



CURRICULUM VITAE  
FREDERICK ARTHUR LENZ  
August, 2009

DEMOGRAPHIC INFORMATION

Current Appointments:

A. Earl Walker Professor of Functional Neurosurgery  
The Johns Hopkins University, Baltimore, MD.  
2008- present.

Professor of Neurosurgery, School of Medicine.  
The Johns Hopkins University, Baltimore, MD.  
1998- present.

Attending Neurosurgeon  
The Johns Hopkins Hospital, Baltimore, MD.  
1988- present.  
- Chief- Epilepsy Surgery 1994- present.

The Johns Hopkins Bayview Medical Center, Baltimore, MD.  
Attending Neurosurgeon 1988-2002  
Part-time Attending Staff 2002 - Present

Personal Data:

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Date of Birth: December 7, 1951

Place of Birth: Hamilton, Canada

Citizenship: Canadian by birth  
 Naturalized American 2000

Marital Status: Married to Yvonne Elisabeth (Istl) Lenz  
 October 8, 1982

Children: Richard Frederick born April 26, 1989.  
 David Eric born December 29, 1990.

Education:

1973	University of Toronto	B.Sc.- Chemistry and Physics. Senior Project: ‘ Effect of acetylene structure on rates and products of addition of 4-chloro-benzene-sulphenyl chloride.
1977	University of Toronto	M.D.
1981	University of Toronto	M.Sc. - Thesis: The Electromyographic Response to Displacement of Several Joints in the Squirrel Monkey Forelimb.
1988	University of Toronto	Ph.D. - Thesis: Single Unit Analysis of the Ventral Nuclear Group of Human Thalamus.

Training:

1977-78	Wellesley Hospital, Toronto	Surgical Intern
1979-83	University of Toronto	Research Fellow- Neurosurgery
<i>Junior Resident</i>		
1978-79	Toronto General Hospital Toronto Western Hospital	Cardiovascular Surgery Orthopaedic Surgery
1983-84	Toronto General Hospital Sunnybrook Medical Center, Toronto	Neurosurgery Neurosurgery
1984-85	St. Michael’s Hospital, Toronto St. Michael’s Hospital, Toronto	Neuroradiology Neurology
1985-86	Toronto Western Hospital	Neurosurgery

	Toronto General Hospital	Neurosurgery
1986-87	Hospital for Sick Children, Toronto Toronto General Hospital Toronto General Hospital	Neurosurgery Neuropathology Neurosurgery
<i>Clinical Fellow</i>		
1987-88	Toronto General Hospital	Botterell Fellow
<i>Courses</i>		
July 2002	University of Pittsburg	Gamma Knife Course

Professional Experience:

1988- 1992	Assistant Professor of Neurosurgery, School of Medicine The Johns Hopkins University, Baltimore, MD.
1992- 1998	Associate Professor of Neurosurgery, School of Medicine The Johns Hopkins University, Baltimore, MD.
1988- 1994	Chief- Department of Neurosurgery Johns Hopkins Bayview Medical Center, Baltimore, MD.
2005- present	Clinical Associate, Neuro-engineering group of Biomedical Engineering, John Hopkins University. 2005.
2007 – present	Professor of Neuroscience. John Hopkins University.

RESEARCH ACTIVITIES

Publications:

A.i. Journals (published/in press):

1. Schmid, G.A., Modro, A., **Lenz, F.A.**, Garratt, D.G. and Yates, K. Effects of acetylene structure on rates and products of addition of 4-chloro-benzene-sulphenyl chloride. J. Org. Chem. 41: 2331-2336, 1976.
2. **Lenz, F.A.**, Tatton, W.G. and Tasker, R.R. Electromyographic response to displacement of different forelimb joints in the squirrel monkey. J. Neurosci. 3: 783-794, 1983.
3. **Lenz, F.A.**, Tatton, W.G. and Tasker, R.R. The effect of cortical lesions on the electromyographic response to joint displacement in the squirrel monkey forelimb. J. Neurosci. 3: 795-805, 1983.

4. **Lenz, F.A.**, Tasker, R.R., Kwan, H.C., Murphy, J.T. and Nguyen-Huu, H.H. Techniques for the study of spike trains in the human central nervous system. Acta Neurochir. Suppl. 33: 57-61, 1984.
5. **Lenz, F.A.**, Tasker, R.R., Kwan, H.C., Schnider, S., Kwong, R. and Murphy, J.T. Cross-correlation analysis of thalamic 'tremor cells' and electromyographic activity in patients with parkinsonian tremor. Appl. Neurophysiol. 48: 305-309, 1986.
6. Schnider, S.M., Kwong, R.H., Kwan, H.C. and **Lenz, F.A.** Detection of feedback in the central nervous system of parkinsonian patients. IEEE Transactions on Decision & Control 25(1): 291-294, 1986.
7. **Lenz, F.A.**, Schnider, S. Tasker, R.R., Kwong, R., Kwan, H.C., Dostrovsky, J.O. and Murphy, J.T. The role of feedback in the tremor frequency activity of tremor cells in patients with parkinsonian tremor. Acta Neurochir. Suppl. 39: 54-57, 1987.
8. **Lenz, F.A.**, Tasker, R.R., Tatton, W.G. and Halliday, W. Long latency reflex activity in a primate MCA occlusion model of human spasticity. EEG Clin. Neurophysiol. 67: 238-246, 1987.
9. Tasker, R.R., **Lenz, F.A.**, Yamashiro, Gorecki, J., Hirayama, T. and Dostrovsky, J.O. Microelectrode techniques in localization of stereotactic targets. Neurol. Res. 9: 105-112, 1987.
10. **Lenz, F.A.**, Tasker, R.R., Dostrovsky, J.O., Kwan, H.C., Gorecki, J., Hirayama, T. and Murphy, J.T. Abnormal neuronal activity in the thalamus of a quadriplegic patient with central pain. Pain 31:225-236, 1987.
11. **Lenz, F.A.**, Tasker, R.R., Kwan, H.C., Schnider, S., Kwong, R., Dostrovsky, J.O. and Murphy, J.T. Selection of the optimal target for the relief of parkinsonian tremor on the basis of spectral analysis of neuronal firing patterns. Appl. Neurophysiol. 50: 338-343, 1988.
12. Tasker, R.R., Dostrovsky, J.O., **Lenz, F.A.**, Yamashiro, K. and Gorecki, J. Thalamic microelectrode recording and microstimulation in central and deafferentation pain. Appl. Neurophysiol. 50: 414-417, 1988.
13. **Lenz, F.A.**, Tasker, R.R., Dostrovsky, J.O., Kwan, H.C., Gorecki, J., Hirayama, T. and Murphy, J.T. Human single unit activity and responses to stimulation in the presumed ventrocaudal nucleus of patients with central pain. Pain Research and Clinical Management 3:157-164, 1988.
14. **Lenz, F.A.**, Dostrovsky, J.O., Kwan, H.C., Tasker, R.R., Yamashiro, K. and Murphy, J.T. Methods for microstimulation and recording of single units and evoked potentials in the human central nervous system. J. Neurosurg. 68: 630-634, 1988.

15. **Lenz, F.A.**, Tasker, R.R., Kwan, H.C., Dostrovsky, J.O. and Murphy, J.T. Single unit analysis of the human thalamic ventral nuclear group: correlation of thalamic 'tremor cells' with the 3-6 Hz component of parkinsonian tremor. J. Neurosci. 8: 754-764, 1988.
16. **Lenz, F.A.**, Tasker, R.R., Dostrovsky, J.O., Kwan, H.C., Yamashiro, K. and Murphy, J.T. Single unit analysis of the human ventral thalamic nuclear group: somatosensory responses. J. Neurophysiol. 59: 299-317, 1988.
17. Hirayama, T., Dostrovsky, J.O., Gorecki, J., Tasker, R.R. and **Lenz, F.A.** Recordings of abnormal activity in patients with deafferentation and central pain. Stereo. and Functional Neurosurgery 52: 120-126, 1989.
18. Gorecki, J., Hirayama, T. Dostrovsky, J.O., Tasker, R.R. and **Lenz, F.A.** Thalamic stimulation and recording in patients with deafferentation and central pain. Stereo. and Functional Neurosurgery 52: 219-226, 1989.
19. Schnider, S.M., Kwong, R.H., **Lenz, F.A.** and Kwan, H.C. Detection of feedback in the human CNS by system identification techniques. Biological Cybernetics 60: 203-212, 1989.
20. **Lenz, F.A.**, Kwan, H.C., Dostrovsky, J.O. and Tasker, R.R. Characteristics of bursts of action potential which occur in the sensory thalamus of patients with central pain. Brain Research 496: 357-360, 1989.
21. **Lenz, F.A.**, Martin, R., Kwan, H.C., Tasker, R.R., Dostrovsky, J.O., and Delong, M.R. Thalamic single unit activity in patients with hemidystonia. Functional and Stereotactic Neurosurgery 54: 159-162, 1990.
22. **Lenz, F.A.**, Neurophysiologic studies in patients with pain secondary to neural injury. Adv. Pain Res. Ther. 19:141-150, 1991.
23. **Lenz, F.A.**, Kwan, H.C., Dostrovsky, J.O., Tasker, R.R., Murphy, J.T., Lenz, Y.E. Single unit analysis of the human ventral thalamic nuclear group: Activity correlated with movement. Brain 113: 1795-1821, 1990.
24. **Lenz, F.A.** Ascending modulation of thalamic function and pain: Experimental and clinical data. Advances in Pain Research and Therapy 20:177-196, 1991.
25. **Lenz, F.A.**, Boivie, J., Casey, K.L., Jones, E.G. The ventral posterior nucleus of thalamus is involved in the generation of central pain syndromes. J. Am. Pain Society 1:42-51, 1992.
26. Lin, Y.C. and **Lenz, F.A.** Effective response evoked by microstimulation of thalamic nuclei in patients with tremor. Chinese Medical Journal 106:372-374, 1993.

