

# Anne C. Smith Ph.D.

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**E-mail:** asmith3142@gmail.com

**Website:** annesmith.net

**Citizenship:** United States

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## Education

1984-1987 B.Sc. Mathematics, University of Manchester, Manchester, UK  
1987-1989 M.S. Applied Mathematics, University of Virginia, Charlottesville, VA  
1989-1993 Ph. D. Applied Mathematics, University of Virginia, Charlottesville, VA

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## Skills and Experience

### Computational/Engineering

- MATLAB, WinBUGS, Linux, R, Windows, C, Fortran, Excel. Willingness to rapidly acquire new languages
- Experience writing graphical user interfaces for interface with laboratory and external imaging and data acquisition equipment
- Experience managing large datasets
- Experience analyzing data from experimentalists
- Direct experimental experience with particle sizing equipment and paint mixing experiments

### Modeling

- Bayesian mixed modeling of data from behavioral neuroscience and anesthesia experiments
- Mathematical data compression techniques for real-time image analysis
- Signal processing for EEG data
- Probability methods for analysis of sequences in neural data
- Time-series and state-space models of point process neural data
- Modeling of pigment dispersion in paint systems using population balance modeling
- Lagrangian and Eulerian fluid dynamics models

### Leadership/Communication

- Able to develop complex mathematical and statistical models across many fields
- Collaboration experience with experimentalists in many environments (engineering, medicine, basic science biology labs)
- Mentored undergraduate and graduate students in mathematics and statistics at UC Davis
- Taught/organized curriculum for freshman course on popular mathematics using MATLAB
- Taught/organized curriculum for freshman course on sleep (3 years)

## Employment

- 2013-present Neurophysiology Researcher, Arizona Research Laboratories, University of Arizona (working from Massachusetts)**  
Development of methods to analyze neural data in rat memory model
- 2013-present MATLAB developer**  
Project with civil engineering consulting company (Geocomp Consulting) to develop data acquisition and signal processing system for sensor data from remote bridge
- 2011-2013(Mar) Visiting Research Assistant Professor, University of Illinois at Chicago, (working from Massachusetts)**  
National Institutes of Health (NIH) funded project to develop MATLAB GUI for acquisition of real-time ratiometric optical imaging data of seizure activity in zebrafish
- 2004-2012 Adjunct Assistant/Associate Professor, UC Davis (95% research, 5% service/teaching)**  
NIH-funded development of algorithms to analyze behavioral data from neuroscience experiments using the state-space paradigm (MATLAB and WinBUGS)
- 1999-2004 Research Fellow in Anesthesia, Massachusetts General Hospital/Harvard Medical School**  
Developed state-space algorithms to analyze neural spike data
- 1998-1999 Postdoctoral Research Associate in Biomathematics, University of Arizona**  
Developed signal processing methods to analyze EEG data from sleeping rats
- 1997-1998 Postdoctoral Research Associate in Neurosurgery Department, University of Virginia**  
Mathematical analysis of neural network models of hippocampus
- 1994-1996 Postdoctoral Research Associate in Process Systems Engineering, Imperial College of Science, Technology and Medicine, University of London**  
Performed experiments and developed mathematical models for ICI Paints to optimize pigment dispersion in the paint mixing process
- 1993 (6 mo) Postdoctoral Research Associate in Applied Mathematics, University of Virginia**  
Developed mathematical models for industrial production of non-woven webs used in house-wrap
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## Honors & Awards

- 1987-1988 Science and Engineering Council of the Great Britain (SERC) Overseas Award**  
(Full tuition and expenses from the UK government for M.S. degree in US)
- 1989 Mary Dean Scott Fellowship, University of Virginia**
- 1998-1999 Flinn Postdoctoral Fellowship, University of Arizona**
- 1999-2001 Training Fellowship in Sleep, Circadian and Respiratory Neurobiology, Brigham and Women's Hospital/Harvard Medical School**
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## Publications

- 24 publications** (see Publications in later pages) in peer-reviewed journals
- 2 reviewed conference proceedings**
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## Abstracts

35 abstracts in proceedings including the Society for Neuroscience Annual Meeting, Computation Neuroscience Meeting, the International Meeting for Autism Research and Joint Statistical Meetings

