, **Haglund MM**, Grady MS, Maris DO. Discrimination of post-traumatic memory vs. Learning in rats using the Morris Water Maze. *Society for Neuroscience*, 22:231, 1996.
41. **Haglund MM**, Walker DH, Chase PJ, Look RB. Optical imaging of seizure propagation in primate visual cortex. *Neuroscience*, 1997.
42. Cerne R, **Haglund MM**. The pattern of propagation of epileptiform activity in the rat neocortex is determined by the balance between inhibition and excitation. *Society for Neuroscience*, 24,(851.13) 1998.
43. **Haglund MM**, Olson, TJ. Determination of seizure propagation pathways by inhibitory-like surrounding primate visual cortex. *Society for Neuroscience*, 24:777, 1998.
44. Hochman DW and **Haglund MM**. Quantitative Optical Imaging of Seizure Propagation in Monkey Cortex. *American Epilepsy Society Annual Meeting*, Philadelphia, Dec. 2001.
45. Hochman DW and **Haglund MM**. Mechanisms Underlying the Generation of Activity-Evoked Optical Changes in Primate and Human Cortex. *American Epilepsy Society Annual Meeting. Epilepsia*, 44 Suppl. 9:257 (Abst. 2.234), Boston, Dec. 2003.
46. **Haglund MM** and Hochman DW. . The Accuracy of Intraoperative Optical Imaging in the Localization of Neocortical Epileptiform Activity. *American Epilepsy Society Annual Meeting. Epilepsia*, 44 Suppl. 9:256 (Abst. 2.233) , Boston, Dec. 2003.
47. Hochman DW and **Haglund MM**. Modulation of the Extracellular Space Suppresses Epileptic Activity in the Human Brain. *Society For Neuroscience Annual Meeting*, Oct.,St. Louis, 2004.
48. Hochman DW and **Haglund MM**. Mechanisms Underlying Optical Spectroscopic Changes in Primate and Human Cortex. *10th Annual Meeting for the Organization of Human Brain Mapping*, Budapest, June, 2004.

49. Hochman DW and **Haglund MM**. Furosemide and Mannitol Suppress Epileptic Activity in the Human Brain. American Epilepsy Society Annual Meeting, San Antonio, Dec2004.
50. Hochman DW and Haglund MM. Evidence that bumetanide suppresses epileptiform activity in adult primate cortex-independent of effects on GABA-A signalling. American Epilepsy Society Meeting, Boston, Dec. 2009.
51. Hochman DW, Haglund MM, Palmer G, Zhang G, Fraser C. Optical imaging of Primate Neocortex using oxygen-sensing nanoparticles. American Epilepsy Socient Meeting, San Antonio, Dec. 2010.



**Invited presentations and seminars:**

1. Immature hippocampal brain slices: mechanisms underlying seizure activity. Research Society of Neurological Surgeons, May, **1983**.
2. Mechanisms underlying Leao's spreading depression and anoxic depolarization shifts. University of Washington Neurological Study Unit, February, **1984**.
3. Mechanisms underlying acupuncture analgesia. Graduate School of University of Washington General Exam in Physiology and Biophysics. April, **1984**.
4. A new in vitro model for studying mechanisms underlying seizure episodes. Society of University Neurosurgeons Meeting. May, **1984**.
5. Mechanisms underlying the onset of spreading depression and seizures. Research Seminar: Department of Neurobiology, Harvard Medical School, September, **1988**.
6. Developmental mechanisms which underlie seizures and spreading depression in the immature rabbit hippocampus. PhD dissertation, Department of Physiology and Biophysics, University of Washington, November, **1988**.
7. Optical imaging of seizures in hippocampal slices. Neuroscience seminar: Department of Neurological Surgery, University of Washington, March, **1989**.
8. Optical imaging of ocular dominance columns in monkey visual cortex. Neurobiology seminar: Department of Neurobiology, Massachusetts Institute of Technology, December, **1989**.
9. Optical imaging of epileptic foci in monkey visual cortex. Research Seminar: Department of Neurobiology, Harvard Medical School, December, **1990**.
10. Mechanisms underlying the role of inhibitory circuitry in upper layer ocular dominance columns in monkey visual cortex. Research seminar: Department of Neurobiology, Harvard Medical School, February, **1991**.
11. Role of inhibition in the generation of ocular dominance columns. Neuroscience seminar: Department of Neurological Surgery, University of Washington, May, **1991**.
12. Optical imaging of functional activity from monkey visual and human cortex. Neuroscience seminar: Department of Neurological Surgery, University of Washington, September, **1992**.

