

The Ohio State University
Department of Psychology
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Columbus, OH 43210
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EDUCATION

California Institute of Technology, Pasadena, California 2000 – 2006
Ph.D. in Computation and Neural Systems.
Advisors: Dr. Christof Koch, Dr. Pietro Perona
Thesis: Interactions of visual attention and object recognition:
computational modeling, algorithms, and psychophysics.

Cambridge University, Trinity College, Cambridge, U.K. 1998 – 1999
Master of Philosophy in physics.
Advisor: Dr. Howard P. Hughes.
Thesis: Studies of Biperiodic Grating-2DEG Systems

Universität Leipzig, Leipzig, Germany 1995 – 1998
Undergraduate studies in physics and computer science (double major).
Vordiplom in physics ("sehr gut") in 1997,
Vordiplom in computer science ("sehr gut") in 1998.

POSITIONS

The Ohio State University, Columbus, Ohio 2010 – present
Assistant Professor
Department of Psychology
with appointments in Neuroscience and Biophysics

University of Illinois at Urbana-Champaign, Urbana, Illinois 2009 – 2010
Postdoctoral Research Associate
Advisors: Dr. Diane Beck, Dr. Fei-Fei Li (Stanford)

University of Illinois at Urbana-Champaign, Urbana, Illinois 2006 – 2009
Beckman Postdoctoral Fellow
Advisors: Dr. Diane Beck, Dr. Fei-Fei Li (Stanford)

York University, Toronto, Ontario, Canada March – July 2006
Postdoctoral Fellow
Advisor: Dr. John Tsotsos

Massachusetts Institute of Technology, Cambridge, Massachusetts 2001 and 2003
Visiting researcher at the Center for Biological and Computational Learning

Lucent Technologies Bell Laboratories, Murray Hill, New Jersey 1999 – 2000
Research consultant in the Silicon Research Laboratory with Dr. Mihal Gross

AWARDS AND FELLOWSHIPS

Beckman Postdoctoral Fellowship 2006 – 2009
Travel Award for the Conference on Computational and Systems Neuroscience 2007
Travel Award for the Workshop on Grand Challenges in Neural Computation 2007
Sloan-Swartz Center for Theoretical Neuroscience Pre-doctoral Fellowship 2005 – 2006

Best Poster Presentation Award at the Joint Symposium on Neural Computation	2005
Best Poster Presentation Award at the International Conference on Computer Vision and Pattern Recognition in Washington, D.C.	2004
Milton E. Mohr Fellowship	2000 – 2001
Tuition award by the Trinity College Cambridge / Studienstiftung des deutschen Volkes Exchange Program	1998 – 1999
Cambridge European Trust Fellowship	1998 – 1999
Fellow of the Studienstiftung des deutschen Volkes (German National Scholarship Foundation)	1996 – 2001

RESEARCH INTERESTS

Broadly:

- perception of complex visual scenes,
- interactions of object recognition, attention, and scene gist
- computational modeling, behavioral experiments, and fMRI

More specifically:

- computational modeling of selective attention for parsing complex scenes into objects
- behavioral experiments measuring the time for deploying attention
- fMRI experiments to find the neural representations of natural scene categories in the brain
- identifying networks of functionally connected brain regions processing natural scenes
- developing new multi-voxel pattern analysis algorithms for fMRI data

TEACHING INTERESTS

- cognitive neuroscience
- perception
- quantitative methods
- computational neuroscience
- neuroimaging

GRANTS

Seed grant, Center for Cognitive Science, The Ohio State University: Eye movements as an objective measure of categorization performance Research support: US\$ 26,838	2011 – 2012
Start-up funding, Department of Psychology, The Ohio State University. Research support: US\$ 500,000	2010 – 2013
NIH 1 R01 EY019429: CRCNS: fMRI Pattern Analysis of Neural Correlates of Natural Scenes Categories, co-PI with Fei-Fei Li and Diane M. Beck. Research support: US\$ 1,302,157	2008 – 2012
NSF 0803219: RI Medium: Audio Diarization - Towards Comprehensive Description of Audio Events, co-PI with Mark Hasegawa-Johnson and Thomas Huang. Research support: US\$ 249,864	2008 – 2010
Institute for Neuromorphic Engineering, seed grant to support interdisciplinary collaboration: Detection of visual events in underwater video using a neuromorphic saliency-based attention system, co-PI with Duane Edgington (MBARI). Research support: US\$ 5,000	2002 – 2003

