

Curriculum Vitae

Name: Christopher W. Cowan, Ph.D.

Home Address: 668 Allen Road
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Work Address: Department of Psychiatry
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Date of Birth: December 4, 1970

Place of Birth: Houston, TX

Current Position

Assistant Professor (2005-present)
Department of Psychiatry (2005-present)
Department of Ophthalmology (2010-present)
The University of Texas Southwestern Medical Center

Education

Postdoctoral Fellow (1999-2005)
Harvard Medical School (Boston, MA)
Department of Neurobiology
Advisor: Michael E. Greenberg, PhD
Molecular mechanisms of axon guidance and activity-dependent synapse plasticity

Doctor of Philosophy (1994-1998)
Baylor College of Medicine (Houston, TX)
Department of Biochemistry, Cell and Molecular Biology Graduate Program
Advisor: Theodore G. Wensel, PhD
Identification of RGS9 as the GAP for transducin in mammalian phototransduction

Bachelor of Arts (1990-1993)
Wesleyan University (Middletown, CT)
Major: Neuroscience and Behavior
Research Advisor: David B. Adams, Ph.D.
Independent research projects on neurological basis of rodent aggressive behavior

Honors and Awards

American College of Neuropsychopharmacology (ACNP) Young Investigator Memorial Travel Award, 2010

Whitehall Foundation Grant Award Recipient, 2006

Individual Postdoctoral National Research Service Award, (AG05870) National Institute of Aging, 2000-2003

Postdoctoral Fellowship, Edward R. and Anne G. Lefler Center for the Study of Neurodegenerative Disorders, Harvard Medical School, 1999-2000

Arnold O. Beckman Academic Achievement Award, Baylor College of Medicine, 1998

Claude W. Smith Award, Baylor College of Medicine, 1997

V. C. Joshi Memorial Award, Baylor College of Medicine, 1997

Independent Funding as a PI (direct costs indicated)

Current:

R01 EY018207 (PI: Cowan) 8/1/2007-7/31/2012 \$ 225,000/yr
NIH/NEI "Molecular Mechanisms of Contact-mediated Axon Guidance"
-goal of grant is to study the role of Vav family GEFs in actin cytoskeleton remodeling during axon guidance and synaptogenesis during development.

R01 EY018207-S1 (PI: Cowan) 9/1/2010-8/30/2012 \$ 38,619/yr
NIH/NEI Diversity Supplement for Underrepresented Minority Students
-this two-year grant supplement supports the salary/fringe and travel for PhD graduate student (Maria Carreira).

R01 DA027664 (PI: Cowan) 3/1/2011-2/28/2016 \$ 202,500/yr
NIH/NIDA "Transcriptional Mechanisms of Addiction-related Neural Plasticity"
-goal of this grant is to study the role and regulation of MEF2-dependent transcription by cocaine in brain reward circuitry.

R21 DA030590 (PI: Cowan) 9/30/2011-8/31/2013 \$150,000/yr1; \$125,000/yr2
NIH/NIDA "Role of FMRP in Cocaine-dependent Behavioral Plasticity"
-goal of this grant is to study the role and regulation of the RNA-binding protein, FMRP, in cocaine-induced behavioral and synaptic plasticity in the brain reward circuitry.

P01 DA08227 (PI: Nestler) 8/1/2008-7/31/2013 \$ 47,500/yr (subcontract to Cowan)
NIH/NIDA "Molecular Neurobiology of Drug Addiction"
-goal of this highly-collaborative PPG with Dr. Eric Nestler (Mt. Sinai School of Medicine) supports studies to explore the gene targets of MEF2, regulation of MEF2 by opiates and development of novel viral reagents.

P30 EY020799 (PI: Niederkorn) 8/1/2011-7/31/2016 \$ 129,181/yr (to Director: Cowan)
NIH/NEI "Center Core Grant for Vision Research"
-the goal of this grant (module 3) is to supervise a recombinant protein and virus core facility that generates purified proteins from bacterial and insect cell expression systems and generates adenoviruses for vision researchers at UTSW.

FRAXA Research Foundation (PI: Cowan) 7/1/11-6/30/12 \$ 45,000/yr
Postdoctoral Fellowship (for Laura Smith, Ph.D.) "Reward Function in Fragile X Syndrome"
-goal of this fellowship is to study the role of FMRP in the brain reward circuitry as it relates to natural reward and cocaine-induced behavioral adaptations in the mouse model of Fragile X Syndrome.

