

**RAJINI RAO, Ph.D.****DEMOGRAPHIC INFORMATION*****CURRENT APPOINTMENT***

Professor, Department of Physiology  
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 The Johns Hopkins University School of Medicine

***PERSONAL DATA***

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***EDUCATION & TRAINING***

INSTITUTION AND LOCATION	DEGREE	YEAR(s)	FIELD OF STUDY
Mount Carmel College, Bangalore, India	B.Sc.	1980-1983	Chemistry, Biology
University of Rochester, Rochester, NY	Ph.D.	1983-1988	Biochemistry
Yale University, New Haven, CT	Postdoctoral	1988-1992	Genetics

***PROFESSIONAL APPOINTMENTS***

1984-1985 Teaching Assistant in the Department of Biochemistry, University of Rochester, for *General Biochemistry*, *Advanced Biochemistry*, and *Proteins and Enzymes*

1988-1992 Postdoctoral Fellow with Dr. Carolyn W. Slayman, Department of Genetics, Yale University School of Medicine, New Haven, CT

1992-1993 Associate Research Scientist, Department of Genetics, Yale University

1993-1998 Assistant Professor, Department of Physiology, Johns Hopkins University School of Medicine

1998-2004 Associate Professor, Department of Physiology, JHUSOM

2004-current Professor, Department of Physiology, JHUSOM

2008-current Director, Graduate Training Program in Cellular & Molecular Medicine

## PERSONAL STATEMENT

**Overview of Research:** My research centers on evolutionarily ancient **ion pumps and transporters** and their role in human health and disease. Our experimental reach is broad and multidisciplinary, harnessing the range of available models: (i) bacterial orthologs for structural insights, (ii) yeast for data mining and functional screening of human variants, (iii) 3D organoids and epithelial cultures for cell biological and transport studies and (iv) mouse models and patient databases for pathophysiological insight. Currently, we apply these approaches to understand the cellular and molecular basis of cancer, neurological and metabolic disorders.

**Early Work:** My Ph.D. thesis with professor Alan Senior (University of Rochester) described the rotary mechanism of the H<sup>+</sup> pumping F<sub>1</sub>F<sub>o</sub> ATP synthase from *E. coli*. As a postdoctoral fellow with professor Carolyn Slayman (Yale), I developed an innovative secretory vesicle expression system in the yeast *S. cerevisiae* for functional and mutagenic analysis of membrane transporters, including the P-type H<sup>+</sup>-ATPase, PMA1. These early contributions laid the foundation for my work as an independent investigator at Johns Hopkins University, below.

**(i) Discovery of P-type Secretory Pathway Ca<sup>2+</sup>-ATPases (SPCA):** In the mid-nineties, my newly minted laboratory defined the transport properties of Golgi localized calcium pumps in yeast and human and proposed that they belong to a new, phylogenetically distinct class of P-type Ca<sup>2+</sup>-ATPases. These calcium and manganese pumps are now recognized to be essential for protein processing, glycosylation and sorting, and defective in the inherited skin disorder Hailey Hailey disease. We devised phenotype screens of mutations in yeast to identify molecular determinants of ion transport and Ca<sup>2+</sup>/Mn<sup>2+</sup> selectivity. These mutants have been widely used in the yeast field to query ion-linked phenotypes ranging from reverse transcription to TOR/rapamycin signaling, glycosylation, cell cycle and respiratory function. We cloned and described the human SPCA2 isoform and discovered its unexpected oncogenic role in breast cancer mediated by ATPase-independent signaling to Orail Ca<sup>2+</sup> channels, revealing a new store-independent paradigm for Orail activation. This unconventional activity drives the massive transfer of calcium into milk during lactation and clinically significant Ca<sup>2+</sup> entry mechanisms in cancer. *Currently, we are developing SPCA pumps as therapeutic targets in neurodegenerative disorders like ALS and in blistering disorders of the skin (Hailey Hailey and Darier disease). Another mechanistic and therapeutic goal is to determine cryo-EM structures of pump-channel complexes including SPCA2, Orail and Kv10.1.*

**(ii) Discovery of Endosomal Na<sup>+</sup>, K<sup>+</sup>/H<sup>+</sup> Exchangers (eNHE):** My lab initially cloned and characterized eNHE, first in yeast, and soon after in plants and mammalian cells. In an influential review, we proposed the phylogenetic classification of intracellular isoforms of NHE as an evolutionarily ancient and ubiquitous group, distinct from previously known plasma membrane NHE isoforms. We demonstrated that eNHE are leak pathways for protons that regulate lumen pH to control cargo delivery and turnover. These observations laid the groundwork for important breakthroughs by other groups in plant biotechnology (engineering of salt tolerance and flower color), and medicine (neurological disorders ranging from autism to ADHD). Two human eNHE isoforms - NHE6 (*SLC9A6*; Christianson Syndrome Protein) and NHE9 (*SLC9A9*; *AUTS16*), have been implicated in a plethora of neuropsychiatric disorders. By linking endosomal pH to cargo trafficking and turnover, we show how loss of eNHE function and acidic endosomes promote amyloidogenesis in Alzheimer disease models, whereas gain of function and endosomal alkalization confers chemoradiation resistance and poor prognosis in brain cancer. *Ongoing and planned studies will develop spatially localized and NHE isoform-selective inhibitors, explore phenotype-genotype relations using PheWAS analysis of human gene variants, and reveal organellar cross-talk between endosomes and mitochondria and their importance in energy metabolism.*

**(iii) Discovery of Metazoan NHA family of Na<sup>+</sup>, Li<sup>+</sup>/H<sup>+</sup> Antiporters:** Our phylogenetic analysis led to the unexpected discovery of a distinct clade of previously unrecognized transporters found in all metazoans, distantly linked to bacterial electrogenic NhaA antiporters. Represented by the NHA1-2 (*SLC9B1-2*) antiporters in humans, their function and mechanism are still emerging. *We are pursuing the hypothesis that NHA2 is the elusive hypertension related locus identified by Na<sup>+</sup>/Li<sup>+</sup> exchange activity, and is implicated in cyst formation in polycystic kidney disease.*

**(iv) Development of Organoid Models of Transport:** To define the human “transportome”, we are developing human *in vitro* organoid models of specific tissues, including lactating mammary gland, to systematically de-orphanize understudied transporters and reveal potential new roles in nutrition and development.

**Scientific leadership and Organization:** My peers have elected me to leadership roles at the local, national and international level. I have served in the **Biophysical Society**, holding elected positions on the council, executive board, nominating committee (chair), professional opportunities for women (chair), and was nominated to run for president, and in the **American Society for Biochemistry and Cell Biology** council where I chaired the advisory board for *ASBMB Today*. I organized, chaired and raised funds from private, government and philanthropic sources for several international conferences in my field of membrane transport, including **Gordon Research** and **FASEB** conferences. I have served on scientific advisory and journal editorial boards, chair searches and grant review panels in the US and Europe. I have used these appointments to promote excellence in science, develop academic policy, and foster diversity.

**Education and Curriculum Development:** I have been a leader in doctoral/postdoctoral training both within Johns Hopkins University and at the national level through my service for the National Institutes of Health Division of Training, Workforce Development and Diversity (TWD). As the Director of the Graduate Program in Cellular & Molecular Medicine, I oversee a T32 training grant-supported translational Ph.D. program that includes approximately 140 faculty mentors across 28 departments and 4 institutes, 130 graduate students (Ph.D., M.D./Ph.D. and D.V.M./Ph.D.) and two full time administrators. Under my directorship, we expanded PhD training to MD fellows. I actively participate in graduate education as course director and instructor, and I taught the lectures in ion channels and pumps to first year Medical students for 25 years. I obtained supplemental funds from NIH to develop a seven-module online course on **Rigor and Reproducibility in Research** that is now a university-wide free resource for all pre- and post-doctoral trainees. The course is also available outside JHU on a Learning Management Platform. Another NIH supplement was used to develop **OPTIONS**, a structured and comprehensive career training curriculum for graduate students offered through our Professional Development and Career Office (PDCO). I served as PI for **professional development grants** (e.g., Burroughs Wellcome funded CRAFT program) and was the faculty supervisor for two PDCO academic fellows. I have improved the CMM core curriculum by creating and directing a **Grant Writing Workshop** that has served as template for other graduate programs. Innovations to our graduate curriculum include translation to the clinic with **Introduction to Clinical Research** and individualized clinical experience with a clinical co-mentor in **Bench to Bedside and Back (3B)**. We were the first graduate program to bring the **Three Minute Thesis (3MT)** competition to JHU by making it a feature on our annual CMM retreat. The 3MT is now a thriving competition at JHU.