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## Editorial and Advisory Boards

2005-2013 Ad Hoc Reviewer for IEEE, Statistics in Medicine, Annals of Statistics, Network: Computation in Neural Systems, Animal Cognition, PlosOne, Journal of Computational Neuroscience, Journal of Neural Engineering

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## Teaching: UC Davis Courses

Spring 2005 Freshman Seminar: Sleep (10 hours)  
Spring 2006 Freshman Seminar: Sleep (10 hours)  
Fall 2007 Freshman Seminar: Mathematics for Cocktail Parties (10 hours)  
Course was run in the computer lab and students programmed in MATLAB  
Spring 2009 Freshman Seminar: Sleep (10 hours)

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## Advising: UC Davis

2004-2011 3 thesis committees in Mathematics and Statistics departments, 3 graduate student advisees/mentees, 3 undergraduate advisees, 4 graduate oral exam committees

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## Other Activities

Brown-black belt in kempo karate (2012)  
American youth soccer coach  
Youth club soccer team treasurer (\$25K turnover)

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## Journal Publications

1. 1994 **Smith AC**, Roberts WW. Straightening of crimped and hooked fibers in converging transport ducts: Computational modeling. *Textile Research Journal*, 64(6): 325-334.
  2. 1994 **Smith AC**, Roberts WW. Computational modeling of fiber formation in spunbonding of polypropylene with crystallization: Comparison with experiments. *International Nonwovens Journal*, 6(1): 31-41.
  3. 2000 **Smith AC**, Wu XB, Levy WB. Controlling activity fluctuations in large, sparsely connected random networks. *Network: Computation in Neural Systems*, 11: 63-81.
  4. 2000 **Smith AC**, Gerrard JL, Barnes CA, McNaughton BL. Effect of age on burst firing characteristics of rat hippocampal pyramidal cells. *Neuroreport*, 11(17): 3865-71.
  5. 2003 **Smith AC**, Brown EN. Estimating a state-space model from point process observations. *Neural Comput*, 15(5): 965-91.
  6. 2003 Wirth S, Yanike M, Frank LM, **Smith AC**, Brown EN, Suzuki WA. Single neurons in the monkey hippocampus and learning of new associations. *Science*, 300(5625): 1578-81.
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7. 2004 **Smith AC**, Frank LM, Wirth S, Yanike M, Hu D, Kubota Y, Graybiel AM, Suzuki WA, Brown EN. Dynamic analysis of learning in behavioral experiments. *J Neurosci*, 24(2): 447-61.
8. 2005 **Smith AC**, Stefani MR, Moghaddam B, Brown EN. Analysis and design of behavioral experiments to characterize population learning. *J Neurophysiol*, 93(3): 1776-92.
9. 2005 Law JR, Flanery MA, Wirth S, Yanike M, **Smith AC**, Frank LM, Suzuki WA, Brown EN, Stark CEL. Functional magnetic resonance imaging activity during the gradual acquisition and expression of paired-associate memory. *Journal of Neuroscience*, 25(24): 5720-5729.
10. 2006 **Smith AC**, Smith P. A set probability technique for detecting relative time order across multiple neurons. *Neural Computation*, 18, 1197-1214., 18(5): 1197-214.
11. 2007 Barter LS, Mark LO, **Smith AC**, Antognini JF. Isoflurane potency in the Northern leopard frog *Rana pipiens* is similar to that in mammalian species. *Vet Res Commun*, 31(6): 757-63..
12. 2007 **Smith AC**, Wirth S, Suzuki WA, Brown EN. Bayesian analysis of interleaved learning and response bias in behavioral experiments. *Journal of Neurophysiology*, PMID17182907, 97(3): 2516-24..
13. 2008 Prerau MJ, **Smith AC**, Eden UT, Yanike M, Suzuki WA, Brown EN. A mixed filter algorithm for cognitive state estimation from simultaneously recorded continuous and binary measures of performance. *Biol Cybern*, 99(1): 1-14.
14. 2008 Yanike M, Wirth S, **Smith AC**, Brown EN, Suzuki WA. Comparison of associative learning-related signals in the macaque perirhinal cortex and hippocampus. *Cereb Cortex* PMID2665157, 19(5): 1064-78.
15. 2009 Wirth S, Avsar E, Chiu CC, Sharma V, **Smith AC**, Brown E, Suzuki WA. Trial outcome and associative learning signals in the monkey hippocampus. *Neuron* PMID2723837, 61(6): 930-40.
16. 2009 **Smith AC**, Shah SA, Hudson AE, Purpura KP, Victor JD, Brown EN, Schiff ND. A Bayesian statistical analysis of behavioral facilitation associated with deep brain stimulation. *J Neurosci Methods* PMID2743761, 183(2): 267-76.
17. 2009 Kubota Y, Liu J, Hu D, DeCoteau WE, Eden UT, **Smith AC**, Graybiel AM. Stable encoding of task structure coexists with flexible coding of task events in sensorimotor striatum. *J Neurophysiol* PMID2774470, 102: 2142-2160.
18. 2009 Prerau MJ, **Smith AC**, Eden UT, Kubota Y, Yanike M, Suzuki W, Graybiel AM, Brown EN. Characterizing learning by simultaneous analysis of continuous and binary measures of performance. *J Neurophysiol*, 102: 3060-72.
19. 2009 **Smith AC**, Scalon JD, Wirth S, Yanike M, Suzuki WA, Brown EN. State-space algorithms for estimating spike rate functions. *Computational Intelligence and Neuroscience* PMID2774470, 2010(Article ID 425639).
20. 2010 McAssey MP, Hsieh F, **Smith AC**. Coupling among electroencephalogram gamma signals on a short time scale. *Computational Intelligence and Neuroscience*, PMID2926578.
21. 2010 **Smith AC**, Nguyen VK, Karlsson MP, Frank LM, Smith P. Probability of repeating patterns in simultaneous neural data. *Neural Comput* PMID: 20608872, 22(10): 2522-2536.
22. 2011 Solomon M, Frank MJ, **Smith AC**, Ly S, Carter CS. Transitive inference in adults with