SFARI Individual Grant (co-PIs: Cowan) 8/1/11-7/31/14 \$ 99,837/yr (to Cowan)
 Simons Foundation “Mechanisms of Synapse Elimination by Autism-linked genes”
 -the goal of this shared grant with collaborator, Dr. Kimberly Huber (UTSW), focuses on identifying the molecular mechanisms that control MEF2- and FMRP-dependent synapse elimination in the cortex, and to assess both circuit and behavioral abnormalities in mutant mice reminiscent of autism-related behaviors.

Pending:

R01 DA032708 (PI: Cowan) 12/1/2011-11/30/2016 \$ 250,000/yr
 NIH/NIDA “Role and Regulation of HDAC5 in cocaine addiction”

F31 MH095401 (Mentor: Cowan) 4/1/2012-3/31/2014
 NIH/NIMH “Mechanisms of MEF2-dependent Synapse Elimination”
 -predoctoral individual NRSA for graduate student, Carly Hale (scored: 6th percentile)

F31 NS074836 (Mentor: Cowan) 4/1/2012-3/31/2014
 NIH/NINDS “A Novel Role for EphB1 Receptor Forward Signaling in Corticothalamic Axon Pathfinding in vivo”
 -predoctoral individual NRSA for graduate student, Michael Robichaux

P30 EY020799 (PI: Self) 7/1/2012-6/30/2017 \$ 162,429/yr (to Core Director: Cowan)
 NIH/NIDA “Core Center for Cellular Investigation of Drug Addiction (CCCIDA)”
 -the goal of this grant (Core 2) is to supervise a “Molecular and Cellular Core” facility that generates primary neuronal cultures, molecular subcloning resources, adeno-associated viruses, and slice pharmacology equipment for drug addiction-related research in the labs of core investigators at UTSW and UT-Austin.

Past:

Whitehall Foundation Grant, Principal Investigator, 2006-2009 \$ 75,000/yr

SFARI Pilot Grant 7/1/2009-6/30/2011 \$ 62,500/yr (50% of award to Cowan)
 (co-PIs: Cowan and Huber)
 Simons Foundation “Coordinated Control of Synapse Development by Autism-linked Genes”
 -the goal of this shared grant with collaborator, Dr. Kimberly Huber (UTSW), focuses on identifying the molecular mechanisms that control MEF2- and FMRP-dependent synapse elimination in the hippocampus.

F32-DA027265 (PI: Laura Smith) 7/1/2009-6/30/2011 \$ 39,756/yr
 NIH/NIDA (Mentor: Cowan) “Molecular Mechanisms of Neural Plasticity in Drug Addiction”
 -this individual postdoctoral NRSA grant supported the salary and fringe of postdoctoral fellow, Dr. Laura Smith, and involved analysis of MEF2 and FMRP in cocaine-induced behavioral plasticity.

P30 EY020799 (PI: Niederkorn) 6/1/2010-5/31/2011 \$190,826/yr (Core 3 Director: Cowan)
 NIH/NEI (ARRA 2009) “Core Grant for Vision Research”
 -this ARRA 2009-funded special one-year grant supported the establishment of a recombinant protein biochemistry core, including funds for equipment, staff and supplies (Core Director: Cowan).

Professional Experience

Summary of Teaching and University Service:

Co-course Director and Lecturer, Works-in-Progress Data Club, Neuroscience Graduate Program, 2006-present
 Director, Organizer, and Lecturer, Neuroscience Graduate Program, PhD Qualifying Examinations,

2006-present

Advisor and Host, Summer Undergraduate Research Fellowship (SURF) program, 2009-present

Lecturer, Neuroscience course (Vision lecture), UTSW School of Health Professions, 2010-present

Lecturer, Neurobiology of Addiction course, UTSW Graduate School, 2010-present

Lecturer and lab tour host, STARS Program, UTSW, 2007-present

Lecturer, Neuropharmacology course, UTSW Graduate School, 2008-present

Career Development Mentor, Psychiatry Resident Research Track (basic science), 2010-present

