

BIOGRAPHICAL SKETCH

NAME Mark Alan Messerli	POSITION TITLE Associate Research Scientist
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EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	YEAR(S)	FIELD OF STUDY
Purdue University, West Lafayette, IN	B.S. Honors	1992	Biology
Purdue University, West Lafayette, IN		1992-1994	Mechanical Engineering
Purdue University, West Lafayette, IN	Ph.D.	1999	Neurobiology

RESEARCH AND PROFESSIONAL EXPERIENCE

1992-1995	<u>Teaching Assistant</u> , Human Anatomy & Physiology, Purdue University W. Lafayette, IN
1997	<u>Teaching Assistant</u> , Neurophysiology, Purdue University W. Lafayette, IN
1998	<u>Teaching Assistant</u> , Physiology & Development, Purdue University W. Lafayette, IN
2000	<u>Postdoctoral Research Assistant</u> , Purdue University, W. Lafayette, IN
2001-2003	<u>NRC Postdoctoral Associate</u> , with NASA Astrobiology Institute, Josephine Bay Paul Center and NIH-NCRR BioCurrents Research Center, MBL, Woods Hole, MA
2003- 2005	<u>Research Associate</u> , NIH-NCRR BioCurrents Research Center, MBL, Woods Hole, MA
2005-2008	<u>Assistant Research Scientist</u> NIH-NCRR BioCurrents Research Center, MBL, Woods Hole, MA
2008-	<u>Associate Research Scientist</u> , Associate Director of Research for NIH-NCRR BioCurrents Research Center, MBL, Woods Hole, MA

PROFESSIONAL MEMBERSHIPS

Biophysical Society

FUNDING HISTORY

1991 Howard Hughes Summer Research Fellowship
1996-1997 Purdue University Neurosciences Fellowship
1997 Journal of Cell Science Travel Fellowship
1998-2000 Purdue Research Foundation Fellowship
2000 Marine Biological Laboratory Research Fellowship
2001-2003 NAI/NRC Postdoctoral Associateship
2004-2009 BioCurrents Research Center NIH:NCRR P41RR (authored Cores 2&3)
Submitted A Spinning Disk Microscope for live cell imaging within an integrated platform.
S10 High-End Instrumentation PAR-09-118

