

BIOGRAPHICAL SKETCH

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NAME Broadie, Kendal S.	POSITION TITLE Stevenson Professor of Neurobiology		
eRA COMMONS USER NAME (credential, e.g., agency login) KBROADIE			
EDUCATION/TRAINING (Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)			
INSTITUTION AND LOCATION	DEGREE (if applicable)	YEAR(s)	FIELD OF STUDY
University of Oregon, Eugene, OR	BSc	1989	Biology, Chemistry
University of Cambridge, Cambridge (U.K.)	PhD	1994	Neuroscience, Genetics
University of Cambridge, Cambridge (U.K.)	Postdoc	1994-1986	Neurogenetics

A. Positions and Honors**Positions and Employment**

1987-1989 Research Assistant, Institute of Neuroscience, University of Oregon
 1989-1990 Fulbright Scholar, Department of Zoology, University of Cambridge, England
 1990-1993 Oliver Gatty Scholar with Michael Bate, FRS, University of Cambridge, England
 1993-1994 Rosamund Chambers Research Fellow, Girton College, University of Cambridge
 1994-1996 Wellcome Trust Research Fellow, University of Cambridge, England
 1996-2001 Assistant Professor, Department of Biology, University of Utah, Salt Lake City UT
 2002-pres Professor, Department of Biological Sciences, Vanderbilt University, Nashville TN
 2002-pres Professor, Department of Pharmacology, Vanderbilt University Medical School
 2003-2008 Director of Developmental Neurobiology & Plasticity, Vanderbilt Kennedy Center
 2004-pres Eldon Stevenson Jr. Professor of Neurobiology, Vanderbilt University

Honors

1989 *Summa Cum Laude*, University of Oregon, Eugene OR, USA
 1989-1990 Fulbright Scholar, Fulbright-Hays Act, United States Congress, USA
 1990-1993 Oliver Gatty Prize Studentship, University of Cambridge, UK
 1990-1993 American Friends of Cambridge University Award Scholar, Cambridge, UK
 1990-1993 Overseas Research Award (ORS), United Kingdom Parliamentary award
 1991 British Society for Developmental Biology Research Prize, UK
 1992 'Young Cell Biologist of the Year', British Society for Cell Biology, UK
 1993-1996 Rosamund Chambers Research Fellow, Girton College, University of Cambridge
 1994 Larry Sandler Memorial Prize, Genetics Society of America, USA
 1994-1996 Wellcome Research Fellow, The Wellcome Trust, England, UK
 1996-1998 Sloan Fellow, Alfred P. Sloan Foundation, New York, USA
 1997-2000 Young Investigator Award, Office of Naval Research, USA
 1997-2000 Searle Scholar, Searle Foundation, Chicago, USA
 1997-2001 CAREER Fellow, National Science Foundation, USA
 2000-2003 EJLB Scholar, EJLB Foundation, Montreal, Canada

B. Selected peer-reviewed publications (in chronological order)

- Broadie, K., and Bate, M. (1993). Synaptogenesis in the *Drosophila* embryo: innervation directs receptor synthesis and localization. *Nature* 361: 350-353.
- Broadie, K., and Bate, M. (1993). Activity-dependent development of the neuromuscular synapse during *Drosophila* embryogenesis. *Neuron* 11: 607-619.
- Broadie, K., Bellen, H.J., DiAntonio, A., Littleton, J.T. and Schwarz, T.L. (1994). The absence of synaptotagmin disrupts excitation-secretion coupling during synaptic transmission. *PNAS* 91: 10727-31.
- Broadie, K., Prokop, A., Bellen, H.J., O'Kane, C.J., Schulze, K.L. and Sweeney, S.T. (1995). Syntaxin and synaptobrevin function downstream of vesicle docking in *Drosophila*. *Neuron* 15: 663-673.
- Broadie, K., Sweeney, S.T., Keane, J., Niemann, H. and O'Kane, C.J. (1995). Targeted expression of tetanus toxin light chain in *Drosophila* specifically eliminates synaptic transmission and causes behavioral defects. *Neuron* 14: 341-351.