13. Optical imaging of functional activity from monkey visual and human cortex. Seminars in Physiology, Department of Physiology and Biophysics, November, **1992**.
14. Optical imaging of epileptic foci. Investigator's Workshop, American Epilepsy Society, December, **1992**.
15. Optical imaging of functional activity and tumors in human cortex. Neurosurgery and Neurology Grand Rounds, Atkinson Morley's Hospital, Wimbledon, London, England, June, **1993**.
16. Optical imaging of functional activity from human cortex. Visiting Professor, Neurosurgery and Neurology Grand Rounds, Brigham and Women's Hospital, Harvard Medical School, September, **1993**.
17. Optical imaging of functional activity from monkey visual and human cortex, Grand Rounds, Department of Neurobiology, Harvard Medical School, September, **1993**.
18. Optical imaging identification of rat and human gliomas and tumor margins. Division of Neurosurgery Grand Rounds, Brigham and Women's Hospital, Harvard Medical School, September, **1993**.
19. Optical imaging of gliomas and tumor margins in human and rat cortex. Preuss Resident Research Award Lecture, Joint Section on Tumors, Congress Neurological Surgeons, October, **1993**.
20. Imaging of the intrinsic optical signal during functional activity from human cortex. Symposium: Waves of the Future Symposium, National Institute of Health, November, **1993**.
21. Optical imaging of tumors and their margins in rat and human cortex. Grand Rounds, Department of Oncology, Memorial Sloan Kettering Hospital, November, **1993**.
22. Optical imaging of functional activity and tumors in human cortex. Grand Rounds, Department of Neurological Surgery, University of Chicago, December, **1993**.
23. Optical imaging of functional activity and tumors in human cortex. Grand Rounds, Department of Neurological Surgery, University of Minnesota, December, **1993**.

24. Imaging of functional activity and tumors from human cortex using the intrinsic optical and indocyanine green signal. Grand Rounds, Division of Neurosurgery, Duke University Medical Center, December, **1993**.
25. Optical imaging of functional activity and tumors in human cortex. Grand Rounds, Department of Electrical Engineering, University of Washington, May, **1994**.
26. Optical imaging of epileptiform activity in monkey visual and human cortex. Symposium: New Frontiers in the Neuroscience of Epilepsy, Bowman Gray School of Medicine, September, **1994**.
27. Optical imaging of epileptiform activity in monkey visual and human cortex. Symposium: New Developments in Pediatric Epilepsy, Joint Section of Child Neurology and International Child Neurology Association Meeting, September, **1994**.
28. Optical imaging of functional activity from human cortex. Symposium: Spectrum of Functional Imaging, Joint Section of Functional and Stereotaxic Neurosurgery, Congress of Neurological Surgeons, October, **1994**.
29. Functional mapping of brain tumors and margins in rat and human cortex. Breakfast Seminar: Intraoperative Functional Imaging, Congress of Neurological Surgeons, October, **1994**.
30. History of Epilepsy Surgery: Hippocrates to Penfield. Department of Neurological Surgery Grand Rounds, University of Washington, Seattle, Washington, June, **1995**.
31. Is there concordance between functional brain mapping techniques. International Human Brain Mapping Symposium, Paris, France, June, **1995**.
32. Cortical localization of language: historical roots to new horizons. Neurology and Neurosurgery Grand Rounds, Duke University Medical Center, Durham, North Carolina, July, **1995**.
33. Intrinsic signal imaging of epileptiform activity in human brain and animal models. International Epilepsy Congress, Sydney, Australia, September, **1995**.
34. Optical imaging of functional and epileptiform activity in animals and humans. Department of Neurobiology Grand Rounds, Duke University Medical Center, Durham, North Carolina, September, **1995**.