Lecturer, UTSW Psychiatry Resident Didactics Course, (synapses) 2006, 2007, (monoamines) 2011

Session Director, Cell Signaling in the Nervous System, 2007

Poster Judge, SGS UTSW Postdoctoral Fellow Symposium, 2010

Abstract Judge, Sigma Xi graduate student competition, 2005, 2006

Term Paper Reader, UTSW Graduate School Core Course, 2006

Term Paper Reader, UTSW Fundamentals of Neuroscience Course, 2006-2007

Graduate Student Thesis Committees (non-advisor): 19 UTSW graduate students (committee chair for 12 students)

Student Mentoring:

Current Graduate Students: Carly F. Hale (4th yr), Michael Robichaux (4th yr), Maria Carreira (3rd yr), Jaswinder Kumar (3rd yr)

Past students: None

Postdoctoral Mentoring:

Current Fellows: Makoto Taniguchi, Ph.D. (2007-present), Laura Smith, Ph.D. (2008-present), George Chenaux, Ph.D. (2011-present), Adam Harrington, Ph.D. (2/2012-), Rachel Penrod, Ph.D. (6/2012-)

Past Fellows: Nishi Srivastava, Ph.D. (2008-2010)

Community Service:

Journal Peer Reviewer: *Neuron, Biological Psychiatry, Neuropsychopharmacology, Neuropharmacology, Journal of Cell Biology, Neurobiology of Disease, Cerebral Cortex, Molecular and Cellular Neuroscience, Journal of Experimental Medicine*

Grant Peer Reviewer: National Institutes of Health (NIDA), Medical Research Council (MRC), Wellcome Trust, Autism Speaks

Societies: Society for Neuroscience, 2006-present

Invited Meeting Speaker:

SFB 488 Symposium, “From Molecules to Neural Systems”, University of Heidelberg, Heidelberg, Germany, 2004

Keystone Symposium, “Axonal Connections: Molecular Cues for Development and Regeneration”, Breckenridge, Colorado, 2005

American Psychiatric Association (APA) Annual Meeting, Session Title: “Gene-Environment-Developmental Interactions: Implications for Psychiatric and Substance Abuse Disorders”, Washington, D.C., 2008

European Behavioral Pharmacology Society (EBPS) Biannual Meeting, Symposium Title: “Drug-induced Reorganization of Dopamine Circuitry: Novel Mechanisms and Implications for Behavioral Plasticity”, Amsterdam, Netherlands, August 2011

Research Department of Neuroscience and the International Graduate School of Neuroscience at Ruhr University of Bochum, Symposium Title: “Molecular Mechanisms of Synaptic Processing, Function and Dysfunction”, Bochum, Germany, April 26-27, 2012

Angelman Treatment and Research Institute (ATRI) 2012 Scientific Symposium, Rockville, Maryland, June 2012

Invited Session Chair:

Keystone Symposium, “Synapses: Formation, Function and Misfunction”, Chair of plenary session on “Glial Cells and Synapse Formation”, Snow Bird, Utah, 2010

Invited Seminars:

2011 The University of Texas at Dallas (Richardson, TX), Department of Behavior and Brain Sciences, Neuroscience Brown Bag seminar series, October 21, 2011, talk title: “Transcriptional Mechanisms of Synapse Elimination: Implications for Cocaine-induced Behavioral Plasticity”

The University of Arizona (Tucson, AR), Dept. of Chemistry and Biochemistry, Minority Biomedical Research Colloquium seminar series, October 17, 2011, talk title: “Brain Mechanisms of Drug Addiction”

The University of Texas Health Science Center at San Antonio (San Antonio, TX), Dept. of Physiology Seminar Series, September 26, 2011, talk title: “Transcriptional mechanisms of activity-dependent synapse elimination: implications for Drug Addiction, Fragile X Syndrome, and Autism”

University of Pittsburgh School of Medicine (Pittsburgh, PA), Dept. of Psychiatry, April 18, 2011, talk title: “Transcriptional mechanisms of activity-dependent synapse elimination: implications for Drug Addiction, Fragile X Syndrome, and Autism”

Northwestern University Feinberg School of Medicine and Children’s Memorial Research Center (Chicago, IL), Distinguished Lecturer Seminar Series, March 31, 2011, talk title: “Transcriptional mechanisms of activity-dependent synapse elimination: implications for Drug Addiction, Fragile X Syndrome, and Autism”