6. Prokop, A., Landgraf, M., Rushton, E., Broadie, K. and Bate, M. (1996). Presynaptic development at the *Drosophila* NMJ: The assembly and localization of presynaptic release sites. *Neuron* 17: 617-626.
7. Broadie, K., Rushton, E., Skoulakis, E. and Davis, R.L. (1997). Leonardo, a 14-3-3 protein involved in learning, regulates presynaptic vesicle dynamics. *Neuron* 19: 391-402.
8. Fergestad, T., Davis, W. and Broadie, K. (1999). The Stoned proteins regulate synaptic vesicle recycling in the presynaptic terminal. *Journal of Neuroscience* 19: 5847-5860.
9. Rohrbough, J., Pinto, S., Mihalek, R., Tully, T. and Broadie, K. (1999). Latheo, a *Drosophila* gene involved in learning, regulates functional synaptic plasticity. *Neuron* 23: 55-70.
10. Avamudan, B., Fergestad, T., Roesch, C., Davis, W. and Broadie, K. (1999). *Drosophila* UNC-13 is essential for synaptic transmission. *Nature Neuroscience* 2: 965-971.
11. Beumer, K., Prokop, A., Rohrbough, J. and Broadie, K. (1999). Role for PS integrins in synaptic growth and function at the postembryonic neuromuscular junction of *Drosophila*. *Development* 126: 5833-46.
12. Featherstone, D., Rushton, E., Hildebrand-Chae, M., Philips, A., Jackson, R. and Broadie, K. (2000). Presynaptic glutamic acid decarboxylase (GAD) is required for induction of the postsynaptic receptor field at a glutamatergic synapse. *Neuron* 27: 71-84.
13. Zhang, Y., Featherstone, D., Davis, W., Rushton, E. and Broadie, K. (2000). *Drosophila* Titin is required for myoblast fusion and skeletal muscle striation. *Journal of Cell Science* 113: 3103-3115.
14. Rohrbough, J., Grotewiel, M.S., Davis, R.L. and Broadie, K. (2000). Integrin-mediated regulation of synaptic morphology, transmission, and plasticity. *Journal of Neuroscience* 20: 6868-6878.
15. Fergestad, T. and Broadie, K. (2001). Interaction of stoned and synaptotagmin in synaptic vesicle endocytosis. *Journal of Neuroscience* 21: 1218-1227.
16. Bodily, K.D., Morrison, C.M., Renden, R.B. and Broadie, K. (2001). A novel member of the immunoglobulin superfamily, *turtle*, is a CNS-specific protein required for bilateral motor control. *Journal of Neuroscience* 21: 3113-3125.
17. Renden, R., Berwin, B., Chin, C.T., Kreber, R., Ganetzky, B., Martin, T.F.J. and Broadie, K. (2001). *Drosophila* CAPS is an essential gene required for the regulation of dense core vesicle release and synaptic vesicle fusion. *Neuron* 31: 421-437.
18. Featherstone, D.E., Davis, W., Dubreil, R. and Broadie, K. (2001). *Drosophila* alpha- and beta-spectrin mutations disrupt presynaptic neurotransmitter release. *Journal of Neuroscience* 21: 4215-4224.
19. Zhang, Y., Bailey, A., Matthies, H., Speese, S., Renden, R., Smith, M., Rubin, G. and Broadie, K. (2001). *Drosophila* fragile X related gene regulates the MAP1B homolog futsch to control synaptic structure and function. *Cell* 107: 591-603.
20. Fergestad, T., Wu, M.N., Schulze, K.L., Lloyd, T.E., Bellen, H.J. and Broadie, K. (2001). Targeted mutations in the Syntaxin H3 domain specifically disrupt SNARE complex function in synaptic transmission. *Journal of Neuroscience* 21: 9142-9150.
21. Featherstone, D.E., Rushton, E. and Broadie, K. (2002). Developmental regulation of glutamate receptor field size by nonvesicular glutamate release. *Nature Neuroscience* 5: 141-146.
22. Beumer, K., Matthies, H.J.G., Bradshaw, A. and Broadie, K. (2002). Integrins regulate DLG/FAS2 via a CaM kinase II-dependent pathway to mediate synapse elaboration and stabilization during postembryonic development. *Development* 129: 3381-91.
23. Rohrbough, J. and Broadie, K. (2002). Electrophysiological analysis of synaptic transmission in identified central neurons of *Drosophila*. *Journal of Neurophysiology* 88: 847-60.
24. Andrews, H.K., Zhang, Y.Q., Trotta, N. and Broadie, K. (2002). *Drosophila* sec10 is required for hormone secretion but not general exocytosis or neurotransmission. *Traffic* 3: 906-21.
25. Rohrbough, J., O'Dowd, D., Baines, R. and Broadie, K. (2003). Cellular bases of behavioral plasticity: establishing and modifying synaptic circuits in the *Drosophila* genetic system. *Journal of Neurobiology* 54: 254-271.
26. Aravamudan, B. and Broadie, K. (2003). Synaptic expression of *Drosophila* UNC-13 is regulated by antagonistic G-protein pathways via a proteasome-dependent degradation mechanism. *Journal of Neurobiology* 54: 417-38.
27. Renden, R. and Broadie, K. (2003). Mutation and activation of G proteins similarly alters pre- and postsynaptic mechanisms modulating neurotransmission. *Journal of Neurophysiology* 89: 2620-38.
28. Speese, S., Trotta, N., Rodesch, C., Aravamudan, B. and Broadie, K. (2003). The ubiquitin-proteasome system regulates presynaptic protein turnover and synaptic efficacy. *Current Biology* 13: 899-910.
29. Zhang, Y., Matthies, Mancuso, J., H. Andrews, H., Woodruff, E. Friedman, D. and Broadie, K. (2004). The *Drosophila* Fragile X-related gene regulates axoneme differentiation during spermatogenesis. *Developmental Biology* 270: 290-307.
30. Trotta, N., Rodesch, C., Fergestad, T. and Broadie, K. (2004). Cellular bases for stress-sensitive paralysis in *Drosophila*. *Journal of Neurobiology* 60: 328-47.
31. Trotta, N., Orso, G., Rossetto, M.G., Daga, A. and Broadie, K. (2004). The hereditary spastic paraplegia gene, *spastin*, regulates microtubule stability to modulate synaptic structure and function. *Current Biology* 14: 1135-47.