PUBLICATIONS

- Robinson, K.R. and Messerli, M.A.* 1996. Electric Embryos: the embryonic epithelium as a generator of developmental information. Found In: Frontiers in Neurobiology 2. Nerve Growth and Guidance, Ed. C.D. McCaig. London, Portland Press, 131-141.
- Messerli, M.A. and Robinson, K.R.* 1997. Tip localized Ca^{2+} pulses are coincident with peak pulsatile growth rates of pollen tubes of *Lilium longiflorum*. J. Cell Sci. **110**: 1269-1278.
- Messerli, M.A. and Robinson, K.R.* 1998. Cytoplasmic acidification and current influx follow growth pulses of *Lilium longiflorum* pollen tubes. Plant J. **16**(1): 87-91.
- Messerli, M.A., Danuser, G. and Robinson, K.R.* 1999. Pulsatile influxes of H^+ , K^+ and Ca^{2+} lag growth pulses of *Lilium longiflorum* pollen tubes. J. Cell Sci. **112**(10): 1497-1509.
- Messerli, M.A., Créton, R., Jaffe, L.F. and Robinson, K.R.* 2000. Periodic increases in elongation rate precede increases in cytosolic Ca^{2+} during tip growth of *Lilium longiflorum* pollen tubes. Dev. Biol. **222**(1): 84-98.
- Palmer, A.M., Messerli, M.A. and Robinson, K.R.* 2000. Neuronal galvanotropism is independent of external Ca^{2+} entry or internal Ca^{2+} gradients. J. Neurobiol. **45**(1): 30-38.
- Cessna, S.G., Messerli, M.A., Robinson, K.R. and Low, P.S.* 2001. Measurement of stress-induced Ca^{2+} pulses in single aequorin-transformed tobacco cells. Cell Calcium **30**(3): 151-156.
- Twig, G., Jung, S-K., Messerli, M.A., Smith, P.J.S. and Shirihi, O.S.* 2001. Real-time detection of reactive oxygen intermediates from single microglial cells. Biol. Bull. **201**: 261-262.
- Messerli, M.A. and Robinson, K.R.* 2003. Ionic and osmotic disruptions of the lily pollen tube oscillator: testing proposed models. Planta **217**(1): 147-57.
- Amaral Zettler, L.A., Messerli, M.A., Laatsch, A.D., Smith, P.J.S. and Sogin, M.L.* 2003. From genes to genomes, beyond biodiversity in Spain's Rio Tinto. Biol. Bull. **204**(2): 205-9.
- Bogorff DJ, Messerli M.A., Malchow RP and Smith PJ.* 2003. Development and characterization of a self-referencing glutamate-selective micro biosensor. Biol. Bull. **205**: 207-208.
- Katzman SM, Messerli M.A., Barry DT, Grossman A, Harel T, Wikstrom JD, Corkey BE, Smith PJ, Shirihi OS.* 2004. Mitochondrial metabolism reveals a functional architecture in intact islets of Langerhans from normal and diabetic *Psammomys obesus*. Am J Physiol Endocrinol Metab. **287**(6): E1090-9.
- Messerli MA, Smith PJ, Lewis RC, Robinson KR.* 2004. Chloride fluxes in lily pollen tubes: a critical reevaluation. Plant J. **40**(5): 799-812.
- Twig G, Graf SA, Messerli M.A., Smith PJ, Yoo SH, Shirihi OS.* 2005. Synergistic amplification of {beta}-amyloid- and interferon-{\gamma}-induced microglial neurotoxic response by the senile plaque component chromogranin A. Am J Physiol Cell Physiol. **288**(1):C169-C175.
- Garber SS, Messerli M.A., Hammar K, Hubert M, Indyk E and Smith PJS.* 2005. Monitoring Cl^- movement in single cells exposed to hypotonic solution. J. Memb. Biol. **203**(2):101-110.
- Messerli M.A., Amaral-Zettler LA, Zettler E, Jung S-K, Smith PJS, and Sogin ML.* 2005 Life at acidic pH imposes an increased energetic cost for a Eukaryotic Acidophile J. Exp. Biol. **208**(13):2569-2579.

- Messerli, M.A., Corson, E.D. and Smith, P.J.S** 2007 Measuring extracellular ion gradients from single channels with ion-selective microelectrodes. Biophys. J. 92(7): L52-L54.
- Monshausen, G.B., Bibikova, T.N., Messerli, M.A., Shi, C., and Gilroy, S.** 2007 Oscillations in extracellular pH and reactive oxygen species modulate tip growth of *Arabidopsis* root hairs. PNAS 104(52):20996-21001.
- Messerli, M.A., Kurtz, I. and Smith P.J.S.** 2008 Characterization of optimized Na⁺ and Cl⁻ liquid membranes for use with extracellular, self-referencing microelectrodes. Anal. Bioanal. Chem. 390(5):1355-1359.
- Monshausen, G.B., Messerli, M.A, and Gilroy, S.** 2008 Imaging of the Yellow Cameleon 3.6 Indicator Reveals That Elevations in Cytosolic Ca²⁺ Follow Oscillating Increases in Growth in Root Hairs of *Arabidopsis*. Plant Phys. 147:1690-1698.
- Huang, L. Cormie, P., Messerli, M.A., and Robinson, K.R.** 2009 The Involvement of Calcium and Integrins in Directional Responses of Zebrafish Keratocytes Exposed to Electric Fields. J. Cell. Physiol. 219:162-172.
- Messerli, M.A., Collis., L.P. and. Smith, P.J.S** (2009) Ion Trapping with Fast Response, Ion-Selective Microelectrodes Enhances Detection of Extracellular Ion Channel Gradients. Biophys. J. 96:1597-1605
- Messerli, M.A., Collis., L.P. and. Smith, P.J.S** (2009) Fast Response, Non-invasive, Potentiometric Microelectrodes Detect Single Potassium Channel Activity in the Diffusive Boundary Layer of a Single Cell Electroanalysis 21(17-18) 1906-1913.