TEACHING EXPERIENCE

The Ohio State University, Columbus, Ohio

- Basic Perception (two quarters)
- Graduate Seminar: Natural Scene Perception (one quarter)

California Institute of Technology, Pasadena, California

- Teaching Assistant for the graduate-level class "Neural Computation" Fall 2003
- Teaching Assistant for the graduate-level class "Vision" Winter 2002

PUBLICATIONS IN PROGRESS

Ana Toralbo, **Dirk B. Walther**, Li Fei-Fei, and Diane M. Beck, Categorization of good and bad examples of natural scene categories, *under review*.

Eamon Caddigan, **Dirk B. Walther**, Li Fei-Fei, Diane M Beck, The Good, the Bad, and the Scrambled: A Perceptual Advantage for Good Examples of Natural Scene Categories, *in prep*.

PUBLICATIONS

Dirk B. Walther, Barry Chai, Eamon Caddigan, Diane M. Beck, and Li Fei-Fei (2011), Simple line drawings suffice for functional MRI decoding of natural scene categories, *PNAS* 108 (23): 9661-9666.

Loan T.K. Vo, **Dirk B. Walther**, Arthur F. Kramer, Kirk I. Erickson, Walter R. Boot, Michelle W. Voss, Ruchika S. Prakash, Monica Fabiani, Gabriele Gratton, Daniel J. Simons, and Michelle Y. Wang (2011), Predicting Individuals' Learning Success from Patterns of Pre-learning MRI Activity. *PLoS One* 6(1): e16093. doi: 10.1371/journal.pone.0016093

Bangpeng Yao, **Dirk B. Walther**, Diane M. Beck, and Li Fei-Fei (2009) Hierarchical Mixture of Classification Experts Uncovers Interactions between Brain Regions, *Neural Information Processing Systems*.

Barry Chai*, **Dirk B. Walther***, Diane M. Beck, and Li Fei-Fei (2009) Exploring Functional Connectivity of the Human Brain using Multivariate Information Analysis, *Neural Information Processing Systems*. (* indicates equal contribution)

Dirk B. Walther, Eamon Caddigan, Li Fei-Fei, and Diane M. Beck (2009), Natural scene categories revealed in distributed patterns of activity in the human brain, *Journal of Neuroscience*, 29(34):10573–10581.

Huazhong Ning, Tony X. Han, **Dirk B. Walther**, Ming Liu, and Thomas Huang (2009), Hierarchical Space-Time Model Enabling Efficient Search for Human Actions, *IEEE Transactions on Circuits and Systems for Video Technology*, 19(6): 808-820.

Dirk B. Walther and Li Fei-Fei (2007) Task-set switching with natural scenes: Measuring the cost of deploying top-down attention. *Journal of Vision*, 7(11):9, 1-12.

Dirk Walther and Christof Koch (2006) Modeling attention to salient proto-objects, *Neural Networks*, 19(9): p. 1395-1407.

Dirk Walther*, Ueli Rutishauser*, Christof Koch, and Pietro Perona (2005) Selective visual attention enables learning and recognition of multiple objects in cluttered scenes, *Computer Vision and Image Understanding*, 100: 41-63. (* indicates equal contribution)

Dirk Walther, Duane R. Edgington, and Christof Koch (2004) Detection and Tracking of Objects in Underwater Video. *IEEE International Conference on Computer Vision and Pattern Recognition*, 1: 544-549.

Ueli Rutishauser*, **Dirk Walther***, Christof Koch, and Pietro Perona (2004) Is bottom-up attention useful for object recognition? *IEEE International Conference on Computer Vision and Pattern Recognition*, 2: 37-44. (**"Best Poster Presentation" award.**) (* indicates equal contribution)

Dirk Walther, Ueli Rutishauser, Christof Koch, and Pietro Perona (2004), On the usefulness of attention for object recognition, *2nd Workshop on Attention and Performance in Computational Vision at the European Conference for Computer Vision*, 96-103.