**Mentor/Educator Training:** I have served on **NIGMS/NIH Training and Workforce Development (TWD)** review panel, attended TWD conferences as an invited speaker, panelist and poster presenter, and was asked to lead an information session on preparing a T32 application. I have reviewed the **HHMI Gilliam Fellows program** and serve on the Hopkins committee for candidate selection. As mentor of a HHMI Gilliam Fellow, I have undertaken extensive mentor training and I give the annual lecture on mentoring at our institutional Responsible Conduct of Research/Ethics course. I chaired a sub-committee of the MA/PhD doctoral board of JHSOM to successfully advocate for **mandatory mentor training of faculty**. I participate in national and international panels on mentoring, including postdoctoral career panel at the 2020 annual meeting of the American Society for Cell Biology (ASCB), and Biophysical Society Early Career panel, and served as the year-long **Physiological Society Mentor** (2020-21) to a selected cohort of early career faculty. As a member of our institutional **professorial promotions committee**, I have advocated pre-screen CVs of basic science faculty to ensure their success in the tenure and promotion process.

**Promoting Diversity and Equity:** Under my leadership, diversity in the student body of our graduate program has increased, averaging 32% in the past 5 years. As part of a long-standing effort to improve the representation of women and minorities at all levels of academia, I co-founded and contributed to an **academic blog site** ([stemwomen.net](http://stemwomen.net)) and authored an [opinion piece](#) in Nature. I chaired the **Committee on Professional Opportunities for Women** at the Biophysical Society for a decade and frequently participate or chair panels on women and minorities in science at local, national and international venues. I recently co-chaired a **Cluster Hire search** for the Institute for Basic Biomedical Sciences, to increase faculty diversity and received a competitive Fannie Gaston-Johansson Faculty Excellence grant that will provide matching funds for hiring faculty in the School of Medicine.

## PEER-REVIEWED PUBLICATIONS

1. Holzschu, D., Principio, L., Conklin, K.T., Hickey, D.R., Short, S., Rao, R., McLendon, G., and Sherman, F. (1987)  
Replacement of the invariant lysine 77 by arginine in yeast iso-1-cytochrome *c* results in enhanced and normal activities *in vitro* and *in vivo*.  
*J. Biol. Chem.* **262**, 7125-7131
2. Rao, R., Perlin, D.S., and Senior, A.E. (1987)  
The defective proton-ATPase of *uncA* mutants of *Escherichia coli*: ATP binding and ATP-induced conformational change in mutant alpha subunits.  
*Arch. Biochem. Biophys.* **255**, 309-315
3. Rao, R., and Senior, A.E. (1987)  
The properties of hybrid F<sub>1</sub>-ATPase enzymes suggest that a cyclical catalytic mechanism involving three catalytic sites occurs.  
*J. Biol. Chem.* **262**, 17450-17454
4. Rao, R., Al-Shawi, M.K., and Senior, A.E. (1988)  
Trinitrophenyl-ATP and -ADP bind to a single nucleotide site on isolated beta subunit of *Escherichia coli* F<sub>1</sub>-ATPase. In vitro assembly of F<sub>1</sub>-subunits requires occupancy of the nucleotide binding site on beta subunit by nucleotide triphosphate.  
*J. Biol. Chem.* **263**, 5569-5573
5. Rao, R., Cunningham, D., Cross, R.L., and Senior, A.E. (1988)  
Pyridoxal 5'-diphospho-5'-adenosine binds at a single site on isolated alpha subunit from *Escherichia coli* F<sub>1</sub>-ATPase and specifically reacts with lysine 201.  
*J. Biol. Chem.* **263**, 5640-5645
6. Rao, R., Pagan, J., and Senior, A.E. (1988)  
Directed mutagenesis of the strongly conserved lysine 175 in the proposed nucleotide binding domain of alpha subunit from *Escherichia coli* F<sub>1</sub>-ATPase.  
*J. Biol. Chem.* **263**, 15957-15963
7. Nakamoto, R.K., Rao, R., and Slayman, C.W. (1991)  
Expression of the yeast plasma membrane H<sup>+</sup>-ATPase in secretory vesicles. A new strategy for directed mutagenesis.  
*J. Biol. Chem.* **266**, 7940-7949
8. Rao, R., and Slayman, C.W. (1992)  
Mutagenesis of the yeast plasma membrane H<sup>+</sup>-ATPase. A novel expression system.  
*Biophys. J.* **62**, 228-237
9. Rao, R., Nakamoto, R.K., Verjovski-Almeida, S., and Slayman, C.W. (1992)  
Structure and function of the yeast plasma membrane H<sup>+</sup>-ATPase.  
*Annals of the N.Y. Acad. Sci.* **671**, 195-203
10. Rao, R., and Slayman, C.W. (1993)  
Mutagenesis of conserved amino acids in the phosphorylation domain of the yeast plasma membrane H<sup>+</sup>-ATPase. Effects on structure and function.  
*J. Biol. Chem.* **268**, 6708-6713
11. Rao, R., Drummond-Barbosa, D., and Slayman, C.W. (1993)  
Transcriptional regulation by glucose of the yeast *PMAl* gene encoding the plasma membrane H<sup>+</sup>-ATPase.  
*Yeast* **9**, 1075-1084
12. Sorin, A., Rosas, G. and Rao, R. (1997)  
PMR1, a Ca<sup>2+</sup>-ATPase in yeast Golgi, has properties distinct from sarco/endoplasmic reticulum and plasma membrane calcium pumps.  
*J. Biol. Chem.* **272**, 9895-9901
13. Nass, R., Cunningham, K. W., and Rao, R. (1997)  
Intracellular sequestration of sodium by a novel Na<sup>+</sup>/H<sup>+</sup> exchanger in yeast is enhanced by mutations in the plasma

- membrane H<sup>+</sup>-ATPase. Insights into mechanisms of Na<sup>+</sup> tolerance.  
*J. Biol. Chem.* **272**, 26145-26152
14. Nakamoto, R.K., Verjovski-Almeida, S., Allen, K.E., Ambesi, A., Rao, R., and Slayman, C.W. (1998)  
 Substitutions of aspartate 378 in the phosphorylation domain of the yeast PMA1 H<sup>+</sup>-ATPase disrupt protein folding and biogenesis.  
*J. Biol. Chem.* **273**, 7338-7344
  15. Nass, R., and Rao, R. (1998)  
 Novel localization of a Na<sup>+</sup>/H<sup>+</sup> exchanger in a late endosomal compartment of yeast. Implications for vacuole biogenesis.  
*J. Biol. Chem.* **273**, 21054-21060
  16. Gaxiola, R.A., Rao, R., Sherman, A., Grisafi, P., Alper, S., and Fink, G.R. (1999)  
 The *Arabidopsis thaliana* proton transporters, AtNhx1 and Avp1, can function in cation detoxification in yeast.  
*Proc. Natl. Acad. Sci. USA* **96**, 1480-1485
  17. Marchi, V., Sorin, A., Wei, Y., and Rao, R. (1999)  
 Induction of vacuolar Ca<sup>2+</sup>-ATPase and H<sup>+</sup>/Ca<sup>2+</sup> exchange activity in yeast mutants lacking Pmr1, the Golgi Ca<sup>2+</sup>-ATPase.  
*FEBS Lett.* **454**, 181-186
  18. Nass, R., and Rao, R. (1999)  
 The yeast endosomal Na<sup>+</sup>/H<sup>+</sup> Exchanger, Nhx1, confers osmotolerance following acute hypertonic shock.  
*Microbiology* **145**, 3221-3228
  19. Wei, Y., Marchi, V., Wang, R., and Rao, R. (1999)  
 Role of the EF-hand motif in ion selectivity and transport by Pmr1, the yeast Golgi Ca<sup>2+</sup>-ATPase.  
*Biochemistry* **38**, 14534-14541
  20. Wei, Y., Chen, J., Rosas, G., Tompkins, D.A., Holt, P.A., and Rao, R. (2000)  
 Phenotypic screening of mutations in Pmr1, the yeast secretory pathway/Golgi Ca<sup>2+</sup>/Mn<sup>2+</sup>-ATPase, reveals residues critical for ion selectivity and transport.  
*J. Biol. Chem.* **275**, 23927-23932
  21. Mandal, D., Woolf, T.B., and Rao, R. (2000)  
 Manganese selectivity of the yeast secretory pathway ion pump, Pmr1, is defined by residue Q783 in transmembrane segment 6. Residue 778 is essential for transport.  
*J. Biol. Chem.* **275**, 23933-23938
  22. Wells, K.M., and Rao, R. (2001)  
 The yeast Na<sup>+</sup>/H<sup>+</sup> exchanger Nhx1 is an N-linked glycoprotein. Topological implications.  
*J. Biol. Chem.* **276**, 3401-3407
  23. Ton, V.-K., Mandal, D., Vahadji, C., and Rao, R. (2002)  
 Functional Expression in Yeast of the Human Secretory Pathway Ca<sup>2+</sup>/Mn<sup>2+</sup>-ATPase defective in Hailey Hailey disease.  
*J. Biol. Chem.* **277**, 6422-6427
  24. Brett, C.L., Wei, Y., Donowitz, M., and Rao, R. (2002)  
 Human Na<sup>+</sup>/H<sup>+</sup> Exchanger NHE6 is Found in the Recycling Endosomes of Cells, Not Mitochondria.  
*Am J Physiol Cell Physiol.* **282**, C1031-1041
  25. Cronin, S.R., Rao, R., Hampton, R.Y. (2002)  
 Cod1p/Spf1p is a P-type ATPase involved in ER function and Ca<sup>2+</sup> homeostasis.  
*J. Cell Biol.* **157**, 1017-1028
  26. Sen Gupta, S., Ton, V.K., Beaudry, V., Rulli, S., Cunningham, K.W., and Rao, R. (2003)  
 Antifungal activity of amiodarone is mediated by disruption of calcium homeostasis.  
*J. Biol. Chem.* **278**, 28831-28839
  27. Mandal, D., Rulli, S. and Rao, R. (2003)  
 Packing interactions between transmembrane helices alter ion selectivity of the yeast Golgi Ca<sup>2+</sup>/Mn<sup>2+</sup>-ATPase Pmr1.  
*J. Biol. Chem.* **278**, 35292-35298
  28. Ali, R., Mukherjee, S., Brett, C.L., and Rao, R. (2004)  
 Inhibition of sodium/proton exchange by a Rab-GTPase activating protein regulates endosomal traffic in yeast.