INVITED REVIEWS

- Robinson, K.R., Wozniak, M., Pu, R. and Messerli, M.** 1999. Symmetry breaking in the zygotes of the fucoid alga: Controversies and recent progress. Curr. Topic. Dev. Biol. 44: 101-125.
- Robinson KR and Messerli MA.** 2002. Pulsating ion fluxes and growth at the pollen tube tip. Science STKE 2002(162): PE51.
- Robinson, KR and Messerli, MA.** 2003. Left/right, up/down: The role of endogenous electrical fields as directional signals in development, repair, and invasion. BioEssays 25(8): 759-66.
- Messerli, M.A., Robinson, K.R. and Smith, P.J.S.** 2006 Electrochemical sensor applications to the study of molecular physiology and analyte flux in plants. pp. 73-104. Found In. *Plant Electrophysiology Theory and Methods*. Ed. Volkov, A.G. (Springer-Verlag)
- Messerli, M.A., and Robinson, K.R.** 2007 MS channels in tip growing systems. Curr. Topics Memb. 58 (393-412).
- Smith, P.J.S., Sanger, R.H. and Messerli, M.A.** 2007 Principles, development and applications of self-referencing electrochemical microelectrodes to the determination of fluxes at cell membranes. pp. 373-405. Found in *Electrochemical Methods in Neuroscience* Eds. Michael, A.C. and Borland, L.M. CRC Press
- M.A. Messerli and Smith, P.J.S.** (submitted). Theory, construction and practical considerations for using self-referencing of Ca²⁺-selective microelectrodes for monitoring extracellular Ca²⁺ gradients. In: *Methods in Cell Biology- A Practical Guide to the Study of Calcium in Living Cells*. Ed. Michael Whitaker.
- Smith, P.J.S, Collis, L.P. and Messerli, M.A.** (submitted). Cell signatures written in the boundary layers: windows to the cell BioEssays

