

# ***Curriculum Vitae***

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## **EDUCATION**

Oberlin College: B.A. in Biology, 1970, Honors Research with Dr. Richard Levin  
University of Washington: Ph.D., 1974, Department of Physiology and Biophysics  
Laboratory of Dr. Bertil Hille  
Postdoctoral Training: University of Rochester, 1975. Department of Physiology,  
University of Pennsylvania, 1976-77. Marine Biological Lab, Woods Hole, MA  
Laboratory of Dr. Clay M. Armstrong

## **FACULTY POSITIONS**

University of California, Irvine, California, Dept. of Physiology and Biophysics  
Assistant Professor, 1977  
Associate Professor, 1983  
Professor, 1985  
Chair 1991-1995, 2007-present  
Distinguished Professor, 2010-present

## **HONORS**

Phi Beta Kappa (junior year), 1969  
Graduated Magna Cum Laude, 1970  
Muscular Dystrophy Postdoc Award, 1976  
NIH Research Career Development Award, 1982  
Alexander von Humboldt Prize, Senior Scientist Award, Max Planck Institute for  
Biophysical Chemistry, Göttingen, West Germany, 1990  
Athalie Clark Research Achievement Award, UCI, 1997  
Kenneth S. Cole Award for Membrane Biophysics, Biophysical Society, 2000  
Javits Neuroscience Investigator Award, NINDS, 2006-13  
Henry Kunkel Society, elected 2008  
Excellence in Teaching Award from medical students, 2009, 2011, 2013  
U.S. National Academy of Sciences, elected 2010  
UCI Distinguished Faculty Award for Research, 2011

## **PROFESSIONAL MEMBERSHIP and EDITORIAL BOARD SERVICE**

Biophysical Society member since 1974  
Biophysical Journal Editorial Board 1996-2003  
Council Member 2008-10  
Society of General Physiologists member since 1979  
President 1999  
Journal of General Physiology Editorial Board 1988-98; Advisory Editor 2002-  
Physiological Reviews Editorial Board 2002-07  
Society for Neuroscience member 1990-2008  
American Association of Immunologists member 2007-present

## **UCI AFFILIATIONS**

Member: Institute for Immunology, Cancer Center; Center for Biomembrane Systems

## **GENERAL RESEARCH INTERESTS**

Ion Channels in the Immune System; Calcium Signaling; Immunoimaging.

## PUBLICATIONS

1. Cahalan, M. 1974. Modifications of sodium channel gating by neurotoxins. Doctoral dissertation. The University of Washington. University Microfilms, Inc., Ann Arbor, Michigan.
2. Cahalan, M. 1975. Modification of sodium channel gating in frog myelinated nerve fibres by *Centruroides sculpturatus* scorpion venom. *Journal of Physiology* 244: 511-534. PMID: 1079869.
3. Cahalan, M. and T. Begenisich. 1976. Sodium channel selectivity: dependence on internal permeant ion concentration. *Journal of General Physiology* 68: 111-125. PMID: 956766.
4. Cahalan, M. 1978. Voltage clamp studies on the node of Ranvier, pp. 155-168 in Physiology and Pathobiology of Axons. S.G. Waxman (Ed.), Raven Press, New York.
5. Cahalan, M. 1978. Local anesthetic block of sodium channels in normal and pronase-treated squid giant axons. *Biophysical Journal* 23: 285-311. PMID: 687766.
6. Begenisich, T. and M. Cahalan. 1978. Nonindependence and selectivity in sodium channels, pp. 113-122 in Membrane Transport Processes, Vol. 3: Ion Permeation through Membrane Channels. C.F. Stevens and R.W. Tsien (Eds.), Raven, New York.
7. Cahalan M. and W. Almers. 1979. Interactions between quaternary lidocaine, the sodium channel gates and tetrodotoxin. *Biophysical Journal* 27: 39-56. PMID: 233568.
8. Cahalan, M. and W. Almers. 1979. Block of sodium conductance and gating current in squid giant axons poisoned with quaternary strychnine. *Biophysical Journal* 27: 57-74. PMID: 233569.
9. Begenisich, T.B. and M.D. Cahalan. 1980. Sodium channel permeation I: reversal potential experiments. *Journal of Physiology* 307: 217-242. PMID: 6259334.
10. Begenisich, T.B. and M.D. Cahalan. 1980. Sodium channel permeation II: nonindependence and current-voltage relations. *Journal of Physiology* 307: 243-257. PMID: 6259335.
11. Cahalan, M.D. 1980. Molecular properties of sodium channels in excitable membranes, pp. 1-47 in Cell Surface Reviews VI: The Cell Surface and Neuronal Function. C. Cotman, G. Poste, and G. Nicolson (Eds.), Elsevier.
12. Cahalan, M.D., W. Almers, and B.I. Shapiro. 1980. Relationship between inactivation of sodium channels and block by quaternary derivatives of local anesthetics and other compounds, pp. 17-33 in Molecular Mechanism of Anesthesia (Progress in Anesthesiology, Vol. 2). B.R. Fink (Ed.), Raven, New York.
13. Almers, W. and M. Cahalan. 1980. Block of sodium channels by internally applied drugs: two receptors for tertiary and quaternary amine compounds. Adv. Physiol. Sci. Vol. 4: 67-74, Physiology of excitable membranes. J. Salanki (Ed.). Pergamon Press.
14. Cahalan, M.D. and P.A. Pappone. 1981. Chemical modification of sodium channel surface charges in frog skeletal muscle by trinitrobenzene sulfonic acid. *Journal of Physiology* 321: 127-139. PMID: 6279821.
15. Strichartz, G., R. Hahin, and M. Cahalan. 1981. Pharmacological models for sodium channels producing abnormal impulse activity. pp 98-129 in Abnormal Nerves and Muscles as Impulse Generators. Oxford University Press, London.
16. Hall, J.E. and M.D. Cahalan. 1982. Calcium-induced inactivation of alamethicin in asymmetric lipid bilayers. *Journal of General Physiology* 79: 387-409. PMID: 7077290.
17. Cahalan, M.D. and Hall, J.E. 1982. Alamethicin channels incorporated into frog node of Ranvier: Calcium-induced inactivation and membrane surface charges. *Journal of General Physiology* 79: 411-436. PMID: 6281358.
18. Cahalan, M.D. and P.A. Pappone. 1983. Chemical modification of potassium channel gating in frog myelinated nerve by trinitrobenzene sulfonic acid. *Journal of Physiology* 342: 119-143. PMID: 6313907.
19. DeCoursey, T.E., K.G. Chandy, S. Gupta, and M.D. Cahalan. 1984. Voltage-gated K channels in human T lymphocytes: a role in mitogenesis? *Nature* 307: 465-468. (cover illustration). PMID: 6320007.

