

# Curriculum Vitæ

## Andrew H. Fagg

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### Education

- Ph.D. in Computer Science from the *University of Southern California* (1996)  
Dissertation: *A Computational Model of the Cortical Processes Involved in Primate Grasping*  
Doctoral Committee: M. A. Arbib (chair), G. A. Bekey, S. T. Grafton.
- M.S. in Computer Science from the *University of Southern California* (1991)
- B.S. in Applied Mathematics, Computer Science Track (with honors) from *Carnegie Mellon University* (1989)

### Research Interests

My research focuses on the relationships between biological systems and machines. In this area of *symbiotic computing*, I study the interaction of humans with machines, machines as models of biological systems, and biological systems as inspiration for new robot control and learning techniques. Specific areas of interest include:

- Motor skill learning in robots and models of primate skill learning. I specifically work in the areas of reaching, grasping, and manipulation.
- Interplay of multiple learning systems, including supervised- and reinforcement-style learning algorithms. I am interested in robot learning through human interaction.
- Learning task-oriented representations.
- Brain-machine interfaces for advanced prosthetic devices.
- Interactive art.

## Positions

2008 - current

**Associate Professor**, Bioengineering, University of Oklahoma.

2004 - current

**Associate Professor**, School of Computer Science, University of Oklahoma.

1998 - 2004

**Research Scientist**, Department of Computer Science, University of Massachusetts Amherst.

1996 - 1998

**Senior Postdoctoral Research Associate**, Autonomous Learning Laboratory, under Prof. Andrew G. Barto. **Focus:** Models of basal ganglia and cerebellar involvement in limb control.

1992 - 1995

**Research Assistant**, Human Frontiers Science Project (HFSP), under Prof. Michael A. Arbib.  
**Focus:** Models of the cortical mechanisms involved in primate reaching and grasping.

April 1995

**Visiting Scholar**, Istituto di Fisiologia Umana, Universita' di Parma, under Dr. Giacomo Rizzolatti.  
**Focus:** Cortical coding of monkey grasping behavior.

## Publications

### Dissertation

*A Computational Model of The Cortical Mechanisms Involved in Primate Grasping*, Ph.D. Dissertation, Computer Science Department, University of Southern California, 1996

### Articles In Preparation/Submitted

1. de Granville, C., Fagg, A. H. (submitted), *Learning Grasp Affordances Through Human Demonstration*, submitted to the Journal of Autonomous Robots
2. Wang, D. and Fagg, A. H. (submitted) *Learning Visual Features that Predict Grasp Type and Location*,
3. Fagg, A. H., Hatsopoulos, N. G., London, B., Reimber, J., Solla, S., Wang, D., Miller, L. E. (submitted) *Toward aBiomimetic, Bidirectional, Brain Machine Interface*, IEEE Engineering in Medicine and Biology Society
4. Palmer, T. J. and Fagg, A. H. (submitted) *Learning Grasp Affordances with Variable Tool Point Offsets*,
5. Nemati, S., Hatsopoulos, N. G., Miller, L. E., and Fagg, A. H. (in revision) *Constructing Robust Neural Decoders Using Limited Training Data*
6. Platt, R., Grupen, R. and Fagg, A. H. (in preparation) *Grasp Control: Theory and Experiments*
7. Platt, R., Fagg, A. H., and Grupen, R., (in revision) *Learning Grasping Skills Using Schema Structured Learning*.

## Journal Articles

1. Fagg, A. H., Ojakangas, G., Miller, L., Hatsopoulos, N. (2009) *Kinetic Trajectory Decoding Using Motor Cortical Ensembles*, to appear in the IEEE Transactions on Neural Systems and Rehabilitation Engineering
2. Ou, S., Fagg, A. H., Shenoy, P., Chen, L. (2009) *Application of Reinforcement Learning in Multisensor Fusion Problems with Conflicting Control Objectives*, Intelligent Automation and Soft Computing, **15(2)**:277–289
3. Fagg, A. H., Hatsopoulos, N. G., de Lafuente, V., Moxon, K. A., Nemati, S., Rebesco, J. M., Romo, R., Solla, S. A., Reimer, J., Tkach, D., Pohlmeier, E. A., and Miller L. E. (2007) *Biomimetic brain machine interfaces for the control of movement*, Journal of Neuroscience, **27(44)**:11842–11846
4. Morales, A., Sanz, P. J., del Pobil, A. P., and Fagg, A. H. (2006) *Vision-based three-finger grasp synthesis constrained by hand geometry* Robotics and Autonomous Systems, **54(6)**:419–512
5. Brock, O., Fagg, A. H., Grupen, R. A., Karuppiah, D., Platt, R., Rosenstein, M., (2005), *A Framework For Humanoid Control and Intelligence*, International Journal of Humanoid Robotics, **2(3)**:301–336
6. Morales, A., Chinellato, E., Fagg, A. H., del Pobil, A. P. (2004) *Using Experience for Assessing Grasp Reliability*, International Journal of Humanoid Robotics, **1(4)**:671-691
7. Shah, A., Fagg, A. H., Barto, A. G. (2004) *Cortical Involvement in the Recruitment of Wrist Muscles*, Journal of Neurophysiology, **91**:2445 - 2456.
8. Fagg, A. H., Shah, A., Barto, A. G. (2002) *A Computational Model of Muscle Recruitment for Wrist Movements*, Journal of Neurophysiology, **88(6)**:3348-3358
9. Marcos, L., Oliveira, A. F., Grupen, R. A., Wheeler, D. S., and Fagg, A. H. (2000), *Tracing Patterns and Attention: Humanoid Robot Cognition* IEEE Intelligent Systems **15 (4)**:70–75, July/August
10. Barto, A. G., Fagg, A. H., Sitkoff, N., Houk, J. C. (1999) *A Cerebellar Model of Timing and Prediction in the Control of Reaching*, Neural Computation **11**:565–594
11. Fagg, A. H., Arbib, M. A. (1998) *Modeling Parietal-Premotor Interactions in Primate Control of Grasping*, Neural Networks **11(7/8)**:1277–1303
12. Grafton, S. T., Fagg, A. H., Arbib, M. A. (1998) *Dorsal Premotor Cortex and Conditional Movement Selection: A PET Functional Mapping Study*, Journal of Neurophysiology, **79(2)**:1092–1097
13. Grafton, S. T., Fagg, A. H., Arbib, M. A., Woods, R. (1996) *Functional Anatomy of Pointing and Grasping in Humans*, Cerebral Cortex, **6(2)**:226–237
14. Arbib, M. A., Bischoff, A., Fagg, A. H., Grafton, S. T. (1995) *Synthetic PET: Analyzing Large-Scale Properties of Neural Networks*, Human Brain Mapping, **2**:225–233
15. Montgomery, J. F., Fagg, A. H., Bekey, G. A. (1995) *The USC AFV-I: A Behavior-Based Entry in the 1994 International Aerial Robotics Competition*, IEEE Expert: Intelligent Systems and Their Applications, **10 (2)**:16–22, April
16. Fagg, A. H., Arbib, M. A. (1992) *A Model of Primate Visual/Motor Conditional Learning*, Journal of Adaptive Behavior, Summer, **1(1)**:3–37

