

Thomas A. Cleland

Department of Psychology, Cornell University
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Academic Positions and Degrees:

Assistant Professor

Computational Physiology Laboratory
Department of Psychology, Cornell University, Ithaca, NY, 2007-
Neurophysiology/pharmacology of cognitive processing in reduced systems; directed perception and active sampling in olfaction; modeling of olfactory sensory processing, learning and memory; mouse behavior genetics.

Senior Research Associate

Computational Physiology Laboratory
Department of Neurobiology and Behavior, Cornell University, Ithaca, NY, 2005-2007
Systems neurobiology; modeling of olfactory processing, learning and memory; behavioral, physiological, pharmacological, and computational approaches; mouse behavior genetics.

Research Associate

Computational Physiology Laboratory
Department of Neurobiology and Behavior, Cornell University, Ithaca, NY, 2000-2005
Behavioral, electrophysiological, and computational modeling studies of olfactory processing using rats and mice.

Postdoctoral Research Associate

Laboratory of Michael E. Hasselmo
Department of Psychology, Boston University, Boston, MA, 1999-2000
Brain slice recordings from CA1/CA3 in rat hippocampus, using patch clamp techniques and infrared differential interference contrast (IR-DIC) microscopy.

Postdoctoral Researcher

Laboratory of John S. Kauer
Department of Neuroscience, Tufts University, Boston, MA, 1997-1999
In vivo multielectrode recordings from mitral cells in the vertebrate olfactory bulb.

Ph.D., Biology (Neurobiology)

Laboratory of Allen I. Selverston
University of California, San Diego, La Jolla, CA, 1997
Multiple electrode recordings from central pattern generator networks, two-electrode voltage clamp and excised-patch clamp recordings from isolated neurons in primary culture.

Graduate training in Biological Anthropology

University of Michigan, Ann Arbor, MI, 1988-1990

B.A., Biology, *cum laude*

Whitman College, Walla Walla, WA, 1987

Honors, Awards, Courses, and Fellowships:

Polak Young Investigator Award, Association for Chemoreception Sciences, 2006
Experimental Neurogenetics of the Mouse workshop, Tennessee Mouse Genome Consortium, 2006
Young Scholars' Institute Fellow, German American Academic Council, 1996-1997
Grass Fellow, Marine Biological Laboratory, Woods Hole, MA, 1995
NSF Graduate Fellow, UCSD, 1991-1994
Outstanding Teacher award, UCSD, 1992
Neural Systems and Behavior course, MBL, Woods Hole, MA, 1991
Regents' Fellow, University of Michigan, Ann Arbor, 1988-1990
Phi Beta Kappa, Whitman College, 1987
National Merit Scholar, Whitman College, 1983-1987.

Administrative Duties, Boards, and Committees:

Coordinator, Behavioral Phenotyping Core, Center for Vertebrate Genomics, Cornell University.
<http://www.vertebrategenomics.cornell.edu/Resources.html>, 2004-present. Designed, established and administer an equipment core facility for the analysis of mouse behavior.

Member, Life Sciences Technology Building Vivarium Design Committee, Cornell University, 2003-2005.
Contributed to design of new centralized barrier/nonbarrier animal facility. In particular, ensured that vivarium design and infrastructure will support within-facility behavioral and physiological procedures.

Organizer, Association for Chemoreception Sciences 2004 Annual Meeting Workshop:
Biophysical Algorithms in Chemosensation: Olfactory Representation and Learning.

Organizer, 2004 Annual Symposium, University of Maryland Program in Neuroscience, and satellite event to the Computational Neuroscience 2004 meeting: *Computation in the Olfactory System*

Review committee, *Organization for Computational Neurosciences*, 2004-present

Editorial board, *American Journal of Alzheimer's Disease and Other Dementias*, 2004-2007

Program committee, *International Joint Conference on Neural Networks*, 2002-2006

Managing editor, *Michigan Discussions in Anthropology*, 1989-1990

Production editor, *Michigan Discussions in Anthropology*, 1988-1989

Invited Seminars and Professional Talks:

GOSPEL Speaker, BioTechno Workshop, European Network of Excellence in Artificial Olfaction, Skokloster Wårdshus, Arlanda, Sweden, February 2008
The computational architecture of biological olfaction

Heritage Speaker, Hotchkiss Brain Institute, Calgary, AB, Canada, January 2008
The construction of odor representations

Speaker, *Nonlinear Dynamics of the Olfactory System* symposium, Society for Industrial and Applied Mathematics (SIAM) annual meeting, Snowbird, UT, May 2007
The construction of high-dimensional olfactory representations

Speaker, Harpur College Workshop Series for Psychobiology, Binghamton University, November 2006
The construction of odor representations