20. Pappone, P.A. and M.D. Cahalan. 1984. Chemical modification of potassium channels in myelinated nerve fibers: treatment with TNBS or high pH causes resistance to block by 4-aminopyridine. *Biophysical Journal* 45: 62-64. PMID: 19431567.
21. Chandy, K.G., T.E. DeCoursey, M.D. Cahalan, C. McLaughlin, S. Gupta. 1984. Voltage-gated potassium channels are required for human T lymphocyte activation. *Journal of Experimental Medicine* 160: 369-385. PMID: 6088661.
22. Pappone, P.A. and M.D. Cahalan. 1985. Demyelination as a test for a mobile Na channel modulator in frog node of Ranvier. *Biophysical Journal* 47: 217-233. PMID: 2579686.
23. Cahalan, M.D., K.G. Chandy, T.E. DeCoursey, and S. Gupta. 1985. A voltage-gated K<sup>+</sup> channel in human T lymphocytes. *Journal of Physiology* 358: 197-237. PMID: 2580081.
24. Chandy, K.G., T.E. DeCoursey, M.D. Cahalan, and S. Gupta. 1985. Ion channels in lymphocytes. *Journal of Clinical Immunology* 5: 1-6. PMID: 2579969.
25. Chandy, K.G., T.E. DeCoursey, M.D. Cahalan, and S. Gupta. 1985. Electroimmunology: the physiological role of ion channels in the immune system. *Journal of Immunology* 135: 787-791. PMID: 2409167.
26. DeCoursey, T.E., K.G. Chandy, S. Gupta, and M.D. Cahalan. 1985. Voltage-dependent ion channels in T lymphocytes. *Journal of Neuroimmunology* 10: 71-85. PMID: 2414315.
27. Gupta, S., K.G. Chandy, B. Vayuvegula, T.E. DeCoursey, and M.D. Cahalan. 1985. Role of potassium channels in interleukin-1 and interleukin-2 synthesis, and interleukin-2 receptor expression. pp. 39-44 in Cellular and Molecular Biology of Lymphokines. Academic Press, San Diego.
28. Pappone, P.A. and M.D. Cahalan. 1986. Ion permeation in cell membranes. pp 249-272 in Physiology of Membrane Disorders, T.E. Andreoli, J.F. Hoffman, D.D. Fanestil and S.G. Schultz, eds., Plenum, New York.
29. Chandy, K.G., T.E. DeCoursey, M. Fischbach, N. Talal, M.D. Cahalan, and S. Gupta. 1986. Altered K<sup>+</sup> channel expression in abnormal T lymphocytes from mice with the *lpr* gene mutation. *Science* 233: 1197-1200. PMID: 2426784.
30. DeCoursey, T.E., K.G. Chandy, S. Gupta, and M.D. Cahalan. 1987. Two types of potassium channels in murine T lymphocytes. *Journal of General Physiology* 89: 379-404. PMID: 2435844.
31. DeCoursey, T.E., K.G. Chandy, S. Gupta, and M.D. Cahalan. 1987. Mitogen induction of ion channels in murine T lymphocytes. *Journal of General Physiology* 89: 405-420. PMID: 2435845.
32. Cahalan, M.D., K.G. Chandy, T.E. DeCoursey, S. Gupta, R. Lewis, and J. Sutro. 1987. Ion channels in T lymphocytes. *Advances in Experimental Medicine and Biology* 213: 85-102. PMID: 2442978.
33. Pappone, P.A. and M.D. Cahalan. 1987. Pandinus imperator scorpion venom blocks voltage-gated potassium channels in nerve fibers. *Journal of Neuroscience* 7: 3300-3305. PMID: 2444679.
34. Lewis, R.S. and M.D. Cahalan. 1988. Subset-specific expression of potassium channels in developing murine T lymphocytes. *Science* 239: 771-775. (cover illustration). PMID: 2448877.
35. Cahalan, M.D. and R.S. Lewis. 1988. Role of potassium and chloride channels in volume regulation by T lymphocytes. *Society of General Physiology Ser.* 43: 282-301. PMID: 2479106.
36. Lewis, R.S. and M.D. Cahalan. 1988. The plasticity of ionic channels: parallels between the nervous and immune systems. *Trends in Neuroscience* 11: 214-218. PMID: 2471326.
37. Grissmer, S., M.D. Cahalan, and K.G. Chandy. 1988. Abundant expression of type I K<sup>+</sup> channels: a marker for lymphoproliferative diseases? *Journal of Immunology* 141: 1137-1142. PMID: 2456342.
38. Sutro, J.B., B.S. Vayuvegula, S. Gupta, and M.D. Cahalan. 1989. Voltage-sensitive ion channels in human B lymphocytes. *Advances in Experimental Medicine and Biology* 254: 113-122. PMID: 2816543.
39. Grissmer, S. and M.D. Cahalan. 1989. TEA prevents inactivation while blocking open K<sup>+</sup> channels in human T lymphocytes. *Biophysical Journal* 55: 203-206. PMID: 2784693.