## Art Exhibitions

1. Brown, A., Fagg, A. H. (2007–2008), *Bion*, **Stephenson Research and Technology Center, University of Oklahoma**, Norman, OK, May 1, 2007 – current
2. Brown, A., Fagg, A. H. (2007), *Bion*, **Singularity in the Communal Tide**, **Pierro Gallery**, South Orange, NJ, May 13–July 15
3. Archinal, A., Bleckley, S., Courtney, C., Cunningham, P., Gay J., Goddard, B., Gomez, J., Hunt, T. Renyer, J., Roman, M., Brown, A., Fagg, A. H. (2007), *PulsePool*, **Boston Cyber-Arts Festival, Boston Museum of Science**, Boston, MA, April 21–29; co-supervisor of this student project
4. Brown, A., Fagg, A. H. (2006), *Bion*, **Bridge Art Fair**, Curated by: Rupert Ravens Contemporary, Miami, Florida, December
5. Brown, A., Fagg, A. H. (2006–2007), *Bion*, **Engaging Technology: A History & Future of Intermedia**, Ball State University, November 16 – March 11
6. Brown, A., Fagg, A. H. (2006), *Bion*, **Newark Between Us**, Newark, NJ, October 22–December 17
7. Brown, A., Fagg, A. H. (2006), *Bion*, **Living Arts of Tulsa**, Tulsa, OK, September 7–28
8. Brown, A., Fagg, A. H. (2006), *Bion*, **33rd International Conference and Exhibition on Computer Graphics and Interactive Techniques**, Boston, MA, July 30–August 3
9. Brown, A., Fagg, A. H. (2006), *Bion*, **iDEAs Exhibition at the International Digital Media and Arts Association Conference**, Miami University, Oxford, OH, April 6–8
10. Brown, A., Fagg, A. H. (2006), *Bion*, **Archival to Contemporary: Six Decades of the Sculptors Guild**, Hillwood Art Museum, Long Island University, Brookville, NY, January 30–May 15

## Refereed Conference and Workshop Publications

1. Miller, L. E., Fagg, A. H., Hatsopoulos, N., Mussa-Ivaldi, F. A., Solla, S. (2009) *Bidirectional Brain-Machine Interfaces: Sensory Fusion and Adaptive Maps* (Workshop), Proceedings of the Spring Meeting on the Neural Control of Movement, electronically published
2. Fagg, A. H., Hatsopoulos, N. G., Miller, L. E., (2007) *M1 and the Dynamic Limb: Decoding Joint Torque for Prediction and Control*, component of the *Biomimetic Brain Machine Interfaces for the Control of Limb Movement* Mini-symposium (Chair, L. E. Miller) at the Annual Meeting for the Society of Neuroscience, Presentation #650.2.
3. Wang, D., Watson, B. T., Fagg, A. H. (2007) *A Switching Control Approach to Haptic Exploration for Quality Grasps*, Proceedings of the Robotics: Science & Systems 2007 Workshop on Sensing and Adapting to the Real World, Electronically Published
4. Nemati, S., Yeary, M., Yu, T.-Y., Wang, Y., Zhai, Y. and Fagg, A. H., (2007) *Spectral Signature Classification Using A Support Vector Classifier*, Proceedings of the IEEE Instrumentation and Measurement Technology Conference, Warsaw, May
5. Brown, A., Fagg, A. H. (2006), *Is it alive? Sensor Networks and Art*, (artist sketch) Proceedings of the 33rd International Conference and Exhibition on Computer Graphics and Interactive Techniques
6. Platt, Jr., R., Grupen, R. A., Fagg, A. H. (2006), *Learning Grasp Context Distinctions that Generalize*, Proceedings of the IEEE-RAS International Conference on Humanoid Robots, Electronically Published