35. Optical imaging of epileptiform activity in animal and humans. Epilepsy Update, Continuing Medical Education, Duke University Medical Center, October, **1995**.
36. Functional mapping using electrical stimulation and optical imaging. Functional imaging symposium, Congress of Neurological Surgeons, October, **1995**.
37. Surgical treatment of epilepsy, Epilepsy Foundation of America clinical seminar series, Greensville, North Carolina, November, **1995**.
38. Surgical treatment of epilepsy, Epilepsy Foundation of America clinical seminar series, Raleigh, North Carolina, December, **1995**.
39. Decade of the Brain Lecture, American Association of Neurological Surgeons, Optical imaging of language and memory changes in the human brain, Minneapolis, Minnesota, April, **1996**.
40. Functional mapping using electrical stimulation and optical imaging, invited speaker, American Association of Neurological Surgeons, Minneapolis, Minnesota, April, **1996**.
41. Temporal lobectomy in the dominant hemisphere, Faculty member, Radionics Brain Mapping Symposium, Seattle, Washington, August, **1996**.
42. Intracranial monitoring for tailored surgical resection using interictal spikes, invited speaker, Intracranial monitoring symposium, American EEG Society, September, **1996**.
43. Cortical organization of language using electrical stimulation mapping and optical imaging, invited faculty member, Review and Update in Neurobiology for Neurosurgeons, American Association of Neurological Surgeons, Woods Hole, MA, October, **1996**.
44. Future of functional mapping using optical imaging, invited faculty, Investigators Workshop, American Epilepsy Society annual meeting, December, **1996**.
45. Functional mapping for epilepsy and brain tumors, Neurosurgery and Neurology Grand Rounds, Duke University Medical Center, March, **1997**.
46. Functional mapping of language for tumor resection, Congress of Neurological Symposium, Short Course, October, **1997**.

47. Optical imaging of functional activity from humans, Neurosurgery and Neurology Grand Rounds, Duke University Medical Center, December, 1997.
48. Seizure propagation and inhibitory surround, Neurosurgery and Neurology Grand Rounds, February, 1998.
49. Surgical treatment for intractable epilepsy. Cape Fear Valley Medical Center Family Practice Ground Rounds, April, 1998.
50. Surgical evaluation and treatment for intractable epilepsy, Womack Army Medical Center Grand Rounds, April, 1998.
51. Optical imaging of seizure propagation, Department of Neurobiology Grand Rounds, Harvard Medical School, May, 1998.
52. Functional brain mapping for tumor resection, Alamance Regional Medical Center Grand Rounds, September, 1998.
53. Optical imaging of neocortical epileptic foci, Society for Neuroscience Annual Meeting Los Angeles, CA, November, 1998.
54. Propagation of epileptiform activity in neocortex, American Epilepsy Society Annual Meeting, December, 1998.
55. Surgical approaches for temporal lobe epilepsy, Brain Mapping Course, American Association of Neurological Surgeons Meeting, New Orleans, April, 1999.
56. Optical imaging of functional and epileptiform activity: New horizons, Pacific Lutheran University, Invited Speaker, Lawrence Heustis Retirement Symposium, Tacoma, WA, May, 1999.
57. Surgical treatment for epilepsy, Wake Medical Center, Internal Medicine Grand Rounds, Raleigh, North Carolina, May, 1999.
58. Optical imaging of seizure onset and propagation in neocortical epilepsy. Venice International School of Neuroscience, International Workshop on Epilepsy, Venice, Italy, June, 1999.
59. Neocortical epilepsy: Preoperative assessment and surgical resections. Duke University Medical Center Neurosurgery and Neurobiology Grand Rounds, September, 2000.

60. Optical imaging of epileptiform activity in primates and humans. American Epilepsy Society Investigator's Workshop, December, **2000**.
61. Integrating clinical practice and religion. Duke-UNC Chapel Hill Christian Medical Dental Association Chapter, Graduation Ceremony speaker, May, **2001**.
62. Brain Mapping: Language and Memory localization, Congress of Neurological Surgeons Annual Meeting Short Course, October, **2001**.
63. Intraoperative Localization of Epileptiform Activity Using Optical Imaging. Neurosurgical Society of America, Sun River, Oregon, June, **2003**.
64. Are you the one? Christian Medical Dental Association, Duke-UNC Chapel Hill Chapter, September, **2003**.
65. Optical imaging of human neocortical epilepsy. Visiting Professor, Department of Neurological Surgery, Indiana University, October, **2003**.
66. Localization of interictal and ictal epileptiform activity using optical imaging. Advances in Imaging of Epilepsy, Annual Course, American Epilepsy Society, city, December, **2003**.
67. Localization of neocortical epilepsy using optical imaging. Functional and Stereotactic Section, American Association of Neurological Surgeons Annual Meeting, April, **2004**.
68. Neurosurgery: from basic science to the mission field. North Raleigh Christian Academy Annual Science Career Day, May, **2004**.
69. Translational research in epilepsy: from basic science to the operating room. Southeastern University, Visiting Professor, May, **2004**.
70. Mapping the human brain in the operating room. Southeastern University, Visiting Professor, May, **2004**.
71. Medical missions: the true field of medicine. Southeastern University, Visiting Professor, May, **2004**.
72. Ecuador medical mission training, Raleigh, NC, July, **2004**.
73. Neurosurgery and Patient-Physician Interactions. Duke-UNC Chapel Hill Christian Medical Dental Association Kickoff Lecture, September, **2004**.