University of Pennsylvania School of Medicine (Philadelphia, PA), Neurobiology and Behavior Lecture Series, Jan. 21, 2011, talk title: “Transcriptional mechanisms of activity-dependent synapse elimination: implications for Drug Addiction, Fragile X Syndrome, and Autism”

2010 University of Texas (Austin, TX), Waggoner Center for Alcohol & Addiction Research Seminar Series, Nov. 1, 2010 talk title: “Transcriptional mechanisms of activity-dependent synapse elimination: implications for Drug Addiction, Fragile X Syndrome, and Autism”

Duke University Medical School (Durham, NC), Dept. of Neurobiology Seminar Series, Sept. 28, 2010 talk title: “Transcriptional mechanisms of activity-dependent synapse elimination: implications for Fragile X Syndrome, Autism and Drug Addiction”

Massachusetts Institute of Technology (Cambridge, MA), Autism and Developmental Disorders Colloquium Series, Department of Brain and Cognitive Sciences and the Simons Initiative on Autism and the Brain, Wednesday, September 15, 2010. Talk title: “Transcriptional mechanisms of activity-dependent synapse elimination: implications for Fragile X Syndrome, Autism and Drug Addiction.”

Baylor College of Medicine (Houston, TX), Department of Biochemistry and Molecular Biology Seminar Series, March 4, 2010, talk title: "Molecular Mechanisms of Synaptic Connectivity in Development and Addiction"

2009 University of Minnesota (Minneapolis, MN), Department of Neuroscience Seminar Series, September 17, 2009, talk title: "Molecular Mechanisms of Addiction-related Synapse Plasticity"

Texas A&M University (College Station, TX), Department of Neuroscience Seminar Series, February 5, 2009, talk title: "Molecular Mechanisms of Drug Addiction-related Synaptic and Behavioral Plasticity"

2006 Baylor University (Waco, TX), Department of Biology Seminar Series, October 11, 2006, talk title: "Wiring up the Brain: a Novel Role for MEF2 in Activity-Dependent Synapse Formation"

Bibliography

Manuscripts in Preparation:

1. Srivastava N, Robichaux MA, Chenuaux G, Dewey CM, Yokubaitis KW, Henkemeyer M, **Cowan CW**. EphB forward signaling-dependent cortical axon guidance requires Pak1 and Nck via a novel Rac/Cdc42-independent mechanism. (in preparation)
2. Smith LN, Taniguchi M, Dietz KC, Huber KM, **Cowan CW**. Fragile X Mental Retardation Protein (FMRP) is required for cocaine-induced behavioral plasticity. (in preparation)
3. Hale CF and **Cowan CW**. BDNF-induced dendritic spine growth and synaptic plasticity. Requested review article for Cognitive Sciences. (in preparation)

Submitted Manuscripts:

1. Wang Y, He H, Srivastava N, Vikarunnessa S, Chen Y-B, Jiang J, **Cowan CW**, Zhang X. Plexins are GTPase Activating Proteins for Rap and are activated by induced dimerization. (submitted to Science Signaling)

Published, In Press or Accepted Papers (total of 22):

1. Taniguchi, M., Carreira, M.B., Smith, L.N., Zirlin, B.C., Neve, R.L., **Cowan, C.W.** Histone Deacetylase 5 limits cocaine reward through cAMP-induced nuclear import. Neuron, in press (2011)
2. Hale, C.F., Dietz, K.C., Varela, J.A., Wood, C.B., Zirlin, B.C., Leverich, L.S., Greene, R.W., **Cowan, C.W.** Essential role for Vav GEFs in brain-derived neurotrophic factor-induced dendritic spine growth and synapse plasticity. J. Neuroscience, 31(35), 12426-12436 (2011).

