Stanford



Uel Jackson McMahan

Professor of Neurobiology and of Structural Biology, Emeritus

Department of Neurobiology

Bio

ACADEMIC APPOINTMENTS

- Emeritus Faculty, Acad Council, Department of Neurobiology
- Member, Bio-X
- Member, Wu Tsai Neurosciences Institute

ADMINISTRATIVE APPOINTMENTS

- Director, Neurosciences Program, (1986-1991)
- Chairman, Department of Neurobiology, (1987-1992)
- Chairman, Committee on Graduate Studies, (1989-1990)
- Member, Administrative Panel for Laboratory Animal Care (APLAC), (1999-2005)
- Member, Appointments and Promotions (A&P) Committee, School of Medicine, (2005-2008)

HONORS AND AWARDS

- Prix (Plasticite Neuronale): shared with G. Fischbach (Harvard) and H.Betz (MPI, Frankfurt), Fondation IPSEN/Fondation de France (1998)
- Alumni Achievement Award, Westminster College, Fulton, MO (1996)
- Jacob Javits Neurosciences Investigator Award, NIH (1991-1998)
- Jacob Javits Neurosciences Investigator Award, NIH (1984-1991)
- Research Career Development Award, NIH (1973-1977)

PROFESSIONAL EDUCATION

- B.A., Westminster College, Fulton, MO , Biology (1960)
- Ph.D., U Tennessee Med Units, Memphis,TN , Anatomy (1964)

COMMUNITY AND INTERNATIONAL WORK

- Visiting Lecture Team Program, Economically underdeveloped nations

LINKS

- Uel Jackson McMahan Laboratory: http://mcmahan.stanford.edu/index.html

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

We use three-dimensional reconstructions of tissue sections generated by electron microscope tomography to study the organization and behavior of macromolecules at the nervous system's synapses. The information we obtain provides insights unobtainable in any other way about the molecular mechanisms involved in synaptic impulse transmission and the sequence of steps in synapse formation. To augment our studies we are developing methods for localizing known proteins to specific macromolecules observed by tomography and for the quantitative analysis of tomographic data, technologies that can be applied to the investigation of macromolecules in any tissue.

Teaching

GRADUATE AND FELLOWSHIP PROGRAM AFFILIATIONS

- Biophysics (PhD Program)
- Neurosciences (PhD Program)

Publications

PUBLICATIONS

- **Active Zone Material-Directed Orientation, Docking, and Fusion o f Dense Core Vesicles Alongside Synaptic Vesicles at Neuromuscular Junctions** *FRONTIERS IN NEUROANATOMY*
  Jung, J. H., Szule, J. A., Stouder, K., Marshall, R. M., McMahan, U. J.
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- **Variable priming of a docked synaptic vesicle** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
  Jung, J. H., Szule, J. A., Marshall, R. M., McMahan, U. J.
  2016; 113 (8): E1098-E1107
- **Alignment of synaptic vesicle macromolecules with the macromolecules in active zone material that direct vesicle docking.** *PloS one*
  Harlow, M. L., Szule, J. A., Xu, J., Jung, J. H., Marshall, R. M., McMahan, U. J.
  2013; 8 (7)
- **Alignment of Synaptic Vesicle Macromolecules with the Macromolecules in Active Zone Material that Direct Vesicle Docking.** *PloS one*
  Harlow, M. L., Szule, J. A., Xu, J., Jung, J. H., Marshall, R. M., McMahan, U. J.
  2013; 8 (7)
- **Regulation of Synaptic Vesicle Docking by Different Classes of Macromolecules in Active Zone Material** *PLOS ONE*
  Szule, J. A., Harlow, M. L., Jung, J. H., De-Miguel, F. F., Marshall, R. M., McMahan, U. J.
  2012; 7 (3)
- **Macromolecular Connections of Active Zone Material to Docked Synaptic Vesicles and Presynaptic Membrane at Neuromuscular Junctions of Mouse** *JOURNAL OF COMPARATIVE NEUROLOGY*
  Nagwaney, S., Harlow, M. L., Jung, J. H., Szule, J. A., Ress, D., Xu, J., Marshall, R. M., McMahan, U. J.
  2009; 513 (5): 457-468
- **Methods for generation high-resolution structural models from electron microscope tomography data.** *Structure*
  D.B. Ress, M.L. Harlow, R.M. Marshall, U.J. McMahan
  2004; 12 (10): 1763-1774
- **Optimization method for isodensity surface models obtained with electron microscope tomography data** *25th Annual International Conference of the IEEE-Engineering-in-Medicine-and-Biology-Society*
  Ress, D., Harlow, M. L., Marshall, R. M., McMahan, U. J.
  IEEE.2003: 774–777

- **Macromolecular architecture of presynaptic apparatus as revealed by electron microscope tomography**
  McMahan, U. J.
  BIOPHYSICAL SOCIETY.2002: 339A

- **The architecture of active zone material at the frog's neuromuscular junction** *NATURE*
  Harlow, M. L., Ress, D., Stoschek, A., Marshall, R. M., McMahan, U. J.
  2001; 409 (6819): 479-484