40. Grissmer, S. and M.D. Cahalan. 1989. Divalent ion trapping inside potassium channels of human T lymphocytes. *Journal of General Physiology* 93: 609-630. PMID: 2786551.
41. Sands, S.B., R.S. Lewis, and M.D. Cahalan. 1989. Charybdotoxin blocks voltage-gated K<sup>+</sup> channels in human and murine T lymphocytes. *Journal of General Physiology* 93: 1061-1074. PMID: 2475579.
42. Lewis, R.S. and M.D. Cahalan. 1989. Mitogen-induced oscillations of cytosolic Ca<sup>2+</sup> and transmembrane Ca<sup>2+</sup> current in human leukemic T cells. *Cell Regulation* 1: 99-112. PMID: 2519622.
43. Chandy, K.G., M.D. Cahalan, and S. Grissmer. 1990. Autoimmune diseases linked to abnormal K<sup>+</sup> channel expression in double-negative CD4<sup>-</sup> CD8<sup>-</sup> T cells. *European Journal of Immunology* 20: 747-751. PMID: 1971790.
44. Lewis, R.S. and M.D. Cahalan. 1990. Ion channels and calcium signaling in single mitogen-stimulated T lymphocytes. *UCLA Symposia on Molecular and Cellular Biology* 113: 125-132.
45. McCloskey, M.A. and M.D. Cahalan. 1990. G-protein control of potassium channel activity in a mast cell line. *Journal of General Physiology* 95: 205-227. PMID: 2106571.
46. Lewis, R.S. and M.D. Cahalan. 1990. Ion channels and signal transduction in lymphocytes. *Annual Review of Physiology* 52: 415-430. PMID: 1691906.
47. Cahalan, M.D. and R.S. Lewis. 1990. Functional roles of ion channels in lymphocytes. *Seminars in Immunology* 2: 107-117. PMID: 1717052.
48. Grissmer, S., B. Dethlefs, J. Wasmuth, A.L. Goldin, G.A. Gutman, M.D. Cahalan, and K.G. Chandy. 1990. Expression and chromosomal localization of a lymphocyte K<sup>+</sup> channel gene. *Proceedings of the National Academy of Sciences U.S.A.* 87: 9411-9415. PMID: 2251283.
49. Grissmer, S., D. Hanson, P. Natale, M.D. Cahalan, and K.G. Chandy. 1990. CD4<sup>-</sup> CD8<sup>-</sup> T cells from mice with collagen arthritis display aberrant expression of type I K<sup>+</sup> channels. *Journal of Immunology* 145: 2105-2109. PMID: 1975826.
50. Cahalan, M.D., K.G. Chandy, and S. Grissmer. 1992. Potassium channels in development, activation, and disease in T lymphocytes. pp. 357-394 in Current Topics in Membranes, Vol. 39, Developmental Biology of Membrane Transport Systems. D.J. Benos (ed.) Academic Press, San Diego.
51. Cahalan, M.D. and E. Neher. 1992. Patch clamp techniques: an overview. *Methods Enzymol.* 207: 3-14. PMID: 1382186
52. Grissmer, S., R.S. Lewis, and M.D. Cahalan. 1992. Ca<sup>2+</sup>-activated K<sup>+</sup> channels in human leukemic T cells. *Journal of General Physiology* 99: 1-23. PMID: 1371308.
53. Osipchuk, Y. and M. Cahalan. 1992. Cell-to-cell spread of calcium signals mediated by ATP receptors in a mast cell line. *Nature* 359: 241-244. PMID: 1388246.
54. Grissmer, S., S. Ghanshani, B. Dethlefs, J. McPherson, J. Wasmuth, G. Gutman, M.D. Cahalan, and K.G. Chandy. 1992. The *Shaw*-related potassium-channel gene, Kv3.1, on human chromosome 11, encodes the type I K<sup>+</sup> channel in T Cells. *Journal of Biological Chemistry* 267: 20971-20979. PMID: 1400413.
55. Hess, S., M. Oortgiesen, and M.D. Cahalan. 1993 Calcium oscillations in human T and natural killer cells depend upon membrane potential and calcium influx. *Journal of Immunology* 150: 2620-2633. PMID: 7681076.
56. Lewis, S., P. Ross, and M.D. Cahalan. 1993. Chloride channels activated by osmotic stress in T lymphocytes. *Journal of General Physiology* 101: 801-826. PMID: 7687269.
57. Ross, P., S. Garber, and M.D. Cahalan. 1993. Membrane chloride conductance and capacitance in Jurkat T lymphocytes during osmotic swelling. *Biophysical Journal* 66: 169-178. PMID: 8130336.
58. Grissmer, S., A.N. Nguyen, and M.D. Cahalan. 1993 Calcium-activated potassium channels in resting and activated human T lymphocytes. *Journal of General Physiology* 102: 601-630. PMID: 7505804.
59. Negulescu, P., N. Shastri, and M.D. Cahalan. 1994. Intracellular calcium dependence of IL-2 gene expression in single T lymphocytes. *Proceedings of the National Academy of Sciences U.S.A.* 91: 2873-2877. PMID: 8146203.