Dirk Walther, Laurent Itti, Maximilian Riesenhuber, Tomaso Poggio, and Christof Koch (2002) Attentional Selection for Object Recognition – a Gentle Way. *Biologically Motivated Computer Vision – Lecture Notes in Computer Science*, Springer 2525: 472-479.

D. Chung, R. Hirata, T. N. Mundhenk, J. Ng, R. J. Peters, E. Pichon, A. Tsui, T. Ventrice, **D. Walther**, P. Williams, and L. Itti (2002) A New Robotics Platform for Neuromorphic Vision: Beobots. *Biologically Motivated Computer Vision – Lecture Notes in Computer Science*, Springer 2525: 558-566.

BOOK CHAPTERS

Dirk B. Walther, Diane M. Beck, and Li Fei-Fei (2011) To err is human: correlating fMRI decoding and behavioral errors to probe the neural representation of natural scene categories. in: Nikolaus Kriegeskorte and Gabriel Kreiman (eds.), *Visual population codes – Toward a common multivariate framework for cell recording and functional imaging*, MIT Press, Cambridge, Massachusetts, pp. 391-415.

Dirk B. Walther and Christof Koch (2007) Attention in Hierarchical Models of Object Recognition. in Paul Cisek, Trevor Drew, and John F. Kalaska (eds.), *Computational Neuroscience: Theoretical insights into brain function*, *Progress in Brain Research*, 165: 57-78.

Popular science publications

Nachiket Kapre, **Dirk Walther**, Christof Koch, and André DeHon (2004) Saliency on a chip – a digital approach on an FPGA. *The Neuromorphic Engineer* 2: 9-11.

Dirk Walther, and Duane Edgington (2004) The art of seeing jellies. *The Neuromorphic Engineer* 1: 6-6.

INVITED TALKS

Neuroscience Graduate Studies Program Seminar, The Ohio State University Nov. 2011
"The neural representation of natural scene categories"

Cogfest, Center for Cognitive Science, The Ohio State University May 2011
"Deciphering the neural codes of natural scene categories"

Biophysics Seminar Day, The Ohio State University: Jan. 2011
"Decoding natural scene categories from fMRI activity patterns"

Dirk Bernhardt-Walther	vita	page 5 / 9
Center for Cognitive Science, The Ohio State University: "Decoding natural scene categories from fMRI activity patterns"		Oct. 2010
The Ohio State University Cognitive brownbag: "Decoding natural scene categories from fMRI activity patterns"		Sept. 2010
Max Planck Institute for Biological Cybernetics, Tübingen: "Decoding natural scene categories from fMRI activity patterns"		June 2010
University of Illinois Advances in Sensory and Developmental Neuroscience Seminar: "The neural representation of natural scene categories"		Sept. 2009
Caltech Computation and Neural Systems seminar: "The neural representation of natural scene categories."		Aug. 2009
Leibniz Institute for Neurobiology, University of Magdeburg, Germany: "The neural representation of natural scene categories"		June 2009
University of Illinois Brain & Cognition brownbag: "The neural representation of natural scene categories"		Sept. 2008
Beckman Institute Director's Seminar: "I know what you saw last summer: Decoding brain activity associated with natural scenes"		Apr. 2008
University of Illinois Visual Cognition and Human Performance Division brownbag: "Modeling visual attention to salient proto-objects"		Apr. 2008
Cosyne Workshop: <i>Characterizing and decoding distributed brain representations</i> : "Predicting perceived natural scene categories from distributed patterns of fMRI activity."		March 2008
NIPS workshop: <i>Models and Mechanisms of Visual Attention: A Critical Appraisal</i> : "Selective attention and object recognition."		Dec. 2007
University of Illinois Brain & Cognition brownbag: "Modeling visual attention to salient proto-objects"		Apr. 2007
Scene Understanding Symposium at MIT: "Modeling Attention to Salient Proto-objects"		Feb. 2007
Workshop on Attention and Performance in Computer Vision at CVPR in San Diego, CA: "Modeling Feature Sharing between Object Detection and Top-down Attention"		June 2005
MIT Perceptual Science Laboratory, Cambridge, Massachusetts: "Selective Attention for Machine Vision."		Nov. 2004
Monterey Bay Aquarium Research Institute, Moss Landing, California: "Detecting, tracking, and classifying visual events in underwater video"		Aug. 2003
Institute of Neuroinformatics, ETH Zurich, Switzerland: "Attentional Selection for Object Recognition – a Gentle Way"		Nov. 2002