74. Optical imaging of neocortical epilepsy, Duke University Medical Center Neurosurgery-Neurology Grand Rounds, October, **2004**.
75. Commencement Speaker: "A Life Worth Giving", Raleigh Home School Association, Raleigh, NC, May, **2005**.
76. Transitioning medical care from the clinic to outreach locations. Guayaquil, Ecuador, July, **2005**.
77. Furosemide and other novel antiepileptic drugs. Duke University Medical Center Neurosurgery and Neurology Grand Rounds, October, **2005**.
78. Language mapping for tumor and epilepsy resections. Congress of Neurological Surgeons, Brain Mapping Short Course, October, **2005**.
79. Anterior Cervical Discectomy and Fusion with plating. Duke Operating Room In-service, November, **2005**.
80. American Association of Neurological Surgeons Annual Meeting, Discussant, Plenary Session, April, **2006**.
81. Bridging Faith and Medicine. Invited co-speaker at public symposium at Southeastern University, Lakeland, Florida, April, **2006**.
82. Neurosurgery preparation from high school through medical school. North Raleigh Christian Academy Annual Career Day, May, **2006**.
83. Operating in Eloquent Cortex, Practical Course, Congress of Neurological Surgeons, October, **2006**.
84. Optical imaging of functional and epileptiform activity, Neurosurgical Society of America, June, **2007**.
85. Functional mapping of language during awake neurosurgical procedures, Grand Rounds, New Mulago Hospital, Kampala, Uganda, August, **2007**.
86. Duke Neurosurgery in Uganda 2007, Department of Surgery Grand Rounds, Duke University Medical Center, August **2007**.

87. Cortical mapping of auditory and language cortex, Operating in Eloquent Cortex, Practical Course, Congress of Neurological Surgeons, September, 2007.
88. The Operating Room as a Laboratory: Neurosurgery and Translational Research, Congress of Neurological Surgeons, September, 2007.
89. Mission to Uganda, Duke University Health System Leadership Retreat, Keynote Speaker, October 2007.
90. Neurosurgery Mission Trip to Uganda, Duke Nursing Grand Rounds, October, 2007.
91. From Brain Slices to the Operating Room. Review and Update in Neuroscience, Woods Hole, October, 2007.
92. Complex Epilepsy Surgery, American Epilepsy Society, Special Interest Group Coordinator, Philadelphia, PA, December, 2007.
93. Operating in Eloquent Cortex, Course Director, Congress of Neurological Surgeons, October 2008.
94. Academic Neurosurgery: Maintaining the Balance of Academics and Giving Back. Review and Update in Neuroscience, Woods Hole, October, 2008.
95. Complex Epilepsy Surgery, American Epilepsy Society, Special Interest Group Coordinator, Philadelphia, PA, December, 2008.
96. Neurosurgery as a Calling. Keynote Speaker Career Day, North Raleigh Christian Academy, Raleigh, North Carolina, May 2008.
97. Missions in Uganda. Christian Medical and Dental Association Spring Retreat, May 2008.
98. Operating in Eloquent Cortex, Course Director, Congress of Neurological Surgeons, October 2008.
99. From Brain Slices to the Operating Room. Review and Update in Neuroscience, Woods Hole, November, 2008.
100. Complex Epilepsy Surgery, American Epilepsy Society, Special Interest Group Coordinator, Philadelphia, PA, December, 2008.