27. **Lenz, F.A.**, Vitek, J.R., DeLong, M.R. The role of Thalamus in Parkinsonian Tremor: Evidence from studies of patients and primate models. Stereotactic and Functional Neurosurgery 60:94-103, 1993.
28. **Lenz, F.A.**, Seike, M., Lin, Y.C., Richardson, R.T., Baker, F.H., C.J. Jaeger and Gracely, R.G. Thermal and pain sensations evoked by stimulation in the area of the human ventrocaudal nucleus. J. Neurophysiol. 70:200-213, 1993.
29. **Lenz, F.A.** Seike, M., Lin, Y.C., Baker, F.H., Rowland, L.H., Gracely, R.G. and Richardson, R.T., Neurons in the area of human thalamic nucleus ventralis caudalis (Vc) respond to painful heat stimuli. Brain Res. 623:235-240, 1993.
30. Dougherty, P.M. and **Lenz,F.A.** Plasticity of the nervous system following neural injury. Prog. Pain Res. Manag. 3:439-460, 1995.
31. **Lenz, F.A.**, Kwan, H.C., Martin, R., Dostrovsky, J.O., Tasker, Murphy, J.T. and Lenz, Y.E. Single unit analysis of the human thalamic ventral nuclear group: tremor-related activity in functionally identified cells. Brain 117: 531-543, 1994.
32. **F.A.Lenz**, R.H.Gracely, E. Hope, F.H. Baker, L.H.Rowland, P.M.Dougherty, R.T.Richardson. The Sensation of Angina can be evoked by Stimulation of the Human Thalamus. Pain 59: 119-125, 1994.
33. **Lenz, F.A.**, Kwan, H.C., Martin, R., Tasker, R.R., Richardson, R.T., Dostrovsky, J.O. Characteristics of somatotopic organization and spontaneous neuronal activity in the region of the human principal sensory nucleus in patients with spinal cord transection. J. Neurophysiol. 72: 1570-1587, 1994.
34. Lin, Y.C. and **Lenz, F.A.** Distribution and response evoked by microstimulation of thalamic nuclei in patients with dystonia and tremor. Chinese Medical Journal. 107:265-270, 1994.
35. **Lenz, F.A.**, Gracely, R.H., Rowland, L.H., Dougherty, P.H. A population of cells in the human thalamic principal sensory nucleus respond to painful mechanical stimuli.' Neurosci. Litt. 180:46-50, 1994.
36. **Lenz,F.A.**, Dougherty, P.M. Pain Processing in Human Ventrocaudal Nucleus of Thalamus. Adv. Pain Res. and Therapy 22:175-185, 1995.
37. **Lenz, F.A.**, Normand, S., Kwan, H.C., Andrews, D., Tasker, R.R., Jones, M.W., Dostrovsky, J.O. and Lenz, Y.E. Statistical prediction of the optimal site for thalamotomy in parkinsonian tremor. Movement Disorders. 10:318-328, 1995.
38. **Lenz, F.A.**, Gracely, R.H., Romanowski, A.J., Hope, E.J., Rowland, L.H., Dougherty, P.H. Stimulation of human somatosensory thalamus can reproduce both the

affective and sensory aspects of previously experienced pain. Nature (Medicine) 1:910-913, 1995.

39. Dougherty, P.M., Li, Y.J., **Lenz, F.A.**, Rowland, L.H. and Mittman, S.M. Evidence that excitatory amino acids mediate afferent input to the primate somatosensory thalamus. Brain Res. 278:267-273, 1996.

40. Yoon, R.S., Tsang, P.W., **Lenz, F.A.**, Kwan, H.C. Characterization of cortical spreading depression by imaging of intrinsic optical signals. Neuroreport 7:2671-2674, 1997.

41. Dougherty, P.M., Li, Y.-J., **Lenz, F.A.**, L.H. Rowland, Mittman, S. Correlation of effects of general anesthetics on somatosensory neurons and cortical EEG power. J. neurophysiol. 77: 1375-1392, 1997.

42. **Lenz, F.A.**, Gracely, R.H., Rowland, L.H., Leopold, D.A., Zirh, A.T., Dougherty, P.M. A human thalamic nucleus mediating taste and other sensations related to ingestive behavior. J. Neurophysiol. 77:3406-3409, 1997

43. **Lenz, F.A.**, Gracely, R.H., Zirh, A.T., Romanoski, A.J., Staats, P., Dougherty, P.M. The sensory-limbic model suggests testable hypotheses about the learned component of the affective dimension of pain. Pain Forum 6:41-43, 1997.

44. Suarez, J.I. Verhagen Metman, L., Reich, S.G., Dougherty, P.M., Hallett, M. **Lenz, F.A.** Pallidotomy for Hemiballismus: Efficacy and Characteristics of Neuronal Activity. Ann. Neurol. 42:807-811, 1997.

45. Mandir, A.S., Rowland, L.H., Dougherty, P.M., **Lenz, F.A.** Microelectrode recording and stimulation techniques during stereotactic procedures in the thalamus and pallidum. Adv. Neurol. 74:159-165, 1997.

46. **Lenz, F.A.**, Gracely, R.H., Romanoski, A.J., Dougherty, P.M. The sensory-limbic model of pain memory: Connections from thalamus to the limbic system mediate the learned component of the affective dimension of pain. Pain Forum 6:22-30, 1998.

47. Hua, S., **Lenz, F.A.**, Zirh, T.A., Reich, S.G., Dougherty, P.M. Thalamic activity correlated with essential tremor. J. Neurol. Neurosurg. Psych. 64:273-276, 1998.

48. Zirh, T.A., **Lenz, F.A.**, Reich, S.G., Dougherty, P.M. Patterns of Bursting occurring in Thalamic cells during Parkinsonian Tremor. Neuroscience 83, 107-121, 1998.

49. Hua, S., Reich, S.G., Zirh, T.A. Perry, V.L., Dougherty, P.M., **Lenz, F.A.** Role of the Thalamus and Basal Ganglia in Parkinsonian Tremor. Movement Disorders 13(suppl. 3), 40-43, 1998.

50. **Lenz, F.A.**, Dougherty, P.M. The new version of the thalamic disinhibition hypothesis may explain clinical features that occur in some patients with central pain. Pain Forum 7:20-23, 1998.
51. van der Munckhof, P., **Lenz, F.A.**, Chase, T.N., Verhagen Metman, L. Square wave action dystonia in parkinson's disease. Movement Disorders 13:354-356, 1998.
52. Hillis, A.E., **Lenz, F.A.**, Zirh, T.A., Eckel, T., Dougherty, P.M., Jackson, K. Hemispatial somatosensory and motor extinction after thalamic lesions. Neurocase. 4:21-34, 1998.
53. **Lenz, F.A.**, Zirh, A., Garonzik, I.M., Richardson, R.T., Rowland, Dougherty, P.M. Characteristics of Spontaneous Neuronal Activity in the region of the Human Principal Sensory Nucleus of thalamus in Patients with Amputations. Neurosci. 86:1065-1081,1998.
54. **Lenz, F.A.**, Rios, M., Zirh, T.A., Chau, D., Krauss, G., Lesser, R.P. Painful Stimuli Evoke Potentials Recorded over the Human Anterior Cingulate Gyrus. J. neurophysiol. 79:2231-2234, 1998.
55. Spatz, M., Kawai, N., Bembry, J., **Lenz, F.A.** and McCarron, R.M. Human Brain Capillary Endothelium: Modulation of K Efflux and K and Ca uptake by endothelium. Neurochemical Research 35:1135-1132, 1998.
56. **Lenz, F.A.**, Dougherty,P.M. Neurons in the Human Thalamic Principal Somatosensory Nucleus (Ventralis Caudalis - Vc) Respond to Innocuous Cool and Mechanical Stimuli. J. neurophysiol. 79:2227-2231, 1998.
57. Oppenheimer, S.M., Kulshreshtha, N., **Lenz, F.A.**, Rowland, L.H., Dougherty, P.M. Distribution of Cardiovascular related sites within the human thalamus. Clin. Autonomic Res. 8:173-179, 1998.
58. Dougherty,P.M., Mittman,S., **Lenz,F.A.** Facilitation of responses to AMPA but not kainate by cyclothiazide in primate somatosensory nucleus. Neurosci. Litt. 246:17-20, 1998.
59. Dougherty,P.M., Willis,W.D., **Lenz,F.A.** Transient inhibition of responses to thermal stimuli in monkey spinal sensory tract cells following intradermal injection of capsaicin. Pain 77: 129-136, 1998.
60. **Lenz, F.A.**, Suarez, J.I., Verhagen-Metman, L., Reich, S.G., Karp, B.I., Hallett, M., Rowland, L.H., Dougherty, P.M. Pallidal activity during dystonia: somatosensory reorganization and activity dependent changes in spontaneous activity. J. Neurol. Neurosurg. Psych. 65: 767-770, 1998.