Session speaker, Association for Chemoreception Sciences Annual Meeting, April 2006
Glomerular computations in the olfactory bulb can normalize neural activation patterns

RISE Seminar speaker, University of Puerto Rico, San Juan, February 2006
A role for learning in odor processing and perception

Seminar speaker, Biocomplexity Institute, Indiana University, September 2005
Non-topographical contrast enhancement in the olfactory bulb

Seminar speaker, Department of Biological Sciences, University of Cincinnati, May 2005
Odor sizes and shapes: representing high-dimensional stimuli in the nervous system

Speaker on *Neuromodulation in Sensory Systems*, Winter Conference on Brain Research, January 2005
Cholinergic regulation of olfactory acuity

Seminar speaker, Department of Neurobiology and Behavior, Cornell University, April 2004
High-dimensional contrast enhancement and the regulation of olfactory acuity

Seminar speaker, Monell Chemical Senses Center, Philadelphia, PA, September 2003
Olfactory acuity and learning: steps toward the physiology of categorization

Speaker, Gordon Research Conference on the Chemical Senses, New London, NH, July 2003
Olfactory acuity and the construction of stimulus representations

Speaker, Workshop on Olfaction, Mathematical Biosciences Institute, Ohio State University, April 2003
Sensory acuity and the construction of olfactory representations

Speaker, Cognitive Neuroscience Symposium, Cornell University, January 2003
Sensory acuity and the construction of olfactory representations

Guest Lecturer, *Mind & Memory: Explorations of Creativity in the Arts and Sciences*, Cornell University, 2003
The neurobiology of categorization: constructing olfactory sensations

George Fried seminar speaker, Department of Biology, CUNY Brooklyn, April 2002
Sensory information processing and the construction of olfactory representations

Speaker, Neural Information and Processing Systems (NIPS) Olfactory Coding Workshop, Dec. 1998
Seminar speaker, Department of Biological Sciences, University of Rhode Island, October 1997

Deconstructing a central pattern generator: inhibitory glutamate receptor channels in the lobster stomatogastric ganglion

Speaker, Section of Neurobiology and Behavior, Cornell University, May 1995

Inhibitory glutamate receptors in the lobster stomatogastric ganglion

Editorial Reviewer: *Books*, Johns Hopkins University Press. *Journals*, American Journal of Alzheimer's Disease and Other Dementias, Behavioral and Brain Sciences, Behavioral Neuroscience, Biological Bulletin, Bulletin of Mathematical Biology, Chemical Senses, Developmental Brain Research, Ethology, Interface (Royal Society of London), Journal of Computational Neuroscience, Journal of Mathematical Psychology, Journal of Neurophysiology, Journal of Theoretical Biology, Molecular and Cellular Neuroscience, Proceedings of the National Academy of Sciences (USA), Trends in Neurosciences.

Grant Review Panelist: Army Research Office, National Science Foundation (NSF), National Institute on Deafness and other Communication Disorders (NIDCD).

Affiliations and Memberships: Association for Chemoreception Sciences (AChemS), Center for Vertebrate Genomics at Cornell University (CVG), International Behavioural and Neural Genetics Society (IBANGS), International Brain Research Organization (IBRO), Molecular and Cellular Cognition Society, New York Academy of Sciences (NYAS), Society for Neuroscience USA (SFN).

Education & Teaching:

Course developer and instructor, *Sensory construction*, Cornell University, 2007/8-

Course developer and instructor, *Neural computation*, Cornell University, 2006/7-

Course developer and instructor, *Behavioral phenotyping of mutant mice*, Cornell University, 2004/5-

Instructor, *Introduction to Neurobiology* (team-taught), Cornell University, 2006/7-

Faculty advisor for entering students in Biological Sciences, 2006-2007

Professional development in academics course development committee, Dept. Neurobiology & Behavior, Cornell University, 2005-2006

Review Committee, Hughes Scholars Program, Cornell University, 2005-

Guest Lecturer, *Neuroscience II: Systems Neuroscience*, University of Calgary, 2008

Guest Lecturer, *Drugs and the Brain*, Boston University, 1999

Guest Lecturer, *Physiology and Behavior*, Whitman College (Walla Walla, WA), 2006

Participant in "Ask a Scientist" program, Ithaca Journal, Ithaca NY, 2007-

Ph.D. dissertation committee member: Nadia Drake (Molecular Biology & Genetics), 2005-

Honors thesis advisor to five students: Daniel Rubin (2005, *summa cum laude*, Miriam Salpeter award for the best honors thesis in neurobiology, two manuscripts published, two in preparation, now in MD/PhD program), Loren DeVito (2005, *magna cum laude*, one manuscript published, two in preparation, now in PhD program), Caren Armstrong (2004, one published, one in preparation, now in MD/PhD program), Praveen Sethupathy (2003, one manuscript published, one in preparation, now in PhD program), Serendipity Rinonos (2002, now in MD program).