3. Pfeiffer, B.E., Zang, T., Wilkerson, J., Taniguchi, M., Maksimova, M.A., Smith, L.N.,
***Cowan, C.W.**, *Huber, K.M.
Fragile X Mental Retardation Protein is required for synapse elimination by the activity-dependent transcription factor MEF2.
Neuron, 66, 191-197 (2010).
(*joint corresponding authors)
4. Meyer, D.A., Richer, E., Benkovic, S.A., Hayashi, K., Kansy, J.W., Hale, C., Moy, L., Kim, Y., O'Callaghan, J.P., Tsai, L.-H., Greengard, P., Nairn, A.C., **Cowan, C.W.**, Miller, D.B., Antich, P., Bibb, J.A.
Striatal dysregulation of Cdk5 alters locomotor responses to cocaine, motor learning, and dendritic morphology.
Proc. Natl. Acad. Sci., USA, 105: 18561-6 (2008).
5. Pulliparacharuvil, S.G., Renthall, W., Hale, C.F., Taniguchi, M., Xiao, G., Kumar, A., Dewey, C.M., Davis, M., Nairn, A., Greengard, P., Nestler, E.J., **Cowan, C.W.**
Cocaine regulates MEF2 to control synaptic and behavioral plasticity.
Neuron, 59: 621-33 (2008).

"News and Views" on this article: Chandler LJ and Kalivas PW. Neuroscience: Brain's defence against cocaine. **Nature**, 455: 743-4 (2008); *"Research Highlights" on this article:* Neuroscience, Coke Heads. **Nature**, 455: 5 (2008); *"Research Findings" on this article:* "Brain adaptation may dampen effects of cocaine". **NIDA Notes**, (2010).
6. Schmidt, S.G., Zhuang, G., Brantley-Sieders, D., Swat, W., **Cowan, C.W.**, Chen, J.
Essential role of Vav family GEFs in EphA receptor-mediated angiogenesis.
Mol. Cell Biol., 26: 4830-42 (2006).
7. *Flavell, S.W., ***Cowan, C.W.**, Kim, T.K., Greer, P.L., Lin, Y., Paradis, S., Griffith, E.C., Hu, L.S., Chen, C., Greenberg, M.E.
Activity-dependent regulation of MEF2 transcription factors suppresses excitatory synapse number.
Science, 311:1008-12 (2006).
(*authors contributed equally)

"Perspectives" on this article: Beg AA and Scheiffele P. Neuroscience: SUMO wrestles the synapse. **Science** 2006, 311: 962-63; *"Leading Edge" on this article:* Neurobiology Select: Putting the brakes on synapse number. **Cell**,125: 207 (2006).
8. **Cowan, C.W.**, Shao, Y.R., Sahin, M., Shamah, S.M., Lin, M.Z., Greer, P.L., Gao, S., Griffith, E.C., Brugge, J.S., Greenberg, M.E.
Vav family GEFs link activated Ephs to endocytosis and axon guidance.
Neuron, 46: 205-17 (2005).

Preview for this article: Murai KK and Pasquale EB. New exchanges in Eph-dependent growth cone dynamics. **Neuron**, 46:161-3 (2005).
9. Sahin, M., Greer, P.L., Lin, M.Z., O'Connell, S., Wright, T.M., Shamah, S.M., Eberhart, J., **Cowan, C.W.**, Hu, L., Goldberg, J.L., Krull, C.E., Corfas, G., Greenberg, M.E.
Eph-dependent tyrosine phosphorylation of ephexin1 modulates growth cone collapse.
Neuron, 46: 191-204 (2005).
10. Sturla, L.-M., **Cowan, C.W.**, Guenther, L., Castellino, R.C., Kim, J.Y.H., Pomeroy, S.L.

A novel role for extracellular signal-regulated kinase 5 and myocyte enhancer factor 2 in medulloblastoma cell death.

Cancer Res, 65: 5683-9 (2005).