7. de Granville, C., Southerland, J., Fagg, A. H. (2006), *Learning Grasp Affordances Through Human Demonstration*, Proceedings of the International Conference on Development and Learning (ICDL'06), Electronically Published
8. Platt, Jr., R., Grupen, R. A., Fagg, A. H. (2006), *Improving Grasp Skills Using Schema Structured Learning*, Proceedings of the International Conference on Development and Learning (ICDL'06), Electronically Published
9. Brown, A., Fagg, A. H. (2006), *Is it alive? Sensor Networks and Art*, Proceedings of the International Digital Media and Arts Association Conference, Miami University, Oxford, OH
10. Platt, Jr., R., Fagg, A. H., Grupen, R. A. (2005), *Re-Using Schematic Grasping Policies*, Proceedings of the IEEE-RAS International Conference on Humanoid Robots, Electronically Published
11. Rosenstein, M. T., Fagg, A. H., Ou, S., Grupen, R. A. (2005) *User Intentions Funneled Through A Human-Robot Interface*, Proceedings of the 10th International Conference on Intelligent User Interfaces, pp. 257–259
12. Platt, Jr., R., Fagg, A. H., Grupen, R. A. (2004), *Manipulation Gaits: Sequences of Grasp Control Tasks*, Proceedings of the IEEE International Conference on Robotics and Automation (ICRA'04), pp. 801–806
13. Rosenstein, M. T., Fagg, A. H., and Grupen, R. A. (2004), *Robot Learning with Predictions of Operator Intent*, In the Proceedings of the 2004 AAAI Fall Symposium on the Intersection of Cognitive Science and Robotics: From Interfaces to Intelligence, pp. 107–8. AAAI Press, Menlo Park, CA
14. Morales, A., Chinellato, E., Fagg, A. H., del Pobil, A.P. (2004), *An active learning approach for assessing robot grasp reliability*, In IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2004), Sendai, Japan, September, Electronically Published.
15. Morales, A. , Chinellato, E., Sanz, P. J., Fagg, A. H., del Pobil, A. P. (2004), *Vision based planar grasp synthesis and reliability assessment for a multifinger robot hand: a learning approach*, In the International Conference on Intelligent Manipulation and Grasping (IMG04), Genoa, Italy, Electronically Published.
16. Morales, A., Chinellato, E., Sanz, P. J., Fagg, A. H., del Pobil, A.P. (2004), *Learning to predict grasp reliability with a multifinger robot hand by using visual features*, In IASTED International Conference on Artificial Intelligence and Soft Computing, Marbella, Spain, September
17. Bluethmann, W., Ambrose, R., Diftler, M., Huber, E., Fagg, A. H., Rosenstein, M., Platt, R., Grupen, R., Breazeal, C., Brooks, A., Lockerd, A., Peters, R. A., Jenkins, O. C., Mataric, M., Bugajska, M. (2004) *Building an Autonomous Humanoid Tool User*, Proceedings of the IEEE-RAS International Conference on Humanoid Robots, Electronically Published
18. Platt, R., Brock, O., Fagg, A. H., Karuppiah, D., Rosenstein, M., Coelho, J., Huber, M., Piater, J., Wheeler, D., and Grupen, R. A. (2003), *A Framework For Humanoid Control and Intelligence*, Proceedings of the IEEE-RAS International Conference on Humanoid Robots, Electronically Published
19. Morales, A., Chinellato, E., Fagg, A. H., del Pobil, A. P. (2003), *Using Experience for Assessing Grasp Reliability*, Proceedings of the IEEE-RAS International Conference on Humanoid Robots, Electronically Published
20. Morales, A., Chinellato, E., Fagg, A. H., del Pobil, A. P. (2003), *Experimental Prediction of the Performance of Grasp Tasks from Visual Features*, Proceedings of International Conference on Intelligent Robots and Systems (IROS'03), Electronically Published

21. Platt, Jr., R., Fagg, A. H., Grupen, R. A. (2003), *Extending Fingertip Grasping to Whole Body Grasping*, Proceedings of International Conference on Robotics and Automation (ICRA'03), pp. 2677–2682
22. Platt, Jr., R., Fagg, A. H., Grupen, R. A. (2002), *Nullspace Composition of Control Laws for Grasping*, Proceedings of the International Conference on Intelligent Robots and Systems (IROS'02), Electronically Published
23. Wang, Y., Thibodeau, B., Fagg, A. H., Grupen, R. A. (2002), *Learning Optimal Switching Policies for Path Tracking Tasks on a Mobile Robot*, Proceedings of the International Conference on Intelligent Robots and Systems (IROS'02), Electronically Published
24. Morales, A., Sanz, P. J., del Pobil, A. P., Fagg, A. H. (2002), *An Experiment in Constraining Vision-Based Finger Contact Selection with Gripper Geometry*, Proceedings of the International Conference on Intelligent Robots and Systems (IROS'02), Electronically Published
25. Wheeler, D. S., Fagg, A. H., Grupen, R. A. (2002), *Learning Prospective Pick and Place Behavior*, Proceedings of the International Conference on Development and Learning (ICDL'02), Electronically Published
26. Amstutz, P. and Fagg, A. H. (2002), *Real Time Visualization of Robot State with Mobile Virtual Reality*, Proceedings of the International Conference on Robotics and Automation (ICRA'02), pp. 241–247
27. Davis, J. A., Fagg, A. H., Levine, B. N. (2001), *Wearable Computers as Packet Transport Mechanisms in Highly-Partitioned Ad-Hoc Networks*, Proceedings of the International Symposium on Wearable Computing, Zurich, Switzerland, October 2001, pp. 141–148
28. Fagg, A. H., Barto, A. G., Houk, J. C. (1998) *Learning to Reach Via Corrective Movements*, Proceedings of the Tenth Yale Workshop on Adaptive and Learning Systems, New Haven, CT, June 10-12, pp. 179-185
29. Fagg, A. H., Sitkoff, N., Barto, A. G., Houk, J. C. (1997) *Cerebellar Learning for Control of a Two-Link Arm in Muscle Space*, Proceedings of the IEEE Conference on Robotics and Automation, May, pp. 2638-2644
30. Fagg, A. H., Sitkoff, N., Barto, A. G., Houk, J. C. (1997) *A Model of Cerebellar Learning for Control of Arm Movements Using Muscle Synergies*, Proceedings of the IEEE International Symposium on Computational Intelligence in Robotics and Automation, July 10-11, pp. 6-12
31. McGovern, A., Sutton, R. S., Fagg, A. H. (1997) *Roles of Macro-Actions in Accelerating Reinforcement Learning*, Grace Hopper Celebration of Women in Computing, pp. 13–18
32. Fagg, A. H., Lotspeich, D. L., Hoff, J. Bekey, G. A. (1994) *Rapid Reinforcement Learning for Reactive Control Policy Design for Autonomous Robots*, Proceedings of the World Congress on Neural Networks, June, pp. II 118–26, San Diego, California
33. Fagg, A. H., Lotspeich, D. L., Bekey, G. A. (1994) *Reinforcement-Learning Approach to Reactive Control Policy Design for Autonomous Robots*, Proceedings of the IEEE Conference on Robotics and Automation, May, pp. 39-44, San Diego, California
34. Fagg, A. H., Lewis, M. A., Montgomery, J. F., Bekey, G. A. (1993) *The USC Autonomous Flying Vehicle: an Experiment in Real-Time Behavior-Based Control*, Proceedings of the IEEE Conference on Intelligent Robots and Systems, July, pp. 1173–1180, Yokohama, Japan
35. Fagg, A. H., Fiser, J. (1993) *Low Level Modeling of the Development of Directionally Selective Microcircuits in Cat Striate Cortex*, IEEE Conference on Neural Networks, March, pp. 772–777, San Francisco, California