60. Cahalan, M.D. and R.S. Lewis. 1994. Regulation of chloride channels in lymphocytes. pp. 103-129 in Current Topics in Membranes Vol. 42. Chloride Channels. William Guggino (ed.), Academic Press, San Diego.
61. Ehring, G. R., Y.V. Osipchuk, and M.D. Cahalan. 1994. Swelling-activated chloride channels in multidrug-sensitive and -resistant cells. *Journal of General Physiology* 104: 1129-1161. PMID: 7699367.
62. Cahalan, M.D., Ehring G.R., and Y.V. Osipchuk. 1994. Volume-sensitive  $\text{Cl}^-$  channels in lymphocytes and multidrug-resistant cell lines. *Japanese Journal of Physiology* 44, S25 - S30. PMID: 7752536.
63. Lewis, R.S. and M.D. Cahalan. 1995. Potassium and calcium channels in lymphocytes. *Annual Review of Immunology* 13: 623-653. PMID: 7612237.
64. Verheugen, J.A.H., H.P.M. Vijverberg, M. Oortgiesen, and M.D. Cahalan. 1995. Voltage-gated and  $\text{Ca}^{2+}$ -activated  $\text{K}^+$  channels in intact human T lymphocytes. *Journal of General Physiology* 13: 765-794. PMID: 7561743
65. Ross, P.E. and M.D. Cahalan. 1995.  $\text{Ca}^{2+}$  influx pathways mediated by swelling and stores depletion in mouse thymocytes. *Journal of General Physiology* 106: 415-444. PMID: 8786341
66. Negulescu, P.A., A. Khan, T.B. Krasieva, H.H. Kerschbaum, and M.D. Cahalan. 1996. Polarity of T cell shape, motility, and sensitivity to antigen. *Immunity* 4: 421-430. (cover illustration). PMID: 8630728.
67. Lepple-Wienhues, and M.D. Cahalan. 1996. Conductance and permeation of monovalent ions through depletion-activated  $\text{Ca}^{2+}$  channels (Icrac) in Jurkat T cells. *Biophysical Journal* 71: 787-794. PMID: 8842217.
68. Nguyen, A., J. Kath, D.C. Hanson, P.C. Kaniff, C. Donovan, R.J. Mather, M. Bruns, B. Dethlefs, H. Rauer, J. Aiyar, A. Lepple-Wienhues, G.A. Gutman, S. Grissmer, M.D. Cahalan, K.G. Chandy. 1996. Novel non-peptide agents block the C-type inactivated conformation of Kv1.3, and suppress T-cell activation. *Molecular Pharmacology* 50: 1672-1769. PMID: 8967992.
69. Allen, D., A. Lepple-Wienhues, and M.D. Cahalan. 1997. Ion channel phenotype of melanoma cell lines. *J. Membrane Biol.* 155: 27-34. PMID: 9002422.
70. Kerschbaum, H.H., Negulescu, P.A. and M.D. Cahalan. 1997. Ion channels,  $[\text{Ca}^{2+}]_i$  signaling, and gene expression in an antigen-specific reporter T cell line. *Journal of Immunology* 159: 1628-1638. PMID: 9257822.
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72. Cahalan, M.D., and A. Lepple-Wienhues. 1997. Ion channels in lymphocyte function: Editorial. *Cellular Physiology and Biochemistry* 7: 133-134.
73. Lepple-Wienhues, A. and M.D. Cahalan. 1997. A mysterious channel: properties of the capacitive  $\text{Ca}^{2+}$  channel in lymphocytes. *Cellular Physiology and Biochemistry* 7: 219-228.
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- expression in T lymphocytes. *Journal of Experimental Medicine* 188: 1593-1602. PMID: 9802971.
79. Kalman, K., M.W. Pennington, M.D. Lanigan, A. Nguyen, H. Rauer, V. Mahnir, K. Paschetto, W.R. Kem, S. Grissmer, G.A. Gutman, E.P. Christian, M.D. Cahalan, R.S. Norton, and K.G. Chandy. 1998. ShK-Dap22, a potent Kv1.3-specific immunosuppressive polypeptide. *Journal of Biological Chemistry* 273: 32697-32707. PMID: 9830012.
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## **ON-LINE LECTURE**

Cahalan, M.D. (2007), "Molecular Identification of the CRAC Channel", in Simpson, A. (ed.), Calcium Signaling: Regulation, Mechanisms, Effectors, Role in Disease and Recent Advances, The Biomedical & Life Sciences Collection, Henry Stewart Talks Ltd, London (online at <http://www.hstalks.com/?t=BL0291460-Cahalan>)

Cahalan, M.D. (2014), "High resolution: In Vivo Optical Imaging", Imaging the cellular dynamics of the immune system. Cell Press / Biophysical Journal Webinar. This on-demand event (1200 viewers of the live presentation) is available by following the link: <http://view6.workcast.net/?pak=5852298848973576>

## **ON-LINE VIDEOS**

1. Penna, A. and M.D. Cahalan. 2007. Western blotting using the Invitrogen NuPage Novex Bis Tris minigels. *J. Vis. Exp.* 2007;(7):264 Epub 2007 Aug 23. PMID: 18989435.
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3. Matheu, M.P. and M.D. Cahalan. 2007. [Isolation of CD4+ T cells from mouse lymph nodes using Miltenyi MACS purification.](#) *J. Vis. Exp.* 2007;(9):409. Epub 2007 Nov 1. PMID: 18989449.
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6. Garrod K.R. and M.D. Cahalan, 2008. [Murine skin transplantation.](#) *J. Vis. Exp.* 2008 Jan 16;(11). PMID: 19066559.