POSTER ABSTRACTS

- Messerli M, and Robinson, K.R.** (1997) Physiological control of pulsing $[Ca^{2+}]$ during pulsatile tip growth of *Lilium longiflorum* pollen tubes. Mol. Biol. Cell 8: 164-164 Suppl.
- Messerli M, Robinson KR** (1997) Endogenous electrical fields affect the distribution of extracellular protein in *Xenopus* embryos. Mol. Biol. Cell 8: 1296-1296 Suppl.
- Palmer AM, Messerli M, Robinson KR** (1997) The role of calcium in *Xenopus laevis* neurite outgrowth in an applied electric field. Mol. Biol. Cell 8: 1937-1937 Suppl.
- Messerli, M.A. and Robinson, K.R.** (1998) Oscillations in cytosolic Ca^{2+} and H^+ lag tip growth in *Lilium longiflorum* pollen tubes. Gordon Research Conference: Developmental Physiology, Plymouth, NH.
- Messerli, M.A., Amaral-Zettler, L.A., Smith, P.J.S. and Sogin, M.L.** (2001). Cytosolic pH maintenance in eukaryotic acidophiles. Astrobiology 1(3): 334-335.
- Messerli, M.A., Sanger, R.H. and Smith, P.J.S** (2002) Measuring Faster Physiological Events with Self-Referencing Electrochemical Probes. NIH BioEngineering Consortium (BECON) Sensors in Biological Research and Medicine, Bethesda, MD.
- Messerli, M.A., Amaral-Zettler, L.A., Smith, P.J.S. & Sogin, M.L.** (2002). Biochemical mechanisms for surviving in acid. 2nd Astrobiology Science Conference, NASA Ames Research Center, Moffett Field, CA.
- Amaral-Zettler, L.A., Messerli, M., Laatsch, A. & Sogin, M.L.** (2002). Adaptations of unicellular Eukaryotes to extremely acidic environments. 2nd Astrobiology Science Conference, NASA Ames Research Center, Moffett Field, CA.
- Garber S.S., Messerli M.A., Hammar K. and Smith P.J.S.** (2003). Following Cl^- movement during cell volume regulation using modulation of ion selective electrodes. Biophys. J. 84(2): 484A-484A Suppl. S
- Garber, S.S., Messerli, M.A., Hammar, K., Huybert, M.D., Indyk, E., and Smith, P.J.S.** (2003) Cl^- flux during cell volume regulation recorded using modulation of ion-selective electrodes. J. Gen. Physiol. 122 (1): 33A-33A
- Garber, S.S., Messerli, M.A., Hammar, K., Huybert, M.D., Indyk, E., and Smith, P.J.S.** (2004) Measuring volume regulated chloride flux in single cells. Biophys. J. 86(1) 286A-286A. Suppl. S.
- Messerli, M.A. and Smith, P.J.S.** (2007). Ionic profiles in the boundary layer reveal single channel and non-electrogenic transporter activity. Biophys. J. 316A-316A Suppl. S.
- Messerli, M.A., Kurtz, I. and Smith, P.J.S.** (2008). Detection of extracellular ion gradients enables characterization and functional mapping of ion channels and transporters. FASEB J. 22:937.30
- Messerli, M.A., Collis, L.P., Kurtz, I. and Smith, P.J.S.** (2008) Electrochemical Detection of Ion Gradients in the Boundary Layer Enables Characterization and Functional Mapping of Ion Channels and Transporters. American Society of Nephrology, Renal Week November 4 – 9.

INVITED TALKS

1999 Wabash College, Crawfordsville, IN “Ion dynamics during oscillating growth of *Lilium longiflorum* pollen tubes.”

1999 Ohio State University, Columbus, OH “Ion dynamics during oscillating growth of *Lilium longiflorum* pollen tubes.”

2000 Marine Biological Laboratory Fellows Lecture (MBL Wood Hole, MA) “Physiological and molecular adaptations in eukaryotic acidophiles.”

2002 Harvard University, Boston, MA. “Real-time, redox coupled measurement of drug transport by multidrug resistant transporters from *Leishmania enrietti* and *Plasmodium falciparum*”

2002 Bay Paul Center Site Review (MBL, Woods Hole, MA) “Maintenance of the transmembrane pH gradient in a eukaryotic acidophile is an active process”

2002 NASA AI Executive Council Meeting, (Penn State U., University Park, PA) “Maintenance of the transmembrane pH gradient in a eukaryotic acidophile is an active process”

2004 BioCurrents Center Site Review (MBL Woods Hole, MA) “Monitoring faster physiological events with electrochemical detection” and “Real-time kinetic analysis of drug transport”

2004 Gordon Research Conference, Mechanisms of Toxicity, (Colby College Waterville, ME) "Real-time and high resolution studies on molecular transport and cellular reactivity using electrochemistry."

2006 2nd Pan American Plant Membrane Biology Workshop (South Padre Island, TX) “Ion dynamics during oscillating growth of *Lilium longiflorum* pollen tubes.”

2009 BioCurrents Center Site Review (MBL, Woods Hole, MA) “Expanding self-referencing with multi-analyte detection and constrained diffusion”

SCIENTIFIC COMMUNITY SERVICE

Scientific Journal Reviewer for: Neuroscience Letters, Plant Cell, Plant Physiology, New Phytologist, Carbon, Biological Bulletin

Marine Biological Laboratory Fellowship Review Committee 2009

Science Fair Judge

St. Boniface Middle School, 1998

Indiana Regional Science Fair 1998, 1999