- 101.** Severe Closed Head Injury Treatment Paradigms, New Mulago Hospital Continuing Medical Education Course, July **2009**.
- 102.** The Ripple Effect: The Walk of Faith. Duke University of North Carolina, Chapel Hill Christian Medical and Dental Association, Kick-off Event, August **2009**.
- 103.** Operating in Eloquent Cortex: Language and Motor Mapping, Course Director, Congress of Neurological Surgeons, Oct 24, **2009**.
- 104.** Academic Neurosurgery: More than the Triple Threat: Academics, Research and Teaching. Review and Update in Neuroscience, Woods Hole, October, **2009**.
- 105.** Complex Epilepsy Surgery, American Epilepsy Society, Special Interest Group Coordinator, Philadelphia, PA, December, **2009**.
- 106.** The Doctor-Patient Relationship: The True Foundations. Duke - University of North Carolina, Chapel Hill, Christian Medical and Dental Association, Kick-off Event, August **2010**.
- 107.** Cortical mapping of auditory and language cortex, Operating in Eloquent Cortex, Practical Course, Congress of Neurological Surgeons, September, **2010**.
- 108.** Surgical Treatment of Epilepsy, Duke Epilepsy Symposium, Duke University Medical Center, October, **2010**.
- 109.** Operating in Eloquent Cortex, Course Director, Congress of Neurological Surgeons, October **2010**.
- 110.** The Quadruple Threat: Clinical Productivity, Academic Research, Teaching, and Giving Back. Review and Update in Neuroscience, Woods Hole, MA, October, **2010**.
- 111.** Complex Epilepsy Surgery, American Epilepsy Society, Special Interest Group Coordinator, Philadelphia, PA, December, **2010**.
- 112.** Building Surgical Capacity in Uganda, Ministry of Health, President Broadhead Visit to Africa, July, **2011**
- 113.** Passion, Curiosity, and the Ripple Effect. Duke AOA Annual Keynote Speech, Duke University Medical Center AOA Symposium for all Duke Medical Students, August, **2011**.

114. Surgical Treatment of Epilepsy, Duke Epilepsy Symposium, Duke University Medical Center, October, **2011**.
115. Neurosurgery in East Africa: Building Surgical Capacity Duke Global Health Institute Five Year Anniversary Lecture, Duke University, Durham, NC, October, **2011**.
116. Combining Academics, Research, and Humanitarian Missions to Neurosurgery, Review and Update in Neuroscience, Woods Hole, MA, November, **2011**.
117. Building Surgical Capacity in East Africa with a Top-Down Approach, Anesthesia and Surgery Alliance Meeting, San Diego, CA, November, **2011**.
118. Complex Epilepsy Surgery, American Epilepsy Society, Special Interest Group Coordinator, Baltimore, MD, December, **2011**.
119. Operative Outcomes in Low Middle Income Countries: Uganda, Kenya, and Rwanda Experience, Foundation for International Education for Neurosurgery, March **2012**.
120. Communications and Faith in Academic Neurosurgery, Christian Medical Dental Association, North Carolina, Annual Meeting Keynote Speaker, May **2012**.
121. Academic Neurosurgery: Combining Clinical Practice, Laboratory Research and Outside Passions, Review and Update for Neurosurgeons, Woods Hole, MA, October **2012**.
122. Neurosurgery in Africa: Building Foundations and Building Programs, Duke Neurology Grand Rounds, December, **2012**.
123. Fellowship Examinations College of Surgeons Eastern, Southern, Central Africa, Addis Ababa, Ethiopia, December, **2012**.
124. Update on Functional Neurosurgery, New Mulago National Hospital Grand Rounds, January, **2013**.
125. Building a Neurosurgical Training Program in Uganda. New Mulago Hospital Grand Rounds, January, **2013**.