CONFERENCE PRESENTATIONS

Loan T. K. Vo, Michelle Y. Wang, Hyunkyu Lee, Arthur F. Kramer, Kirk I. Erickson, Michelle W. Voss, Ruchika S. Prakash and **Dirk B. Walther** (2011) Predicting individual differences in future learning success from T2* images: physiological basis and mechanisms. *Annual meeting of the Society for Neuroscience*, Washington, DC.

M. Cătălin Iordan, Christopher Baldassano, **Dirk B. Walther**, Diane M. Beck, Li Fei-Fei (2011) Translation invariance of natural scene categories, *Annual Meeting of the Vision Sciences Society*, Naples, FL.

Diane M. Beck, **Dirk B. Walther**, Barry Chai, Eamon Caddigan & Li Fei-Fei (2010) Line drawings and color photographs elicit similar neural representations of scene categories. *Annual meeting of the Society for Neuroscience*, San Diego, CA.

Dirk B. Walther, Barry Chai, Eamon Caddigan, Diane Beck, Li Fei-Fei (2010) fMRI Decoding of Natural Scene Categories from Line Drawings, Oral presentation at the *Annual Meeting of the Vision Sciences Society*, Naples, FL.

Eamon Caddigan, **Dirk B. Walther**, Li Fei-Fei, Diane M Beck (2010) The Good, the Bad, and the Scrambled: A Perceptual Advantage for Good Examples of Natural Scene Categories, Oral presentation at the *Annual Meeting of the Vision Sciences Society*, Naples, FL.

Bangpeng Yao, **Dirk B. Walther**, Diane M. Beck, and Li Fei-Fei (2009). Hierarchical Mixture of Classification Experts Uncovers Interactions between Brain Regions. Poster at the *Workshop on Connectivity Inference in Neuroimaging at NIPS*, Whistler, B.C., Canada.

Dirk B. Walther, Ana Torralbo, Barry Chai, Eamon Caddigan, Diane M. Beck, and Li Fei-Fei (2009) Good exemplars of natural scene categories elicit more robust neural activity patterns than bad exemplars. Oral presentation at the *Annual meeting of the Society for Neuroscience*, Chicago, IL.

Loan T.K. Vo, **Dirk B. Walther**, Y. Michelle Wang, Kirk I. Erickson, Walter R. Boot, Michelle W. Voss, Ruchika S. Prakash, and Arthur F. Kramer (2009) Predicting training success for individuals from patterns of pre-training fMRI activity. Poster presentation at the *Annual meeting of the Organization for Human Brain Mapping*, San Francisco, CA.

Dirk B. Walther, Eamon Caddigan, Diane M. Beck, and Li Fei-Fei (2009) Searchlight analysis reveals brain areas involved in scene categorization. Poster presentation at the *Annual meeting of the Vision Sciences Society*, Naples, FL.

Eamon Caddigan, **Dirk B. Walther**, Diane M. Beck, and Li Fei-Fei (2009) Finding “good” features for natural scene classification. Poster presentation at the *Annual meeting of the Vision Sciences Society*, Naples, FL.

Ana Torralbo, Barry Chai, Eamon Caddigan, **Dirk B. Walther**, Li Fei-Fei, and Diane M. Beck (2009) Categorization of good and bad examples of natural scene categories. Poster presentation at the *Annual meeting of the Vision Sciences Society*, Naples, FL.

Loan T.K. Vo, Harish A. Sharma, Y. Michelle Wang, **Dirk B. Walther**, Arthur F. Kramer, and William Olivero (2009) Classification technique to detect activation

patterns in pain fMRI data. Poster presentation at the *International Society for Magnetic Resonance in Medicine 17th Scientific Meeting*, Honolulu, Hawaii.