61. **Lenz, F.A.**, Gracely, R.H., Baker, F.H., Richardson, R.T. and Dougherty, P.M., Reorganization of sensory modalities evoked by microstimulation in region of the thalamic principal sensory nucleus in patients with pain due to the nervous system injury. J. Comp. Neurol. 399:125-138, 1998.
62. **Lenz, F.A.**, Rios, M., Chau, D., Krauss, G., Lessor, R.P. Painful stimuli evoke potentials recorded from the human parasyllian cortex. J. neurophysiol. 80: 2077-2088, 1998.
63. Zirh, T.A., Reich, S.G., Perry, V. and **Lenz, F.A.** Thalamic single unit and electromyographic activities in patients with dystonia. Adv. Neurol. 78:27-32, 1998.
64. Chen, Y., McCarron, M.C., Bembry, J., Ruetzler, C., Azzam, N., **Lenz, F.A.**, Spatz, M. Nitric oxide modulates ET-1-induced Ca<sup>2+</sup> mobilization and cytoskeletal F-Actin filaments in human cerebromicrovascular endothelial cells. J. Cerebral Bloodflow and Metabolism. 19:133-138, 1998.
65. Perry, V.L., **Lenz, F.A.** Ablative Surgery for Treatment of Movement Disorders: Thalamotomy for Parkinson's Disease. Neurosurgical Clinics of North America. 9:317-324, 1998.
66. Skolasky, R.L., Dal Pan, G.J., Olivi, A., **Lenz, F.A.**, Abrams R.A., McArthur, J.C. HIV-associated primary CNS lymorbidity and the utility of brain biopsy. J.Neurol. Sci. 63:32-38, 1999.
67. Zirh, T.A., Reich, S.G., Dougherty, P.M., **Lenz, F.A.** Stereotactic Thalamotomy in the Treatment of Essential Tremor: Re-assessment including a Blinded Measure of Outcome. J. Neurol. Neurosurg. Psych. 66:772-775, 1999.
68. Lee, J., Dougherty P.M., Antezana, D., **Lenz, F.A.** Responses of neurons in the region of human thalamic principal somatic sensory nucleus to mechanical and thermal stimuli graded into the painful range. J Comp Neurol 410(4): 541-55, 1999.
69. Treede, R.D., Vogel, H., Rios, M., Krauss, G., Lesser, R.P., **Lenz, F.A.** Pain-related evoked potentials from parasyllian cortex in humans. Electroencephalogr Clin Neurophysiol (Suppl.) 49: 250-5, 1999.
70. Vitek, J.L., Lozano, A., **Lenz, F.A.** Stereotactic Ablative and Stimulation Procedures for Treatment of Movement Disorders. Neurosurgical Quarterly 9:103-119, 1999.
71. Greenspan, J.D., Lee, R.R., **Lenz, F.A.** Pain threshold elevations associated with lesions of parasyllian cerebral cortex. Pain 81:273-282, 1999.

72. M.Rios, R.D.Treede, J-I. Lee, **F.A.Lenz** Evoked Potentials Recorded over the Human Anterior Cingulate Gyrus and Parasylvian cortex in Response to Painful Stimuli. Current review of pain 3: 256-264, 1999.
73. A.W. Lemstra, L.Verhagen Metman, P.M.Dougherty, J.I.Lee, **F.A.Lenz**. Tremor-frequency (3-6 Hz) activity in arm sensorimotor portion of the globus pallidus in patients with Parkinson's disease. Neurosci. Lett. 267: 129-132, 1999.
74. Spatz,M., Yamamoto, T., Yamamoto,H., Brenner,M., **Lenz,F.A.**, and McCarron, R. NO-mediated modification of endothelin receptor properties. Neurochemical Research 23:1125-1132, 1999.
75. Dougherty, P.M., Schwartz, A., and **Lenz, F.A.** Responses of primate spinomesencephalic tract cells in intradermal capsaicin. Neuroscience 90: 1377-1392, 1999.
76. **Lenz,F.A.**, Jaeger, C.J., Seike, M., Lin,Y.C., Reich, S.G., DeLong, M.R., Vitek,J.R. Single neuron analysis of the motor thalamus in patients with dystonia. J. Neurophysiol. 82: 2372-2392, 1999.
77. Giangaspero, F., Guiducci, A., **Lenz, F.A.**, Mastronardi, L., Burger, P.C. Meningioma with meningioangiomas: a condition mimicking invasive meningiomas in children and young adults. Am J Surg Path 23:872-875, 1999.
78. **Lenz, F.A.**, Byl, N.N. Reorganization in the Cutaneous Core of the Human Thalamic Principal Somatic sensory Nucleus (Ventral caudal - Vc) in patients with dystonia. J. Neurophysiol. 82:3204-3212, 1999.
81. Hallett, M., Litvan, I., and the members of the Task Force on Surgery for Parkinson's Disease of the American Academy of Neurology Therapeutic and Technology Assessment Committee. Evaluation of Surgery for Parkinson's Disease. Neurology 53:1910-1921, 1999.
82. Chen,Y., McCaron, R.M., Azzam, N., Ruetzler, C., **Lenz, F.A.**, Spatz, M. Endothelin-1 and Nitric Oxide affect human microvascular endothelial responses and signal transduction. Acta Neurochirurgica, Suppl. 76: 131-135, 2000.
83. Ohara,Y., McCarron, R.M., Hoffman,T.J., Sugano,H., Bemby,J., **Lenz, F.A.**, Spatz,M.. Adrenergic mediation of TNF-alpha stimulated ICAM-1 expression on human brain microvascular endothelial cells. Acta Neurochirurgica. Suppl. 76: 117-120, 2000.
84. Muthuswamy, J., Tran, R., Rangarajan, R., **Lenz, F.A.**, Hanley,D.F., Thakor,N.V. Somatosensory stimulus entrains spindle oscillations in the thalamic VPL nucleus in barbiturate anesthetized rats. Neurosci Lett. 262: 191-194, 1999.

85. Boatman, D., Gordon, B., Hart, J., Selnes, O., Miglioretti, D., **Lenz, F.A.** Transcortical sensory aphasia: Revisited and revised. Brain 123:1634-1641, 2000.
86. Ralston, D.D., Dougherty, P.M., **Lenz, F.A.**, Weng, H-R., Vierck, C.J., Ralston, H.J. Plasticity of the inhibitory circuitry and neuronal responses in the primate somatosensory thalamus following lesions of the dorsal column and spinothalamic pathways. Prog. pain research manag. 16: 427-434, 2000.
87. **Lenz, F.A.**, Rios, M., Lee, J-I., Treede, R.D., Boatman, D., Port, J., Krauss, G. Pain and auditory-evoked potentials have different generators than the auditory P3 potential in temporal-parasyylvian cortex. Neuroscience Letters 279:153-156, 2000.
88. Hallett, M., Litvan, I., and the members of the Task Force on Surgery for Parkinson's Disease of the American Academy of Neurology Therapeutic and Technology Assessment Committee. Scientific Position Paper of the Movement Disorder Society: Evaluation of Surgery for Parkinson's Disease. Movement Disorders 15:436-438, 2000.
89. Hua, S.E., Garonzik, I., Lee, J-I., **Lenz, F.A.** Microelectrode studies of normal organization and plasticity of human somatosensory thalamus. J Clin. Neurophysiol.: 17:559-274, 2000.
90. Treede, R.D., Apkarian, A.V., Bromm, B. Greenspan, J.D., **Lenz, F.A.** Cortical representation of pain: functional characterization of nociceptive areas near the lateral sulcus. Pain 87:113-120, 2000.
91. Boatman, D, Alidoost, M, Bergey, G, Gordon, B, Crone, N, **Lenz, FA.** Right hand language dominance in a right handed patient with late-onset seizures. Epilepsy and Behavior 1:281- 286, 2000.
92. **Lenz,F.A.**, Lee,J-I., Garonzik, I.M., Rowland, L.H., Dougherty, P.M. Hua,S.E. Plasticity of pain-related neuronal activity in human thalamus. Progress in Brain Research. 129:259-273, 2000.
93. Weng, H.R., Lee, J-I, **Lenz, F.A.**, Schwartz, A., Vierck, C., Rowland, L., Dougherty, P.M. Functional plasticity of the primate somatosensory thalamus following chronic lesion of the ventral lateral spinal cord. Neurosci. 101:393-401,2000.
94. Chen, Y., R.MacCarron, Ohara, Y., Bembry,J., Azzam,N., **Lenz, F.A.**, Shohami, E., Mechoulam, R., Spatz, M., Human Brain Capillary Endothelium; 2-Arachidonoglycerol interacts with Endothelin. Circ Res. 87:323-327, 2000.
95. I. Garonzik, E.Samdani, S.Ohara, **F. A. Lenz.** Deep brain stimulation for the control of pain. Epilepsy and Behavior 2: S55-60, 2001.