- **Regulation of the size and distribution of agrin-induced postsynaptic-like apparatus in adult skeletal muscle by electrical muscle activity** *MOLECULAR AND CELLULAR NEUROSCIENCE*
  Mathiesen, I., Rimer, M., Ashtari, O., Cohen, I., McMahan, U. J., Lomo, T.
  1999; 13 (3): 207-217

- **Automatic acquisition of fiducial markers and alignment of images in tilt series for electron tomography** *JOURNAL OF ELECTRON MICROSCOPY*
  Ress, D., Harlow, M. L., Schwarz, M., Marshall, R. M., McMahan, U. J.
  1999; 48 (3): 277-287

- **Neuregulins and erbB receptors at neuromuscular junctions and at agrin-induced postsynaptic-like apparatus in skeletal muscle** *MOLECULAR AND CELLULAR NEUROSCIENCE*
  Rimer, M., Cohen, I., Lomo, T., Burden, S. J., McMahan, U. J.
  1998; 12 (1-2): 1-15

- **Dissection of active zones at the neuromuscular junction by EM tomography** *JOURNAL OF PHYSIOLOGY-PARIS*
  Harlow, M., Ress, D., Koster, A., Marshall, R. M., Schwarz, M., McMahan, U. J.
  1998; 92 (2): 75-78

- **Ligands for ErbB-family receptors encoded by a neuregulin-like gene** *NATURE*
  Chang, H., Riese, D. J., Gilbert, W., Stern, D. F., McMahan, U. J.
  1997; 387 (6632): 509-512

- **GLOBULAR AND ASYMMETRIC ACETYLCHOLINESTERASE IN THE SYNAPTIC BASAL LAMINA OF SKELETAL-MUSCLE** *JOURNAL OF CELL BIOLOGY*
  Anglister, L., Haesaert, B., McMahan, U. J.
  1994; 125 (1): 183-196

- **ISOLATION AND CHARACTERIZATION OF A CDNA THAT ENCODES AN AGRIN HOMOLOG IN THE MARINE RAY** *MOLECULAR AND CELLULAR NEUROSCIENCE*
  Smith, M. A., MAGILLSOLC, C., Rupp, F., Yao, Y. M., SCHILLING, J. W., Snow, P., McMahan, U. J.
  1992; 3 (5): 406-417

- **Agrin isoforms and their role in synaptogenesis.** *Current opinion in cell biology*
  McMahan, U. J., HORTON, S. E., Werle, M. J., Honig, L. S., Kröger, S., Ruegg, M. A., Escher, G.
  1992; 4 (5): 869-874

- **AGRIN RELEASED BY MOTOR NEURONS INDUCES THE AGGREGATION OF ACETYLCHOLINE-RECEPTORS AT NEUROMUSCULAR-JUNCTIONS** *NEURON*
  Reist, N. E., Werle, M. J., McMahan, U. J.
  1992; 8 (5): 865-868

- **THE AGRIN GENE CODES FOR A FAMILY OF BASAL LAMINA PROTEINS THAT DIFFER IN FUNCTION AND DISTRIBUTION** *NEURON*
  Ruegg, M. A., Tsim, K. W., HORTON, S. E., Kroger, S., Escher, G., GENSCH, E. M., McMahan, U. J.
  1992; 8 (4): 691-699

- **CDNA THAT ENCODES ACTIVE AGRIN** *NEURON*
  Tsim, K. W., Ruegg, M. A., Escher, G., Kroger, S., McMahan, U. J.
  1992; 8 (4): 677-689

- **MOLECULES THAT INDUCE THE FORMATION OF SYNAPTIC APPARATUS** *MEETING ON PLASTICITY OF MOTONEURONAL CONNECTIONS*
  Werle, M. J., McMahan, U. J.