126. Patient Physician Communications for Neurosurgeons. Senior Society of Neurological Surgeons Boot Camp 2, New York, April, **2013**.
127. Patient Physician Communications for Neurosurgeons. Senior Society of Neurological Surgeons Boot Camp 2, St. Louis, May, **2013**.
128. Communications for Neurosurgeons, Senior Society of Neurological Surgeons Annual Meeting, Boston, June, **2013**.
129. Anterior Cervical Discectomy: Approaches and Complications, Duke Spine Center Symposium, September **2013**.
130. From Epileptic Neurons to the Pearl of Africa, Distinguished Alumni of the Year Lectureship, Pacific Lutheran University, October, **2013**.
131. Academic Neurosurgery: Combining Clinical Practice, Laboratory Research and Outside Passions, Review and Update for Neurosurgeons, Woods Hole, MA, October **2013**.
132. Fellowship Examiner, College of Surgeons of Southern, Eastern and Central Africa, Harare, Zimbabwe, December, **2013**.
133. Patient Physician Communications for Neurosurgeons. Senior Society of Neurological Surgeons Boot Camp 2, Indianapolis, Indiana, May, **2014**.
134. Fellowship Examiner, College of Surgeons of Southern, Eastern and Central Africa, Addis Ababa, Tanzania, December, **2014**.
135. Surgical Autonomy Project, Innovations in Medical Education, Awardee, University of Southern California, February, **2015**.
136. Building Neurosurgical Capacity and Training in Uganda, Foundation for International Education for Neurological Surgeons Annual Meeting, March, **2015**.
137. Global Education and Training in Neurosurgery, Senior Society of Neurological Surgeons, Annual Meeting, Miami, Florida, June, **2015**.
138. The Match for Medical Students, Regional Southeastern Under-represented Minority Conference, Duke University, August, **2015**.

139. Going Global with Neurosurgery and Neuroscience, Duke Department of Neurology Grand Rounds, August, **2015**.

140. Burden of Surgical Disease in Uganda, Surgical and Anesthesia Annual Conference, Kampala, Uganda, September, **2015**.

141. Global Neurosurgery as an Academic Endeavor, Review and Update for Neurosurgeons, Woods Hole, MA, October **2015**.

142. Evaluation of Neurosurgery Fellows Teaching and Training, Head External Examiner Neurosurgery Fellowship (FCS), College of Surgeons of Eastern, Central, Southern Africa (COSECSA), December **2015**.

### **Neurosurgical and Medical Service and Training Camps:**

**1. July, 1996, Director**, Ecuador General Medical Team (9 member team):

General Medical Treatment (500 patients treated in one week), Ambato, Ecuador.

**2. July, 1997, Director**, Ecuador General Medical Team (25 member team):

General Medical Treatment (1,000 patients treated in one week), Guayaquil, Ecuador.

**3. August, 1998, Director**, Ecuador General Medical Team (40 member team):

General Medical Treatment (1,250 patients treated in one week), Guayaquil, Ecuador.

**4. July, 1999, Co-Director**, Ecuador General Medical Team (65 member team):

General Medical Treatment (2,500 patients treated in one week), Guayaquil, Ecuador.

**5. July, 1999, Camp Physician**, Royal Family Kids Camp, Providing Medical Care and Treatment for 40 Wake County Foster Children at one week camp, The Summit, Winston-Salem, NC.

**6. July, 2000, Co-Director**, Ecuador General Medical Team (60 member team):

General Medical Treatment (2,500 patients treated in one week), Guayaquil, Ecuador.

**7. July, 2000, Camp Physician**, Royal Family Kids Camp, Providing Medical Care and Treatment for 40 Wake County Foster Children at one week camp, The Summit, Winston-Salem, NC.

8. **July, 2001, Camp Physician**, Royal Family Kids Camp, Providing Medical Care and Treatment for 40 Wake County Foster Children at one week camp, The Summit, Winston-Salem, NC.
9. **July, 2002, Camp Physician**, Royal Family Kids Camp, Providing Medical Care and Treatment for 38 Wake County Foster Children at one week camp, The Summit, Winston-Salem, NC.
10. **July, 2003, Camp Physician**, Royal Family Kids Camp, Providing Medical Care and Treatment for 40 Wake County Foster Children at one week camp, The Summit, Winston-Salem, NC.
11. **July, 2003, Co-Director**, Ecuador General Medical Team (62 member team): General Medical Treatment (2,750 patients treated in one week), Guayaquil, Ecuador.
12. **July, 2004, Camp Physician**, Royal Family Kids Camp, Providing Medical Care and Treatment for 41 Wake County Foster Children at one week camp, The Summit, Winston-Salem, NC.
13. **June, 2004, Co-Director**, Ecuador General Medical Team (75 member team): General Medical Treatment (3,000 patients treated in one week), Guayaquil, Ecuador.
14. **July, 2005, Camp Physician**, Royal Family Kids Camp, Providing Medical Care and Treatment for 40 Wake County Foster Children at one week camp, The Summit, Winston-Salem, NC.
15. **July, 2005, Co-Director**, Ecuador General Medical Team (68 member team): General Medical Treatment (3,000 patients treated in one week), Guayaquil, Ecuador.
16. **July, 2006, Co-Director**, Ecuador General Medical Team (80 member team): General Medical Treatment (3,000 patients treated in one week), Guayaquil, Ecuador.
17. **August 4-14, 2007, Director** Duke in Uganda (33 member team): Delivering 1,400 pieces of medical equipment weighing 9 tons, worth \$1,250,00, performed 33 complex neurosurgical procedures, New Mulago Hospital, Kampala, Uganda.
18. **July 23- August 4, 2008, Director** Duke in Uganda (55 member team): Delivering 7 tons of Donated Medical Equipment, worth \$800,000, performed 25 complex neurosurgical procedures, New Mulago Hospital, Kampala, Uganda.

