## BIOGRAPHICAL SKETCH

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| NAME | POSITION TITLE |
|---|---|
| William J. Betz | Professor and Chair, Department of Physiology & Biophysics |
| eRA COMMONS USER NAME (credential, e.g., agency login)<br>billbetz | |

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable.)*

| INSTITUTION AND LOCATION | DEGREE *(if applicable)* | MM/YY | FIELD OF STUDY |
|---|---|---|---|
| Washington University, St. Louis, MO (1961-64) | -- | -- | Undergraduate |
| Washington University Medical School (1964-66) | B.S. | 6/1965 | Medicine |
| Yale University, New Haven, CT (1966-69) | Ph.D. | 6/1969 | Physiology |

### A. Personal Statement

While a second year medical school, I was inspired by reading the works of Bernard Katz, and after graduate work with A.R. Martin, I received NIH support for postdoctoral work in Katz' department. I have studied the mechanisms of synaptic transmission at the neuromuscular junction ever since. I have mentored about two dozen pre- and post-doctoral trainees, and have taught undergraduate, graduate, and professional (especially medical) students. I am probably most recognized for introducing and characterizing the so-called FM dyes, which have proven useful for studies of exocytosis, endocytosis, and endosomal trafficking. My work currently involves close collaboration with Professor Lucia Tabares (Dept. of Medical Physiology & Biophysics, University of Seville, Spain). We study presynaptic mechanisms of transmitter release in general, and the role of exocytic 'active zones' in particular, in transgenic mice, using fluorescence and electron microscopy and electrophysiological techniques.

### B. Positions and Honors

*Professional Positions*

| | |
|---|---|
| 1969-71 | Postdoctoral Fellow, Department of Biophysics, University College London (Sir Bernard Katz, sponsor) |
| 1971-77 | Assistant Professor, Department of Physiology, University of Colorado Medical School |
| 1977-84 | Associate Professor, Department of Physiology, University of Colorado Medical School |
| 1984-present | Professor, Department of Physiology & Biophysics, University of Colorado Medical School |
| 1993-present | Chair, Department of Physiology & Biophysics, University of Colorado Medical School |

*Awards and Other Professional Activities*

| | |
|---|---|
| 1969-71 | U.S. Public Health Service Postdoctoral Fellowship |
| 1979,84,85,87 | Kaiser Permanente Teaching Award, nominee |
| 1983 | Minority Student Teaching Award, nominee |
| 1983,86,88,93-97 | Excellence in Teaching Award (first year medical class) |
| 1983-89 | Neurology B Study Section, Ad hoc (1983); Regular Member (1984-89); Chair (1987-89). |
| 1993-94 | Alexander von Humboldt Senior Scientist Award |
| 1994-95 | IBRO (International Brain Research Organization): Lecturer (Chile, Venezuela; India); |
| 1998 | Jonathon Magnes Lecturer, Hebrew University, Jerusalem |
| 1999 | IBRO (International Brain Research Organization) Program Committee, 1999 |
| 1999 | Grass Lecturer, U. Missouri |
| 2001 | J.S. Guggenheim Fellow |
| 2001 | Visiting Professor, Hebrew University (cancelled due to intifada) |
| 2007 | Sir Bernard Katz Award, Exo-Endocytosis Subgroup, Biophysical Society |
| 2008 (2), 2009 | Medical Student Awards for Best Handouts |
| 2004, 2009 | External Reviewer, Dept. of Neuroscience, MRC Laboratory of Molecular Biology, Cambridge |
| 2010 | Hille Lecturer, University of Washington |
| 2010 | Fellowship, Ministry of Science & Innovation, Government of Spain |
| 2005, 2011 | External Reviewer, MRC Laboratory of Molecular Biology, Cambridge |

**C. Selected peer-reviewed publications**

*Early publications*


Betz, W.J. (1970). Depression of transmitter release at the neuromuscular junction of the frog. J. Physiol. 206, 666-680.

Betz, W.J. & Sakmann, B. (1971). "Disjunction" of frog neuromuscular synapses by treatment with proteolytic enzymes. Nature New Biol. 232, 94-95.