## **RESEARCH SUPPORT**

### **As Principal Investigator:**

#### **Ongoing**

NIH NS-14609, "Molecular Mechanisms of Ion Channels in T Lymphocytes". 1978-present. 25% effort. Renewed as Javits Neuroscience Investigator Award through 2013. 1<sup>st</sup> percentile on recent grant review, renewed 2013-2018 25% effort

NIH GM-41514, "Functional Imaging of Lymphocyte Motility and Cell Interactions in Lymph Node". 1985-present. Renewed 2010-2014. 25% effort

#### **Completed**

UC Biostar Project with Neurogenetics, Inc. "Capacitative Calcium Entry as a Therapeutic Target for Alzheimer's Disease". 2002-2004. 10% effort

Reeve-Irvine Research Center. "Tracking & Targeting Lymphocytes in Spinal Cord Injury". 2001-2002. 10% effort

Zeneca Pharmaceuticals Inc. "The Kv1.3 channel in T cells: target for novel immunosuppressive drugs". 1996-1999

ONR N00014-87-K-0049, "Neuromodulation of Ion Channels and Calcium Signalling in T Lymphocytes". 1987-1991

NIH Shared Instrumentation Program. RRO5912 "Advanced Video Microscopy" 1990-1991

Arthritis Foundation "Ion Channels in Animal Models of Systemic Lupus Erythematosus". 1986-1988

DOD Instrumentation Grant "Image Analysis of Cellular Interactions in the Nervous and Immune Systems". 1986-1987

NIH NS-00662. Research Career Development Award "Molecular Mechanisms in Excitable Membranes". 1981-1986

UCI Faculty Research Fellowship. "Mechanisms of Lymphocyte Activation: a Patch Clamp Study" 1983-1984

### **As Co-Principal Investigator:**

NIH K "Modeling Immunity for Biodefense". Thomas Kepler, Duke University PI. 2005-2010

NIH MH-59222. "A K<sup>+</sup> Channel Model for trinucleotide-expansion diseases. 1999-2003

Pfizer Pharmaceutical Corp. "Ion Channels as Therapeutic Targets in the Immune System". 1990-1996

NIH AI-24783 "Ion Channels in Lymphocytes: Genetic Probes". 1987-1990

### **As Core Facility Director**

NIH Clinical Cancer Center, Director of Optical Biology Core Facility. 1994-2002

## LABORATORY RESEARCHERS

### Postdoctoral

Pamela A. Pappone, Ph.D. University of Washington, 1980-1983. Current position: Professor, Department of Animal Physiology, University of California, Davis

Thomas E. DeCoursey, Ph.D. University of Cincinnati. 1982-1985. Current position: Professor, Department of Physiology, Rush Medical College, Chicago

Richard S. Lewis, Ph.D. California Institute of Technology. 1984-1989. Current position: Professor, Department of Molecular and Cellular Physiology, Stanford University

Stephan Grissmer, Ph.D. Universität des Saarlandes, Homburg, West Germany. 1986-1993. Current position: Professor, University of Ulm, Germany

Michael A. McCloskey, Ph.D. University of California at Davis. 1988-1989. Current position: Professor, Department of Zoology, Iowa State University, Ames, Iowa

Stephen Hess, Ph.D. University of Kentucky. 1990-1992. Current position: Research Fellow at Invitrogen Discovery Sciences, Madison, Wisconsin

Dorothe Hoppe, Ph.D. University of Heidelberg, West Germany. 1990-1992. Current position: teaching high school and community college chemistry and biology, Irvine

Yuri Osipchuk, Ph.D. Bogomoletz Institute for Physiology, Kiev, USSR. 1991-1994. Current position: Chief Systems Scientist at Molecular Devices Corp.

Paul Negulescu, Ph.D. University of California, Berkeley, 1991-1996. Current position: Vice President of Discovery Biology at Vertex Pharmaceuticals

Albrecht Lepple-Wienhues, M.D/Ph.D. University of Berlin. 1994-1996. Current position: at Department of Physiology, University of Tübingen. Founder, Flylon, Inc.

George Ehring, Ph.D. University of California, San Francisco 1993-1994. Current position: Senior Scientist at Allergan

Paul Ross, Ph.D. University of California, Irvine. 1995-1996. Current position: unknown.

Linda McCauley, Ph.D. University of Southern California. 1995-1997. Current position: not in science

Hubert Kerschbaum, Ph.D. University of Salzburg. 1995-2001. Current position: Professor, University of Salzburg

Claudia Eder, Ph.D. Humboldt University of Berlin. 1997-1998. Current position: Senior Lecturer, Saint George's University of London

Heiko Rauer, Ph.D. University of Ulm. 1998-2000. Current position: Scientist at ALTANA Pharma, Konstanz, Germany

Chris Fanger, Ph.D. Stanford University. 1998-2000. Current position: Director of lead discovery at Hydra Biosciences, Waltham MA

Mark Miller, Ph.D. UCI. 1999-2004, Current position: Associate Professor at Washington University

Alla Fomina, Ph.D. Bogomoletz Institute for Physiology, Kiev, Ukraine. 1999-2002. Current position: Associate Professor, UC Davis

J. Ashot Kozak. Ph.D. Mount Sinai School of Medicine, NY. 2000-2006. Current position: Assistant Professor, Wright State University, Dayton, Ohio

Andrei Yereimin, Ph.D. Bogomoletz Institute for Physiology, Kiev, Ukraine. 2001-2004; 2006- present

Maria Lioudyno, Ph.D. Pavlov Institute of Physiology, St. Petersburg, Russia. 2003-2008. Current position: Project Scientist, Department of Neurobiology and Behavior, UCI

Ying Yu, Ph.D. Showa University, Japan; M.D., Shuzhou Medical College, China. 2005-2008. Current position: Senior scientist at Allergan, Irvine, California