36. Fagg, A. H., King, I. K., Lewis, M. A., Liaw, J.-S., Weitzenfeld, A. (1992) *A Neural Network Based Testbed for Modeling Sensorimotor Integration in Robotic Applications*, Proceedings of the International Joint Conference on Neural Networks, June, pp. I 86-91, Baltimore
37. Lewis, M. A., Fagg, A. H., Solidum, A., Bekey, G. A. (1992) *Genetic Programming Approach to the Construction of a Neural Network for Control of a Walking Robot*, Proceedings of the IEEE Conference on Robotics and Automation, May, pp. 2618-2623, Nice, France
38. Fagg, A. H., Lewis, M. A., Iberall, T., Bekey, G. (1991) *R<sup>2</sup>AD : Rapid Robotics Application Development Environment*, Proceedings of the IEEE Conference on Robotics and Automation, April, pp. 1420–1426, Sacramento, California
39. Taber, W. R., Deich, R., Simpson, P., Fagg, A. H. (1988) *The Recognition of Orca Calls with a Neural Network*, Proceedings of the Japan Conference on Fuzzy Logic

## Book Chapters

1. de Granville, C., Wang, D., Southerland, J., Platt, Jr. R., and Fagg, A. H. (2009), *Grasping Affordances: Learning to Connect Vision to Hand Action*, “The Path to Autonomous Robots; Essays in Honor of George A. Bekey” (Gaurav S. Sukhatme, Ed.), Springer
2. Arbib, M. A., Fagg, A. H., and Grafton, S. T. (2002), *Synthetic PET Imaging for Grasping: From Primate Neurophysiology to Human Behavior*, in *Explorative analysis and data modelling in functional neuroimaging*, (F. Sommer and A. Wichert, Eds.), Cambridge MA: The MIT Press, pp. 231–250
3. Houk, J. C., Fagg, A. H., Barto, A. G. (2002), *Fractional Power Damping Model of Joint Motion*, Progress in Motor Control: Structure-Function Relations in Voluntary Movements (M. Latash, Ed.), Vol. II, pp. 147–178
4. Fagg, A. H., Weitzenfeld, A. (2002) *A Model of Primate Visual-Motor Conditional Learning*, NSL – Neural Simulation Language: Systems and Applications (A. Weitzenfeld, M. A. Arbib, and A. Alexander, Eds.), MIT Press
5. Fagg, A. H., Lotspeich, D. L., Hoff, J. Bekey, G. A. (1998) *Rapid Reinforcement Learning for Reactive Control Policy Design for Autonomous Robots*, in Artificial Life in Robotics (T. Shibata and T. Fukuda, Eds.)
6. Iberall, T., Fagg, A. H. (1996) *Neural Network Models for Selecting Hand Shapes*, in Hand and Brain: The Neurophysiology and Psychology of Hand Movements (A. M. Wing, P. Haggard, J. R. Flanagan Eds.), pp. 243-264, Academic Press, San Diego, CA
7. Lewis, M. A., Fagg, A. H., Bekey, G. A. (1994) *Genetic Algorithms for Gait Synthesis in a Hexapod Robot*, Chapter 11 of Recent Trends in Mobile Robots (Y. Zheng Ed.), pp. 317-331, World Scientific Press
8. Fagg, A. H. (1993) *Reinforcement Learning for Robotic Reaching and Grasping*, Chapter 14 of New Perspectives in the Control of the Reach to Grasp Movement (K. M. B. Bennett and U. Castiello, Eds.), pp. 281-308, North Holland Press
9. Fagg, A. H. (1991) *Developmental Robotics : A New Approach to the Specification of Robot Programs*, Chapter 26 of Neural Networks in Robotics (G. A. Bekey and K. Y. Goldberg, Eds.), pp. 459-486, Kluwer Academic Publishers

## Conference Abstracts and Non-Refereed Conference Papers

1. Goossaert, E. and Fagg, A. H. (2009), *A Corrective Movement Approach to Online Adaptive Decoders* (poster), Proceedings of the Spring Meeting on the Neural Control of Movement, electronically published
2. Hatsopoulos, N. G., Suminksi, A., Tkach, D. and Fagg, A. H. (2009) *Augmenting Brain-Machine Interfaces with Proprioceptive Feedback* (poster), Proceedings of the Spring Meeting on the Neural Control of Movement, electronically published
3. Tingle, D.T., Fagg, A.H., Rennaker, R.L. and Zee, M.C. (2008) *Decoding Odor from the Piriform Cortex Using a Free-Paced Classifier*, Society for Neuroscience Annual Meeting, student poster session
4. Nemati, S. Fagg, A. H., Hatsopoulos, N., Miller, L. (2007) *A Comparison of Linear and Kalman Filter Models for Arm Motion Prediction*, Proceedings of the Spring Meeting on the Neural Control of Movement, Electronically Published
5. Brown, A., Fagg, A. H. (2006), *The Bion Sensor Network*, Invited talk at Upgrade! International, November 30 – December 3
6. Shah, A., Barto, A. G., Fagg, A. H. (2006) *Biologically-Based Functional Mechanisms of Coarticulation*, Proceedings of the Spring Meeting on the Neural Control of Movement, Electronically Published
7. Goldberg, D., Fagg, A. H., Hatsopoulos, N., Ojakangas, G., Miller, L. (2006) *A Kernel-Based Approach to Predicting Arm Motion from MI Activity*, Proceedings of the Spring Meeting on the Neural Control of Movement, Electronically Published
8. Fagg, A. H., Grupen, R. A., Rosenstein, M., and Sweeney, J. (2005), *Intent Recognition as a Basis for Imitation Learning in Humanoid Robots*, New England Manipulation Symposium, Electronically Published
9. Fagg, A. H., Rosenstein, M. T., Platt, Jr., R., Grupen, R. A. (2004), *Extracting User Intent in Mixed Initiative Teleoperator Control*, Proceedings of the American Institute of Aeronautics and Astronautics Intelligent Systems Technical Conference, 2004-6309
10. Ou, S., Karuppiah, D. R., Fagg, A. H. and Riseman, E. (2004), *An Augmented Virtual Reality Interface for Assistive Monitoring of Smart Spaces*, Proceedings of the IEEE International Conference on Pervasive Computing and Communications, p. 33.
11. Fagg, A. H., Ou, S., Hedges, T. R., Brewer, M., Piantedosi M., Amstutz P., Hanson, A., Zhu, Z., Grupen, R., and Riseman, E. (2002), *Human-Robot Interaction Through a Distributed Virtual Environment*, Proceedings of the Workshop on Intelligent Virtual Environments and Human Augmentation (WIHAVE), Chapel Hill, NC, October 17–19.
12. Shah, A., Fagg, A. H., and Barto, A. G. (2002) *A Model of Wrist Movement Representation in Primary Motor Cortex*, Proceedings of the Spring Meeting on the Neural Control of Movement, Naples, FL, Electronically Published
13. Shah, A., Fagg, A. H., and Barto, A. G. (2001), *A Computational Model of Muscle Recruitment for Wrist Movements*, Proceedings of the Spring Meeting on the Neural Control of Movement, Sevilla, Spain, Electronically Published
14. Fagg, A. H., Alamed, B., and Warwick, J. (2001), *A Mobile Interactive Tour Guide: An Experiment in Wearable Computing*, Five College Multimedia Fair, February 28

