BIOGRAPHICAL SKETCH

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NAME	POSITION TITLE
Cui, Jianmin	Professor of Biomedical Engineering
eRA COMMONS USER NAME (credential, e.g., agency login) JIANMINCUI	

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
Peking University, Beijing, China	B.S.	1983	Physics
Peking University, Beijing, China	M.S.	1986	Biophysics
State University of New York, Stony Brook, NY	Ph.D.	1992	Physiology & Biophysics
State University of New York, Stony Brook, NY	Postdoc	1994	Physiology & Biophysics
Stanford University, CA	Postdoc	1998	Molecular and Cellular Physiology

A. Personal Statement

My research focuses on membrane permeation to ions, drugs and genes. Ion channels conduct ions through the membrane, generating bioelectricity that is the basis for the function of heart and brain. Our research aims to reveal principles of ion channel activation and identify drug targets for treatment of diseases. Ultrasound can open pores in the membrane and has advantages for targeted drug/gene delivery. We aim to design optimal ultrasound protocols for drug/gene delivery in various applications. Both research directions in my lab are supported by NIH grants. I have been a faculty member for more than ten years, first in Case Western Reserve University and now in Washington University in St. Louis. During this time, I have had the opportunity to work with nine graduate students who did/do Ph.D. thesis in my lab and served in Ph.D. thesis committee or as rotation mentor of more than thirty graduate students. Four students have completed Ph.D. thesis in my lab and found post-doctoral positions in the first-rate laboratories.

B. Positions and Honors

Positions and Employment

1999-2004 Assistant Professor, Department of Biomedical Engineering, Case Western Reserve University
2004-2009 Adjunct Assistant Professor of Biomedical Engineering, Case Western Reserve University
2004-2010 Associate Professor on the Spencer T. Olin Endowment, Department of Biomedical Engineering, Washington University in St. Louis
2005- Associate Professor of Cell Biology and Physiology
Associate Professor of Chemical Engineering
Washington University in St. Louis
2010- Professor on the Spencer T. Olin Endowment, Department of Biomedical Engineering, Washington University in St. Louis

Honors

1988 Talbot Travel Award at the 32nd Annual Meeting of the Biophysical Society
1991 Grass Foundation Fellowship, Marine Biological Laboratory, Woods Hole, MA
1994-96 Neuromuscular Disease Research Fellowship, Muscular Dystrophy Association
1996-98 Cardiac and Cellular Electrophysiology Training Grant, Stanford University
2003 Nomination for the 2003 Carl F. Wittke Award for Distinguished Undergraduate Teaching
2004-08 Established Investigator Award, American Heart Association

2004- Associate Professor and Professor of Biomedical Engineering on the Spencer T. Olin Endowment
2009 Ad hoc reviewer for NIH study section MBPP
2010 Member of a Special Review Committee for a Program Project Grant (NIH/NHLBI)