Shenyuan Zhang, Ph.D., University of California, Irvine. 2005-2009. Current position: Assistant Professor, Department of Physiology, Texas A&M University

Aubin Penna, Ph.D. Montpellier University, France. 2005-2010. Current position: CNRS faculty, University of Rennes, France

Joseph Dynes, Ph.D. University of California, Berkeley. 2011-present

Shivashankar Othy, Ph.D. Pierre and Marie Curie University, Paris France. 2013-present

## **Predoctoral**

Mark Estacion. 1983-1989. Current position: Associate Research Scientist, Department of Department of Neurology, Yale University

Paul Ross. 1989-1994. Current position: unknown

Xunbin Wei. 1994-1999. Current position: Professor at Institutes of Biomedical Sciences, Fudan University

Sindy Wei. 2001- 2008. Resident at UCLA, Department of Radiology

Shenyuan Zhang, 2003-2005. Current position: Assistant Professor, Texas A&M University

Debasish Sen. 2004-2009. Current position: Postdoc with Adam de la Zerda, Stanford

Melanie Matheu. 2004-2009. Current position: Postdoc with Jeff Bluestone, UCSF Diabetes Center.

Kym Garrod. 2005-2009. Former position: Postdoc at Pasteur Institute. Current position: unknown.

Anna Amcheslavsky. 2008-2014. Current position: Genetex, Irvine, CA

Milton Greenberg. 2009-2014. Current position: Chapman University, Orange, CA

Tobias Dong. MD/PhD program 2012-present

## **PROFESSIONAL SERVICE AND ACTIVITIES**

Editorial Board: Journal of General Physiology 1988-1998. Advisory Editor 2002 – present

Editorial Board: Physiological Reviews 2002 – 2007

Society of General Physiologists: Council 1993-1995; President, 1998

Biophysical Society: Councilor 2008-2011

External review service: Cellular and Molecular Immunology A, NIH Study Section February, 2007; Howard Hughes Medical Institute, July and October 2009; Wellcome Trust (2008); Pasteur Institute (2007); Austrian Science Fund (2009, 2010); Molecular, Cellular, and Developmental Neuroscience Study Section April, 2012

Manuscript reviewer (2011 – present, 67 reviews written) including for the following journals: Nature, Science, Cell, other Nature Press journals, other Cell Press journals PNAS, Journal of Immunology, Journal of Clinical Investigation, Journal of Physiology, FASEB Journal

## **TEACHING**

Medical Physiology 206: Cardiac Physiology. Selected by students for Excellence in Teaching Award in 2009, 2011, and 2013

Physiology of Ion Channels P&B 232 (Graduate course): Lectures and discussion of papers in molecular and cellular aspects of ion channel physiology

Integrative Immunology MB&B 215 (Graduate course): Lectures and discussion of papers in T cell signaling and cellular immunology

History of Neuroscience (Winter quarter): Department of Neurobiology and Behavior.

Immunology undergraduate lecture (Winter quarter): visualizing the immune response, Department of Molecular Biology and Biochemistry

MBGB graduate advisor 2006 - 2010

## **UNIVERSITY SERVICE**

Chair of Physiology and Biophysics 1991-1995, 2005-present

Coordinated recruitment of six FTE faculty members in the Department

Administrative Council of the Cellular and Molecular Biosciences (CMB) graduate program (formerly Molecular Biology, Genetics, and Biochemistry) 2005-present

Health Sciences Research Council 2007 - present

Search committee for Hospital Director 2007

Search committee for Interim Dean of School of Medicine 2009

Search committee for Cancer Center Deputy Director 2011

Space Resources Advisory Committee 2003-2005



Director of Optical Biology Core Facility 1993-2002

Medical School Admissions and Interview Committee. 1983-1994

Graduate Program Admissions Committee 1995-1998, 2003

Directed Strategic Plan for Research and Education in the School of Medicine 2010

## **ENTREPRENEURIAL ACTIVITY**

Co-founder of Airmid, Inc. ([www.Airmid.com](http://www.Airmid.com)), a biotech company based on targeting lymphocyte K<sup>+</sup> channels for treatment of autoimmune disorders. IP was licensed to Kineta, Inc., in Seattle. Phase 1 clinical trials with a potent Kv1.3 blocker were successfully concluded in 2012-2013. The FDA has now approved Phase 1b trials, coordinated by Kineta. ([http://www.kinetabio.com/press\\_releases/PressRelease07072009.pdf](http://www.kinetabio.com/press_releases/PressRelease07072009.pdf))

## **Patents**

[Assay, methods and products based on n K<sup>+</sup> channel expression](#)  
US Pat. 5827655 - Filed Sep 12, 1995 - The Regents of the University of California

[Assay for and treatment of autoimmune diseases](#)  
US Pat. 5397702 - Filed Oct 2, 1992 - The Regents of the University of California

[Non-peptide inhibition of T-lymphocyte activation and therapies related thereto](#)  
US Pat. 6803375 - Filed Jan 6, 2000 - The Regents of the University of California

[Non-peptide inhibition of T-lymphocyte activation and therapies related thereto](#)  
US Pat. 7235577 - Filed Mar 28, 2003 - The Regents of the University of California

[\[APPLICATION\] CRAC channel and modulator screening methods](#)  
US Pat. 11807244 - Filed May 24, 2007 - The Regents of the University of California

## **SYMPOSIA AND SEMINAR PRESENTATIONS (since 2003)**

January, 2003: Scripps Institute, Department of Immunology

February, 2003: Keystone Symposium "Optical Imaging: Applications to Biology and Medicine", Taos, NM

March, 2003: Biophysical Society Symposium "Biophysics In Situ", San Antonio, TX

March, 2003: City of Hope, Dept of Neuroscience

April, 2003: Symposium "Immune Cells on the Move"; keynote speaker. Lunteren, Holland