- J. Biol. Chem.* **279**, 4498-4506
29. Ton, V.K., and Rao, R. (2004)  
Expression of Hailey Hailey disease mutations in yeast.  
*J. Invest. Dermatol.* **23**, 1192-4.
  30. Brett, C.L., Tukaye, D.N., Mukherjee, S., Rao, R. (2005)  
The Yeast Endosomal Na<sup>+</sup>(K<sup>+</sup>)/H<sup>+</sup> Exchanger Nhx1 Regulates Cellular pH to Control Vesicle Trafficking.  
*Mol Biol. Cell.* **16**, 1396-405
  31. Xiang, M., Mohamalawari, D., Rao, R. (2005)  
A novel isoform of the secretory pathway Ca<sup>2+</sup>, Mn<sup>2+</sup>-ATPase, hSPCA2, has unusual properties and is expressed in brain.  
*J. Biol. Chem.* **280**, 11608-11614
  32. Brett, C.L., Donowitz, M. and Rao, R. (2006)  
Does the proteome encode organellar pH?  
*FEBS Lett.* **580**, 717-719
  33. Mukherjee, S., Kallay, L., Brett, C.L. and Rao, R. (2006)  
Mutational analysis of the intramembranous H10 loop of yeast Nhx1 reveals a critical role in ion homeostasis and vesicle trafficking.  
*Biochem J.* **398**, 97-105
  34. Hill, J., Brett, C.L., Chyou, A., Kallay, L.M., Sakaguchi, M., Rao, R. and Gillespie, P.G. (2006)  
Vestibular hair cells control pH with Na<sup>+</sup>(K<sup>+</sup>)/H<sup>+</sup> exchangers NHE6 and NHE9.  
*J. Neuroscience.* **26**, 9944-9955
  35. Yadav, J., Muend, S., Zhang, Y., and Rao, R. (2007)  
A Phenomics Approach in Yeast Links Proton and Calcium Pump Function in the Golgi.  
*Mol Biol Cell.* **18**, 1480-1489
  36. Xiang, M., Feng, M., Muend, S., and Rao, R. (2007)  
A human Na<sup>+</sup>/H<sup>+</sup> antiporter sharing evolutionary origins with bacterial NhaA may be a candidate gene for essential hypertension.  
*Proc Natl Acad Sci U S A.* **104**:18677-81
  37. Zhang, Y.Q., and Rao, R. (2007)  
Global disruption of cell cycle progression and nutrient response by the antifungal agent amiodarone.  
*J. Biol. Chem.* **282**:37844-53
  38. Muend, S., and Rao, R. (2008)  
Fungicidal activity of amiodarone is tightly coupled to calcium influx.  
*FEMS Yeast Research* **8**:425-431.
  39. Faddy HM, Smart CE, Xu R, Lee GY, Kenny PA, Feng M, Rao, R., Brown MA, Bissell MJ, Roberts-Thomson SJ, Monteith GR. (2008)  
Localization of plasma membrane and secretory calcium pumps in the mammary gland.  
*Biochem Biophys Res Commun* **369**: 977-87
  40. Maresova L, Muend S, Zhang YQ, Synchronova H and Rao, R. (2009)  
Membrane hyperpolarization drives cation influx and fungicidal activity of amiodarone.  
*J. Biol. Chem.* **284**: 2795-802.
  41. Gamarra, S., Rocha, E.M., Zhang, Y.Q., Park, S., Rao, R., Perlin, D.S. (2010)  
Mechanism of the synergistic effect of amiodarone and fluconazole in *Candida albicans*.  
*Antimicrob Agents Chemother.* **54**, 1753-61.
  42. Schushan M., Xiang, M., Bogomiakov, P., Padan, E., Rao, R. and Ben-Tal, N. (2010)  
Model-guided mutagenesis drives functional studies of human NHA2, implicated in hypertension.  
*J. Mol. Biol.* **396**, 1181-1196
  43. Zhang, Y.Q., Gamarra, S., Garcia-Effron, G., Park, S., Perlin, D.S. and Rao, R. (2010)  
Requirement for ergosterol in V-ATPase function underlies antifungal activity of azole drugs.  
*PLoS Pathog.* **6**, e1000939
  44. Rao, A., Zhang, Y.Q., Muend, S. and Rao, R. (2010)  
Mechanism of Antifungal Activity of Terpenoid Phenols Resembles Calcium Stress and Inhibition of the TOR Pathway.  
*Antimicrob Agents Chemother* **54**, 5062-9.
  45. Feng, M., Grice, D., Faddy, H.M., Ngyuen, N., Leitch, S., Wang, Y., Muend, S., Kenny, P.A., Sukumar, S., Roberts-Thomson, S., Monteith, G., and Rao, R. (2010)  
Store-independent activation of Orail by SPCA2 in mammary tumors.

- Cell* **143**, 84-98.
46. Leitch, S., Feng, M., Muend, S., Braiterman, L., Hubbard, A. and Rao, R. (2011)  
Vesicular distribution of secretory pathway Ca<sup>2+</sup>-ATPase isoform 1 (SPCA1) and a role in manganese detoxification in liver-derived polarized cells.  
*Biomaterials* **24**, 159-170.
47. Brett, C.L., Kallay, L.M., Hua, Z., Green, R., Chyou, A., Zhang, Y.Q., Graham, T.R., Donowitz, M., and Rao, R. (2011) Genome wide analysis reveals the vacuolar pH-stat of *Saccharomyces cerevisiae*.  
*PLoS ONE*. **6**, e17619.
48. Chanroj S., Lu, Y., Padmanaban, S., Nanatani, K., Uozumi, N., Rao, R., Sze H. (2011) Plant specific cation/H<sup>+</sup> exchanger 17 and its homologs are endomembrane K<sup>+</sup> transporters with roles in protein sorting.  
*J. Biol. Chem.* **286**, 33931-41.
49. Kallay, L.M., Brett, C.L., Tukaye, D.N., Wemmer, M.A., Chyou, A., Odorizzi, G., Rao, R. (2011)  
The endosomal Na<sup>+</sup>(K<sup>+</sup>)/H<sup>+</sup> exchanger Nhx1 functions independently and downstream of the multivesicular body pathway.  
*J Biol Chem.* **286**, 44067-77
50. Kondapalli, K.C., Kallay, L., Muszelik, M., and Rao, R. (2012)  
Unconventional chemiosmotic coupling of NHA2, a mammalian Na<sup>+</sup>/H<sup>+</sup> antiporter, to a plasma membrane H<sup>+</sup> gradient.  
*J. Biol. Chem.* **287**: 36239-50.
51. Shim, J.S. Rao, R., Beebe K., Neckers L., Han I., Nahta R., and Liu J.O. (2012)  
Selective inhibition of HER-2 positive breast cancer cells by the HIV protease inhibitor nelfinavir.  
*J Natl Cancer Inst* **104**, 1576-90.
52. Cross, B., Hack, A., Reinhardt, T.A., and Rao, R. (2013)  
SPCA2 regulates Orail trafficking and store independent entry in a model of lactation.  
*PLoS ONE* **8**, e67348
53. Patenaude, C., Zhang, Yongqiang, Cormack, B., Kohler, J., and Rao, R. (2013)  
Essential role for vacuolar acidification in *Candida albicans* virulence.  
*J. Biol. Chem.* **288**, 26256-64.
54. Kondapalli, K.C., Hack, A., Schushan, M. Landau, M., Ben-Tal, N. and Rao, R. (2013)  
Functional evaluation of autism associated mutations in NHE9.  
*Nat. Commun.* **4**, 2510. doi: 10.1038/ncomms3510.
55. Kondapalli, K.C., Llongueras, J.P., Capilla-Gonzalez, V., Hack, A., Smith, C., Guerrero-Cazares, H., Quinones-Hinojosa, A., and Rao, R. (2015)  
A leak pathway for luminal protons in endosomes drives oncogenic signaling in glioblastoma.  
*Nat. Commun.* **6**, 6289. doi: 10.1038/ncomms7289
56. Prasad, H. and Rao, R. (2015)  
The Na<sup>+</sup>/H<sup>+</sup> exchanger NHE6 modulates endosomal pH to control processing of amyloid precursor protein in a cell culture model of Alzheimer Disease.  
*J. Biol. Chem.* **290**: 5311-27.
57. Nishito Y, Tsuji N, Fujishiro H, Takeda TA, Yamazaki T, Teranishi F, Okazaki F, Matsunaga A, Tuschl K, Rao R, Kono S, Miyajima H, Narita H, Himeno S, Kambe T. (2016)  
Direct comparison of manganese detoxification/efflux proteins and molecular characterization of ZnT10 protein as a manganese transporter.  
*J Biol Chem.* 291:14773-87.
58. Kondapalli KC, Todd Alexander R, Pluznick JL, Rao R. (2017)  
Nha2 is expressed in distal nephron and regulated by dietary sodium.  
*J Physiol Biochem.* 73:199-205.
59. Prasad, H., Osei-Owusu, J. and Rao, R. (2017)  
Functional analysis of Na<sup>+</sup>/H<sup>+</sup> exchanger 9 variants associated with autism and epilepsy.  
*Matters* 10.19185/matters.201704000009
60. Dang, D., Prasad, H. and Rao, R. (2017)  
Secretory pathway Ca<sup>2+</sup>-ATPases promote microcalcifications in breast cancer cells.  
*Mol. Carcinogenesis* 56:2474-2485
61. Prasad, H., Rao, R. (2018)  
Histone deacetylase mediated regulation of endolysosomal pH  
*J. Biol. Chem.* 293: 6721-6735