96. Moriarity, J.L, Krauss, G.L., Boatman, D., Storm, P., **Lenz, F.A.** Memories can be evoked by electrical stimulation of lateral temporal cortex after hippocampal resection. Journal of Neurol Neurosurg Psych 71:549-551, 2001.
97. I.M.Garonzik, S.E.Hua, S. Ohara, **F.A. Lenz.** Intraoperative microelectrode recording and semi-microrecording during the physiologic localization of thalamic nucleus ventral intermediate. Movement Disorders – 17:S135-144, 2002.
98. P. Krack, J. Dostrovsky, I. Ilinsky, K. Kultas-Ilinsky, **F. Lenz,** A. Lozano, J. Vitek Surgery of the motor thalamus: problems with the present nomenclatures. Movement Disorders, - 17:S2-8, 2002.
99. S. Ohara, **F.A. Lenz** ,Reorganization of Somatic Sensory Function in the Human Thalamus after Ischemic Stroke. Annals of Neurology, 50:800-803, 2002.
100. **F. A. Lenz,** C. J. Jaeger, M. S. Seike, Y. C. Lin+, S. G. Reich., Single Neuron Analysis of Human Thalamus in Patients with Intention Tremor and Cerebellar Signs. J. neurophysiol. 87: 2084-2094, 2002.
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58. R. Hurley, R, **Lenz FA**. The neurosurgical treatment of cancer pain. In: Cancer Pain: Assessment and Management. Second Edition, edited by Eduardo D. Bruera and Russell K. Portenoy. New York: Cambridge University press. In press.
59. W.S. Anderson, R.E. Clatterbuck, M.D, K. Kobayashi, J-H Kim, **F.A. Lenz**. Lesions versus implanted stimulators in functional neurosurgery,. Springer-Verlag, Berlin. Textbook of Stereotactic and functional neurosurgery. edited by AM Lozano, PL Gildenberg, RR Tasker. pp 1349-1358, 2009.
60. W.S. Anderson, K. Kobayashi, J-H Kim, **F.A. Lenz**. Neurosurgical treatment of tremor. In R Winn ed, Youman's Neurological Surgery. Saunders: New York – in press.
61. W.S. Anderson, K. Kobayashi, J-H Kim, **F.A. Lenz**. Thalamotomy. In C. Comella, Encyclopedia of Movement Disorders, Elsevier: New York. – in press.
62. W. S. Anderson, Richard.Clatterburg, K.Kobayashi, J.H. Kim, F.A. Lenz, Lesioning and Stimulation as Surgical Treatments for Psychiatric Disorders. Neurosurg. Quarterly – in press.

#### D. Abstracts:

1. Lenz, F.A., Tasker, R.R., Bruce, I.C. and Tatton, W.G. The EMG response to displacement of several upper limb joints in the squirrel monkey. The Physiologist 23: 22, 1980.
2. Lenz, F.A., Tasker, R.R., Bruce, I.C. and Tatton, W.G. The EMG response to joint displacement in flexors and extensors of the squirrel monkey forelimb. Can. Physiol. 11: 98, 1980.
3. Lenz, F.A., Tasker, R.R. and Tatton, W.G. The effect of cortical lesions on reflex responses to torque perturbations in the squirrel monkey forelimb. Soc. Neurosci. 7: 560, 1981.
4. Lenz, F.A., Tasker, R.R. and Tsuda, T. MCA occlusion in the squirrel monkey: 'clinical picture' and torque motor studies. Neurology 31: 49, 1981.
5. Lenz, F.A., Schloegel, S., Tatton, W. and Tasker, R. Mechanical properties of the primate forelimb during imposed displacement. Soc. Neurosci. Abstr. 8: 535, 1982.
6. Lenz, F.A., Tatton, W.G. and Tasker, R.R. The reflex response to displacement of several forelimb joints in normal and lesioned squirrel monkeys. Can. J. Neurol. Sci. 9: 276, 1982.
7. Lenz, F.A., Lenz, Y.E., Schloegel, S., Tatton, W.G. and Tasker, R.R. The influence of reflex activity on mechanical properties of the primate forelimb during imposed displacement. Can. J. Neurol. Sci. 11: 326, 1984.
8. Lenz, F.A., Tasker, R.R., Kwan, H.C., Schnider, S., Kwong, R. and Murphy, J.T. Single unit analysis of the ventral tier of lateral thalamic nuclei in patients with parkinsonian tremor. Soc. Neurosci. Abstr. 11: 1164, 1985.
9. Dostrovsky, J.O., Tasker, R.R., Yamashiro, K., Albe-Fessard, D. and Lenz, F.A. Sensations evoked by microstimulation in human thalamus. Proceedings of the International Union of Physiological Societies 26: 571, 1986.
10. Dostrovsky, J.O., Tasker, R.R., Yamashiro, K., Albe-Fessard, D. and Lenz, F.A. Sensations evoked by microstimulation in human ventral thalamus in relation to neuronal receptive fields. Soc. Neurosci. Abstr. 12: 329, 1986.
11. Lenz, F.A., Dostrovsky, J.O. and Tasker, R.R. Functional organization of human somatosensory thalamus. Soc. Neurosci. Abstr. 12: 329, 1986.
12. Lenz, F.A., Tasker, R.R. and Dostrovsky, J.O. Human thalamic single unit activity in central pain. Pain 4S: 347, 1987.

13. Lenz, F.A., Tasker, R.R., Kwan, H.C., Schnider, S., Kwong, R., Dostrovsky, J.O. and Murphy, J.T. Platform Presentation: The mechanism of parkinsonian tremor: Results from systems analysis of the human central nervous system. Proceedings of the American Association of Neurologic Surgeons 182, 1987.
14. Tasker, R.R., Dostrovsky, J.O., Lenz, F.A., Yamashiro, K. and Gorecki, J. Thalamic microelectrode recording and microstimulation in central and deafferentation pain. Proceedings of the American Society for Stereotactic and Functional Neurosurgery 85, 1987.
15. Gorecki, J., Tasker, R.R., Hirayama, T., Lenz, F., and Dostrovsky, J.O. Microelectrode recording from the deafferented thalamus. Proceedings of the American Association of Neurologic Surgeons 323, 1988.
16. Hirayama, T., Tasker, R.R., Gorecki, J., Dostrovsky, J.O. and Lenz F.A. Abnormal thalamic neuronal activity in patients with central and deafferentation pain. Proceedings of the American Association of Neurologic Surgeons 334, 1988.
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18. Lenz, F.A., Dostrovsky, J.O., Kwan, H.C., Hirayama, T., Gorecki, J., Tasker, R., Lenz, Y. Do calcium spikes account for the bursts of action potentials which occur in sensory thalamus of central pain patients? Soc. Neurosci. Abstr. 14: 561, 1989.
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20. Lenz, F.A., Dostrovsky, J.O., Lee, L., Tasker, R.R. Mismatch between neuronal receptive fields and projected fields evoked by microstimulation in sensory thalamus of patients with spinal cord injury. Soc. Neurosci. Abstr. 15: 384, 1989.
21. Lenz, F.A., Normand, S., Kwan, H., Andrews, D., Tasker R., and Dostrovsky, J.O. Statistical estimation of the target for relief of parkinsonian tremor. Functional and Stereotactic Neurosurgery 54: 214, 1990.
22. Lenz, F.A., Guilbaud, G. and Willis, W.D. Symposium: Thalamic mechanisms of pain following peripheral injury. Pain 5S: 473, 1990.