Dirk B. Walther, Eamon Caddigan, Li Fei-Fei, and Diane M. Beck (2008) The neural representation of natural scene categories. Oral presentation at the *Annual meeting of the Society for Neuroscience*, Washington, DC.

Eamon Caddigan, **Dirk B. Walther**, Li Fei-Fei, and Diane M. Beck (2008) Decoding scene categories using distributed patterns of fMRI activity. Poster presentation at the *European Conference on Visual Perception*, Utrecht, Netherlands.

Eamon Caddigan, **Dirk B. Walther**, Li Fei-Fei, and Diane M. Beck (2008) Decoding of natural scene categories from transformed images using distributed patterns of fMRI activity. Poster presentation at the *Annual meeting of the Vision Sciences Society*, Naples, FL.

Dirk B. Walther, Eamon Caddigan, Diane M. Beck, and Li Fei-Fei (2008) Decoding Perceived Natural Scene Categories from fMRI Activity in PPA and RSC. Poster presentation at the *Computational and Systems Neuroscience*, Salt Lake City, UT.

Dirk B. Walther, Eamon Caddigan, Justas Birgiolas, Li Fei-Fei, and Diane Beck (2007), Predicting perceived natural scene categories from distributed patterns of fMRI activity. Oral and poster presentation at the *Human Brain Mapping*, Chicago, IL.

Eamon Caddigan, **Dirk Walther**, Justas Birgiolas, Jonathan Weissman, Diane Beck, and Li Fei-Fei (2007), Decoding distributed patterns of activity associated with natural scene categorization. Oral presentation at the *Vision Sciences Society Annual Meeting*, Sarasota, FL.

Dirk Walther (2007), Neural Circuits for Attending to Salient Proto-Objects. Poster presentation at the *Computational and Systems Neuroscience*, Salt Lake City, UT.

Dirk Walther (2007), Modeling attention to proto-objects in natural scenes. Poster presentation at the *Workshop on Grand Challenges in Neural Computation*, Santa Fe, NM.

Dirk Walther, Li Fei-Fei, Christof Koch (2006), Measuring the cost of deploying attention. Poster presentation at the *Vision Sciences Society Annual Meeting*, Sarasota, FL.

Christof Koch, **Dirk Walther** (2006) Bottom-up visual attention to salient proto-object regions. Oral presentation at the *Vision Sciences Society Annual Meeting*, Sarasota, FL.

Ueli Rutishauser, **Dirk Walther**, Pietro Perona, Christof Koch (2005), Bottom-up attention permits unsupervised learning and recognition of small objects. Poster presentation at the *Computational Vision in Neural and Machine Systems*, Toronto, Ontario, Canada.

Duane R. Edgington, I. Kerkez, D. Oliver, Danelle E. Cline, L. Kuhnz, **Dirk Walther**, Marc'Aurelio Ranzato, Pietro Perona (2005) Detection and Classification of Rathbunaster Californicus in Underwater Video. Poster presentation at the *Eos. Trans. AGU*, 86(18), Jt. Assem. Suppl., Abstract U24A-05.

Dirk Walther, Thomas Serre, Tomaso Poggio, Christof Koch (2005), Modeling Feature Sharing between Object Detection and Top-down Attention. Poster presentation at the *Joint Symposium on Neural Computation*, Los Angeles, CA. (**"Best Poster Presentation" award.**)

Dirk Walther, Thomas Serre, Tomaso Poggio, Christof Koch (2005), Modeling Feature Sharing between Object Detection and Top-down Attention. Poster presentation at the *Vision Sciences Society Annual Meeting*, Sarasota, FL.

Duane R. Edgington, I. Kerkez, D. Oliver, L. Kuhnz, Danelle E. Cline, **Dirk Walther**, Laurent Itti (2004), Detecting Benthic Megafauna in Underwater Video, Poster presentation at the *Eos Trans. AGU*, 85(47), Fall Meet. Suppl., Abstract OS43B-0551.

Duane R. Edgington, **Dirk Walther**, Danelle E. Cline, R. E. Sherlock, and Christof Koch (2004) Detecting and Tracking Animals in Underwater Video. Demonstration at the *IEEE International Conference on Computer Vision and Pattern Recognition*, Washington, DC.