Betz, W.J. (1976). The formation of synapses between chick embryo skeletal muscle and ciliary ganglion grown in vitro. J. Physiol. 254, 63-74.

Betz, W.J., Caldwell, J.H., & Ribchester, R.R. (1980).The size of motor units during postnatal development of rat lumbrical muscle. J. Physiol. 297, 463-478.

Betz, W.J., Caldwell, J.H., Ribchester, R.R., Robinson, K.R., & Stump, R.F. (1980). Endogenous electric field around muscle fibres depends on the Na/K pump. Nature 287, 235-237.

Betz, W.J. & Caldwell, J.H. (1984). Mapping electric currents around skeletal muscle with a vibrating probe. J. Gen. Physiol. 83, 143-156.

Chua, M. & W.J. Betz. (1991). Characterization of a non-selective cation channel in the surface membrane of adult rat skeletal muscle. Biophys. J. 59, 1251-1260.


*Representative publications since 1992*


Betz, W.J., F. Mao & G.S. Bewick. (1992). Activity-dependent staining and destaining of living vertebrate motor nerve terminals. J. Neurosci. 12, 363-375. (Cover illustration)

Betz, W.J. & G.S. Bewick. (1992). Optical analysis of synaptic vesicle recycling at the frog neuromuscular junction. Science 255, 200-203. (cover illustration)

Betz, W.J. and A. Henkel. (1994). Okadaic acid disrupts clusters of synaptic vesicles in frog motor nerve terminals. J. Cell Biol., 124, 843-854. (cover illustration)

Betz, W.J. and L.-G. Wu. (1995). Kinetics of synaptic vesicle recycling. Current Biol. 5, 1098-1101.

Henkel, A., J. Lübke and W.J. Betz (1996). FM1-43 ultrastructural localization in and release from frog motor nerve terminals. Proc. Natl. Acad. Sci. USA, 93, 1918-1923.

Smith, C.B. and Betz, W.J. (1996). Simultaneous independent measurement of endo- and exocytosis. Nature, 380, 531-534.

Wu, L.-G. and W.J. Betz (1996). Nerve activity but not intracellular calcium determines the time course of endocytosis at the frog neuromuscular junction. Neuron, 17, 769-779.

Angleson, J.K. and W.J. Betz (1997). Monitoring secretion in real time: capacitance, amperometry and fluorescence compared. Trends in Neurosci, 20, 281-286 (includes poster).

Wu, L.-G. and W.J. Betz (1998) Kinetics of synaptic depression and vesicle recycling after tetanic stimulation of frog motor nerve terminals. Biophys. J., 74, 3003-3009.

Angleson, J.K., Cochilla, A.J., Kilic, G., Nussinovitch, I., and Betz, W.J. (1999) Dopaminergic control of dense core release from neuroendocrine cells revealed by imaging single exocytic events with FM1-43. Nature Neurosci, 2, 440-6.

Cochilla, A.J., Angleson, J.K., and Betz, W.J. (2000) Differential regulation of granule and granule-to-plasma membrane fusion during secretion from rat pituitary lactotrophs. J. Cell Biol., 150, 839-848.

Richards, D.A., Guatimosim, C., and Betz, W.J. (2000) Two endocytic recycling routes fill two vesicle pools in frog motor nerve terminals. Neuron, 27, 551-559.

Angleson J.K., and Betz W.J. (2001) Intraterminal Ca(2+) and spontaneous transmitter release at the frog neuromuscular junction. J Neurophysiol. 85, 287-294.

Rizzoli, S.O. and Betz, W.J. (2003) All change at the synapse. Nature 423, 591-592. [News and Views]

Richards, D.A., Guatimosim, C., Rizzoli, S.O., and Betz, W.J. (2003) Synaptic vesicle pools at the frog neuromuscular junction. Neuron 39, 529-541.

