

# Michael Campos, Ph.D

California Institute of Technology  
Computation & Neural Systems, 216-76  
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## EDUCATION:

### California Institute of Technology, Pasadena, CA

Ph.D. in Computation and Neural Systems, 11/01 – 10/06

- Completed Ph.D. in the lab of Prof. Richard Andersen, leading neuroscientist and member of the National Academy of Sciences
- Discovered a correlate of reward expectancy and a sequential state representation in supplementary motor cortex and elucidated complementary roles of two cortical structures in behavioral timing
- Pioneered the development of online data visualization to speed the process of discovery in neurophysiology experiments
- Developed skills in neurophysiology, including primate surgical procedures, single and multiple unit recording techniques, monkey handling and behavioral training, task design, implementation, and experimental execution
- Authored two publications in the *Journal of Neurophysiology*, with additional manuscript submitted
- Thesis Committee: Christof Koch, John O’Doherty, Wolfram Schultz, and Shinsuke Shimojo.
- Relevant Coursework: Theory of neural computation, Information and complexity, Neurobiology, Cerebral cortex, Vision, Clinical neuropsychology, Social Neuroscience, Responsible conduct in research

### Northwestern University, Evanston, IL

B.A. with honors in the Integrated Science Program, 9/96 – 6/00

- Researched the natural scanning of images with simultaneous recordings of neural activity in the awake behaving monkey.
- Manuscript based on undergraduate senior thesis was sent out for review by *Nature* prior to publication in the *Journal of Neurophysiology*

## RESEARCH EXPERIENCE:

### Conte Center for Research in Obsessive Compulsive Disorder, Mass General Hospital/Harvard, Boston, MA

Research Fellow, Advisor: Emad Eskandar, 1/10-Present

- Research to be performed in the lab of Dr. Emad Eskandar, the only practicing neurosurgeon that also maintains an active monkey neurophysiology laboratory
- Will have primary responsibility for the monkey neurophysiology portion of a multi-site, cross-species effort to elucidate the neurocircuitry of deep brain stimulation (DBS) for obsessive compulsive disorder
- Will participate in collaborative activities that bring together scientific and clinical specialists to understand the circuitry that underlies OCD and related affective and addictive disorders
- Will perform multi-electrode recordings in frontal and striatal circuits involved in decisions that balance reward and fear considerations, apply simulation to mimic DBS to influence choices

### ERATO Implicit Brain Functions Project, Caltech, Pasadena, CA

Postdoctoral fellow & Collaborator, Advisor: Shinsuke Shimojo, 11/05-12/09

- Developed novel paradigm to study preference-based decision making using non-appetitive rewards
- Designed and assembled a state-of-the-art monkey neurophysiology rig capable of algorithmically controlled multi-channel recordings from two cortical areas, as well as human psychophysics, and eye tracking

- Coordinated negotiations between Caltech and a research/medical device company to bring automatic electrode positioning software to market
- Compared human and monkey preferences for visually engaging stimuli
- Trained and supervised one research technician and three undergraduate students

#### **ATR Computational Neuroscience Laboratories, Kyoto, Japan**

East Asia and Pacific Summer Institutes Fellow, Advisor: Kenji Doya, 6/04 – 8/04

- Compared models of reward based learning to understand internal decision making strategies, and calculated the values of associated internal parameters, acknowledged in the group's *Science* paper
- Won a competitive NSF research grant

#### **Santa Fe Institute, Santa Fe, NM**

Research Experience for Undergraduates (REU) intern, 6/98 – 8/98

- Created models of ant colony swarm behavior
- Implemented a model of dynamic task allocation in a virtual ant colony, with a successful application to a factory scheduling problem
- Presented results to resident SFI community, and published in peer-reviewed journal, *Adaptive Behavior*

### **PROFESSIONAL EXPERIENCE:**

#### **Icosystem, Paris, France**

Associate Scientist, 12/00 – 6/01

- Designed and analyzed a proof of concept method of evolving businesses
- Performed research directed toward the computational evolution and harvesting of profitable business models
- Lead project to distribute a genetic programming breeding ground across computers on the internet and co-invented a genetic programming migration strategy that will become patented intellectual property

#### **Eurobios, Paris, France**

Scientist, 8/00 – 12/00

- Contributed to a proposal for a cross-European initiative to create swarms of autonomous miniature robots, called swarm-bots