62. Prasad H, Rao R. (2018)  
Amyloid clearance defect in ApoE4 astrocytes is reversed by epigenetic correction of endosomal pH.  
*Proc. Natl. Acad. Sci* 115:E6640-E6649.
63. Prasad, H. Dang, D.K., Kondapalli, K.C., Natarajan, N., Cebotaru, V., Rao, R. (2019)  
NHA2 promotes cyst development in an in vitro model of polycystic kidney disease.  
*J. Physiol.* 597:499-519
64. Dang, D.K., Makena, M.R., Llongueras, J.P., Prasad, H., Ko, M., Bandral M., Rao, R. (2019)  
A Ca<sup>2+</sup>-ATPase regulates E-cadherin biogenesis and epithelial-mesenchymal transition in breast cancer cells.  
*Mol. Cancer. Res.* 17:1735-1747
65. Makena, M.R., Ko, M., Dang, D.K. and Rao, R. (2021)  
Epigenetic modulation of SPCA2 reverses epithelial to mesenchymal transition in breast cancer cells.  
*Cancers (Basel)* 13(2):E259
66. Makena, M.R., Ko, M., Mekile, A.X., Senoo, N., Dang, D.K., Warrington, J., Buckhaults, P., Talbot, C.C., Claypool, S. M., and Rao, R. (2022)  
Secretory Pathway Ca<sup>2+</sup>-ATPase SPCA2 regulates mitochondrial respiration and DNA damage response through store independent Ca<sup>2+</sup> entry.  
*Redox Biology* 50:102240
67. Ko, M.J., Makena, M.R., Schiaparelli, P., Suarez-Meade, P., Mekile, A.X., Lal, B., Lopez-Bertoni, H., Kozielski, K.L., Green, J.J., Laterra, J., Quiñones-Hinojosa, A., and Rao, R. (2022). The endosomal pH regulator NHE9 is a driver of stemness in glioblastoma.  
*PNAS Nexus*, pgac013
68. Junyi Zou, Koushambi Mitra, Palapuravan Anees, Daphne Oettinger, Joseph Ramirez, Aneesh Tazhe Veetil, Priyanka Dutta Gupta, Rajini Rao, Jayson J. Smith- Paschalis Kratsios, Yamuna Krishnan (2023) A DNA nanodevice for mapping sodium at single organelle resolution.  
*Nat Biotechnol* (2023). <https://doi.org/10.1038/s41587-023-01950-169>.
69. Mekile, A.X., Makena, M.R., Gupta, R., White, C.J., Bowman, R.W., Patnayak, R.L., Lorenzo, D.N. and Rao, R. (2023) The endosomal pH regulator NHE6 is required for insulin stimulated glucose uptake in adipocytes.  
BioRxiv (preprint) <https://biorxiv.org/cgi/content/short/2023.07.30.551163v1>

## **REVIEWS**

1. Nakamoto, R.K., Rao, R., and Slayman, C.W. (1989)  
Transmembrane segments of the P-type cation-transporting ATPases: a comparative study.  
*Annals of the N.Y. Acad. Sci.* 574, 165-179
2. Rao, R., Nakamoto, R.K., and Slayman, C.W. (1989)  
The nucleotide binding site of the plasma membrane H<sup>+</sup>-ATPase of *Neurospora crassa*: a comparison with other P-type ATPases.  
In *Ion Transport*. D. Keeling, and C. Benham, editors. Academic Press, N.Y. 35-53
3. Padmanabha, K.P., Petrov, V., Ambesi, A., Rao, R., and Slayman, C.W. (1994)  
Structural features of the plasma membrane H<sup>+</sup>-ATPase  
*Membrane Transport in Plants and Fungi: Molecular Mechanisms and Control*. Symposia of the Society for Experimental Biology XLVII, 33-42; Blatt, M.R., Leigh, R.A., Sanders, D. (eds). The Company of Biologists Ltd. Cambridge UK
4. Ton, V.-K. and Rao, R. (2004)  
Functional expression of heterologous proteins in yeast: insights into calcium signaling and Ca<sup>2+</sup>-transporting ATPases.  
*Am. J. Physiol. Cell Physiol.* 287, C580-589
5. Brett, C. L., Donowitz, M. and Rao, R. (2005)  
The evolutionary origins of eukaryotic Na<sup>+</sup>/H<sup>+</sup> exchangers  
*Am. J. Physiol. Cell Physiol.* 288, C223-239
6. Zhang, Y.Q., and Rao, R. (2008)  
A spoke in the wheel: calcium spikes disrupt yeast cell cycle.  
*Cell Cycle* 7:870-873.
7. Zhang, Y.Q. and Rao, R. (2010)  
Beyond ergosterol: linking pH to antifungal mechanisms.  
*Virulence* 1(6):551-4.



8. Zhang, Y.Q. and Rao, R. (2012)  
The V-ATPase as an antifungal target.  
*Current Protein and Peptide Science* 12(2):134-40.
9. Zhang Y, Muend S, Rao R. (2012)  
Dysregulation of ion homeostasis by antifungal agents.  
*Frontiers in Microbiology (minireview)* 3(133).
10. Feng, M. and Rao, R. (2013)  
New insights into store-independent Ca<sup>2+</sup> entry: Secretory Pathway Calcium ATPase 2 in normal physiology and cancer.  
*Int. J. Oral. Sci.* doi: 10.1038/ijos.2013.23.
11. Cross, B.M., Breitwieser, G., Reinhardt, T. and Rao, R. (2014)  
Cellular Ca<sup>2+</sup> dynamics in lactation and breast cancer: From physiology to pathophysiology  
*Am. J. Physiol. Cell Physiol.* 306:C515-526.
12. Kondapalli, K.C., Prasad, H. and Rao, R. (2014)  
An Inside Job: How Endosomal Na<sup>+</sup>/H<sup>+</sup> Exchangers link to Autism and Neurological Disorders  
*Front. Cell. Neurosci.* 8:172 doi 10.3389/fncell.2014.00172
13. Prasad H, Rao R. (2015)  
Applying knowledge of autism to brain cancer management: what do we know?  
*Future Oncol.* 11: 1847-50
14. Dang D, Rao R. (2016)  
Calcium ATPases: Gene disorders and dysregulation in cancer.  
*Biochim Biophys Acta.* 1863:1344-50.
15. Makena, M.R., Rao, R. (2020)  
Subtype specific targeting of calcium signaling in breast cancer.  
*Cell Calcium*, 85:102109
16. Prasad, H., Rao, R. (2020)  
Endosomal acid-base homeostasis in neurodegenerative diseases  
*Rev Physiol Biochem Pharmacol.* doi: 10.1007/112\_2020\_25. Online ahead of print
17. Ko, M., Quiñones-Hinojosa, A., and Rao, R. (2020)  
Emerging links between endosomal pH and cancer  
*Cancer Metastasis Review* 39(2):519-534
18. Rao, R. (2021)  
Milk on the Moo've  
*Cell Calcium* 94:102332

## **BOOK CHAPTERS**

1. Rao, R., and Slayman, C.W. (1996)  
The fungal P-ATPases: a functionally diverse family of cation pumps.  
*The Mycota Vol. IV*, 29-56 (R. Brambl and G.A. Marzluf, eds. Springer-Verlag, Berlin)
2. Rao, R., and Inesi, G. (2004)  
Inherited disorders of Calcium ATPases: Role in health and disease  
*Membrane Transport Diseases: Molecular basis of inherited transport defects.* (S. Broer and C.A. Wagner, eds. Kluwer Academic/Plenum Publishers)