Rizzoli, S.O. and Betz, W.J. (2004) The structural organization of the readily releaseable pool of synaptic vesicles. Science, 203, 2037-2039. [with Perspective, pp. 1986-1987]

Rizzoli, S.O. and Betz, W.J. (2005) Synaptic vesicle pools. Nature Review Neuroscience, 6, 57-70 (cover illustration).

Gaffield, M.A., Rizzoli, S.O., and Betz, W.J. (2006). Mobility of synaptic vesicles in different pools in resting and stimulated frog motor nerve terminals. Neuron, 51, 317-325.

Tabares, L., Ruiz, R., Linares-Clemente, P., Gaffield, M.A., Alvarez de Toledo, G., Fernandez-Chacón, R., Betz, W.J. (2007). Monitoring synaptic function at the neuromuscular junction of a mouse expressing synaptopHluorin. J. Neurosci., 27, 5422-5430.

Gaffield, M.A. and Betz, W.J. (2007). Synaptic vesicle mobility in mouse motor nerve terminals with and without synapsin. J. Neurosci. 27, 13691-13700.
Gaffield, M.A., Tabares, L., and Betz, W.J. (2009). The spatial pattern of exocytosis and post-exocytic mobility of synaptopHluorin in mouse motor nerve terminals. J. Physiol. 587,1187-2000 (cover illustration).
Gaffield M.A., Tabares, L., and Betz, W.J. (2009). Preferred sites of exocytosis and endocytosis colocalize during high but not lower frequency stimulation in mouse motor nerve terminals. J. Neurosci. 29: 15308- 15316.
Ruiz, R., , Cano, R., Casañas, J.J., Gaffield, M.A., Betz, W.J., and Tabares, L. (2011). Active zones and the readily releasable pool of synaptic vesicles at the neuromuscular junction of the mouse. J. Neurosci, 31, 2000-2008.
Gaffield, M.A., Romberg, C.F., and Betz, W.J. (2011) Live imaging reveals stochastic growth of bulk endocytic structures in frog motor nerve terminals. In press, J. Neurophysiol.

*Recent Invited presentations*

**2007**: Department of Pharmacology, Vanderbilt University; Biophysical Society Meeting, Baltimore (Bernard Katz Awardee); “Synaptic Transmissions” Workshop, Max Planck Institute for Biomedical Research, Heidelberg; Summer course, "Imaging structure and function in the nervous system", Cold Spring Harbor Labs, NY; **2008**: Workshop on exocytosis, Ljubljiana, Slovenia, Department of STED microscopy in Synaptic Function, European Neuroscience Institute, Goettingen; Department of Physiology, University of Iowa; Vollum Institute, OHSU, Portland. **2009**: Workshop, "Active Zones as Organizers of Neuronal Function", co-organizer and speaker, Baeza, Spain. **2010**: Hille Lecture, University of Washington. **2011**: Workshop on the Synapse, Okinawa, Japan.

**D. Research Support**

5 RO1 NS23466-17. Role: PI. 7/1/86 – 6/30/10. Optical Analysis of Synaptic Vesicle Recycling. The major goal of this project is to discover the cellular and molecular mechanisms that control the recycling of synaptic vesicles, in particular those that regulate intracellular trafficking of vesicles.

1S10RR027136-01. Role: PI. 5/1/10-5/40/11. Shared Instrumentation Grant for purchase of two microlens spinning disk confocal microscopes.

Muscular Dystrophy Association (MDA) Research Grant. 1/1/07-12/31/12. Role: PI. The project involves further characterization of the synaptopHluorin transgenic mouse.

IS10RR2674-01 Role: Major User. Shared Instrumentation Grant. For purchase of STimulated Emission Depletion (STED) microscope. D. Restrepo, PI.

1 P30 NS048154-01A1. 9/15/10 – 6/30/15. Role: Director Core A (Fluorescence Microscopy). Rocky Mountain Neurological Disorders Core Center. PI A. Ribera

5 T32 NS07083-25 Ribera (PI). 2007-2011. Role: Trainer. Advanced Training in Basic Neuroscience. The major goal of this project is to train advanced predoctoral and beginning postdoctoral fellows. PI: A. Ribera