### **TEACHING EXPERIENCE:**

**Training:** Exploratorium Science Museum, San Francisco, Teacher Institute, July 28-August 8, 2008

**Guest Lecturer,** Caltech, Course: Cognition, Topic: Monkey Neurophysiology, May 29, 2008

**Guest Lecturer,** Caltech, Course: Experimental Methods in Cognitive Neuroscience, Topic: Animal Decision-Making, March 3, 2008

**Training:** Caltech Project for Effective Teaching Certificate Program, 2006-2009

**Teaching Assistant,** Caltech, Course: Theory of Neural Computation, Fall 2003

**English Teacher,** Opus Dei, Santa Pau, Spain, Summer, 1994-1995

### **PUBLICATIONS -- Research Papers:**

**Campos M.,** K. Koppitch, R.A. Andersen, S. Shimojo. "Switch and Stay selective Orbitofrontal neurons." *In preparation.*

**Campos M.,** K. Koppitch, R.A. Andersen, S. Shimojo. "Specific and General responses of individual OFC neurons for Juice and Video Rewards." *In revision.*

- Campos M.**, B. Breznen, R.A. Andersen. "Neural representation of sequential states within and instructed task." *In revision*.
- Breznen, B., **M. Campos**, R.A. Andersen. "Context-specific tuning of LIP cells in object based saccade task." *In revision*.
- Campos M.**, B. Breznen, R.A. Andersen. "Separate representations of Target and Timing Cue Locations in SEF." *Journal of Neurophysiology*. 101: 448-459, 2009.
- Campos M.**, A. Cherian, M.A. Segraves. "Effects of eye position upon the activity of neurons in macaque superior colliculus." *Journal of Neurophysiology*. 95: 505-526, 2006.
- Campos M.**, B. Breznen, K. Bernheim, R.A. Andersen. "The supplementary motor area encodes reward expectancy in eye movement tasks." *Journal of Neurophysiology*. 94: 1325-1335, 2005.
- Campos, M.**, E. Bonabeau, G. Theraluz, and J-L. Deneubourg. "Dynamic Scheduling and Division of Labor in Social Insects." *Adaptive Behavior*. Spring 2001, Vol. 8-2. p 83-92.

#### **PUBLICATIONS -- Abstracts:**

- Campos M.**, K. Koppitch, R.A. Andersen, S. Shimojo. "Intrinsic reward value of entertaining videos is represented in primate orbitofrontal cortex." Program No. 194.2. *2009 Neuroscience Meeting Planner*. Chicago, IL: Society for Neuroscience, 2009. Online.
- Campos M.**, K. Koppitch, R.A. Andersen, S. Shimojo. "Changing your mind - contributions of primate OFC to self-initiated free-choice behavior." Program No. 590.24. *2008 Abstract Viewer/Itinerary Planner*. Washington, DC: Society for Neuroscience, 2008. Online.
- Campos M.**, K. Koppitch, R.A. Andersen, S. Shimojo. "Contributions to decision-making between juice and video rewards in primate OFC." ERATO Implicit Brain Project Symposium, Shuzenji, Japan, 2008
- Campos, M.**, Koppitch, K., Andersen, R. A., & Shimojo, S. (2008). "Overlapping representation of juice and video rewards in primate OFC." *Journal of Vision*, 8(6):546, 546a, <http://journalofvision.org/8/6/546/>
- Campos M.**, K. Koppitch, R.A. Andersen, S. Shimojo. "MonkeyTV: Orbitofrontal responses during self-initiated video-watching" *Neural Mechanisms of The Social Mind*. Tamagawa Univeristy. Tokyo, Japan, 2007
- Campos M.**, B. Breznen, R.A. Andersen. "Neural Representation of Sequential States within an Instructed Task. 14th Joint Symposium on Neural Computation. California Institute of Technology. Pasadena, 2007
- Campos M.**, B. Breznen, R.A. Andersen. "Neural representation of sequential states within and instructed task." COSYNE conference. Salt Lake City, Utah, 2007
- Campos M.**, B. Breznen, R.A. Andersen. "Selection of targets and active disregard of irrelevant information in monkey LIP and SEF." Program No. 549.1. *2006 Abstract Viewer/Itinerary Planner*. Washington, DC: Society for Neuroscience, 2006. Online.
- Campos M.**, B. Breznen, R.A. Andersen. "Event detection in SEF and spatial representations in LIP during an irrelevant-object saccade task." Program No. 287.3. *2005 Abstract Viewer/Itinerary Planner*. Washington, DC: Society for Neuroscience, 2005. Online.
- Breznen, B., **M. Campos**, R. A. Andersen. "Macaque supplementary eye fields neurons exhibit task specific spatial tuning." Program No. 302.9. *2004 Abstract Viewer/Itinerary Planner*. Washington, DC: Society for Neuroscience, 2004. Online.
- Campos M.**, B. Breznen, R.A. Andersen. "Reward expectancy in dorsomedial frontal cortex of the macaque monkey." Program No. 187.3. *2003 Abstract Viewer/Itinerary Planner*. Washington, DC: Society for Neuroscience, 2003. Online.
- Breznen, B., **M. Campos**, R.A. Andersen. "Parietal coding of saccades to symmetrical objects." Program No. 658.10. *2003 Abstract Viewer/Itinerary Planner*. Washington, DC: Society for Neuroscience, 2003. Online.
- Campos M.**, A. Cherian, M.A. Segraves. "Lessons from visual scanning and search." *Laboratory of Sensorimotor Research 25<sup>th</sup> Anniversary Symposium*. Washington, D.C., 2003.
- Breznen, B., **M. Campos**, R.A. Andersen. "Parietal activity in a symmetrical-object saccade task." *Laboratory of Sensorimotor Research 25<sup>th</sup> Anniversary Symposium*. Washington, D.C., 2003.
- Breznen, B., P. N. Sabes, **M. Campos**, R.A. Andersen. "Object-based saccades." *Laboratory of Sensorimotor Research 25<sup>th</sup> Anniversary Symposium*. Washington, D.C., 2003.