15. Fagg, A. H., Shah, A., Barto, A. G. (2000) *A Model of Wrist Movement Representation in Muscle and Primary Motor Cortex* presented at the *USC Symposium on Computational and Cognitive Neuroscience*, Aug. 11-12, Los Angeles, CA
16. Fagg, A. H., Zelevinsky, L., Barto, A. G., Houk, J. C. (1998) *A Pulse-Step Model of Control for Arm Reaching Movements*, Proceedings of the Spring Meeting on the Neural Control of Movement
17. Fagg, A. H., Sitkoff, N., Barto, A. G., Houk, J. C. (1997) *A Computational Model of Cerebellar Learning for Limb Control*, Proceedings of the Spring Meeting on the Neural Control of Movement
18. Lewis, M. A., Fagg, A. H., Bekey, G. A. (1994) *Evolution of Complex Behaviors in Robotic Systems* SPIE's Robotics and Machine Perception Newsletter, March, **3(1)**, pp. 1-6
19. Fagg, A. H. (1993) *Reinforcement Learning for Robotic Reaching and Grasping*, Proceedings of the 1993 USC Workshop on Neural Architectures and Distributed AI: from Schema Assemblages to Neural Networks, Oct. 19-20, Los Angeles, California
20. Fagg, A. H., Tillery, S. I. H., Terzuolo, C. A. (1992) *Motion Velocity Profiles Influence the Perception of Hand Trajectories in the Absence of Vision*, Proceedings of the 22nd Meeting of the Society for Neuroscience, October, p. 647.9, Anaheim, California

## Workshop and Tutorial Presentations

1. Platt, Jr., R., Fagg, A. H., Grupen, R. A. (2004), *Learning Dexterous Manipulation Skills Using the Control Basis* AAAI Fall Symposium on Real-life Reinforcement-Learning, Oct. 22-24
2. del Pobil, A. P., Fagg, A. H. (2000) *Robotics and Neuroscience*, Tutorial presented at Intelligent Robots and Systems (IROS), Oct. 31, Takamatsu, Japan
3. Fagg, A. H., Barto, A. G., Houk, J. C. (1998) *Learning to Reach Using Crude Corrective Feedback* presented at the NIPS workshop on *Movement Primitives: Building Blocks for Learning Motor Control*, Dec. 4, Breckenridge, CO
4. Fagg, A. H., Zelevinsky, L., Barto, A. G., Houk, J. C. (1997) *Using Crude Corrective Movements to Learn Accurate Motor Programs for Reaching*, presented at the NIPS workshop on *Can Artificial Cerebellar Models Compete to Control Robots*, Dec. 5, Breckenridge, CO

## Invited Talks

1. Fagg, A. H. (2007), *A Structured Approach for Control and Learning of Humanoid Reaching and Grasping Skills* Drury University. November 16
2. Fagg, A. H., Watson, B., Wang, D., Southerland, J. (2006), *Whole-Body Contact Sensing, Presentation*, Dexterous Robotics Laboratory, NASA/Johnson Space Center, May 22
3. Fagg, A. H. (2005), *Predicting Arm Motion from Motorcortical Activity* (talk and lab session), 5th International UJI Summer School on Robotics and Neuroscience, September, 19-23, 2005, Benicassim, Spain
4. Fagg, A. H. (2001), *Wearable Computers: A Changing (Inter)Face of Computing*, talk presented at Sandia National Laboratories, Livermore, CA, August 9, 2001

## Regional Invited Talks

1. Fagg, A. H. and McGovern, A. (2006), *Pushing the Boundaries: An Interdisciplinary Perspective on Computer Science* Southwestern Oklahoma State University, November
2. Fagg, A. H. (2005), *Robot Manipulation*, Guest lecture, (RADI 5403; Instructor: Dee Wu) Introduction to Clinical Biomedical Informatics For Quantitative Scientists and Engineers
3. Fagg, A. H. (2005), *Research Experiences for Undergraduates Program*, the OU American Indian Science and Engineering Society
4. Fagg, A. H. (2005), *Research Experiences for Undergraduates Program*, East Central University
5. Fagg, A. H. (2005) *Research Experiences for Undergraduates Program*, Southeastern Oklahoma State University
6. Fagg, A. H. (2005) *Embedded Systems and Machine Learning*, Southwestern Oklahoma State University

## Technical Reports

1. Thibodeau, B. J., Fagg, A. H., Levine, B. N. (2004), Signal Strength Coordination for Cooperative Mapping Technical Report #04-64, Department of Computer Science, University of Massachusetts, Amherst
2. Fagg, A. H. (2000), A Model of Muscle Geometry for a Two Degree-Of-Freedom Planar Arm Technical Report #00-03, Department of Computer Science, University of Massachusetts, Amherst

## Art Reviews and other Commentary

*Bion* has been reviewed and discussed in a variety of venues. Several examples follow.