- 19. January 11-21, 2009, Co-Director** Duke in Uganda (16 member team): Delivered \$1,200,000 of spine equipment to Orthopedic Surgery Department, performed 17 complex spine surgery procedures, New Mulago Hospital, Kampala, Uganda.
- 20. July 22- August 3, 2009, Director** Duke in Uganda (30 member team): Delivering 6 tons of Donated Medical Equipment, worth \$600,000, performed 17 complex neurosurgical procedures, New Mulago Hospital, Kampala, Uganda.
- 21. April 4-10, 2009, Director** Duke in Rwanda (3 member team): Delivered \$1,200,000 of neurosurgical equipment and made preparations for March 2010 Neurosurgical Surgical Camp, King Faisal and CHUK Hospitals, Kigali, Rwanda.
- 22. July 25- August 4, 2010, Director** Duke in Uganda (27 member team): Delivering 4 tons of Donated Medical Equipment, worth \$550,000, performed 21 complex neurosurgical procedures, New Mulago Hospital, Kampala, Uganda.
- 23. March 3-14, 2011, Director** Duke in Rwanda (16 member team): Delivered 7 tons of Donated Medical Equipment, worth \$650,000, performed 28 complex neurosurgical procedures, King Faisal Hospital, Kigali, Rwanda.
- 24. August 27-September 7, 2011, Director,** Duke in East Africa (17 member team): Delivered 8 tons of Donated Medical Equipment, worth \$850,000, performed 28 complex neurosurgical procedures, MOI Teaching and Referral Hospital, Eldoret, Kenya.
- 25. April 10- April 19, 2012, Director,** Duke in East Africa (22 member team); Delivered 5 tons of Donated and Purchased Medical Equipment worth \$650,000, performed 23 complex neurosurgical procedures, New Mulago National Hospital, Kampala, Uganda.
- 26. January 8-19, 2013, Director,** Duke in East Africa (23 member team); Delivered 6 tons of Donated and Purchased Medical Equipment worth \$450,000, performed 21 complex neurosurgical procedures and opened new Operating Theater worth \$100,000 plus new operating microscope worth \$50,000, New Mulago National Hospital, Kampala, Uganda.
- 27. November 10-19, 2013, Director,** Duke in East Africa (19 member team); Delivered 5 tons of Donated and Purchased Medical Equipment worth \$650,000, performed 38 complex neurosurgical procedures, New Mulago National Hospital, Kampala, Uganda.
- 28. August 15-23, 2014, Director,** Duke in East Africa (24 member team); Delivered 6 tons of Donated and Purchased Medical Equipment worth \$575,000, performed 31 complex neurosurgical procedures, New Mulago National Hospital, Kampala, Uganda.

**29. April 17-24, 2015**, Director, Duke in East Africa (17 member team); Delivered 7 tons of Donated and Purchased Medical Equipment worth \$450,000, performed 19 complex neurosurgical procedures, New Mulago National Hospital, Kampala, Uganda.

**30. October 30-November 7, 2015**, Director of Duke in East Africa (27 member team); Delivered 19 tons of Donated and Purchased Medical Equipment worth \$750,000, performed 24 complex neurosurgical procedures and operationalized two new operating rooms, Mbarara University Science and Technology University Hospital, Mbarara, Uganda.