C. Publications

Peer Reviewed Publications

1. **Cui, J.,** Mandel, G., DiFrancesco, D., Kline, R. P., Pennefather, P., Datyner, N. B., Haspel, H. C., and Cohen, I. S. (1992). Expression and characterization of a canine hippocampal inwardly rectifying K+ current in Xenopus oocytes. *J. Physiol*. 457, 229-246.
2. **Cui, J.**, Kline, R. P., Pennefather, P., and Cohen, I. S. (1994). Gating of IsK expressed in Xenopus oocytes depends on the amount of mRNA injected. *J. Gen. Physiol*. 104, 87-105.
3. **Cui, J.,** Cox, D. H., and Aldrich, R. W. (1997). Intrinsic voltage dependence and Ca^{2+} regulation of *mslo* large conductance Ca-activated K+ channels. *J. Gen. Physiol*. 109, 647-674.
4. Cox, D. H., **Cui, J**., and Aldrich, R. W. (1997). Separation of gating properties from permeation and block in *mslo* large conductance Ca-activated K+ channels. *J. Gen. Physiol*. 109, 633-646.
5. Cox, D. H., **Cui, J**., and Aldrich, R. W. (1997). Allosteric modeling of a large conductance Ca-activated K+ channel. *J. Gen. Physiol*. 110, 257-281.
6. Horrigan, F. T., **Cui, J.**, and Aldrich, R. W. (1999). Allosteric voltage-gating of potassium channels I: *mslo* ionic currents in the absence of Ca2+. *J. Gen. Physiol* 114, 277-304.
7. **Cui, J.** and Aldrich, R. W. (2000). The allosteric linkage between voltage and Ca2+ dependent Gating of BK- type *mslo* Ca2+-activated K+ channels. *Biochemistry* 39, 15612-15619.
8. Shi, J. and **Cui, J.** (2001). Intracellular Mg2+ enhances the function of BK-type Ca2+-activated K+ channels. *J. Gen. Physiol.* 118, 589-605. PMCID: 2233844 [Commentary: *J. Gen. Physiol.* 118, 583-587].
9. Shi, J. Krishnamoorthy, G., Yang, Y., Hu, L., Chaturvedi, N., Harilal, D., Qin, J., and **Cui, J.** (2002). Mechanism of magnesium activation of calcium-activated potassium channels. *Nature* 418, 876-880.
10. Lei Hu, Jingyi Shi, Zhongming Ma, Gayathri Krishnamoorthy, Fred Sieling, Guangping Zhang, Frank Horrigan and **Jianmin Cui** (2003) Participation of the S4 Voltage Sensor in the Mg2+-Dependent Activation of Large Conductance (BK) K+ Channels. *Proc. Natl. Acad. Sci., U.S.A.* 100, 10488-10493. PMCID: 193588
11. Cheri Deng, Fred Sieling, Hua Pan, and **Jianmin Cui** (2004) Ultrasound-induced cell membrane porosity. *Ultrasound in Medicine and Biology*. 30, 519-526.
12. Guoxia Liu, Jingyi Shi, Lin Yang, Luxiang Cao, Soo Mi Park, **Jianmin Cui**, Steven O. Marx (2004) Assembly of a Ca2+-dependent BK channel signaling complex by binding to β2 adrenergic receptor. *EMBO J* 23, 2196-2205.
13. Yiqing Yang, Min Xia, Qingfeng Jin, Saïd Bendahhou, Jingyi Shi, Yiping Chen, Bo Liang, Jie Lin, Yi Liu, Ban Liu, Qinshu Zhou, Dongwei Zhang, Rong Wang, Ning Ma, Xiaoyan Su, Kaiya Niu, Yan Pei, Wenyuan Xu, Zhaopeng Chen, Haiying Wan, **Jianmin Cui**, Jacques Barhanin, and Yihan Chen (2004) Identification of a KCNE2 Gain-of-Function Mutation in Familial Atrial Fibrillation. *Am. J. Hum. Genet. 75:899–905*
14. Pan, H., Zhou, Y., Izadnegahdar, O., **Cui, J.**, and Deng, C. X. (2005) Study of Sonoporation Dynamics Affected by Ultrasound Duty Cycle. *Ultrasound in Medicine and Biology*. 31, 849-856. PMCID: 1182120
15. Du, W., Bautista, J. F., Yang, H., Diez-Sampedro, A., You, S.-A., Wang, L., Kotagal, P., Lüders, H. O., Shi, J., **Cui, J**., Richerson, G. B., and Wang, Q. (2005) Calcium-sensitive potassium channelopathy in human epilepsy and paroxysmal movement disorder. *Nat. Genet.* 37, 733-738
16. Krishnamoorthy, G., Shi, J., Sept, D., and **Cui, J.** (2005) The N-terminus of RCK1 domain regulates Ca2+ dependent BKCa channel gating. *J. Gen. Physiol.* 126, 227-241. PMCID: 2266574
17. Lei Hu, Huanghe Yang, Jingyi Shi, and **Jianmin Cui** (2006) Effects of multiple metal binding sites on calcium and magnesium-dependent activation of BK channels. *J. Gen. Physiol.* 127, 35-49. PMCID: 2151482
18. Yang, H., Hu, L., Shi, J., and **Cui, J.** (2006) Tuning magnesium sensitivity of BK channels by mutations. *Biophys. J.,* 91, 2892-2900. PMCID: 1578465
19. Zhou, Y., Shi, J., **Cui, J**. and Deng, C.X. (2007) Effects of extracellular calcium on cell membrane resealing in sonoporation. *J. Control. Release.* 126:34-43. PMCID: 2270413