23. Lenz, F.A., Kwan, H.C., Martin, R., Tasker, R., Dostrovsky, J.O. Characteristics of spontaneous neural activity at different locations in ventrocaudal thalamus of patients with spinal cord transection. Pain 5S: 493, 1990.
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29. Lin, Y.C., Gracely, R.H., Lenz, F.A., Baker, F.H., Rowland, L.H., Dougherty, P.M., Richardson, R.T. Sensations Evoked by Microstimulation in the Area of the Ventrocaudal Nucleus of Thalamus (Vc) in Patients with Chronic Pain. Soc. Neurosci. Abstr. 19: 1572, 1993.
30. Lenz, F.A., Gracely, R.H., Hope, E., Baker, F.H., Rowland, F.H., Dougherty, P.M., Richardson, R.T. Microstimulation in the Area of Human Vc can evoke the Sensation of Angina. Soc. Neurosci. Abstr. 19: 1572, 1993.
31. Berkeley, K.G., Jansens, J., Giamberdino, M.A., McMahon, S.B. and Lenz, F.A. Symposium: New insights into mechanisms of visceral pain. Proceedings of the Seventh World Congress on Pain 239, 1993.
32. Boivie, J., K.L. Casey, K.L., Cesaro, P., Jones, E.G., Lenz, F.A., Leijon, G., Wiesenfeld-Hallin, Z. Symposium: Central Pain. Proceedings of the World Congress on Pain 7: 484, 1993.
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39. Lenz, F.A., Gracely, R.H., Romanoski, A.J., Hope, E.J., Rowland, L.H., Dougherty, P.M. Pain with a strong affective dimension reproduced by stimulation of the human somatosensory thalamus. Soc. Neurosci. Abstr. 21: 1444, 1995.
40. Kulshreshtha, N., Rowland, L., Lawson, C., Mao, C., Lenz, F.A., Dougherty, P. and Oppenheimer, S. Distribution of Cardiovascular related sites within the human thalamus. Soc. Neurosci. Abstr. 21: 637, 1995.
41. Lenz, F.A. Relationship between thalamic neuronal and EMG activities recorded in patients with movement disorders. Electroencephalog. Clinical Neurophysiol. 97: S57, 1995.
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47. Lenz, F.A., Jeanmonod, D., Willis, W.D., Nauta, H.J.W. Symposium: Newer neurosurgical approaches to pain. Proceedings of the World Congress on Pain 8: 324, 1996.
48. Dougherty, P.M., Li Y.J., Rowland, L.H., Lenz, F.A. Sensitization of primate spinomesencephalic neurons by capsaicin is paralleled by facilitation of responses to excitatory amino acids. Proceedings of the World Congress on Pain 8: 40, 1996.
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50. Dougherty, P.M., Weng, H.R., Rowland, L.H., Schwartz, A., Vierck, C.J., Lenz, F.A. Spinal cord lesion produces alterations in neurophysiologic properties of thalamic neurons. Soc. Neurosci. Abstr. 23: 159, 1997.
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54. Hallett, M., Byl, N., Nudo, R., Lenz, F.A. Reorganization of sensorimotor maps in dystonia. Soc. Neurosci. Abstr. 24: 1, 1998.
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56. Hua, S.E., and Lenz, F.A. Single unit analysis of the human ventral thalamic nuclear group: correlation with thalamic activity with essential tremor. Soc neurosci. Abstr 30:257, 2000.
57. Lenz, F.A., Rowland, L.H., Dougherty, P.M., Lee, J-I. Sensations evoked by stimulation in the principal sensory nucleus of thalamus by bursts of different numbers of impulses at different frequencies. Soc neurosci. Abstr 30:2105, 2000.
58. Vogel H, Treede RD, Port J, Solaiyappan M, Krauss G, Lenz FA Dipolquellenanalyse subdural abgeleiteter Laser evozierter Potenziale aus dem parasyllvischen Kortex des Menschen. Klin Neurophysiol 31: 191.
59. Greenspan, JD, Coghill RC, Rosier EM, Gilron I, and Lenz FA. Anterior Cingulotomy Effects on Thermal Pain Sensation and PET responses. Congr Proc IASP 10:76:P72, 2002.
60. Sarlati E., Lenz F, Greenspan J. Two mechanisms of cold allodynia in central pain. Congr Proc IASP 10:94:P90, 2002.
61. Garonzik IM, Ohara S, Hua SE, Belzberg A, Lenz FA. Sites in the region of the thalamic principal somatic sensory nucleus (Vc) and VMpo where threshold microstimulation (TMIS) evokes thermal (cold and warm sites) or pain sensations (pain sites). SNS Abstracts CD, 2002
62. Ohara S, Garonzik IM, , Hua SE, Lenz FA. Threshold microstimulation (TMIS) in the region of the human thalamic principal somatic sensory nucleus (Vc) evokes sensations like those of mechanical stimulation and movement. SNS Abstracts CD, 2002.
63. Sinai A, Bowers CW, Gordon B, Lesser RP, Lenz F, Crone NE. Cortical mapping of language with subdural electrodes: a direct comparison of electrocorticographic gamma activity with electrical cortical stimulation mapping. AES Abstracts, 2004.
64. Lenz FA. Mechanisms of Human Forebrain Pain Processing. Program and Abstracts of the International Pain Clinic World Society of Pain Clinicians. 11:74, 2004.
65. Nirit Weiss, Shinji Ohara, Frederick A. Lenz. Human Thalamic Vim is Involved in Motor Imagery. AANS Abstracts 2003.
66. S Hua, FA Lenz. Ventral Lateral Thalamic Activity in Essential Tremor Differs from Cerebellar Intention Tremor. AANS abstracts, 2004.

67. H. Chen, S. Hua, FA Lenz, R Shadmehr. Thalamotomy and thalamic DBS in a voltage dependent manner impairs motor adaptation in patients with essential tremor. AASFN abstracts, 2004.
68. SE Hua, A Fernandez, FA Lenz. Sites of Tremor Reduction by Microelectrode Stimulation are Posterior and Inferior to the STN. CNS abstracts, 2004.
69. HC Lawson, Ohara S, Greenspan J, Lenz FA Quantitative Sensory Testing Demonstrates Distributed Pattern of Modality Representation in Parasylvian Cortex. AANS abstracts 2005.
70. Lenz FA, Human Forebrain Pain-related Activity: Pathways and Networks. Rachidian Soc Abstr, 13:20, 2005.
71. Lenz FA, Human Forebrain Activity in Dystonia: Dystonia-related activity and Somatic Sensory Reorganization. Rachidian Soc Abstr, 13:23, 2005.
72. Koubeissi MZ, Sinai A, Lenz FA, Lesser RP, Crone NE. Functional Connectivity between Perisylvian and Bilateral Basal Temporal Cortex. AAN Abstr. Neurology. - in press, 2006.

Extramural Sponsorship (current, pending, previous):

Grants (completed):

The New York Academy of Medicine

PI- F.A. Lenz

Elsberg Award

\$30,000.00 (1988-89).

The Charles A. Dana Foundation

PI - F.A. Lenz

Neuroscience Fellowship

\$40,000.00 (1988-89).

Eli Lilly Clinician Scientist Award

PI - F.A. Lenz

\$100,000.00 (1989-91).

NIH

PI - F.A. Lenz

Studies of the Ventrocaudal Thalamus in Human Pain

K08 NS 01384

\$356,400.00 (1989-94).

NIH

PI - F.A. Lenz

Studies of the Ventrocaudal Thalamus in Human Pain  
R29 NS28598  
\$566,271.00 (1990-95).

NIH  
PI - F.A. Lenz  
Ventrocaudal Thalamus in Thermal and Pain Sensation  
Project I, P01 NS32386, 'Studies of Neuropathic Pain' PD - J.N.Campbell  
\$1,036,355 (1994-99).

NIH/NIA  
PI - F.Bylsma, Co-PI - F.A.Lenz.  
Neuropsychologic effects of pallidotomy in Parkinson's Disease.  
P50 AG05146 Alzheimer's Disease Research Center: Clinical Core  
P.D. C.K.Kawas  
\$20,000 (1994-95).

NIH/NIA  
PI – J.Brandt, Co-PI - F.A.Lenz  
Neuropsychologic effects of pallidotomy in Parkinson's Disease.  
P50 AG05146 Alzheimer's Disease Research Center: Clinical Core.  
P.D. C.K. Kawas  
\$55,500 (1995- 1998).

NIH  
PI – F.A. Lenz, Co-PIs – P.M. Dougherty, R. Gracely.  
The Ventrocaudal Thalamus in Human Pain  
RO1 NS40059  
\$1,968,291 (2000-2004).

Grants (active):

NIH  
PI-F.A. Lenz, Co-PIs – N. Crone, J. Greenspan, R. Gracely, S. Ohara, R. Treede.  
The biology of human cortical pain-related activity,  
RO1 NS38493  
\$ 2,735,519 (2005-2010).

NIH  
PI – Y-D Zhou, Co-PI – F.A.Lenz.  
Cortical Memory of Cross-modal Sensory Information  
R01 NS044919-01A2  
\$ 1,337,600 (2004-2009).

NIH  
PI - M Mirski, FA Lenz (Co-PI)  
Deep Brain Stimulation For Epilepsy: Coupled Chemical & Electrical Actions.

Pending (Study Section 11-05).

NIH

PI - R Shadmehr, Co-PIs: A Bastion, FA Lenz.

Thalamic Deep Brain Stimulation and Motor Adaptation

Pending (Study section 10.06)

#### EDUCATIONAL ACTIVITIES

##### Teaching:

Neurosurgical Residency Training Program (within Johns Hopkins School of Medicine) - Rounds, clinic, ward and operative teaching at JHH, JHBMC. November 1988 - present.

1. Radionics Stereotactic Course. Baltimore, Maryland. February 27, 1990- Instructor.
2. Radionics Stereotactic Course. Baltimore, Maryland. April 11, 1990 - Instructor.
3. Symposium: Thalamic mechanisms of pain following peripheral injury. International association for the study of pain meeting. Adelaide. April 5, 1990.
4. Radionics Stereotactic Course. Baltimore, Maryland. November 10, 1990 - Instructor.
5. Radionics Stereotactic Course. Baltimore, Maryland. January 21, 1991 - Instructor.
6. Symposium: Central Pain. International Association for the Study of Pain Meeting. Paris, France. August 24, 1993 - Lecturer.
7. Symposium: New insights into mechanisms of visceral pain. International Association for the Study of Pain Meeting. Paris, France. August 26, 1993 - Lecturer.
8. Course: Thalamotomy Techniques. Annual meeting of the American Association of Neurologic Surgeons. San Diego, CA. April 11, 1994 -Lecturer.
9. Neurobiology Review Course: Canadian Congress of Neurological Sciences. London, Canada. June 29-30, 1996 - Instructor.
10. Symposium: Thalamic mechanisms of pain processing. International Association for the Study of Pain Meeting. Vancouver, Canada. August 24, 1996 – Lecturer.
11. Symposium: Newer neurosurgical approaches to pain. International Association for the Study of Pain Meeting. Vancouver, Canada. August 24, 1996 - Lecturer.