Advisor to four Cornell Hughes Scholars (Loren DeVito 2004, Karim Boudadi 2004, Caren Armstrong 2003, Serendipity Rinonos 2002), 2002-2004.

FUNDING

Research Grants:

4/2006 – 3/2009 National Institute on Deafness and Other Communication Disorders (NIDCD)
"Computational mechanisms in the olfactory bulb"
R03 DC 007725, \$150,000 direct costs.

Facility Grants:

12/2005 Center for Vertebrate Genomics, Cornell University (CVG)
“Shared equipment for the CVG Behavioral Phenotyping Core”
\$14,862

11/2004 Center for Vertebrate Genomics, Cornell University (CVG)
“Behavioral phenotyping of Rasgrf1 epigenetic mutants” [genesis of CVG behavioral phenotyping core]
\$9,605

Postdoctoral fellowships:

7/2002 – 6/2005 National Institute on Deafness and Other Communication Disorders (NIDCD)
“Dendrodendritic computation in the olfactory glomerulus”
F32 DC 05727, \$160,368 direct costs.

Seed and travel grants:

4/2006 Ralph E. Powe Junior Faculty Enhancement Award (collaborator)
Oak Ridge Associated Universities (ORAU)
Supporting auditory generalization project with Dr. Laura Hurley (PI, Indiana University).
\$10,000

2/2006 Center for Vertebrate Genomics, Cornell University (CVG)
Travel grant to attend Tennessee Mouse Genome Consortium workshop on neurogenetics, May 2006
\$1,000

PEER-REVIEWED PUBLICATIONS AND BOOK CHAPTERS**Submitted:**

Cleland TA, Narla VA, Boudadi K. Multiple learning parameters differentially regulate olfactory generalization. *Submitted to Behavioral Neuroscience*.

Guerin D, Peace ST, Didier A, Linster C, Cleland TA. Noradrenergic neuromodulation in the olfactory bulb modulates odor habituation and spontaneous discrimination. *Submitted to Behavioral Neuroscience*.

Published and in press (total of 29 peer-reviewed papers and 7 book chapters):

Bath KG, Mandairon N, Rajagopal R, Kapoor R, Jing D, Chen Z-Y, Khan T, Proenca CC, Kraemer R, Cleland TA, Hempstead BL, Chao MV, Lee FS. Variant BDNF (Val66Met) alters adult olfactory bulb neurogenesis and spontaneous olfactory discrimination. *J. Neuroscience*, in press.

McNamara AM, Magidson PD, Linster C, Wilson DA, Cleland TA (2008). Distinct neural mechanisms mediate olfactory memory formation at different timescales. *Learning & Memory*. In press.

Cleland TA (2008). The construction of olfactory representations. In: *Mechanisms of information processing in the brain: encoding of information in neural populations*, Holscher C, Munk M, eds. Cambridge (UK): Cambridge University Press. In press.

Cleland TA (2008). Contrast enhancement. In: *Encyclopedia of Neuroscience*, Binder MD, Hirokawa N, Windhorst U, Hirsch MC, eds. Berlin: Springer-Verlag. In press.

Cleland TA, Linster C (2008). Olfactory systems theory. In: *New Encyclopedia of Neuroscience*, Squire L, Albright T, Bloom F, Gage F, Spitzer N, eds. New York: Elsevier. In press.

Linster C, Cleland TA (2008). Modeling of olfactory processing. In: *Handbook of the senses, volume 2: Olfaction and taste*, Smith D, Firestein S, eds. New York: Elsevier. In press.

David F, Linster C, Cleland TA (2007). Lateral dendritic shunt inhibition can regularize mitral cell spike patterning. *J. Computational Neuroscience*. In press.