- William V. Ganis, “Archival to Contemporary: Six Decades of the Sculptors Guild” (2006), *Sculpture*, **25(7):71-2**

“Though the installation [of the entire exhibit] was quite dense, several pieces stood out for their conceptual and formal quality. ... Adam Brown’s light and sound installation *Bion* (2005) was skillfully integrated into a separate architectural environment so that it could be seen glowing from afar, delighting the senses in an immersive encounter with its 1000 artificially intelligent elements.”

- Gae Savannah, “Newark, NJ, ‘Newark Between Us,’ National Newark Building” (2007), *Sculpture*, **26(10):71-2**

“Entertaining the dark rectangular grove of suspended objects, one was caught delightfully off guard as luminous blue orbs lit up in cascade. Responding to the spectator’s energy, the frolicky alien beings glowed and blinked, emitting a chorus of high-pitched chirping that increased in intensity, like birdsong at dawn. Then, as the visitor slowly calmed down, the bions also settled into stillness, emitting only an intermittent twittering.”

- James D. Watts, Jr. “Exhibit Explores Electronics, Artificial Intelligence” (2006) *Tulsa World*, Thursday, Sept 7.

“Art and science come together with a touch of mystery and whimsy in ‘Bion’ ...”

- *Bion* will be discussed in an upcoming art history book by Stephen Wilson “Border Patrol: Artists Working at the Frontiers of Science and Technology,” published by Thames & Hudson.

- Bion is one of four projects featured in Vision Magazine: Looking at the Future of Learning, Summer/Autumn 2007, p. 16

“It is essential for learners to be creative, to generate new ideas and to experiment in the application of those ideas. In this section, we celebrate those that do not always take the safe and proven route, but instead are committed to trying something truly innovative. Here are just some of the exciting creative ideas that have made us sit up and listen recently”

- Bion is featured in the documentary *Oklahoma: Spirit of the People*, which is being shown regularly at the Oklahoma Heritage Society Museum

## Funding: External

- Fagg, A. H., *Development of a Bidirectional Brain Machine Interface*, Budget Period: 5/1/05 – 4/31/09; Sponsor: NIH (Northwestern University Subcontract); Total Award Amount: \$580,494.00;
- Fagg, A. H., McGovern, A., Fierro, R., Hougen, D. F., and Lane, T., *REU Site: Integrated Machine Learning Systems*, Budget Period: 1/01/08 – 12/31/10; Sponsor: NSF; Award amount: \$310,952;
- McGovern, A. and Fagg, A. H., *REU Supplement: Integrated Machine Learning Systems*, Budget Period: 5/01/08 – 9/01/08; Sponsor: Oklahoma EPSCoR; Award amount: \$5,000; . This award allows our REU program to add one additional student from Oklahoma.
- Fagg, A. H., Hougen, D. F., Droegemeier, K. K., Lane, T., and McGovern, A., *REU Site: Embedded Machine Learning Systems*, Budget Period: 2/15/05 – 1/31/08; Sponsor: NSF; Total Award Amount: \$299,997.00;
- Brown, A. and Fagg, A. H., *PulsePool Art Installation*, Budget Period: 9/06 – 5/07; Sponsors: Turbulence, Boston Museum of Science, and Rhizome.org, Total Award Amount: \$4,000; . Partial support for the fabrication of the art piece.
- Fagg, A. H., *Learning Grasp Affordances for Control of Humanoid Robot Grasping and Manipulation*, Budget Period: 10/7 – 12/7; Sponsor: NASA/EPSCoR; Total Award Amount: \$1,500; . This supported travel to NASA/Johnson Space Center for me and two students to report on ongoing work and to discuss future projects.
- Brown, A. and Fagg, A. H. *Bion* (Tilles Center Installation); Period: 1/30/06 – 4/30/06; Sponsored in part by Elliott Stroka, Director of the Institute of Arts and Culture, Hillwood Art Museum at Long Island University. This sponsorship covered the transportation and installation costs of Bion.
- Brown, A. and Fagg, A. H. *Bion* (Living Arts of Tulsa Installation); 9/7/06 – 9/28/06; Sponsored in part by the Andy Warhol Foundation for the Visual Arts. This sponsorship covered the transportation and installation costs of Bion.
- Grupen, R. A., Mahadevan, S. R., and Fagg, A. H., *Instructing Robotic Assistants to Acquire Autonomous Behavior*, 8/1/02-12/31/04; Sponsor: DARPA (NASA/Johnson Space Center Subcontractor); Total: \$1,305,000;
- Neeman, H. J., Roe, B. J., Wu, D. and Severini, H., *CI-TEAM Demonstration Project: Cyberinfrastructure Education for Bioinformatics and Beyond*, National Science Foundation, 12/1/06 - 11/30/08, Fagg Percentage (as a senior personnel member): 0%. This project provides computational resources to my group.