12. Practical Course: Movement Disorders. Congress of Neurological Surgeons. Montreal, Canada. September 29, 1996 - Instructor.
13. Motor control course. American Academy of Neurology. Boston, MA. April 19, 1997 - Lecturer.
14. Course: Functional studies of cortex during epilepsy surgery. American Association of Neurological Surgeons. Denver, Colorado. April 17, 1997- Lecturer.
15. Course: Pallidotomy: Stereotactic treatment of movement disorders. American Association of Neurological Surgeons. Denver, Colorado. April 13, 1997- Lecturer.
16. Course: Stereotactic Surgery for the treatment of Movement Disorders. Congress of Neurological Surgeons. New Orleans, LA. October 24, 1997 - Instructor.
17. Course: Surgical treatment of movement disorders. American Association of Neurologic Surgeons. Philadelphia, PA. April 26, 1998- Lecturer.
18. Course: Functional studies during epilepsy surgery. American Association of Neurologic Surgeons. Philadelphia, PA. April 29, 1998 - Lecturer.
19. Course: Monitoring during functional stereotaxis. American Society of Neurophysiologic Monitoring. Philadelphia, PA. May 3, 1998 - Lecturer.
20. Course: Neuropathic Pain. Pain clinic of University of Rochester and Allegany University. Rochester, New York . June 5-6, 1998– Instructor.
21. Course: Neuroplasticity. American Physical Therapy Society: Section on Research. Newport, RI. August 15-21, 1998 – Lecturer.
22. Course: Surgical treatment of movement disorders. Congress of Neurosurgeons. Seattle, Washington. October 3, 1998 - Lecturer.
23. Course: Lateral thalamus and central pain. American Pain Society. San Diego, CA. November 6, 1998 – Lecturer.
24. Course: Movement disorders. American Association of Neurologic Surgeons New Orleans, LA. April 24, 1999– Lecturer.
25. Course: Functional studies of Cortex during epilepsy surgery. American Association of Neurologic Surgeons. New Orleans, LA. April 26, 1999 - Lecturer.

26. Course: New neurosurgical approaches to the treatment of pain. International Association for the Study of Pain Meeting. Vienna, Austria. August 24, 1999 – Lecturer.
27. Course: Pathophysiology of central pain secondary to spinal cord injury. International association of the study of pain. Vienna, Austria. August 25, 1999 – Lecturer.
28. Course: Electrophysiologic studies of nociceptive inputs to cortex. International Association for the Study of Pain Meeting. Vienna, Austria. August 23, 1999 – Lecturer.
29. Course: Pallidotomy and other surgical treatments of Parkinson’s disease. Congress of Neurologic Surgeons. Boston, MA. November 3, 1999 - Lecturer.
30. Course: Movement Disorders. American Academy of Neurology. San Diego, CA. April 30, 2000 – Lecturer.
31. Course: Central Pain. American Pain Society. Atlanta GA. November 2, 2000 – Lecturer.
32. Course: Visceral Pain Pathways. American Pain Society. Atlanta GA. November 5, 2000 – Lecturer.
33. Course: Phantom Pain. American Pain Society. Atlanta GA. November 5, 2000 – Lecturer.
34. Course: Video Case Discussion: Advanced Parkinson’s Disease and Dystonia. Congress of Neurosurgeons. San Antonio, TX. September 27, 2000, Speaker.
35. Course: Treatment of Central Pain. : Eastern Pain Society. NY, NY. December 8, 2000. Lecturer.
36. Course: Surgical treatment of dystonia. Dystonia Medical Research Council. Atlanta, Georgia, December 9-10, 2000. – lecturer.
37. Course: International Association for the Study of Pain Research Symposium on Spinal Cord Injury Pain. Pheonix, Arizona, April 16-19, 2001 – Lecturer.
38. Course: IASP Symposium on Hyperalgesia. Erlangen, Germany. September 18, 2003 - Invited Presentation.
39. Course: State of the art pain imaging. Congress of Neurological Surgeons. San Francisco, California. October 19, 2004 – lecturer.

40. Course: Mechanisms and treatments of central pain. The 11th annual Kentucky Spinal Cord and Head Injury Research Trust Symposium. Louisville, Kentucky. June 8-10 2005 - Lecturer.
41. Course: Surgical approaches to the treatment of Parkinson's Disease. National Parkinson's Foundation Course. Baltimore, Maryland. November 4, 2005.
42. Course: Surgical Approaches to the treatment of Essential tremor. International Essential Tremor Foundation. Baltimore MD. November 2006.
43. Course: Brain pacemakers for treatment of neurologic and psychiatric disorders. Office on Disability: Dept of Health and Human Services, & Cleveland Clinic. May 6 2008.

Mentoring (pre- and post-doctoral):

- M. Seike MD, Postdoctoral Fellow  
Research 1990-91.  
Current position: Assistant Professor, Attending Neurosurgeon –  
Functional stereotaxis  
Department of Neurosurgery  
Kochi Medical School.  
Nankoku-City, Kochi 781-51, Japan.
- Yan Chong Lin MD, Postdoctoral Fellow  
Research 90-92  
Deceased 1997, last position:
  - Assistant Professor  
Department of Neurosurgery  
Wenzhou Medical College.
  - Attending Neurosurgeon - Functional stereotaxis.  
No.1 Hospital  
Wenzhou, Zhejiang,  
People's Republic of China.
- Isham Khoja MD, Postdoctoral Fellow  
Research 1991-92.  
Current position:
  - Attending Neurosurgeon  
Erie General Hospital.  
Erie, New York, USA.
- C.J. Jaeger MD, Pre- and Postdoctoral Fellow Part time  
Research 1991-97.  
Current position:  
Hospitalist

Inpatient Managers Medical group  
California Pacific Medical Center  
San Francisco, California

- A.E. Hillis PhD, MD, Pre- and Postdoctoral Trainee Part time  
Research 93-97.  
Current position:
  - Attending Neurologist, Johns Hopkins Hospital
  - Professor of Neurology, Johns Hopkins University.
  
- M. Rhios MD, Postdoctoral research fellow during clinical epilepsy fellowship  
With Professor R. Lesser 1994-96.  
Current position:
  - Attending Neurologist, Director of Pediatric Epilepsy  
San Juan Hospital
  - Academic Staff, University of Puerto Rico.
  
- T.A. Zirh MD, Postdoctoral fellow  
Research 1995-96.  
Current position:
  - Assistant Professor  
Department of Neurosurgery  
Koq University
  - Attending Neurosurgeon - Functional Stereotaxis  
American Hospital  
Istanbul, Turkey.
  
- J.I.Lee MD, Postdoctoral fellow  
Research 1997-99  
Current position:
  - Assistant Professor  
Department of Neurosurgery  
Sungkyunkwan University.
  - Attending Neurosurgeon - Functional Stereotaxis  
Samsung Medical Center  
Seoul, Korea.
  
- E. Leemstra MD, Predoctoral fellow  
Research 1999  
Current position:
  - Resident in Neurology  
Academic Medical Center  
and The Netherlands Institute for Brain Research  
Amsterdam, Netherlands
  
- S. Ohara, Postdoctoral fellow - Research 2000-02

Research Associate (2002-2004)  
Current position (2004 to present):  
Assistant Professor  
Dept of Neurosurgery  
Johns Hopkins School of Medicine

- IM Garonzik, MD, Postdoctoral Trainee  
Research 2000-2002.

Current position:  
Assistant Professor.  
Dept of Neurosurgery  
Johns Hopkins School of Medicine

- S. Hua, MD PhD, Postdoctoral Trainee  
Research Fellow 2001-2004.

Current position:  
Assistant Professor  
Department of Neurosurgery  
University of Southern California

- N Weiss, MD, Postdoctoral Trainee  
Research Fellow 2001-2004.

Current position:  
Assistant Professor  
Department of Neurosurgery  
Mount Sinai School of Medicine, New York, New York.

- HC Lawson  
Research Fellow 2004-2006.

Current Position: Instructor.  
Department of Neurosurgery  
Hopkins University School of Medicine

- HT Lee  
Research Fellow 2005-2006

Current position: Instructor  
National Defence Medical Center  
Taichung (407), Taiwan, R.O.C.

- W.S. Anderson, MD, Postdoctoral Trainee  
Research Fellow 2005-2007.

Current position:  
Assistant Professor  
Department of Neurosurgery  
Harvard Medical School.

- E. Corthout  
Research Fellow 2005-2006.

-JH Kim  
Research Fellow 2006-2008.  
Assistant Professor of Neurosurgery  
Ansan Hospital, Korea University. Soeul.

- K Kobayashi.  
Research Fellow 2007-2008.  
Assistant Professor of Neurosurgery  
Nihon University School of Medicine, Tokyo.

#### Editorial Activities:

##### *Peer Review Service:*

- Editorial Boards:
  - Journal of the American Pain Society, 1991-95
  - Pain Forum, 1994-2000.
  - European Journal of Pain, 1996-2002.
  - The Journal of Pain, 1999-2003.
  - Thalamus and related systems, 2000 - present.
  - Pain – Journal of the International Assoc. for the Study of Pain. Associate Editor, 2004 to present.
  - IEEE transactions on Neuro-engineering and Rehabilitation. Editorial Board: Senior Advisor. 2005.
  - CME course on The 20<sup>th</sup> Annual Meeting of the American Pain Society, April 18-22, 2001 – Course Director and Editor of the Proceedings, Medscape. NY: NY.
  - Editor for Neurosurgery: Encyclopedia of Pain, WD Willis and R Schmidt (eds). 2002.
  - Associate Editor, European Journal of Pain, 2008-.
  - Honorary Editor, International Journal of Pain. 2008-.
  