Duane R. Edgington, **Dirk Walther**, Danelle E. Cline, Rob Sherlock, and Christof Koch (2004) Detecting and tracking animals in underwater video using a neuromorphic saliency-based attention system. Poster presentation at the *American Society of Limnology and Oceanography (ASLO) Summer Meeting*, Savannah, GA.

Duane R. Edgington, **Dirk Walther**, Danelle E. Cline, Rob Sherlock, Karen A. Salamy, Alexis Wilson, and Christof Koch (2004). Detecting and tracking animals in underwater video using a neuromorphic saliency-based attention system. Poster presentation at the *American Society of Limnology and Oceanography (ASLO)/The Oceanography Society (TOS) Ocean Research Conference*, Honolulu, Hawaii, USA, February 15-20.

Duane R. Edgington, **Dirk Walther**, Danelle E. Cline, Rob E. Sherlock, Karen A. Salamy, Alexis Wilson, and Christof Koch (2003), Detection of Visual Events in Underwater Video Using a Neuromorphic Saliency-based Attention System. Poster presentation at the *Eos Trans. AGU*, 84, Fall Meet. Suppl., Abstract H11F-0912.

Duane R. Edgington, **Dirk Walther**, Karen A. Salamy, Michael Risi, Rob E. Sherlock, and Christof Koch (2003), Automated Event Detection in Underwater Video. Poster presentation at *MTS/IEEE Oceans*, San Diego, CA.

Dirk Walther, Duane Edgington, Karen A. Salamy, Michael Risi, Rob E. Sherlock, and Christof Koch (2003), Automated Video Analysis for Oceanographic Research. Demonstration at *IEEE International Conference on Computer Vision and Pattern Recognition*, Madison, WI.

Dirk Walther, Maximilian Riesenhuber, Tomaso Poggio, Laurent Itti, and Christof Koch (2002), Towards an integrated model of primate vision. Poster presentation at the *Annual Meeting of the Cognitive Neuroscience Society*, San Francisco, CA.

Dirk Walther, Mihal E. Gross, Ken Evans-Lutterodt, Walter L. Brown, M. Oh, S. Merchant, and P. Naresh (2000), Room Temperature Recrystallization of Electroplated Copper Thin Films: Methods and Mechanisms. Poster presentation at the *Materials Research Society Spring Meeting*, San Francisco, CA.

PROFESSIONAL ACTIVITIES

Scientific software

- Author and maintainer of freely available **SaliencyToolbox** (<http://saliencytoolbox.net>)
- Approx. 5200 downloads since 2006.
- Cited in more than 300 papers.

Workshop organizer

- Characterizing and decoding distributed brain representations.
at *Computational and Systems Neuroscience*, Snowbird, Utah March 2008
- Models and Mechanisms of Visual Attention: A Critical Appraisal.
at *Neural Information Processing Systems*, Whistler, British Columbia Dec. 2007
- Saliency-based Visual Attention. at the *Neuromorphic Engineering Summer School*, Telluride, Colorado July 2002

Ad-hoc reviewing

Psychological Review
Cerebral Cortex
Neuroimage
Neuropsychologia
Brain Research
Neural Networks
Journal of Vision
Vision Research
IEEE Transactions on Pattern Analysis and Machine Intelligence
International Journal of Computer Vision
Computer Vision and Image Understanding
IEEE Transactions on Image Processing
IEEE Transactions on Multimedia
Pattern Recognition
Multimedia Systems Journal
Journal of Information Science and Technology
Neural Information Processing Systems
International Conference on Computer Vision
Computer Vision and Pattern Recognition
International Conference on Artificial Neural Networks
SIGGRAPH

- Organized and coordinated a monthly seminar speaker series as part of the activities of the "Neuromorphic Engineering Student Society" (NESS) at Caltech. 2003 – 2005
- Co-organized the 11th North America Symposium of the *Studienstiftung des deutschen Volkes* (German National Scholarship Foundation) for 150 participants in Pasadena, California. Oct. 2002

PROFESSIONAL ORGANIZATIONS

- Member of the Society for Neuroscience (SfN)
- Member of the Vision Sciences Society (VSS)