## Funding: Internal

- Landers, T., Enrico, E., Brown, A. and Fagg, A. H. *Center for Symbiotic Media Research*, Office of the Vice President for Research, and Colleges of Fine Arts and Engineering, 7/1/08–6/30/09, \$55,000;
- Brown, A. and Fagg, A. H. *Presidential Dream Course: Smart Art Spaces*, Office of the Provost, 1/1/09–5/15/09, \$20,000;
- Hougen, D. F. , Cheng, Q., McGovern, A., Dong, Y. and Fagg, A. H. *Computer Science Graduate Fellowship Program*, Graduate College and College of Engineering, University of Oklahoma, 08/06 – 05/15. This fellowship program supports computer science graduate students who are working toward their PhD and has been critical to our recruitment and maintenance of quality students. I have two students funded under this program (Di Wang and Thomas Palmer).
- Brown, A. and Fagg, A. H. *Bion* (original development of piece); 12/22/5 – 12/31/6; Sponsor: Offices of the President, Vice President for Research (the Research Council); Colleges of Fine Art and Engineering; and Schools of Art and Computer Science; Total: \$30,000;

## Teaching Experience

- Spring 2008: Embedded Real-Time Systems (AME 3623)  
Embedded Systems (CS 4163/5163)  
Freshman Engineering Orientation (ENGR 1420)
- Spring 2007: Embedded Real-Time Systems (AME 3623)  
Embedded Systems (CS 4973/5973)  
Freshman Engineering Orientation (ENGR 1420)
- Fall 2006: Empirical Methods for Computer Science (CS 5973)
- Spring 2006: Embedded Real-Time Systems (AME 3623)  
Seminar on Sm[Art] Spaces (CS 5973)
- Fall 2006: Seminar on Neuro/Cognitive Robotics (CS 5973)
- Spring 2005: Embedded Real-Time Systems (AME 3623)
- Fall 2003: Graduate/Undergraduate Embedded Systems (CS 503/591c)
- Spring 2003: Undergraduate Operating Systems (CS 377)  
Co-instructor (1 of 10) of the Graduate Computational Psychology Seminar (Psych 891E)
- Fall 2002: Undergraduate Operating Systems (CS 377)
- Spring 2002: Wearable Computing seminar (CS 691w)
- Fall 2001: Computational Neuroscience seminar (CS/NSB 691c)
- Spring 2001: Wearable Computing seminar (CS 691w)
- Fall 1999: Computational Neuroscience seminar (CS/NSB 691c) with Andrew G. Barto

## Honors and Awards

- Nominated for the University-level Outstanding Teacher Award for the 2002-2003 academic year (University of Massachusetts).

## Academic Committees and Advisees

Students shown in bold are MS or PhD thesis students for which I am/was committee chair.

- MD Sazzadur Rahman (MS committee member): SEMO6 - A Multihoming-Based Seamless Mobility Management Framework, completed May 2009
- Brent E. Eskridge (PhD committee member): Effects of State and Action Abstraction on Development of Controllers for Concurrent, Interfering, Non-Episodic Tasks, completed May 2009.
- Lesheng Hua (MS committee member):
- **Thomas Palmer (PhD student starting in Fall, 2008): Manipulation task learning.**
- **Emmanuel Goossaert (MS student starting in Fall, 2008): Brain-machine interfaces.**
- **Matthew Bodenhammer (current PhD supervisor, CS): Grounding sensors in task- and communication-centric knowledge structures.**
- Matthew J. Roman (PhD committee member, AME): Effects of Perception Range on Mobile Robot Path Efficiency.
- Ashvin Shah (PhD committee, UMass Neuroscience and Behavior, completed in August 2008): Biologically-based Functional Mechanisms of Motor Skill Acquisition.
- **Andrew Hill (MS committee chair, CS): A Structured Approach to Predicting Arm Motion from Neural Activity.**
- **Charles de Granville (MS committee chair, CS): Learning Grasp Affordances, completed in June 2008.** A journal paper based on Charles' thesis has been submitted to *Autonomous Robots*.
- **Di Wang (MS committee chair, CS): A 3D Feature-Based Object Recognition System for Grasping, completed in December 2007.** Di is now a PhD student with me. A book chapter based on Charles' and Di's theses will be published before year end.
- **David Goldberg (MS committee chair, CS): Predicting Arm Motion from Cortical Activity, completed in December 2007.**
- Pedro Diaz-Gomez (PhD committee member, CS): Optimization of Parameters for Binary Genetic Algorithms, completed in December 2007.
- **Robert Platt (co-chair of PhD committee, UMass CS): Control basis approach to learning for robot reaching, grasping, and manipulation, completed 2006.** Two journal papers resulting from this thesis are in preparation (one is currently being revised).
- Sreedevi Chandrasekaran (MS committee member, CS): Control of Bio-Nano Robots, completed in 2006.
- Joshua J. Beitelspacher (MS committee member, CS): Implicit Robot Localization through Prediction, completed 2006.

- Surendra Kumar Sivagurunathan (MS committee member, CS): PEARS: a Power Aware Sigma (Seamless IP diversity based Generalized Mobility Architecture), completed 2004.
- Ashvin Shah (PhD synthesis committee, UMass Neuroscience and Behavior): Computational models of muscle recruitment in wrist movements and implications for neural coding of movement, completed 2002.
- Shichao Ou (PhD synthesis project committee, UMass CS): A machine learning approach to context-aware power management in mobile devices.
- Antonio Morales (PhD committee member, CSE, Universitat Jaume I, Spain): Learning to Predict Grasp Reliability with a Multifinger Robot Hand by using Visual Features.
- Sam Weinger (chair, undergraduate honors thesis committee, UMass CS): Multimodal interfaces for wearable computers.
- Kevin Kohler (chair, undergraduate honors thesis committee, UMass CS): Multimodal interfaces for wearable computers.
- Joshua Gay (chair, undergraduate honors thesis committee, UMass CS): A hybrid reinforcement and supervised learning model of audio-visual calibration.
- David Timothy Collins (PhD external reviewer, University of Queensland, Australia): Cerebellar Modeling Techniques for Mobile Robot Control in a Delayed Sensory Environment, completed 2003.
- Bryan Thibodea (PhD synthesis project committee, UMass CS): Communication sensitive approaches to mobile robot cooperation in search-and-retrieval tasks.
- Michael Rosenstein (PhD committee member, UMass CS): Learning to Exploit Dynamics for Robot Motor Coordination, completed 2003.
- James Davis (PhD synthesis project committee, UMass CS): Wearable Computers as Packet Transport Mechanisms in Highly-Partitioned Ad-Hoc Networks, completed 2002.
- **David Wheeler (MS committee chair, UMass CS): Learning Prospective Pick and Place Behavior, completed 2002.**
- Yunqing Wang (MS committee member, UMass CS): Learning Optimal Switching Policies for Path Tracking Tasks on a Mobile Robot, completed 2002.
- Laura Claxton (MS committee member, UMass Psychology): The kinematics of intent: A new approach to measuring intention in infants, completed 2002.
- Justus Piater (PhD committee member, UMass CS): Constructive Feature Learning and the Development of Visual Expertise, completed 2001.
- Renee Johnson (MS committee member, UMass Psychology): The role of vision in infants' precision reaching, completed 2000.
- Nathan Baughman (MS committee member, UMass CS): Cheat-Proof Payout for Centralized and Distributed Online Games, completed 2000.