**Complete List of Published Work in My Bibliography (H index-51, i10 index-79, 8897 citations):**

<http://www.ncbi.nlm.nih.gov/myncbi/rajini.rao.2/bibliography/47954430/public/?sort=date&direction=ascending>

**Google Scholar:** <https://scholar.google.com/citations?user=2WhfcLoAAAAJ&hl=en>

## **FUNDING/SPONSORSHIP**

### ***CURRENT***

Title: Minerals in Nutrition and Development (MINeD)  
Principal Investigator: Rajini Rao, Ph.D.  
Agency: National Institutes of Child Health and Development  
Type: UC2  
Total Award: \$4,892,576  
Period: 8/07/23-8/06/28

Title: Training Program in Cellular & Molecular Medicine  
Principal Investigator: Rajini Rao, Ph.D.  
Agency: National Institutes of General Medical Sciences (NIGMS)  
Type: T32  
Total Award: \$3,811,414  
Period: July 1, 2020-June 30, 2025

Title: Mechanism and Function of Intracellular Sodium Proton Exchangers  
Principal Investigators (Multi-PI): Rajini Rao (PI), Yamuna Krishnan (Co-PI), Tooraj Mirshahi (Co-I)  
Agency: National Institute of General Medical Sciences  
Type: R01  
Total Award: \$2,272,123  
Period: September 1, 2022-August 31, 2026

Title: Targeting SLC9B2 in a human organoid model of cystogenesis  
Principal Investigator: Rajini Rao, Ph.D.  
Agency: NIH/NIDDK  
Type: PKD RRC Pilot and Feasibility Award  
Total Award: \$127,000  
Period: 03/01/2024-02/28/2026

### ***INTRAMURAL***

Title: The Institute for Basic Biomedical Sciences Molecules to Medicine Initiative  
Principal Investigators: Luis Garza, M.D., Ph.D. and Rajini Rao, Ph.D.  
Agency: Fannie Gaston-Johansson Faculty Excellence Program, Johns Hopkins University  
Type: Cluster Hire/Faculty Recruitment Funds  
Total Award: \$4M  
Period: 2023-2026

### ***PREVIOUS***

Title: Manipulating Golgi Ions  
Principal Investigator: Rajini Rao, Ph.D.  
Agency: FVE Foundry  
Type: Venture Capital (private)  
Total Award: \$137,103  
Period: 1/1/23-12/31/23

Title: Training Program in Cellular & Molecular Medicine  
Principal Investigator: Rajini Rao, Ph.D.  
Agency: National Institutes of General Medical Sciences  
(NIGMS) Type: T32  
Period: July 1, 2016-June 30, 2020

Title: Transport mechanism and renal function of a newly recognized  $\text{Na}^+/\text{H}^+$  Exchanger  
Principal Investigator: Rajini Rao, Ph.D.  
Agency: National Institute of Diabetes and Digestive and Kidney Disease (NIDDK)  
Type: R01  
Period: September 1, 2015-August 31, 2020

Title: Secretory Pathway Calcium and Manganese Pumps  
Principal Investigator: Rajini Rao, Ph.D.  
Agency: National Institute of General Medical Sciences  
(NIGMS) Type: R01  
Period: December 1, 2011- November 30, 2015

Title: Cellular Basis for the Antifungal Activity of Amiodarone  
Principal Investigator: Rajini Rao,  
Ph.D. Agency: National Institutes of  
Health Type: R01  
Period: July 1, 2006-June 30, 2011

Title: The NhaA Na/H antiporters: structure and evolutionary-bioinformatic based study  
Principal Investigators: Etana Padan, Ph.D. (Israel) and Rajini Rao, Ph.D.  
(USA) Agency: United States-Israel Binational Science Foundation (BSF)  
Type: Research Grant

Title: Mechanisms of Ion Selection and Transport in P-type ATPases  
Principal Investigator: Rajini Rao, Ph.D. (40% effort)  
Agency: National Institutes of General Medical Sciences  
(NIGMS) Type and ID number: R01 GM62142

Title: Endosomal Exchangers from Yeast and Human: Role and Regulation  
Principal Investigator: Rajini Rao, Ph.D. (30 % effort)  
Agency: National Institutes of Health (NIDDK)  
Type and ID number: R01 DK5421

Title: Cellular and Molecular Properties of the Human Secretory Pathway Calcium Pumps  
Principal Investigator: Rajini Rao, Ph.D. (5% effort) Agency:  
American Heart Association Mid-Atlantic Affiliate Type and ID  
number: Grant-In-Aid

Title: Molecular Basis of Ion Transport in Calcium and Proton Pumps  
Principal Investigator: Rajini Rao  
Agency: American Cancer Society  
Type and ID number: Institutional Research Grant (IRG 11-33)

Title: Molecular Mechanisms of Cation Transport in Yeast  
Principal Investigator: Rajini Rao

Agency: American Cancer Society  
Type and ID number: Junior Faculty Award (JFRA 538)

Title: Molecular Analysis of Calcium Pumps Principal Investigator: Rajini Rao, Ph.D. Agency: National American Heart Association  
Type and ID number: Grant-In-Aid (GIA 95012290)

Title: Cellular and Molecular Role of Endosomal Na<sup>+</sup>/H<sup>+</sup> Exchangers  
Principal Investigator: Rajini Rao, Ph.D.  
Agency: National Institute of Diabetes and Digestive and Kidney Disease (NIDDK)  
Type: R01 DK54214

Title: Molecular Basis for Selectivity and Transport in Ion Pumps  
Principal Investigator: Rajini Rao, Ph.D.  
Agency: National Institutes of General Medical Sciences (NIGMS)  
Type: R01 GM52414

### ***INTRAMURAL***

Title: A Patient Derived Preclinical Model for Endosomal Pathology in Alzheimer's Disease  
Principal Investigator: Rajini Rao, Ph.D. Agency: JHU Discovery Fund  
Period: September 1, 2016 – August 31, 2018

Title: Targeting a Novel Mechanism of Chemoradiation Resistance in Glioblastoma  
Principal Investigator: Rajini Rao, Ph.D.  
Agency: Alleghany Health Network-Johns Hopkins Research Fund  
Period: April 1, 2015-March 31, 2017

### ***CONFERENCE GRANTS***

Title: 2016 Membrane Transport Proteins, Translating Molecules to Medicine Gordon Research Conference  
Principal Investigator: Rajini Rao, Ph.D.  
Agency: National Center for Advancing Translational Sciences (NCATS)  
Type: R13 TR001690

Title: 2014 Membrane Transport ATPases Gordon Research Conference  
Principal Investigator: Rajini Rao, Ph.D.  
Agency: National Institutes of Neurological Disorders & Stroke (NINDS) Type:  
Type: R13 NS089244

Title: 2010 Transport ATPases, From Molecules to Maladies, FASEB Summer Research Conference  
Principal Investigator: Rajini Rao, Ph.D.  
Agency: National Institutes of Digestive & Kidney Disease (NIDDK)  
Type: R13 DK088397

## **EDUCATIONAL ACTIVITIES**

### ***GRADUATE TRAINING PROGRAMS***

#### *Cellular & Molecular Medicine (CMM)*

Role: Faculty Mentor (1999-current), Policy Committee (2002-2007), Director (2008-current), PI on T32 award (2008-current)

#### *Biochemistry, Cell & Molecular Biology (BCMB)*

Role: Faculty Mentor (1994-current), Admissions Committee, Course Director (Pathways & Regulation; 2003-2011)

#### *Cellular & Molecular Physiology (CMP)*

Role: Faculty Mentor (1994-current), Admissions Committee

### ***TEACHING***

### **GRADUATE & MEDICAL COURSES**

#### Medical School *Molecules and Cells* (1<sup>st</sup> year course)

Description: 2 lectures, small group discussions (daily for ca. 2.5 weeks)/approx. 150 students

Role: Lecturer, Faculty Leader (1995-2019)

#### Medical School *Organ Systems* (1<sup>st</sup> year course)

Description: Journal Clubs, small group discussions in Renal and GI section

Role: Faculty Leader (1995-2011)

#### BCMB *Graduate Biochemistry and Cell Biology*

Description: 4 lectures/approx. 100 students

Role: Lecturer (1998-2003)

#### BCMB *Core Discussion Series*

Description: Twice/week journal club throughout the academic year

Role: Course Director (1999-2003)

#### BCMB *Pathways and Regulation* Core Module Course

Description: Core course for 1<sup>st</sup> year graduate students/16 lecture slots/approx. 100 students

Role: Course Director (2003-2011) and Lecturer (current); 3 lectures

#### CMP/Pharmacology, BCMB and CMM Discussion Series

Description: 3-4 journal clubs/year

Role: Faculty Leader (1999-current)

#### CMM *Human Body*

Description: 1 lecture/approx. 20 students

Role: Lecturer (2008-current)

#### School of Medicine *Research and Ethics* (multiple graduate programs)

Description: 3 hours

Role: Lecture on "Finding a Mentor", small group discussion on research ethics (2008-current)

#### Biomedical Engineering *Horizons in biological calcium and voltage signaling* (Elective Course)

Description: 2 journal clubs (3 hours)

Role: Faculty Leader with the late David Yue (2013-2014)

#### *CMM Grant Writing Workshop*

Description: 2-3 lectures/24 students

Role: Course development, director and lecturer (2010-current)

#### *JHU Rigor and Reproducibility*

Description: 7 online modules

Role: Course development and oversight, funder

## **MENTORING**

**Training Record:** In my laboratory, I have mentored 16 postdoctoral fellows and 12 PhD students; many have won national awards and fellowships (NRSA F31/F32, HHMI Gilliam, APS Porter Fellow, AHA Fellow, AACR AstraZeneca Fellow) and gone on to independent academic faculty positions or to industry. Four trainees have won the prestigious Young Investigator Award at Johns Hopkins. Four Ph.D. trainees are from historically marginalized/underrepresented communities.