20. Yang, H., Hu, L., Shi, J., Delaloye, K., Horrigan, F., and **Cui, J**. (2007) Mg2+ Mediates Interaction between the Voltage-Sensor and Cytosolic Domain to Activate BK channels. *Proc. Natl. Acad. Sci., U.S.A.* 104, 18270-18275. PMCID: 2084332 [Commentary: *J. Gen. Physiol.* 131, 5-11]
21. Zhou, Y., **Cui, J.** and Deng, C.X. (2008) Dynamics of Sonoporation Correlated with Acoustic Cavitation Activities. *Biophys. J.,* 94:L51-53. PMCID: 2267145
22. Yang, H., Zhang, G., Shi, J., Lee, U.S., Delaloye, K., and **Cui, J**. (2008) Subunit-specific Effect of the Voltage Sensor Domain on Ca2+ Sensitivity of BK Channels. *Biophys. J.,* 96:4678-4687. PMCID: 2397326
23. Yang, H., Shi, J., Zhang, G., Yang, J, Delaloye, K., and **Cui, J.** (2008) Activation of Slo1 BK channels by Mg2+ coordinated between the voltage sensor and the RCK1 domains *Nature Structure and Molecular Biology* 15:1152-1159. PMCID: 2579968 [News & Views: *Nature Structure and Molecular Biology* 15:1130 -1132].
24. Lee, U.S. and **Cui, J.** (2009) β subunit-specific modulations of a mutant BK channel associated with epilepsy and dyskinesia. *J. Physiol. (London)* 587:1481-1498. PMCID: 2678220
25. Silva, J., Pan, H., Wu, D., Nekouzadeh, A., Decker, K., **Cui, J**., Baker, N., Sept, D., and Rudy, Y. (2009) Linking Ion-Channel Molecular Dynamics to the Action Potential: Cardiac IKs Simulations. *Proc. Natl. Acad. Sci., U.S.A.,* 106:11102-11106. PMCID: 2700153
26. Zhou, Y., Kumon, R.E., **Cui, J**. and Deng, C.X. (2009) The Size of Sonoporation Pores on the Cell Membrane. *Ultrasound in Medicine and Biology* 35:1756-1760. PMCID: 2752487
27. Wu, D., Delaloye, K., Zaydman, M.A., Nekouzadeh, A., Rudy, Y., and **Cui, J.** (2010) State dependent electrostatic interactions of S4 arginines with E1 in S2 during Kv7.1 activation. *J. Gen. Physiol. 135:595-606.* PMCID: 2888051
28. Yang, J,, Krishnamoorthy, G., Saxena, A., Zhang, G., Shi, J., Yang, H., Delaloye, K., Sept, D., and **Cui, J.** (2010) An epilepsy/dyskinesia-associated mutation enhances BK channel activation by potentiating the Ca2+ dependent allosteric mechanism. *Neuron* 66:871-883. PMCID: 2907746 [Previews: *Neuron* 66, 817-818].
29. Li, J., Yan B., Huo Z., Liu Y., Xu J., Sun Y., Liu Y., Liang D., Peng L., Zhang Y., Zhou Z.N., Shi J., **Cui J.**, Chen Y.H. (2010) {beta}2- but not {beta}1-adrenoceptor activation modulates intracellular oxygen availability. *J. Physiol.* 15:2987-2998.
30. Lee, U.S., Shi, J. and **Cui, J.** (2010) Modulation of BK channel gating by the β2 subunit involves both membrane-spanning and cytoplasmic domains of Slo1. *J Neurosci.* 30:16170-16179. PMCID: in process
31. Zhang, G., Huang, S.Y., Yang, J. Shi, J., Yang, X., Moller, A., Zou, X., and **Cui, J.** (2010) Ion sensing in the RCK1 domain of BK channels. *Proc. Natl. Acad. Sci., U.S.A.* 107:18700-18705. PMCID: 2972974.
32. Wu, D., Pan, H., Delaloye, K., and **Cui, J.** (2010) KCNE1 remodels the voltage sensor of Kv7.1 to modulate channel function. *Biophys. J.* 99:3599-3608. PMCID: 2998620