May, 2003: FASEB Symposium "Imaging in the Immune System". Denver, CO

August, 2003: Society for Molecular Imaging Symposium "Cell Migration: Stem Cells and Immunology". San Francisco, CA

October, 2003: California Institute of Technology, Division of Biology. Pasadena, CA

October, 2003: Univ. Cal. Irvine, Symposium "Structure and Physiology of Ion Channels: an Open and Shut Case?". Irvine, CA

November, 2003: American Society of Nephrology Symposium “Stopping Lymphocytes in Their Tracks: you can’t go home again”. San Diego, CA

February, 2004: University of Southern California, Neuroscience Program. Los Angeles, CA

March, 2004: Stanford University, Department of Molecular and Cellular Physiology. Palo Alto, CA

March, 2004. American Academy of Allergy, Asthma and Immunology (AAAAI) Symposium. San Francisco CA

June, 2004: Sigrid Juselius Foundation Symposium “Cell Trafficking in Inflammation and Cancer: a round trip between tissues and vessels”. Helsinki, Finland

July, 2004: International Congress of Histochemistry and Cytochemistry. LaJolla, CA

September, 2004: UCI Cancer Center Growth Factor and Signaling Retreat. Newport Beach CA

October, 2004: Columbia University, Department of Pharmacology. New York, NY

October, 2004: LaJolla Immunology Conference. LaJolla, CA

December, 2004: American Society of Hematology Annual Meeting. San Diego, CA

March, 2005: Keystone Conference on Leukocyte Trafficking. Taos, NM

March, 2005: New Frontiers in Cellular Imaging Symposium. University of California, Berkeley, CA

April, 2005: UCI Cell Death Club. Irvine, CA

May, 2005: University of Pennsylvania Symposium “Frontiers of Ion Channel Research: A celebration of the career of Clay Armstrong”. Philadelphia, PA

May, 2005: American Transplant Congress. Seattle, WA

June, 2005: Harvard University Wellman Center for Photomedicine, Massachusetts General Hospital. Boston, MA

June, 2005: Harvard University Center for Blood Research. Boston, MA

July, 2005: Lymphocyte regulation and migration in autoimmune diseases. Munich, Germany

September, 2005: Howard Hughes Medical Institute in vivo imaging symposium. Washington, D.C.

September, 2005: Interview on National Public Radio, Morning Edition, “Researchers examine immune cells’ workings”

November 2005: Amgen. Thousand Oaks, CA

November 2005: UCI Immunology Fair. Irvine, CA

January, 2006: UCLA Department of Molecular Pharmacology. Los Angeles, CA

January, 2006: Asilomar Midwinter Immunology Conference. Pacific Grove, CA

March, 2006: Keynote lecture, American Academy of Asthma, Allergy and Immunology (AAAAI). Miami, FL

April, 2006: Sidney Kimmel Cancer Center. LaJolla, CA

April, 2006: Univ. Texas, Southwestern. Dallas, TX

May, 2006: UCI Veterans Administration, Department of Medicine. Long Beach, CA

June, 2006: Gordon Research Conference on Ligand Recognition. Barga Italy

June 2006: Pasteur Institute, Paris France

July 2006: FASEB conference on Calcium. Aspen, CO.

September 2006: Duke University, Durham, NC

October 2006: University of Chicago, Immunology. Chicago, IL.

October 2006. LaJolla Immunology Conference. Salk Institute.

October 2006: University of California, Berkeley, Molecular & Cell Physiology. Berkeley, CA

December 2006: Stanford University, Immunology. Palo Alto, CA

January 2007: Pfizer symposium on ion channels. Ann Arbor, MI

February 2007: Gordon Research Conference on Salivary Glands and Exocrine Secretion, Transport Processes. Ventura, CA

March 2007: Schering-Plough Pharmaceuticals. Kenilworth, NJ

March 2007: LaJolla Institute for Allergy and Immunology, LaJolla, CA

May 2007: Calcium Signaling and Cellular Nanodomains. Homburg, Germany

May 2007: Institut Cochin. Paris France

June 2007: University of Washington, Immunology/Physiology & Biophysics. Seattle WA

October 2007: Schering-Plough Pharmaceuticals. Kenilworth, NJ

October 2007: Assays and Cellular Targets Symposium, Invited Lecture. San Diego, CA

November 2007: Scripps Research Institute, Immunology. LaJolla, CA

November 2007: UCI Cancer Center Retreat. Rancho Mirage, CA

January 2008: SPIE Photonics West, Invited Lecture. San Jose, CA

February 2008: Biophysical Society, Symposium Lecture on Biophysics of the Immune Response.

April 2008: New York University, Pathology and Skirball Institute of Biomolecular Medicine, New York

June 2008: Roche Pharmaceuticals, Palo Alto, CA

October 2008: Assays and Cellular Targets Symposium, Invited Lecture. San Diego, CA

February 2009: UCLA Department of Physiology

May 2009: Nobel Symposium on “High-Resolution *In Vivo* Imaging of Cell Biology”, Stockholm, Sweden

May 2009: Institute for Research in Biomedicine. Bellinzona, Switzerland

October 2009: Keynote Speaker American Society for Histocompatibility & Immunogenetics, San Francisco, CA

December 2009: Vollum Institute, Portland, OR

March 2010: Cedars-Sinai Hospital, Board of Governors’ Gene Therapeutics Research Institute, Department of Biomedical Sciences, Los Angeles CA

April 2010: Imaging Symposium, American Physiological Society, Experimental Biology, Anaheim, CA

May 2010: American Association of Immunologists annual meeting, Symposium on Immunoimaging (organizer and speaker)