## **Ph.D. THESIS ADVISOR**

- Richard Nass (1994-98) Cellular and Molecular Physiology (CMP) Graduate program; Currently Associate Professor of Pharmacology and Toxicology, Indiana University School of Medicine.
- Christopher L. Brett (1999-2005) Cellular and Molecular Medicine (CMM) Graduate program, *American Heart Association PreDoctoral Fellowship* (2002-2004); *David Israel Macht Young Investigator Award*, Johns Hopkins. Currently Professor of Biology and University Research Chair of Applied Cell Science, Concordia Univ. Montreal.
- Van-Khue Ton (2000-2005) Biochemistry Cell & Molecular Biology (BCMB) Graduate program, *Winner of 2002 Graduate Student Poster Award in 2nd-3rd year category*, *Organizer of 2003 Hopkins Yeast Meetings (monthly research presentations)*. Currently Assistant Professor and Advanced Heart Failure Cardiologist, Harvard University Mass General Hospital.
- Sabina Muend (2004-2009) Cellular & Molecular Physiology (CMP) Graduate Program, Currently Staff Scientist Immuno-Oncology, City of Hope National Medical Ctr. Duarte, CA.
- Mingye Feng (2005-2011) Cellular & Molecular Physiology (CMP) Graduate Program, *H.A. and Mary K. Chapman Young Investigator Fellowship*, *AHA Predoctoral Fellowship* (2008-2010), *Martin & Carol Macht Young Investigator Award* (2011), Currently Associate Professor, City of Hope National Medical Ctr, Duarte, CA.
- Brandie Cross (2008-2013) Biochem. Cell & Mol. Biol (BCMB) Graduate Program, *Kelly Young Scholar* (2008); Currently Chief Scientific Officer of The Pot Lab, a non-profit cooperative of scientists supporting medical products, services and scientific research into Cannabis. Adjunct Asst Professor, California Polytechnic and California State University, Los Angeles, CA.
- Anniesha Hack (2008-2013) Cellular & Molecular Medicine (CMM) Graduate Program, *APS Porter Fellow* (2010-2012); Currently Clinical Research Scientist at Novartis (NJ).
- Cassandra Patenaude (2011-2014) Biochem. Cell & Mol. Biol (BCMB) Graduate Program; Currently Medical Writer/Clinical Research Specialist at Technical Resources International, Inc.

Hari Prasad	(2011-2018) Cellular & Molecular Medicine (CMM) Graduate Program; <i>Fulbright Fellow, Dinesh Thekdi Young Investigator Awardee</i> , Johns Hopkins. Currently <i>Burroughs Wellcome Junior Faculty</i> at Indian Institute of Science, Bangalore, India.
Donna Dang	(2012-2018) Cellular & Molecular Medicine (CMM) Graduate Program; Currently Principal Associate for Biomedical Research, The Pew Charitable Trust.
Myungjun Ko	(2014-2020) Cellular & Molecular Medicine (CMM) Graduate Program; Currently in medical school, UCLA Geffen School of Medicine. <i>Cancer Nanotechnology Predoctoral Fellow, Ruth L. Kirschtein National Research Service (NRSA) Fellow</i> .
Allatah Mekile	(2015-2022) Biochemistry, Cell and Molecular Biology (BCMB) Graduate Program. <i>Turock Young Scientist Award, HHMI Gilliam Fellow</i> ; Currently Scientist at Thermo Fisher.

## POSTDOCTORAL FELLOWS

Gisele Rosas	(1995-97); Fellow, Mexico City Justice Department
Debjani Mandal	(1998-2001); Senior Scientist at the Indian Institute of Chemical Biology, Calcutta, India
Karen Wells	(1998-2000); <i>American Heart Association Postdoctoral fellow</i> , Faculty, Sr. Lecturer Advanced Academic Programs at Johns Hopkins University, Baltimore, MD
Samuel Rulli	(2001-2002); Experienced Global Product Manager in Life Sciences, Qiagen
Rashid Ali	(2001-2004); Research Associate at University of Connecticut, Storrs
Sanchita Mukherjee	(2001-2004); Staff Scientist at Mayo Clinic, Rochester MN
Jyoti Yadav	(2004-2006); Scientist, Institute of Genome and Integrative Biology, CSIR, India
Minghui Xiang	(2004-2009); Math & Science Instructor, Frank Peterson Academy, Jacksonville, FL
Sharon Leitch	(2008-2010); Senior Scientist, BD Biosciences, Molecular Division of Women's Health and Cancer
Laura Kallay	(2005-2010); Lab Manager, University of Cincinnati, OH
Yong Qiang Zhang	(2006-2013); Senior Biostatistician (Thrive, Exact Sciences, Baltimore MD).
Kalyan Kondapalli	(2008-2014); <i>American Heart Association Postdoctoral Fellow</i> ; Associate Professor in Biology, U. Michigan at Dearborn.
Elizabeth Ploetz	(2015-2017); <i>Ruth L. Kirschtein National Research Service (NRSA) Fellow</i> , currently Research Associate in Physical Chemistry, Kansas State University
Monish Ram Makena	(2017- 2022); <i>AACR-AstraZeneca Breast Cancer Research Fellow; Paul Ehrlich Award of the Young Investigator's Day, Johns Hopkins SOM</i> ; Currently Clinical Trials division, Eli Lilly.
Ruby Gupta	(2022-current); Postdoctoral Fellow
Ray Wes Bowman	(2022-2023); Postdoctoral Fellow
Misba Masood	(2023-current); Postdoctoral Fellow
Akash Chinchole	(2023-current); Postdoctoral Fellow

## VISITING STUDENTS *Representative selection*

1994	Runsheng Wang, M.D., Visiting student from China; <i>World Health Organization Scholarship</i>
2001	Stephen Cronin, Visiting Ph.D. candidate from U.C. San Diego
2002	Soma SenGupta, Ph.D., Visiting Medical student from Cambridge, UK; <i>Burroughs Wellcome Scholarship</i>
2003	Sam Kuruvilla, Visiting Ph.D. candidate from SPIC, India; <i>UNESCO/American Society for Microbiology Scholarship</i>
2008	Barbara Stiller, Visiting Ph.D. candidate from University of Cologne, Germany
2008	Uchenna Emeche, Visiting Medical student from Case Western Reserve

2019 Manuj Bandral, Khorana Scholar  
2023 Nitin Rao, Saira Sherfudeen, Visiting Medical Students

**MINORITY TRAINING** *Representative selection (avg. 1 URM student/summer)*

1995 Sonya Green (*MSIP* scholarship)  
1999 LaTanja Watkins (*MSIP* scholarship)  
2006-2007 Akunna Iheanacho (postbaccalaureate), Anselm Beach (HS student; supported by research supplement from NIGMS)  
2007 Melinda Beale (volunteer trainee)  
2010-2014 Jose P. Llongueras, Johns Hopkins Post-Baccalaureate (PREP) program  
2017 Michael Carpenter, SARE scholar, Baltimore  
2018 Shantika Bhat, SARE scholar, Baltimore  
2022 Reina Ambrocio, PREP program, JHMI  
2023 Seblewongel Enyew, BSI-SIP program, JHMI  
2024 Catrina Tounjian, CSM-SIP program, JHMI