- Ad hoc member of Study Section:
  - National Science Foundation, 1989-present.
  - International Science Foundation, 1993-present.
  - Medical Research Council of Canada, 1995 - present.
  - NIH-NINDS-IFCN-4, 1998-2000.
  - NIH-NINDS-BDCN-2, 2001.
  - NIH-NINDS-ZRG1 (IFCN-3) 05 S, 2002.
  - National Academy of Sciences - BRRT. 2004-2006.
  - National Research Council - WCI, 2004-2006.
  - Burroughs Wellcome Fund – 2006 -.present.
  - Special emphasis panels:
    - : ZRG1 IFCN-E (11), Parent SBIR [R43/R44]). 2007.

- ZRG1 IFCN-A (58)R. 2009.
- Regular Member of Study Section or other NIH/federal panel.
  - NIH-NINDS-IFCN-4, 2000-2004.
  - NIH-NINDS-RFA-NS99006.
  - Member of DSMB of the GDNF/PSP trial of the NIH-NINDS-ETB 2000-present.
  - Neurological Devices Panel-MDA Comm-Center DRH-FDA – 2003 to present..
  - ZRG1 ETTN-B (03) F, 2008-2009.
- Ad hoc reviewer of manuscripts, books etc:
  - Journal of Neurophysiology.
  - Pain.
  - Harvard University Press.
  - Journal of Neuroscience.
  - Nature (Medicine).
  - Experimental Brain Research.
  - European Journal of Pain.
  - Annals of Neurology.
  - Brain Research.
  - Pain Medicine Journal Club Journal.
  - Proceedings of the US National Academy of Sciences.
  - Journal of Physiology (Lond.).
  - Brain.
  - The Lancet.
  - Brain Research Interactive.
  - Clinical Neurophysiology.
  - Neuroscience.
  - Neuroscience Letters.
  - Pain Practice
  - Neurology (Minn.).
  - Movement Disorders.
  - Journal of Neuroscience Methods.
  - Journal of Neurology, Neurosurgery and Psychiatry.
  - Movement Disorders.
  - The Lancet Neurology.
  - Pain medicine.
  - Neuroreport.
  - Neuromodulation.
  - Behavioral brain research.
  - New England Journal of Medicine.
  - IASP Press.
  - IEEE Transactions on Biomedical Engineering.
  - IEEE Transactions on Neuro-engineering.
  - Experimental Neurology

- Physical Review Litt.
- European Journal of Neuroscience.
- Progress in Neurobiology.
- Neurotherapeutics.

#### CLINICAL ACTIVITIES

##### Certification:

- |      |  |
|------|--|
| 1987 | Written Exam of the American Board of Neurological Surgery.<br>(94th percentile)                     |
| 1987 | FRCS(C) Specialist Certificate of the Royal College of Surgeons of<br>Canada - Neurological Surgery. |
| 1993 | Board Certified- American Board of Neurological Surgery.   |

#### ORGANIZATIONAL ACTIVITIES

##### Professional Societies (membership, committees, dates, role):

- New York Academy of Medicine, Member- Elsberg Scholarship Committee.  
- 1996-2001.
- American Pain Society, Scientific Program Committee.  
- 1992-1993.
- American Pain Society, Nominating Committee – 1995-96.
- DC Chapter of the National Parkinson Foundation, Governor  
- 1995-98.
- Johns Hopkins University Neurosciences Appointment and Promotions  
Committee, Member  
- 1992-2001.
- American Academy of Neurology TTA Committee on 'Surgical  
Treatment of Parkinson's Disease', Member.  
- Chairman: Subcommittee on Thalamotomy.  
- 1996 - 2000.
- International Association for the Study of Pain Committee on Research.  
- 2000 – present.
  
- Canadian Association for Neuroscience.
- Congress of Neurosurgeons.
- Canadian Neurosurgical Society.
- Fellow of the Royal College of Surgeons of Canada (awarded 1987).
- Society of Neuroscience.
- International Association for the Study of Pain.
- American Association of Neurological Surgeons.
- Movement Disorder Society.
- 'Senior' Society of Neurological Surgeons.

## RECOGNITION

### Academic Awards:

1973-74	John Melady Admission Award University of Toronto Medical School.
1979-83	Medical Research Council of Canada Fellowship.
1981	Honorable Mention - Resident Research Award American Academy of Neurosurgeons.
1982	MacKenzie Award The Canadian Neurosurgical Society and the Royal College of Physicians and Surgeons- Canada.
1982-83	Schering Scholar The American College of Surgeons.
1985	MacKenzie Award The Canadian Neurosurgical Society, The Royal College of Physicians and Surgeons- Canada, and the International Federation of Neurosurgical Societies.
1987	Medical Research Council of Canada Fellowship (ranked 2nd out of 346 applicants).
1988	Elsberg Award New York Academy of Medicine.
1988	Neuroscience Fellowship The Charles A. Dana Foundation.
2005	Grass Foundation Award of the 'Senior' Society of Neurological Surgeons - Career award for research accomplishments in Neurological Surgery.
2005-07 Aiken SC.	Best Doctors in America: Neurological Surgery. Best Doctors Inc.

### Awards for presentations at meetings etc.

1. Poster Award of the Movement Disorder Society. Single unit and crosscorrelation analysis of thalamic neuronal and EMG signals in in dystonia. Lenz, F.A., Seike, M.S., Jaeger, C.J., Lin, Y.C., DeLong, M.R., Tasker, R.R., Vitek, J. Triennial meeting of the Movement Disorder Society, Munich, June 1992.
2. A human thalamic nucleus mediating taste and other sensations related to ingestive behavior (Zirh, T.A. with Lenz, F.A., Gracely, R.H., Rowland, L.H., Leopold, D.A., Dougherty, P.M.) Twelfth Meeting of the World Society of Stereotactic and Functional Neurosurgery, Lyon, France. July 4, 1997 - Leksell Award Paper.
3. Nirit Weiss, Shinji Ohara, Frederick A. Lenz. Human Thalamic Vim is Involved in Motor Imagery. AANS annual meeting. Poster Award of the AANS annual meeting, 2003.

4. S Hua, FA Lenz. Ventral Lateral Thalamic Activity in Essential Tremor Differs from Cerebellar Intention Tremor. Poster Award of the AANS annual meeting. 2004.
5. H. Chen, S. Hua, FA Lenz, R Shadmehr. Thalamotomy and thalamic DBS in a voltage dependent manner impairs motor adaptation in patients with essential tremor. Poster Award of the AASFN triennial meeting, 2004.

Invited Talks, Panels (title, date, venue, sponsor):

1. Central nervous system activity in patients with deafferentation and central pain. Pain against man - Symposium of the Menarini Foundation. Florence, Italy (May 1, 1990) - Invited Presentation.
2. Thalamic mechanisms of somatic sensation and pain. Physiology Seminar Series - Visiting Professor: Department of Physiology, University of Wurzburg, FRG. May 3, 1990 - Invited Presentation.
3. Thalamic activity recorded during operative procedures for the treatment of movement disorders and pain. Visiting Professor: Department of Neuroscience, University of Heidelberg, FRG. May 5, 1990 - Invited Presentation.
4. Responses to microstimulation in the area of human ventrocaudal nucleus. Visiting Professor: Department of Physiology - University of Wurzburg, FRG. April 5, 1992 - Invited Presentation.
5. Electrophysiologic studies of human thalamus during stereotactic procedures for movement disorders and pain. Visiting Professor: German Basal Ganglia Society, Freiburg, FRD. April 10, 1992 - Invited Presentation.
6. Electrophysiologic studies of human thalamus in patients with movement disorders and pain. NINDS Grand Rounds, Bethesda, Maryland. June 5, 1992 - Invited Presentation.
7. Studies of human thalamus in acute and chronic pain. Neurology Seminar Series - Visiting Professor: Department of Neurology, Linkoping University, Sweden. June 29, 1992 - Invited Presentation.
8. Electrophysiologic and psychophysical studies of human thalamus. Annual meeting of the American Pain Society, San Diego, CA. October 24, 1992 - Invited Presentation.
9. Symposium: Thalamic Mechanisms of Nociception. (with Jones, E.G., Apkarian, A.V. and Bushnell, M.C.) Annual Meeting of the Society of Neuroscience. October 29, 1992 – Invited presentation.