June 2010: Distinguished Lecture in Immunology, sponsored by Bristol-Myers Squibb. Immunosuppression: Cellular Choreography and Molecular Targeting. University of California, Irvine CA

July 2010: Symposium on Channelopathies, World Pharma 2010, Copenhagen Denmark

August 2010: Symposium honoring Stephen H. White. “Frontiers in Membrane and Membrane Protein Biophysics: Experiment and Theory”. University of California, Irvine CA

October 2010: Peter Curran Lecture, Department of Cellular and Molecular Physiology, Yale University, New Haven CT

October 2010: Symposium honoring Bertil Hille. University of Washington, Seattle, WA

November 2010: Autoimmunity Awareness Association Symposium, University of California, Irvine CA

November 2010: Primary Immunodeficiency Diseases, 6<sup>th</sup> annual symposium. Newport Beach, CA

November 2010: 2010 Allergan Lecture in Modern Biology, “Imaging the Dynamics of the Immune Response” at the Arnold and Mabel Beckman Center of the National Academies, Irvine, CA

March 2011: Minisymposium on Store-Operated Calcium Channels. Organizer and Chair. Biophysical Society, Baltimore MD

March 2011: Pathogenesis Affinity Group, The Scripps Research Institute. LaJolla CA

March 2011: American Academy of Allergy, Asthma and Immunology (AAAAI) Symposium on “Cell Traffic and the 4-Dimensional Immune Response”. San Francisco CA

April 2011: Department of Molecular Pharmacology and Biological Chemistry, Northwestern University, Chicago IL

April 2011: Department of Neurobiology, University of Chicago, Chicago IL

May 2011: Frontiers in Intravital Microscopy Symposium at NIH, Bethesda MD

May 2011: Induction Ceremony, National Academy of Sciences, Washington DC

June 2012: FASEB conference, Calcium and Cell Function, Aspen CO

July 2012: Pasteur Institute, Paris, France

April 2013: NIEHS, Research Triangle Park NC

May 2013: Plenary Lecture "CYTO 2013", the 28th Congress of the International Society for Advancement of Cytometry (ISAC), San Diego CA

June 2013: FASEB conference, Ion Channel Regulation, Nassau, Bahamas

August 2013: Symposium to honor Wolf Almers, Vollum Institute, Portland, OR

May 2014: University of Washington, Edwin G. Krebs Lecture, Seattle WA

February 2015: The Scripps Research Institute, LaJolla, CA

## CAHALAN LAB: Research Interests

The Cahalan lab has pursued a single-cell approach to investigate the immune response. Cahalan's pioneering work identified the pivotal role of ion channels in T lymphocytes. He elucidated the physiological functions and the molecular basis for calcium signaling that activates T lymphocytes. By two-photon imaging in intact lymphoid organs, his work continues to reveal an elegant and dynamic cellular choreography that underlies the initiation of the immune response *in vivo*.

- **Ion Channels in the Immune System.** Cahalan's group discovered the biophysical fingerprint and molecular properties of five distinct ion channel types in T lymphocytes. His work shows that ion channel types play vital roles in T cell activation, cell motility, and cell volume regulation. His collaborative work with George Chandy shows that a voltage-gated potassium channel (Kv1.3) can be effectively targeted *in vivo* for treatment of inflammatory and autoimmune disorders, with proven efficacy in animal models of multiple sclerosis and delayed type hypersensitivity. Kv1.3 blockers are now being tested for safety in human Phase 1 clinical trials.
- **Calcium Signaling.** Calcium is a vital second messenger in lymphocytes. Cahalan described the electrophysiological signature of calcium entry triggered by antigen. His single-cell imaging experiments decoded the intracellular calcium signaling requirements for gene transcriptional activation and cell motility in lymphocytes. Later, he imaged the dynamics of T cells interacting with antigen-presenting cells and showed that  $Ca^{2+}$  also inhibits motility of T cells and helps them to remain anchored at the site of antigen presentation. Of particular note within the past five years, using an RNAi screening approach he identified two proteins, STIM and Orai, that together form the molecular basis for store-operated calcium channel activity. By mutational analysis, Cahalan showed that STIM functions as the  $Ca^{2+}$  sensor in the endoplasmic reticulum, as the messenger to the plasma membrane, and as the effector molecule that activates  $Ca^{2+}$  influx. The Cahalan group carried out a critical genome-wide RNAi screen that led to the co-discovery of the  $Ca^{2+}$  channel-forming protein Orai. His recent work proved that Orai embodies the pore of the calcium channel, and that Stim mediates dimerization of Orai dimers to form the functional tetrameric CRAC channel.
- **Immunoimaging Cellular Choreography *in vivo*.** Within the past decade Cahalan's group, together with Ian Parker, pioneered the use of two-photon microscopy to image cell motility and interaction dynamics inside lymphoid organs. T and B cells are highly motile in their native habitat and this plays an important role in locating and responding to antigen. During the initiation of an immune response, T cells interact with and respond to dendritic cells, forming clusters; whereas individual T cells pair up with individual B cells while delivering "help" to trigger antibody production. *In vivo* imaging approaches, in combination with targeted gene deletion and specific pharmacological agents, are continuing to revealing important insights into the choreography of immune responses *in vivo*.

**Scientific Impact.** Cahalan's papers have been highly cited, resulting in an overall 'h-index' of 80. Sixty-five of his papers have been cited more than 100 times. Since 2002, 14 of his publications have been highlighted by the Faculty of 1000, including 4 rated as "exceptional" and 6 as "must read". Cahalan lab alumni include 12 faculty members and 10 scientists in biotech companies. In addition to laboratory research, he serves as Chair of his Department.