**THESIS COMMITTEE/THESIS READER:** *Representative selection*

BCMB program: Sean O’Hearn, Grace Naco, Jennifer Mehlman, Julia Romano, Kellie Cummings, Nurjana Bachman, Ed Brignole, Karen Pinco, Tom Sussan, Tillman Schneider-Poetsch,  
CMM program: Nicholas Christoforou, Shafinaz Akhter, Anand Ganesan, Jennifer Hendersen, Robert Wardlow, Deepthi Ashok, Will Aisenberg, Manuel Seman  
CMP program: Jia Xu, Sang-Ho Kwon, Hongmei Yang, Tian Xu, Xiaoli Zhong, Oluwaseun Ogunbona, James Osei-Owusu, Jiachen Chu  
Pharmacology: Jeff Shaman  
Immunology: Sara Pai, Vivian Weiss, Kenya Lemon  
Biological Chemistry: Elizabeth Petro, Lin Shen, Fulya Turker, Emily Cook  
Biology/Homewood: Myriam Bonilla, Christine Birchwood, Emily Locke, Eric Muller, Kristine Funkhouser, Huynh Long, Mary Weston  
Bloomberg SPH: Edward Luk, Sunil Nayak, Amonrat Narauntar, Leah Rosenfeld  
UMD at College Park: Ildoo Hwang, Xiyan Li, Salil Chanroj  
UVA at Charlottesville: Christian Ketchum  
U Alberta at Edmonton: Delaine Ceholski  
Univ Leuven, Belgium: Jialin Chen  
Stockholm University: Iven Winkleman, Jutta Diessl

**UNDERGRADUATE STUDENTS:** *Representative selection*

Alexander Sorin, Valerie Marchi (*Recipient of Johns Hopkins University Provost's Award for Research*), Patrick Andrew Holt, Sridaran Narayanan, Kimberly Young, Jenny Lin, LaTanja Watkins (*MSIP scholar*), Anthony Chyou (*Recipient of Johns Hopkins University Provost's Award for Research*), Michael Poli, Brooke Weckselblatt (*SIP scholar*, Bryn Mawr College), Sonya Murthy (Cedar Crest College), Lukman Solola (*SIP scholar*, Brooklyn College), Amitosh Singh (Johns Hopkins University), Melanie Muzelik (Wittenberg College), Pakinam Mekki (*SIP scholar*, Wagner College), Manuj Bandral (*Khorana Fellow*), Reina Ambrocio (*PREP scholar*).

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## ***EDITORIAL ACTIVITIES***

Editorial Board Member: Journal of Biological Chemistry (2003-2008) and (2011-2016)

Editorial Advisory Board: ASBMB Today (2013-2016), Chair (2017-current)

Editorial Board Member: Journal of Physiology (2018-current)

Editorial Advisory Board: Journal of General Physiology (2020-current)

Special Editor: Biophysics of Cancer, Biophysical Journal (2021-22)

Ad hoc reviewer for Nature, eLife, Journal of Cell Biology, Biochemistry, Microbiology, Molecular Biology of the Cell, Molecular Microbiology, J. Invest. Dermatology, J. Clinical Investigation, Plant Physiology, EMBO J., and others.

## **ORGANIZATIONAL ACTIVITIES**

### ***INSTITUTIONAL***

1994-1998	Medical School Council of the Johns Hopkins University
1995-2010	Young Investigators Day Awards Committee of the Johns Hopkins University
1998-2010	Admissions Committee and Student Progress Committee of Graduate Program in Cellular and Molecular Physiology (CMP)
2003	HIT Center Faculty Recruitment Committee
2002-2007	Policy Committee of the Graduate Program in Cellular & Molecular Medicine (CMM)
2003	Graduate Student Association Poster Competition Judge
2004-2007	Admissions Committee of the Graduate Program in Biochemistry Cell and Molecular Biology
2008-current	Admissions Committee of the Graduate Program in Cellular & Molecular Medicine
2005	IBBS Proposal Screening Committee
2007-current	Director, Center for Membrane Transport (IBBS Center)
2007-2011	Chair, Faculty Search Committee, Physiology department
2007-2009	Member, Faculty Search Committee, Center for Sensory Biology (IBBS Center)
2010-2012	Member, Faculty Search Committee, Center for Chemoprotection (IBBS Center)
2013	Chair, committee to review PhD Innovation Initiative (PII) applications
2016	Physician Scientist Program Director Search Committee, Dept. Medicine
2016	Center for Human Systems Biology Director Search Committee, IBBS
2017-current	Professorial Promotions Committee, School of Medicine
2017-2018	Biochemistry Chair Search Committee, Bloomberg School of Public Health
2019-2022	Nomination Committee, HHMI Gilliam Scholars Program
2019-current	Advisory Board, R <sup>3</sup> ISE Graduate Program, Bloomberg School of Public Health
2020	Cell Biology, Chair Search, School of Medicine
2021-2022	Co-Chair, Cluster Hire Search, Institute of Basic Biomedical Sciences
2023	Search Committee, Assistant Dean for Diversity, Equity, and Inclusion (DEI) for Graduate Medical Education and Postdoctoral Affairs

### ***PROFESSIONAL SOCIETIES***

Member	Federation of American Society of Experimental Biology (FASEB), Biophysical Society (BP), American Association for the Advancement of Science (AAAS), American Society for Biochemistry and Molecular Biology (ASBMB), Society for General Physiology (SGP)
2006-2009	Elected Member of the Biophysical Society Council
2006-2015	Elected Chair, Committee on Professional Opportunities for Women
2007-2008	Elected Member of the Executive Council, Biophysical Society
2009	Elected Chair, Nominating Committee, Biophysical Society

2010	Elected Member, Nominating Committee, Biophysical Society
2012	Nominated to run for President, Biophysical Society
2015-2021	ASBMB Today Advisory Board
2017-2021	Chair, ASBMB Today Advisory Board
2020-2021	Mentor, Junior Faculty Network, Journal of General Physiology

### ***OPPORTUNITIES FOR WOMEN***

1998-2000	Day Care Committee of the Johns Hopkins University ( <i>successful in instituting the first child care center at the JHU medical campus</i> )
2002-current	Women's Leadership Council (WLC), Member and former Chair of Mentoring Committee, Advisory Board Member, Johns Hopkins University SOM
2006-2015	Member & Elected Chair, Committee on Professional Development of Women (CPOW) Biophysical Society
2008	Moderator: "Getting paid and other negotiation skills" Biophysical Society Panel discussion
2013	Speaker, Conference on Excellence of Women in Science, Bern, Switzerland
2014-2021	Co-Founder, STEMWomen.net
2015	Speaker, NMTC Women in STEM forum, Aberdeen Proving Ground, MD
2015	Panelist, Excellence of Women in Science at Biomedical Transporters, Lugano Switzerland.
2015	Columbia University, Women in Science, Special Panel
2016	Keynote speaker, Towson University Women in Science Day
2016	Keynote speaker, Maryland Collegiate STEM Conference
2016	Keynote speaker, BioXFEL conference, Las Vegas
2019	Chair, Panel and Scientific Session on Women in Science, BioParadigms Conference, Lucerne, Switzerland

### ***HISTORICALLY MARGINALIZED AND UNDERREPRESENTED COMMUNITIES***

2007-current	Johns Hopkins SOM Summer Internship Program Admissions Committee (Diversity Program)
2008	NIH Review Panel for Predoctoral Fellowships (Minorities and Disabilities)
2008	Annual Biomedical Research Conference for Minority Students ( <i>ABRCMS</i> ), Poster Judge
2010	NIH Review Panel <i>MBRS</i> program
2015-current	JHU Post-baccalaureate Research Education Program (PREP) Advisory Board
2020-current	Physiology Department Journal Club on Diversity, Equity and Inclusion, facilitator and discussion leader
2020	ASCB Minority Affairs Committee Panelist, Education & Professional Development, ASCB Annual Meeting
2022	Panelist on Increasing Diversity in Academia, Conference on The Brain in Flux, Japan
2022	Co-Chair, Cluster Hire Faculty search for Institute of Basic Biomedical Sciences.
2023	Search Committee, Assistant Dean for Diversity, Equity, and Inclusion (DEI) for Graduate Medical Education and Postdoctoral Affairs
2023	DEI speaker and panelist, Molecular Biophysics mini symposium of the Weill Cornell and Memorial Sloan Kettering Cancer Center, NYC

### ***CONFERENCE CHAIR***

2000	Conference Organizer and Chair for the 2000 Mid-Atlantic Yeast Conference at the Homewood Campus of the Johns Hopkins University (June 2-4, 2000) featuring 150 registered participants, 30 platform talks and 40 poster presentations. My role as principal organizer was to set up the meeting web site, facilitate on-line registration, compile abstracts, receive payments, and organize meals, housing and entertainment, and coordinate the scientific sessions.
2002	Conference Organizer and Chair for the 20th Annual SMYTE (International Meeting on Yeast Transport and Bioenergetics) held at the Homewood Campus of the Johns Hopkins University (June

7-10, 2002) featuring 50 participants world-wide from 13 countries (25 talks and 12 poster presentations).