10. Thalamic activity related to movement disorders. Visiting Professor: Neurology and Neurosurgery Grand Rounds. SUNY Syracuse Health Science Center. September 15, 1993 - Invited presentation.
11. Thalamic activity in acute and chronic pain. Visiting Professor: Neuroscience Seminar Series. SUNY Syracuse Health Science Center. September 17, 1993 - Invited presentation.
12. Reorganization of thalamus in patients with lesions of the nervous system. Symposium honoring Ulf Lindblom, retiring Chair in Neurology, The Karolinska Institute: Touch, temperature, and pain sensation in health and disease. Wenner-Gren Foundation, Stockholm, Sweden. October 6-10, 1993 - Invited presentation.
13. Studies of human thalamus in acute and chronic pain. In: 'New Vistas in Central Pain Mechanisms' - Symposium at the Triennial Meeting of the International Brain Research Organization (IBRO), Kyoto, Japan. July 12, 1995 - Invited Presentation.
14. Relationship between Thalamic Neuronal and EMG activities recorded in patients with Movement Disorders. Symposium at the Tenth Biennial Meeting of the International Society for Clinical Neurophysiology and Electromyography, Kyoto, Japan. October 19, 1995 - Invited Presentation.
15. The role of thalamo-corticolimbic connections in the affective dimension of acute pain. in 'Forebrain areas involved in pain processing' Symposium of the Association pour la Neuro Psycho Pharmacologie and L'Institute de Recherche International Servier. Dinard, France. May 28-30, 1995 - Invited Presentation.
16. Mechanism of the therapeutic effect of Vim stimulation upon tremor. In: 'Surgical therapies for Parkinson's disease' - Symposium of the Movement Disorder Society. San Sebastian, Spain. June 24, 1995 - Invited Presentation.
17. Stereotactic procedures for movement disorders. Snodgrass Visiting Lecturer, Department of Neurosurgery and the Marine Biological Institute, University of Texas Medical Branch at Galveston. March 11-13, 1996 - Invited Presentation.
18. Symposium: Thalamotomy/Thalamic stimulation. Biennial International meeting of the Movement Disorder Society, Vienna, Austria. June 21, 1996 - Invited Presentation.
19. Thalamotomy for the treatment of essential tremor: An assessment using blinded measures of outcome (with Zirh, T.A., with Lenz, F.A., Reich, S.G., Rowland, L.H., Dougherty, P.M.) Plenary presentation - Annual meeting of the American Association of Neurological Surgeons, April 15, 1997.

20. Human thalamic activity related to the sensory and affective dimension of pain. Symposium: Pain from molecules to perception. XXXIII International Congress of Physiological Sciences, St Petersburg, Russia. July 5, 1997 - Invited Presentation.
21. CNS activity in patients with tremor. Tremor - Symposium of the Movement Disorder Society, Kiel, FRD. July 10, 1997 - Invited Presentation.
22. Leksell Award Paper: A human thalamic nucleus mediating taste and other sensations related to ingestive behavior (Zirh, T.A. with Lenz, F.A., Gracely, R.H., Rowland, L.H., Leopold, D.A., Dougherty, P.M.) Twelfth Meeting of the World Society of Stereotactic and Functional Neurosurgery, Lyon, France. July 4, 1997 - Plenary Presentation.
23. Thalamotomy for tremor. Visiting Professor, Mayo Clinic, Rochester Minnesota, July 30, 1997 - Invited Presentation.
24. Reorganization of thalamic and pallidal activity in patients with dystonia (with Hallett, M., Byl, N., Nudo, R.). Society for Neuroscience Plenary Symposium: Reorganization of sensorimotor maps in dystonia. Los Angeles, CA. November 6, 1998 - Invited Presentation.
25. Mechanisms of Dystonia: Sensory Reorganization of the Motor System. Visiting Professor: Neurology/Neurosurgery Grand Rounds, Temple University. Philadelphia, PA. January 29, 1999 - Invited Presentation.
26. The sensory limbic model of pain memory. International Association for the Study of Pain Meeting satellite symposium on 'Nervous system plasticity and pain.' Heidelberg, FRD, August 15, 1999 - Invited Presentation.
27. Microelectrode recording from subcortical sensory structures. Symposium at the XII Biennial Meeting of the International Society for Clinical Neurophysiology and Electromyography, Prague, Czechoslovakia. September 6, 1999 - Invited Presentation.
28. Thalamic pacemakers in parkinsonian tremor. Symposium on 'The thalamus and basal ganglia.' The Burdenko Institute of Neurosurgery, Moscow, Russia. May 30, 2000 – Invited presentation.
29. Physiology of VA, VL and VP thalamus in patients with dystonia. Symposium on the thalamus and basal ganglia. The Burdenko Institute of Neurosurgery, Moscow, Russia. May 31, 2000 – Invited presentation.
30. Physiologic localization of Vim. Deep brain stimulation for the treatment of movement disorders. Symposium of the Movement Disorder Society. Salza, Kiel, FRD. June 3-7, 2001 – invited presentation.

31. Human CNS pain-related activity. Dept of Anesthesiology, University of Iowa, Iowa City:Iowa. March 5-6, 2002 - Invited Presentation.
32. Human CNS activity related to movement disorders. Dept of Neuroscience, Dalhousie University, Halifax. February 25-26, 2002- Invited Presentation.
33. Human Thalamo-Cortical Pain Mechanisms - Jasper Lecturer. World Federation of Clinical Neurophysiology. San Francisco. September 8, 2003 - Invited Presentation.
34. Mechanisms of DBS for tremor and chronic pain. Visiting Professor: Clinic im Park, Zurich, Switzerland, June 3, 2004 - Invited Presentation.
35. Mechanisms of Forebrain Pain Processing. Plenary Lecture, International Pain Clinic World Society of Pain Clinicians. Tokyo, Japan, July 14, 2004 - Invited Presentation.
36. Mechanisms of DBS for movement disorders and chronic pain. Visiting Professor: FDA Staff College (CDRH), Rockville MD, July 28, 2004 - Invited Presentation.
37. Single neuron analysis of the thalamus and pallidum in patients with dystonia: somatosensory reorganization and dystonia related activity. Visiting Professor at Grand Rounds, Department of Neurosurgery, George Washington University, Washington DC. January 11, 2005 – Invited Presentation.
38. Thalamic neuronal activity related to parkinsonian symptoms of tremor and dystonia is characterized by disordered somatosensory feedback. Symposium on Parkinson's Disease – Basic Mechanisms and Therapies. Cold Spring Harbor Laboratory, Long Island, NY. January 16-18, 2005 – Invited Presentation.
39. Human brain pain-related activity: binary channels, analog channels and memory. 13<sup>th</sup> Annual Rachidian Society Meeting, Kona, Hawaii. February 27, 2005 – invited presentation.
40. Human brain dystonia-related activity: activity-dependent changes in function, sensori-motor mismatch, and phase lags. 13<sup>th</sup> Annual Rachidian Society Meeting, Kona, Hawaii. March 3, 2005 – invited presentation.
41. Human Forebrain Pain-related Activity: pathways and networks. Grass Lecturer. The 'Senior' Society of Neurological Surgeons. Palo Alto, California. May 2005 – plenary presentation.

42. Forebrain Pain-related activity: pathways, networks and neuromodulation. Congress of International Society of Reconstructive Neurosurgery. Seoul, Korea. September 2, 2005 – plenary presentation.
43. ‘Neuronal activity in patients with Essential Tremor’ NIH Consensus Conference on Essential Tremor. Bethesda Maryland, USA, October 20, 2005 – Invited Presentation.
44. ‘Stimulation of the Brain: Deep Brain Stimulation for PD: Targets and Review’ North American Neuromodulation Society. Washington DC November 11, 2005 - Invited Presentation.
45. ‘Human forebrain mechanisms of Dystonia.’ Presentation at ‘The neural control of abnormal movement.’ April 30 to May 2, 2006, Key Biscayne, FL, A satellite meeting preceding the Neural Control of Movement Society Meeting – Invited Presentation.
46. ‘Overflow of muscle activation in dystonia explained by sensor-motor mismatch resulting from reorganization of forebrain sensory maps’ NIH-NINDS Grand Neurology Rounds. May 9, 2006, Bethesda MD – Invited Presentation.
47. ‘Forebrain pain related pathways and networks.’ Heller Lecture Series, Faculty of Medicine, Hebrew University, Jerusalem, Israel. March 6, 2007 – invited presentation.
48. ‘Forebrain pain related pathways and networks.’ Symposium Series for the Institute for Computational Neuroscience, Faculty of Medicine, Hebrew University, Jerusalem, Israel. March 8, 2007 – invited presentation.
49. ‘Human forebrain activity related to central pain’ Biennial meeting of the Asian Society of Stereotactic, Functional, and Computer-assisted Neurosurgery. May 22, 2007. Mount Fuji Resort, Yamanashi, Japan – Invited Presentation.
50. ‘Human pain pathways and networks.’ Brain Science Institute Forum - RIKEN Institute. May 24 2007, Wakoshi, Tokyo, Japan – Invited Presentation.
51. Pain processing in Human S1 Cortex: Traditional and Emerging Perspectives.. Triennial World Congress of the International Assoc for the Study of Pain. August 18, 2008, Glasgow UK. – Invited Presentation.
52. Forebrain networks mediating pain related activity. Walter E. Dandy Lecture. Johns Hopkins University, Baltimore Maryland. November 20, 2008. – Invited Lecture
53. ‘Distributed cortical processing of thermal and pain sensations in humans.’ John D. Loeser lecturer and Honored Guest, Section on Pain, American Assoc. of Neurologic Surgeons. May 5, 2009, San Diego, California, – Invited Presentation.

54. Pain pathways and networks as the basis for sensory, cognitive and affective dimensions. Special Guest Lecturer 50<sup>th</sup> Anniversary of Department of Neurosurgery, Korea University, Seoul, Korea. May 30, 2009. – Invited Presentation.

Patents: US Patent 6,589,190 (July 8, 2003).

Title of Invention: Quantitative Assessment of Muscle Tone in the Wrist

JHUSOM Office of technology licensing no. DM-3434

Name of Lead Inventor: deLateur, B. J.

Additional Inventors: Kanderian, S.J., Goldberg, R., Rieflin, K., Whitcomb, L.L.,  
**Lenz, F.A..**