32. Rohrbough, J., Rushton, E., Palanker, L., Mancuso, J. and Broadie, K. (2004). Ceramidase regulates synaptic vesicle exocytosis and trafficking. *Journal of Neuroscience* 24: 7789-803.
33. Huang, F.D., Matthies, H.J., Speese, S.D., Smith, M.A. and Broadie, K. (2004). Rolling blackout, a PIP2-DAG pathway lipase required for *Drosophila* phototransduction. *Nature Neuroscience* 7: 1070-78.
34. Broadie K. (2004). Synapse scaffolding: intersection of endocytosis and growth. *Current Biology* 14: 853-58.
35. Bogdanik, L., Mohrmann, R., Ramaekers, A., Bockaert, J., Grau, Y., Parmentier, M.L. and Broadie, K. (2004). The *Drosophila* metabotropic glutamate receptor DmGluRA regulates activity-dependent synaptic facilitation and fine synaptic morphology. *Journal of Neuroscience* 24: 9105-16.
36. Pan, L., Zhang, Y. Q., Woodruff, E. and Broadie, K. (2004). The *Drosophila* fragile X gene negatively regulates neuronal elaboration and synaptic differentiation. *Current Biology* 14: 1863-70.
37. Zhang, Y., Friedman, D.B., Wang, Z., Woodruff, E., Pan, L., O'Donnell, J. and Broadie, K. (2005). Protein expression profiling of the *Drosophila* Fragile X mutant brain reveals upregulation of monoamine synthesis. *Cellular and Molecular Proteomics* 4: 278-90.
38. Zhang, Y.Q. and Broadie, K. (2005). Fathoming fragile X in fruit flies. *Trends in Genetics* 21: 37-45.
- Rohrbough, J. and Broadie, K. (2005). Lipid regulation of the synaptic vesicle cycle. *Nature Reviews Neuroscience* 6: 139-50.
39. Broadie, K. and Pan, L. (2005). Translational complexity of the fragile X mental retardation protein: insights from the fly. *Molecular Cell* 17: 757-9.
40. Featherstone, D.E., Rushton, E., Rohrbough, J., Liebl, F., Karr, J., Sheng, Q., Rodesch, C.K. and Broadie, K. (2005). An essential *Drosophila* glutamate receptor subunit that functions in both central neuropil and neuromuscular junction. *Journal of Neuroscience* 25: 3199-208.
41. Vijayakrishnan, N. and Broadie, K. (2006). Temperature-sensitive paralytic mutants: insights into the synaptic vesicle cycle. *Biochemistry* 34: 81-87.
42. Huang, F.D., Woodruff, E., Mohrmann, R. and Broadie, K. (2006). Rolling blackout is required for synaptic vesicle exocytosis. *Journal of Neuroscience* 26: 2369-79.
43. Yan, Y. and Broadie, K. (2007). In vivo assay of presynaptic microtubule cytoskeleton dynamics in *Drosophila*. *Journal of Neuroscience Methods* 162: 198-205.
44. Haas, K.F., Miller, S.L., Friedman, D.B. and Broadie, K. (2007). The ubiquitin-proteasome system postsynaptically regulates glutamatergic synaptic function. *Molecular and Cellular Neuroscience* 35: 64-75.
45. Haas, K.F., Woodruff, E. and Broadie, K. (2007). Proteasome function is required to maintain muscle cellular architecture. *Biology of the Cell* 99: 615-26.
46. Rohrbough, J., Rushton, E., Woodruff, E., Fergestad, T., Vigneswaran, K. and Broadie, K. (2007). Presynaptic establishment of the synaptic cleft extracellular matrix is required for postsynaptic differentiation. *Genes & Development* 21: 2607-28.