**Campos M.**, A. Cherian, M.A. Segraves. “Spike triggered averaging of natural scanning reveals the dynamics of multiplexed eye and head signals in the primate superior colliculus.” Program No. 11.1. *2002 Abstract Viewer/Itinerary Planner*. Washington, DC: Society for Neuroscience, 2002. Online.

**Campos, M.**, A. Cherian, M. A. Segraves. “Eye and head dependency of saccade-related activity in monkey superior colliculus during natural scanning eye movements.” *Society for Neuroscience Abstracts*, 26. New Orleans, November 2000.

**Campos, M.**, A. Cherian, M. A. Segraves. “Natural scanning eye movements reveal head- as well as eye-centered movement fields in monkey superior colliculus neurons.” *Eye movements and vision in the natural world*. Amsterdam, September 2000.

#### **PUBLICATIONS -- Patents:**

**Campos, M.**, J. Branke. “Method and system for implementing evolutionary algorithms.” International application number: PCT/US02/34571. Filed: 28 October 2002. Pending.

Anderson, C., E. Bonabeau, J. M. Scott, O. Bandte, S. Malinchik, T. Ashburn, M. Sullivan, J. Branke, **M.**

**Campos**, B. Orme, P. Funes. “Interactive evolution methods and systems.” U.S. Provisional Patent Application Ser. No. 60/537,761. Filed 20 January 2004. Pending.

#### **HONORS & AWARDS:**

Society for Neuroscience abstract chosen for inclusion in Lay Language Media Summary (2008)

Exploratorium Teach Institute postdoctoral fellowship (Summer 2008)

East Asia Pacific Summer Institute awardee (6/04-8/04)

Press mentions in Scientific American (4/00) and Harvard Business Review (6/01)

Graduated with departmental honors, Integrated Science Program (6/00)

APS travel award to attend American Physical Society annual meeting (3/99)

NSF Research Experience for Undergraduates Intern at the Santa Fe Institute (6/98-8/98)

#### **SOCIETIES:**

Member of the Society for Neuroscience (4/03-present)

Member of the Vision Sciences Society (12/07 – 12/08)

Member of the American Physiological Society (7/04-present)

Member of Neuromorphic Engineering Student Society, Caltech (9/01-6/06, invited to be President in ‘02)

Northwestern University - Integrated Science Program alumni network

#### **OTHER:**

Ad hoc reviewer for the *Journal of Neuroscience*

Started the Caltech Yoga Club, Started a political volunteer society, active in journal clubs

Have lived and worked in London, Paris, Barcelona, and Kyoto. Speak some Spanish and French