**Research Experiences for Undergraduates (REU) Advisees**

- Derek Tingle (2008): Decoding Odor from Rat Olfactory Cortex.
- Samuel Bleckley (2008): Orgonome: a Synthetic Creature for Interactive Art.
- Rachel Shadoan (2008): Orgonome: Learning Interactive Behavior from Sparse Experience.
- Joshua Southerland (2008): Design of a Mobile Manipulation Robot for Human-Scaled Environments.
- Rudy Sandoval (2007): Learning Color Models to Segment and Map Robot Environments.
- Nicole Doorly (2007): A Robotic Mobile Manipulator Platform for Planning and Learning.
- Robert Lindsey (2007): A Dynamic Programming Approach to Mobile Robot Path Planning.
- Charles de Granville (2004-2006): Learning grasp affordances from demonstration. **Charles was named Outstanding Computer Science Senior by OU, and received an honorable mention for the 2007 CRA Outstanding Undergraduate Award.**
- Joshua Southerland (2004-2006): Learning pick-and-place task sequences from a human teacher.
- Brian Watson (2004-2006): Whole body contact detection with a 6-axis load cell.
- Elyse Steiner (2006): Learning pick-and-place task representations from human demonstration.
- Eric Sondhi (2002-2004): Formation of cortical representations of wrist movements in the primary motor cortex.
- Matthew Brewer (Summers 2000-2003): Localization and path planning for a mobile robot.
- Joshua Gay (2001-2004): Audio/visual calibration for the UMass Torso.
- Marwan Mattar (2004): Speech interfaces for robots.
- Reed Hedges (2001-2003): A virtual reality interface for multi-robot search-and-rescue tasks.
- Enrique Irigoyen (2003; New Mexico State University): Texture representations for subject tracking in a smart space.
- Christopher Atenasio (2002): Collision-free motion planning for a 14 degree-of-freedom, dual-arm robot.
- Peter Amstutz (2001-2002): A mobile virtual/augmented reality interface for wearable computers.
- Jonathan Flynn (2001): Multi-modal interfaces for wearable computers.
- David Whitehead (2001-2002): A neural model of visual and tactile fusion in the parietal and premotor cortices.
- Michael Piantedosi (2001-2002): audio spatialization for wearable computers.

**Independent Study Advisees**

- Charles de Granville (undergraduate): Using Learned Grasp Affordances as Reach Control Primitives (Fall 2006)
- Di Wang (graduate): A Hybrid Convex/Concave Grasp Controller for Haptic Exploration of Objects (Spring/Summer 2006)

- Shichao Ou (graduate): An Augmented Virtual Reality Interface for Assistive Monitoring of Smart Spaces. (Spring/Summer 2003)
- Michael Piantedosi (undergraduate): A 3D audio system for wearable computers. (Fall 2000)
- James Davis (graduate): Oscillation primitives for robot control. (Spring 2000)
- Benjamin Alamed (undergraduate): A Wearable Computer Tour Guide. (Spring 2000)

## Professional Activities

2004–current

- Journal/Conference paper review:
  - Journal of Autonomous Robotics
  - International Conference on Robotics and Automation
  - Neurocomputing Journal
  - Journal of Systems, Man, and Cybernetics
  - International Conference on Advanced Robotics
  - International Conference on Humanoid Robotics (**program committee member: 2006, 2008**)
  - Psychological Review (journal)
  - IEEE/RSJ International Conference on Intelligent Robots and Systems
  - Robotics Science and Systems workshop on “Robot Manipulation: Sensing and Adapting to the Real World” (**program committee member: 2007–2008**)
  - IASTED International Conference on Intelligent Systems and Control
  - Neural Computation (journal)
  - Machine Learning Journal
  - Journal of Neurophysiology
  - International Conference on Epigenetic Robotics
- Funding Review Panels:
  - Vanderbilt University (internal review)
  - NSF Panel on Research Experiences for Undergraduates
  - NSF Panel on Computational Neuroscience
- Department and College Service
  - Graduate recruitment Committee: 2004 – 2008
  - Ad Hoc CS Web Presence Committee: 2005
  - Speaker for Introduction to Engineering (ENGR 1410): 2006, 2007
  - College of Engineering Committee on the Introduction to Engineering Curriculum: 2006–2007
  - CS Research Committee: 2007–2008
  - CS Computing Committee: 2008

- Numerous laboratory tours to visiting students: 2004–2008
- Miscellaneous:
  - Director, “OU/UNM REU Site on Integrated Machine Learning Systems,” 2008–2010
  - Director, “OU/UNM REU Site on Embedded Machine Learning Systems,” 2005–2008
  - Instructor for the “Interactive Art Workshop” at the Global Conference on Educational Robotics (middle and high school students), July 8–11, 2008 (co-taught with Adam Brown). This one day course focused on Finite State Machines and programming sensor network nodes for interactive art.
  - Instructor for the *K20 Research Experience for Science Teachers Institute* (middle school teachers), June 16–27, 2008 (co-taught with Amy McGovern). This nine day course focused on Finite State Machines and programming sensor network nodes for interactive art.
  - Judge, Oklahoma Botball competition, 2006 and 2008
  - External Mentor, year-long Engineering Senior Design Clinic Course at Smith College (Northampton, MA). Project: “Design of a Non-Visually Accessible Campus Mapping/Database Interface” (Course taught by Professor Susannah Howe), AY 2004–2005

## Professional Organizations

- Society for the Neural Control of Movement
- IEEE; Robotics Society; Computer Society
- Oklahoma Cognitive Neuroscience Board