Invited Review

1. **Cui, J**., Yang, H., and Lee, U.S. (2009) Molecular mechanisms of activation of Ca2+ activated K+ channels. *Cellular and Molecular Life Sciences*, 66:852-875. PMCID: 2694844.
2. **Cui, J.** (2010) Reduction of CaV channel activities by Ca2+-CaM: inactivation or deactivation? *J. Gen. Physiol.* 135:297-301. PMCID: 2847919
3. Lee, U.S. and **Cui, J.** (2010) BK channel activation: structural and functional insights. *Trends in Neurosciences* 33:415-423. PMCID: 2929326.
4. **Cui, J.** (2010) BK-type calcium-activated potassium channels: coupling of metal ions and voltage sensing. *J. Physiol.* 588:4651-4658. PMCID: in process

Book Chapter

1. **Cui, J.,** Yu, H., Kline, R. P., Pennefather, P., and Cohen, I. S. (1995). The IsK channel exhibits multiple open states that may reflect different levels of aggregation. In *Potassium Channels in Normal and Pathological Conditions*, J. Vereecke, P. P. van Bogaert, F. Verdonck, eds. Leuven University Press, Leuven, Belgium. 221-226.

D. Research Support

Ongoing Research Support

R01 HL70393, J. Cui (PI) 4/01/02-6/30/11
National Institutes of Health
Ca^{2+}-Activated K^+ Channels, an Allosteric Mechanism
Major goal: to provide molecular mechanism of voltage, Ca^{2+}, and Mg^{2+} dependent gating of BK channels formed by Slo1 (α) subunits.
Role: PI.

R01 NS060706 J. Cui (PI) 12/01/09-11/30/14
National Institutes of Health
Subunits Interaction in the Function of BK Channels
This study will identify amino acids and structural motifs important for BK channel gating and reveal the nature of the interactions between Slo1 and β subunits.
Role: PI

Small Research Grant J. Cui (PI) 7/01/10-6/30/11
McDonnell Center Cellular & Molecular Neurobiology, Washington University in St. Louis
Cellular mechanism of epilepsy associated with mutation D434G in BK-type Ca2+ activated K+ Channels
The goal of this research is to examine if the enhancement of BK channel activity in neurons by the mutation D434G leads to increased excitability due to hastening action potential repolarization, leading to a faster firing rate and elevated synaptic transmission.
Role: PI

Completed Research Support

Scientist Development Grant 9930025N J. Cui (PI) 01/99-12/02
American Heart Association (National)
Molecular mechanisms of the Interaction between MinK and KvLQT1 Potassium Channels
The major goal is to determine the molecular mechanism of MinK modulation of KvLQT1 function.
Role: PI

Whitaker Research Grant RG 00-0396 J. Cui (PI) 09/01-08/04
The Whitaker Foundation
Measuring and Modeling Micro-domain Ca2+ Concentration Close to a Ca2+ Channel
The goal is to use Ca-activated BK channels as a probe to measure micro-domain Ca2+ concentration close to a Ca2+ channel.
Role: PI.

Research Grant 2001229, B. Attali (PI) 9/01/02-8/31/06
United States-Israel Binational Science Foundation
Allosteric subunit interactions involved in IKS channel gating
The major goals of this project are to elucidate the structural determinants involved in allosteric interactions existing between the extracellular and the intracellular boundaries of the KCNE1 transmembrane segment that lead to a conformational change of the KCNQ1 channel a subunit.
Role: Co-Investigator

Established Investigator Award 0440066N, J. Cui (PI) 1/01/04-12/31/08
American Heart Association (National)
Long QT syndrome and atrial fibrillation: molecular mechanism of altered IKS function and its whole-cell manifestation
Major goal: to provide mechanistic insights and quantitative description of processes through which mutations in IKS channels result in cardiac arrhythmias.
Role: PI

Subcontract R01 CA116592, C. Deng (PI) 7/01/05-6/30/10

National Institutes of Health
Mechanisms of ultrasound mediated intracellular drug and gene delivery
The goal of this research is to develop robust and reliable ultrasound strategy for intracellular delivery of desirable agents (e.g. drugs, genes, imaging markers) for biomedical applications including targeted cancer treatment and gene therapy.
Role: Co-Investigator