47. Pan, L. and Broadie, K. (2007). *Drosophila* fragile X mental retardation protein and metabotropic glutamate receptor A convergently regulates the synaptic ratio of ionotropic glutamate receptor subclasses. *Journal of Neuroscience* 27: 12378-89.
48. Kucenas, S., Takada, N., Park, H.C., Woodruff, E., Broadie, K. and Appel, B. (2008). CNS-derived glia ensheath peripheral nerves and mediate motor root development. *Nature Neuroscience* 11: 143-151.
49. Pan, L., Woodruff, E., Liang, P. and Broadie K. (2008). Mechanistic relationships between *Drosophila* Fragile X Mental Retardation Protein and Metabotropic Glutamate Receptor A signaling. *Molecular & Cellular Neuroscience* 37: 747-60.
50. Tessier, C. and Broadie, K. (2008). *Drosophila* Fragile X Mental Retardation Protein developmentally regulates activity-dependent axon pruning. *Development* 135: 1547-57.
51. Long, A.A., Kim, E., Leung, H.T., Woodruff, E., An, L.L., Doerge, R.W., Pak, W.L. and Broadie, K. (2008). Presynaptic calcium channel localization and calcium-dependent synaptic vesicle exocytosis regulated by the Fuseless protein. *Journal of Neuroscience* 28: 3668-82.
52. Mohrmann, R., Matthies, H.J., Woodruff, E. and Broadie, K. (2008). Stoned B mediates sorting of synaptic vesicle proteins. *Neuroscience* 153:1048-63.
53. Phillips S.E., Woodruff, E.A., Liang, P., Patten, M. and Broadie, K. (2008). Neuronal loss of *Drosophila* NPC1a causes cholesterol aggregation and age-progressive neurodegeneration. *Journal of Neuroscience* 28: 6569-82.
54. Gatto, C.L. and Broadie, K. (2008). Temporal requirements of the fragile X mental retardation protein in the regulation of synaptic structure. *Development*. 135: 2637-48.
55. Bolduc, F.V., Bell, K., Cox, H., Broadie, K. and Tully, T. (2008). Excess protein synthesis in *Drosophila* fragile X mutants impairs long-term memory. *Nature Neuroscience* 11: 1143-5.
56. Venkatachalam, K., Long, A.A., Elsaesser, R., Nikolaeva, D., Broadie, K. and Montell, C. (2008). Motor deficit in a *Drosophila* model of mucopolidiosis type IV due to defective clearance of apoptotic cells. *Cell* 135: 838-51.

C. Research Support

Current Research Support

RO1 GM54544 Broadie (PI)

4/1/07-3/31/11

NIGMS

Genetic Analysis of Synapse Formation and Function
National Institute of General Medical Sciences

This work involves forward genetic screens to uncover proteins required for glutamatergic synapse formation, including differentiation of the postsynaptic domain and presynaptic active zone.

Role: PI

RO1 NS41740 Broadie (PI)

5/1/05-4/31/10

NINDS

Synaptic Mechanisms of Neurodegenerative Disease
National Institute of Neurological Disorders & Stroke

This work involves the study of lipid-based pathways in synaptic mechanisms and regulation of neuronal viability, including phospholipid and sphingolipid pathways.

Role: PI

RO1 MH07504 Broadie, Pak

5/1/06-4/31/11

NIMH

Molecular Analysis of Synaptic Transmission Mutants
National Institute of Mental Health

This work involves forward genetic screens to uncover proteins required for glutamatergic neurotransmission, including mechanisms of the synaptic vesicle cycle and calcium-dependent neurotransmitter release.

Role: Co-PI