- autism spectrum disorders. *Cogn Affect Behav Neurosci*, 11(3): 437-49.
23. 2011 Solomon M, **Smith AC**, Frank MJ, Ly S, Carter CS. Probabilistic reinforcement learning in adults with autism spectrum disorders. *Autism Res*, 4(2): 109-20.
24. 2011 Poulsen C, **Smith AC**, Tucker D, Mattson C, Luu P. Learning and the Development of Contexts for Action. *Frontiers in Human Neuroscience*. **Published online:** 09 December, 2011. Vol 5 Article 159 pp 1-12.
25. 2013 Kin F. Wong, Anne C. Smith, Eric T. Pierce, P. Grace Harrell, John L. Walsh, Patrick L. Purdon, Emery N. Brown. Statistical Analysis of Response Characteristics in Behavioral Statistical modeling of behavioral dynamics during propofol-induced loss of consciousness . **Submitted.**
26. 2013 **Smith AC**, Page T, Lauderdale JD, Fall CP, Sornborger AT. A graphical user interface for near-real-time analysis of multivariate neural imaging data. **In preparation.**
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### **Reviewed Conference Proceedings**

- 2011 Wong KF, **Smith AC**, Pierce ET, Harrell PG, Walsh JL, Salazar AF, Tavares CL, Cimenser A, Prerau MJ, Mukamel EA, Sampson A, Purdon PL, and Brown EN. Bayesian Analysis of Trinomial Data in Behavioral Experiments and Its Application to Human Studies of General Anesthesia. Proceedings from the 33rd Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC '11), Page(s): 4705 - 4708.
- 2011 **Smith AC**, Fall CP, Sornborger AT. Near-real time connectivity estimation for multivariate neural data. Proceedings from the 33rd Annual International Conference of the IEEE Engineering in Medicine and Biology Society, EMBC 2011, Page(s): 4721 - 4724.
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### **Limited Distribution**

- 2007 Liyanage TA, **Smith AC**: A preponderance of girls: Statistical fluke or something about our anesthesia residency program? WARC 2007, 215.