



QUICK LINKS:

- about
- people
 - faculty
 - recent publications
 - courses
 - staff
- research
- events
- contacts
- news
- bme home
- pratt home
- duke home
- INFORMATION FOR:
- undergrads
- grads
- industry
- employment

WARREN M GRILL, ADDY PROFESSOR OF BIOMEDICAL ENGINEERING

Our research is in the area of neural engineering: using engineering techniques to understand and control neural function. We work primarily on fundamental questions related to neural prostheses. Neural prostheses are a developing technology that uses electrical activation of the nervous system to restore function to individuals with neurological impairment. The long-term goal of our research program is to develop advanced neural prostheses that interface with the central nervous system (brain and spinal cord) to restore function.



Current projects include electrical stimulation for restoration of bladder function, deep brain stimulation for treatment of motor disorders, electrical stimulation for restoration of multi-joint motor function (e.g., reaching), and design of novel electrodes and waveforms for selective stimulation of the nervous system.

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Teaching (Spring 2010): [\(typical courses\)](#)

- BME 101L.001, *ELECTROBIOLOGY* [Synopsis](#)
- BME 101L.01L, *ELECTROBIOLOGY*
CIEMAS 1392, M 01:15 PM-04:15 PM
- BME 101L.02L, *ELECTROBIOLOGY*
CIEMAS 1392, M 04:25 PM-07:25 PM

Education:

PhD, Case Western Reserve University, 1995
 MS, Case Western Reserve University, 1992
 BS, Boston University, 1989

Specialties:

Neuroengineering
 Neural Prosthesis

Research Interests:

Dr. Grill's research interests and in neural engineering and neural prostheses and include design and testing of electrodes and stimulation techniques, the electrical properties of tissues and cells, and computational neuroscience with applications in restoration of bladder function, treatment of movement disorders with deep brain stimulation, and multi-joint limb movement.

Awards, Honors, and Distinctions

Capers & Marion McDonald Award for Excellence in Teaching and Research, Duke University, Pratt School of Engineering, July, 2008
 Distinguished Alumni Award for Service to Profession, Boston University, 2007
 Fellow, American Institute of Medical and Biological Engineering, 2007

Representative Publications ([More Publications](#))

1. J. P. Woock and P. B. Yoo and W. M. Grill, *Intraurethral Stimulation Evokes Bladder Responses via 2 Distinct Reflex Pathways*, Journal Of Urology, vol. 182 no. 1 (July, 2009), pp. 366 -- 373 [[abs](#)].
2. A. Mahnam and S. M. R. Hashemi and W. M. Grill, *Measurement of the current-distance relationship using a novel refractory interaction technique*, Journal Of Neural Engineering, vol. 6 no. 3 (June, 2009) [[abs](#)].
3. M. B. Cantrell and W. M. Grill and S. M. Klein, *Computer-based Finite Element Modeling of Insulated Tuohy Needles Used in Regional Anesthesia*, Anesthesiology, vol. 110 no. 6 (June, 2009), pp. 1229 -- 1234 [[abs](#)].
4. A. M. Kuncel and D. A. Turner and L. J. Ozelius and P. E. Greene and W. M. Grill and M. A. Stacy, *Myoclonus and tremor response to thalamic deep brain stimulation parameters in a patient with inherited myoclonus-dystonia syndrome*, Clinical Neurology And Neurosurgery, vol. 111 no. 3 (April, 2009), pp. 303 -- 306 [[abs](#)].
5. Grill WM, Norman SE, Bellamkonda RV, *Implanted neural interfaces: biochallenges and engineered solutions*, Annual Review of Biomedical Engineering, vol. 11 (2009), pp. 1-24 .
6. P. B. Yoo and J. P. Woock and W. M. Grill, *Somatic innervation of the feline lower urinary tract*, Brain Research, vol. 1246 (December, 2008), pp. 80 -- 87 [[abs](#)].
7. A. Wongsarnpigoon and W. M. Grill, *Computational modeling of epidural cortical stimulation*, Journal Of Neural Engineering, vol. 5 no. 4 (December, 2008), pp. 443 -- 454 [[abs](#)].
8. A. D. Dorval and G. S. Russo and T. Hashimoto and W. Xu and W. M. Grill and J. L. Vitek, *Deep Brain Stimulation Reduces Neuronal Entropy in the MPTP-Primate Model of Parkinson's Disease*, Journal Of Neurophysiology, vol. 100 no. 5 (November, 2008), pp. 2807 -- 2818 [[abs](#)].
9. S. E. Cooper and A. M. Kuncel and B. R. Wolgamuth and A. R. Rezai and W. M. Grill, *A Model Predicting Optimal Parameters for Deep Brain Stimulation in Essential Tremor*, Journal Of Clinical Neurophysiology, vol. 25 no. 5 (October, 2008), pp. 265 -- 273 [[abs](#)].
10. A. M. Kuncel and S. E. Cooper and W. M. Grill, *A method to estimate the spatial extent of activation in thalamic deep brain stimulation*, Clinical Neurophysiology, vol. 119 no. 9 (September, 2008), pp. 2148 -- 2158 [[abs](#)].
11. A. Mahnam and S. M. R. Hashemi and W. M. Grill, *Computational evaluation of methods for measuring the spatial extent of neural activation*, Journal Of Neuroscience Methods, vol. 173 no. 1 (August, 2008), pp. 153 -- 164 [[abs](#)].
12. P. B. Yoo and J. P. Woock and W. M. Grill, *Bladder activation by selective stimulation of pudendal nerve afferents in the cat*, Experimental Neurology, vol. 212 no. 1 (July, 2008), pp. 218 -- 225 [[abs](#)].
13. Birdno MJ, Kuncel AM, Dorval AD, Turner DA, Grill WM, *Tremor varies as a function of the temporal regularity of deep brain stimulation*, NeuroReport, vol. 19 (2008), pp. 599-602 .
14. J. P. Woock and P. B. Yoo and W. M. Grill, *Activation and inhibition of the micturition reflex by penile afferents in the cat*, American Journal Of Physiology-regulatory Integrative And Comparative Physiology, vol. 294 no. 6 (June, 2008), pp. R1880 -- R1889 [[abs](#)].
15. C. W. Peng and J. J. J. Chen and C. L. Cheng and W. M. Grill, *Improved bladder emptying in urinary retention by electrical stimulation of pudendal afferents*, Journal Of Neural Engineering, vol. 5 no. 2 (June, 2008), pp. 144 -- 154 [[abs](#)].
16. M. J. Birdno and A. M. Kuncel and A. D. Dorval and D. A. Turner and W. M. Grill, *Tremor varies as a function of the temporal regularity of deep brain stimulation*, Neuroreport, vol. 19 no. 5 (March, 2008), pp. 599 -- 602 [[abs](#)].
17. C. A. Bossetti and M. J. Birdno and W. M. Grill, *Analysis of the quasi-static approximation for calculating potentials generated by neural stimulation*, Journal Of Neural Engineering, vol. 5 no. 1 (March, 2008), pp. 44 -- 53 [[abs](#)].
18. C. W. Peng and J. J. J. Chen and C. L. Cheng and W. M. Grill, *Role of pudendal afferents in voiding efficiency in the rat*, American Journal Of Physiology-regulatory Integrative And Comparative Physiology, vol. 294 no. 2 (February, 2008), pp. R660 -- R672 [[abs](#)].