11. Datta, S.R., Ranger, A.M., Lin, M.Z., Sturgill, J.F., Ma, Y.C., **Cowan, C.W.**, Dikkes, P., Korsmeyer, S.J., Greenberg, M.E.
Survival factor-mediated BAD phosphorylation raises the mitochondrial threshold for apoptosis.
Dev. Cell, 3: 631-43 (2002).
12. Kornhauser, J.M., **Cowan, C.W.**, Shaywitz, A.J., Dolmetsch, R.E., Griffith, E.C., Hu, L.S., Haddad, C., Xia, Z., Greenberg, M.E.
CREB transcriptional activity in neurons is regulated by multiple, calcium-specific phosphorylation events.
Neuron, 34: 221-33 (2002).
- Minireview for this article:* Deisseroth, K. and Tsien, R.W. Dynamic multiphosphorylation passwords for activity-dependent gene expression. **Neuron**, 34:179-182 (2002).
13. He, W., Melia, T.J., **Cowan, C.W.**, Wensel, T.G.
Dependence of RGS9-1 membrane attachment on its C-terminal tail.
J. Biol. Chem., 276: 48961-6 (2001).
14. Hu, G., Jang, G.-F., **Cowan, C.W.**, Wensel, T.G., Palczewski, K.
Phosphorylation of RGS9-1 by an endogenous protein kinase in rod outer segments.
J. Biol. Chem., 276: 22287-95 (2001).
15. Slep, K.C., Kerchner, M.A., He, W., **Cowan, C.W.**, Wensel, T.G., Sigler, P.B.
Structural determinants for regulation of phosphodiesterase by a G-protein at 2.0 angstroms.
Nature, 409: 1071-7 (2001).
16. He, F., Seryshev, A.B., **Cowan, C.W.**, Wensel, T.G.
Multiple zinc binding sites in retinal rod cGMP phosphodiesterase.
J. Biol. Chem., 275: 20572-7 (2000).
17. Rahman, Z., Gold, S.J., Potenza, M.N., **Cowan, C.W.**, Ni, Y.G., He, W., Wensel, T.G., Nestler, E.J.
Cloning and characterization of RGS9-2: a striatal-enriched alternatively spliced product of the RGS9 gene.
J. Neuroscience, 19: 2016-2026 (1999).
18. **Cowan, C.W.**, Farris, R.N., Sokal, I., Palczewski, K., Wensel, T.G.
High expression levels in cones of RGS9, the predominant GTPase accelerating protein of rods.
Proc. Natl. Acad. Sci., USA, 95: 5351-5356 (1998).
19. *He, W., ***Cowan, C.W.**, Wensel, T.G.
RGS9, a GTPase accelerator for vision.
Neuron, 20: 95-102 (1998).
(*authors contributed equally)

Minireview for this article: Arshavsky VY and Pugh EN. Lifetime regulation of the G protein-effector complex: emerging importance of RGS proteins. **Neuron**, 20:11-14 (1998).

20. Melia, T.J., **Cowan, C.W.**, Angleson, J.K., Wensel, T.G.

A comparison of the efficiency of G protein activation by ligand-free and light-activated forms of rhodopsin.

Biophys. J., 73: 3182-3191 (1997).

21. Adams, D.B., **Cowan, C.W.**, Marshall, M.E., Stark, J.
Competitive and territorial fighting: two types of offense in the rat.
Physiol. Behav., 55: 247-54 (1994).
22. Adams, D.B., Boudreau, W., **Cowan, C.W.**, Kokonowski, C., Oberteuffer, K., Yohay, K.
Offense produced by chemical stimulation of the anterior hypothalamus of the rat.
Physiol. Behav., 53: 1127-1132 (1993).

B) Invited Book Chapters, Review Articles, Perspectives and Misc. Material (total of 5)

1. Shen, K. and **Cowan, C.W.**
Guidance Molecules in Synapse Formation and Plasticity.
Neuronal Guidance: The Biology of Brain Wiring, Tessier-Lavigne, M. and Kolodkin, A.L. eds.
Cold Spring Harbor Press, 311-328 (2009). Invited Book Chapter.
2. **Cowan, C.W.**, Hale, C.F., Taniguchi, M.
Regulation of synaptic connectivity with chronic cocaine.
Images in Neuroscience: Tamminga, C.A. ed.
Am. J. Psychiatry, 165(11): 1393 (2008). Invited Perspective.
3. Griffith, E.C., **Cowan, C.W.**, Greenberg, M.E.
REST acts through multiple deacetylase complexes.
Neuron, 31: 339-40 (2001). Invited Preview.
4. **Cowan, C.W.**, He, W., Wensel, T.G.
RGS proteins: lessons from the RGS9 subfamily and phototransduction.
Prog. Nucleic Acid Res. Mol. Biol., 65: 341-59 (2000). Invited Review.
5. **Cowan, C.W.**, Wensel, T.G., Arshavsky, V.Y.
Enzymology of GTPase acceleration in phototransduction.
Methods Enzymol., 315: 524-38 (2000). Invited Chapter.