- Cleland TA, Johnson BA, Leon M, Linster C (2007) Relational representation in the olfactory system. *Proceedings of the National Academy of Sciences (USA)* 104(6):1953-1958.
- Mandaïron N, Ferretti CJ, Stack CM, Rubin DB, Cleland TA, Linster C (2006) Cholinergic modulation in the olfactory bulb influences spontaneous olfactory discrimination in adult rats. *European J. Neuroscience* 24:3234-3244
- Rubin DB, Cleland TA (2006) Dynamical mechanisms of odor processing in olfactory bulb mitral cells. *J. Neurophysiology* 96(2):555-568.
- Wei CJ, Linster C, Cleland TA (2006) Dopamine D2 receptor activation modulates perceived odor intensity. *Behavioral Neuroscience* 120(2):393-400.
- Armstrong CM, DeVito LM, Cleland TA (2006) One-trial associative odor learning in neonatal mice. *Chemical Senses* 31(2):131-144.
- Cleland TA, Sethupathy P (2006) Non-topographical contrast enhancement in the olfactory bulb. *BMC Neuroscience* 7:7 (24 Jan 2006). *Highly accessed.*
- Schoenfeld TA, Cleland TA (2005) Anatomical contributions to odorant sampling and representation in rodents: zoning in on sniffing behavior. *Chemical Senses* 31(2):131-144.
- Cleland TA, Linster C (2005) Computation in the olfactory system. *Chemical Senses* 30(9):801-813.
- Schoenfeld TA, Cleland TA (2005) The anatomical logic of smell. *Trends in Neurosciences* 28(11):620-627.
- McNamara AM, Cleland TA, Linster C (2004) Characterization of the synaptic properties of olfactory bulb projections. *Chemical Senses* 29(3):225-233.
- Yue EL, Cleland TA, Pavlis M, Linster C (2004) Opposing effects of D1 and D2 receptor activation on odor discrimination learning. *Behavioral Neuroscience* 118(1):184-190.
- Linster C, Cleland TA (2004) Configurational and elemental mixture perception can arise from lateral inhibition. *J. Computational Neuroscience* 16(1):39-47.
- Cleland TA (2004) Pharmacology of the crayfish neuromuscular junction. In: *Laboratory manual for physiology*, Silverthorn DU, Johnson BR, Mills C, eds. San Francisco: Benjamin Cummings, pp. 107-127.
- Cleland TA, Narla VA (2003) Intensity modulation of olfactory acuity. *Behavioral Neuroscience* 117(6):1434-1440.
- Cleland TA, Linster C (2003) Central olfactory processing. In: *Handbook of olfaction and gustation, 2nd ed*, Doty RL, ed. New York: Marcel Dekker, pp. 165-180.
- Cleland TA, Teres JJ (2003) Inexpensive ethography using digital video. *J. Neuroscience Methods* 125(1-2): 1-6.
- Linster C, Cleland TA (2002) Cholinergic modulation of sensory representations in the olfactory bulb. *Neural Networks* 15(4-6):709-717.
- Giannaris EL, Cleland TA, Linster C (2002) Intramodal blocking between olfactory stimuli in rats. *Physiology & Behavior* 75(5):717-722.
- Cleland TA, Morse A, Yue EL, Linster C (2002) Behavioral models of odor similarity. *Behavioral Neuroscience* 116(2):222-231.
- Cleland TA, Linster C (2002) How synchronization properties among second order sensory neurons can mediate stimulus salience. *Behavioral Neuroscience* 116(2):212-221.
- Linster C, Cleland TA. (2001) How spike synchronization among olfactory neurons can contribute to sensory discrimination. *J. Computational Neuroscience* 10:187-193.
- Cleland TA, Linster C (1999) Concentration tuning mediated by spare receptor capacity in olfactory sensory neurons: a theoretical study. *Neural Computation* 11(7):1673-1690.
- Alkasab TK, Bozza TC, Cleland TA, Dorries KM, Pearce TC, White J, Kauer JS (1999) Characterizing complex chemosensors: information-theoretic analysis of olfactory systems. *Trends in Neurosciences* 22(3):102-108.
- Cleland TA, Selverston AI (1998) Inhibitory glutamate receptor channels in cultured lobster stomatogastric neurons. *J. Neurophysiology* 79(6):3189-3196.

- Cleland TA, Selverston AI (1997) Dopaminergic modulation of inhibitory glutamate receptors in the lobster stomatogastric ganglion. *J. Neurophysiology* 78(6):3450-3452.
- Cleland TA (1996) Inhibitory glutamate receptor channels. *Molecular Neurobiology* 13(2):97-136.
- Cleland TA (1996) Ethical considerations in peer counseling. In: *Peer counseling: skills, ethics, and perspectives* (2nd ed.), D'Andrea VJ, Salovey P, eds. Palo Alto, CA: Science and Behavior Books, pp. 133-162.
- Cleland TA, Selverston AI (1995) Glutamate-gated inhibitory currents of central pattern generator neurons in the lobster stomatogastric ganglion. *J. Neuroscience* 15:6631-6639.
- Panchin Y, Arshavsky Y, Selverston AI, Cleland TA (1993) Lobster stomatogastric neurons in primary culture. I. Basic characteristics. *J. Neurophysiology* 69(6):1976-1992.