ELSEVIER SCIENCE PUBL B V.1991: 269–273

- **SYNTHESIS AND TRANSPORT OF AGRIN-LIKE MOLECULES IN MOTOR NEURONS** *DISCUSSION MEETING ON SYNAPSE FORMATION*
  MAGILLSOLC, C., McMahan, U. J.
  COMPANY OF BIOLOGISTS LTD.1990: 1–10
- **AGRIN-LIKE MOLECULES IN MOTOR NEURONS** *13TH GIF CONF ON NEUROBIOLOGY : EXPRESSION AND ASSEMBLY OF A FUNCTIONAL NEURON*
  MAGILLSOLC, C., McMahan, U. J.
  MASSON EDITEUR.1990: 78–81
- **MOLECULES IN BASAL LAMINA THAT DIRECT THE FORMATION OF SYNAPTIC SPECIALIZATIONS AT NEUROMUSCULAR-JUNCTIONS** *DEVELOPMENTAL NEUROSCIENCE*
  McMahan, U. J., Wallace, B. G.
  1989; 11 (4-5): 227-247
- **MOTOR NEURONS CONTAIN AGRIN-LIKE MOLECULES** *JOURNAL OF CELL BIOLOGY*
  MAGILLSOLC, C., McMahan, U. J.
  1988; 107 (5): 1825-1833
- **IDENTIFICATION OF AGRIN, A SYNAPTIC ORGANIZING PROTEIN FROM TORPEDO ELECTRIC ORGAN** *JOURNAL OF CELL BIOLOGY*
  Nitkin, R. M., Smith, M. A., Magill, C., Fallon, J. R., Yao, Y. M., Wallace, B. G., McMahan, U. J.
  1987; 105 (6): 2471-2478
- **AGRIN-LIKE MOLECULES AT SYNAPTIC SITES IN NORMAL, DENERVATED, AND DAMAGED SKELETAL-MUSCLES** *JOURNAL OF CELL BIOLOGY*
  Reist, N. E., Magill, C., McMahan, U. J.
  1987; 105 (6): 2457-2469
- **IDENTIFICATION OF AGRIN IN ELECTRIC ORGAN EXTRACTS AND LOCALIZATION OF AGRIN-LIKE MOLECULES IN MUSCLE AND CENTRAL-NERVOUS-SYSTEM** *JOURNAL OF EXPERIMENTAL BIOLOGY*
  Smith, M. A., Yao, Y. M., Reist, N. E., Magill, C., Wallace, B. G., McMahan, U. J.
  1987; 132: 223-230
- **Agrin** *PROGRESS IN BRAIN RESEARCH <D>*
  Magill, C., Reist, N. E., Fallon, J. R., Nitkin, R. M., Wallace, B. G., McMahan, U. J.
  1987; 71: 391-396
- **CELL ACCUMULATION IN THE JUNCTIONAL REGION OF DENERVATED MUSCLE** *JOURNAL OF CELL BIOLOGY*
  Connor, E. A., McMahan, U. J.
  1987; 104 (1): 109-120
- **AGGREGATES OF ACETYLCHOLINESTERASE INDUCED BY ACETYLCHOLINE RECEPTOR AGGREGATING FACTOR** *NATURE*
  Wallace, B. G., Nitkin, R. M., Reist, N. E., Fallon, J. R., Moayeri, N. N., McMahan, U. J.
  1985; 315 (6020): 574-577
- **BASAL LAMINA DIRECTS ACETYLCHOLINESTERASE ACCUMULATION AT SYNAPTIC SITES IN REGENERATING MUSCLE** *JOURNAL OF CELL BIOLOGY*
  Anglister, L., McMahan, U. J., Marshall, R. M.
  1985; 101 (3): 735-743
- **ACETYLCHOLINE RECEPTOR AGGREGATING FACTOR IS SIMILAR TO MOLECULES CONCENTRATED AT NEUROMUSCULAR-JUNCTIONS** *NATURE*
  Fallon, J. R., Nitkin, R. M., Reist, N. E., Wallace, B. G., McMahan, U. J.
  1985; 315 (6020): 571-574
- **COMPONENTS OF TORPEDO ELECTRIC ORGAN AND MUSCLE THAT CAUSE AGGREGATION OF ACETYLCHOLINE-RECEPTORS ON CULTURED MUSCLE-CELLS** *JOURNAL OF CELL BIOLOGY*
  Godfrey, E. W., Nitkin, R. M., Wallace, B. G., Rubin, L. L., McMahan, U. J.
  1984; 99 (2): 615-627

- **EXTRACELLULAR-MATRIX COMPONENTS INVOLVED IN NEUROMUSCULAR-TRANSMISSION AND REGENERATION** *CIBA FOUNDATION SYMPOSIA*
  Anglister, L., McMahan, U. J.
  1984; 108: 163-178

- **THE INFLUENCE OF BASAL LAMINA ON THE ACCUMULATION OF ACETYLCHOLINE-RECEPTORS AT SYNAPTIC SITES IN REGENERATING MUSCLE** *JOURNAL OF CELL BIOLOGY*
  McMahan, U. J., Slater, C. R.
  1984; 98 (4): 1453-1473

- **MOLECULAR-COMPONENTS OF THE SYNAPTIC BASAL LAMINA THAT DIRECT DIFFERENTIATION OF REGENERATING NEUROMUSCULAR-JUNCTIONS** *COLD SPRING HARBOR SYMPOSIA ON QUANTITATIVE BIOLOGY*
  Nitkin, R. M., Wallace, B. G., Spira, M. E., Godfrey, E. W., McMahan, U. J.
  1983; 48: 653-665

- **FACTORS THAT INFLUENCE REGENERATION OF THE NEUROMUSCULAR-JUNCTION** *JOURNAL OF EXPERIMENTAL BIOLOGY*
  McMahan, U. J., EDGINGTON, D. R., Kuffler, D. P.
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- **ACETYLCHOLINE RECEPTORS IN REGENERATING MUSCLE ACCUMULATE AT ORIGINAL SYNAPTIC SITES IN THE ABSENCE OF THE NERVE** *JOURNAL OF CELL BIOLOGY*
  Burden, S. J., Sargent, P. B., McMahan, U. J.
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