- 2007 Co-Chair, FASEB Summer Research Conference on Transport ATPases, Saxtons River, VT
- 2010 Conference Organizer and Chair, FASEB Summer Research Conference on Transport ATPases: From Molecules to Maladies, Snowmass Village,
- 2014 Vice-Chair, Gordon Research Conference on Membrane Transporters, Maine
- 2016 Chair, Gordon Research Conference on Membrane Transporters, Il Ciocco, Italy.
- 2022 Conference Organizing Committee, P-type ATPases in Health and Disease, Banff, Canada

### **CONFERENCE SESSION CHAIR**

- 1996, 2000, 2001 Session Chair for *Ion Motive ATPases* at Annual Meeting of the Biophysical Society
- 2007 Session Chair & Organizer, *Metal Transport* at Annual Meeting of the Biophysical Society
- 2007 Session chair, FASEB conference on Transport ATPases, Saxtons River, VT
- 2022 Session Chair, Neurological and Neuropsychiatric Disorders: Transporters at Play, Gordon Research Conference on Membrane Transporters, Castelldefels, Spain

### **ABSTRACT SORT**

- 2001, 2002, 2006, 2008, 2009 Abstract Sort Committee for the Annual Meeting of the Biophysical Society

### **EXTERNAL ADVISORY COMMITTEES & REVIEW GROUPS**

- 1998, 2000, 2008, 2010 Ad hoc reviewer for the NIH
- 2001-2005 Regular Member of Cardiovascular Physiology and Pharmacology Study Section of the National American Heart Association
- 2002-2007 Regular Member, NIH Study Section on Physical Biochemistry (PB)/Biophysics of Biological Membranes (BBM)
- 2010-2012 Member, College of CSR Reviewers, NIH
- 2013-2019 Member, Training Work Force and Development TWD-A Review Panel, NIH
- 2015 Member, Department of Defense BCRP Review Panel
- 2016-2019 HHMI Gilliam Fellowship Review Panel
- 2017 Reviewer, NIH CSR Special Emphasis Panel (SEP) “Fellowship: Cell Biology, Developmental Biology, and Bioengineering (F05-U)”
- 2017 Reviewer, NIH CSR IAM panel “ZRG1 BCMB-P (02) M”
- 2018 Reviewer, NSF Graduate Research Fellowship Program
- 2018 Reviewer, NIH CSR F03A panel “Neurodevelopment, Synaptic Plasticity & Neurodegeneration”
- 2018-2019 Member, Department of Defense BCRP Review Panel
- 2019-2024 Advisory Board, RESOLUTE consortium, Vienna
- 2021 Reviewer, NIH CSR F09-B panel, Oncological Sciences Fellowship
- 2021 External Reviewer, Program in Molecular & Cellular Biology (MCB) for the Division of Biology and Biomedical Sciences at Washington University, St. Louis, MO
- 2021 External Reviewer, Program in Integrative Membrane Biology, University of Maryland School of Medicine, MD
- 2021 Reviewer, Training Workforce and Development TWD-B Review panel, NIH
- 2022 External Advisor, OHSU Program in Biomedical Sciences

2022 External Advisor, Yale School of Medicine Training Program in Molecular Medicine  
2023 External Advisor, Case Western University Training Program in Pharmacology

## **SCIENCE OUTREACH**

I use social media to network with my scientific peers, promote a culture of diversity and inclusion in academia, and to advocate for best practices in scientific publishing, research and graduate education. Most recently (March 2024), I was featured during Biophysics Week in the “**Ask Me Anything**” outreach by the Biophysical Society on Twitter/X.

Twitter/X handles: [@madamscientist](#), [@CMM\\_JHU](#), [@STEMwomen](#)

Blog sites: [madamscientist.com](#), [STEMWomen.net](#)

I have written **science microblogs** that aim to educate and engage the intelligent layperson. I have moderated the largest science community (~500K followers) on the now-defunct Google Plus network, curated Science on Google+: A Public Database, STEM Women on Google+, and #ScienceSunday. I was featured on Google’s Suggested User List for Science and followed by >300K people. My science blogs are now archived on my personal Wordpress blog site [madamscientist.com](#).

I have co-written and edited data-driven blog articles on **women in STEM** for the blog site STEMWomen.net which I co-founded in 2014. These include articles on the **Matilda Effect** on the lack of diversity in academic awards, the role of Professional Societies in promoting women, profiles of women scientists and most recently, on best practices in mentoring of Postdoctoral Fellows at Johns Hopkins School of Medicine. The site was archived in 2021.

## **RECOGNITION**

### **ACADEMIC AWARDS, HONORS & FELLOWSHIPS**

1980 Ranked 1st in the State of West Bengal, and 3rd in India, Indian School Certificate Examination  
1983 Gold Medal in Chemistry, Gold Medal in Botany, Bangalore University, India  
Ranked 3rd in the Field of Science (Mathematics, Physics, Chemistry, Botany, and Zoology) by Bangalore University (>10,000 students)  
1984-85 Program in Biology and Medicine Fellowship, University of Rochester, Rochester, NY  
1987-88 Elon Huntington Hooker Graduate Fellowship in Chemistry, University of Rochester, Rochester  
1989 Walter Bloor Award for Excellence in Biochemistry, University of Rochester, Rochester, NY  
1988-89 James Hudson Brown/Alexander B. Coxe Postdoctoral Fellowship, Yale University, New Haven  
1990-91 American Heart Association Postdoctoral Fellowship, Connecticut Affiliate  
1994-97 American Cancer Society Junior Faculty Award, Johns Hopkins University, Baltimore  
2001, 2003 Nico Van Uden Lecturer (Keynote speaker) at the 19<sup>th</sup> and 21<sup>st</sup> SMYTE conferences at Crete and Bonn  
2006 Keynote speaker, Pan American Plant Membrane Biology Workshop, South Padre Island TX  
2009 **Teacher of the Year Award** from Graduate Student Association, Johns Hopkins University School of Medicine  
2009 Johns Hopkins **Professors Award for Excellence in Teaching in Preclinical Sciences**  
2009 Hans Prochaska Memorial Lecturer, Johns Hopkins MSTP-MD/PhD Program  
2016 Keynote speaker, Maryland Collegiate STEM Conference  
2017 Keynote speaker, BioXFEL conference, Las Vegas  
2018 Keynote Speaker, SMYTE conference on Yeast Transporters (Italy)  
2018 Named one of 125 “**Hopkins Heroes**” for *Living the Hopkins Mission*, JHUSOM 125<sup>th</sup> Anniversary  
2022 Keynote speaker, APS Greater Washington DC Area Annual Meeting  
2022 Distinguished Speaker, R<sup>3</sup>ISE Welsh Symposium, Bloomberg School of Public Health, JHU  
2023 **Elected Fellow** of American Association for Advancement in Science (AAAS)  
2023 Keynote speaker, Brain in Flux Conference International Society for Neurochemistry in Gaia, Portugal

## ***INVITED TALKS & PANELS***

- 1997            Uniformed Health Science Services, Bethesda, MD  
University of Maryland in Baltimore, MD
- 1998            Annual Meeting of the American Society for Microbiology, Atlanta, GA  
Symposium on Membrane Transport in Banff, Canada  
University of Virginia at Charlottesville
- 1999            Annual Meeting of the Biophysical Society, Baltimore, MD Small  
Meeting in Yeast Transport and Energetics, Spain University of  
Maryland at College Park, MD  
University of Alberta, Edmonton, Canada
- 2000            Annual Meeting of the Biophysical Society, Kansas City  
Small Meeting in Yeast Transport and Bioenergetics (SMYTE) in Brazil  
Public Health Research Institute of NY  
NIH Symposium on “Advances in Membrane Transport: Lessons from Model Organisms” in  
Bethesda
- 2001            Nico Van Uden/KEYNOTE Lecturer at the 19th SMYTE in Crete, Greece  
Wayne State University, Detroit MI  
Annual Meeting of the Biophysical Society, Boston, MA  
Symposium on Model Organisms, American Physiological Society FASEB meeting in Orlando  
Mid-Atlantic Yeast Meeting, Baltimore, MD  
Gordon Research Conference on Mechanisms in Membrane Transport  
FASEB conference on Transport ATPases, Snowmass, CO  
Small Meeting in Yeast Transport and Bioenergetics (SMYTE) in Crete  
Georgetown University, MD
- 2002            Annual Meeting of the Biophysical Society, San Francisco, CA  
University of Chicago, IL  
Syracuse University, NY  
Small Meeting in Yeast Transport and Energetics, Baltimore, MD  
Indian Institute of Science, Bangalore, India  
University of Rochester, NY  
Bowling Green State University of Ohio
- 2003            Annual Meeting of the Biophysical Society, San Antonio, TX  
FASEB Conference on Transport ATPases, VT  
Nico Van Uden/Keynote Lecturer of 21st SMYTE in Bonn, Germany
- 2004            Tufts University, Boston  
University of Maryland Medical School, Baltimore  
Annual Meeting of the Biophysical Society, Baltimore (Speaker for Transport and Permeability  
Subgroup)  
University of Maryland at College Park, MD  
Oregon Health Sciences University, Portland
- 2005            Annual Meeting of the Biophysical Society, Long Beach, CA

- University of Maryland College Park  
 Mt. Sinai School of Medicine, NY  
 Georgia State University, Atlanta  
 Gordon Research Conference on Bioenergetics, NH  
 FASEB meeting on Transport ATPases, VT
- 2006 Annual Meeting of the Biophysical Society, Salt Lake City, UT  
 National Center for Biological Sciences, Bangalore, India  
 Pan American Workshop on Plant Membrane Proteins  
 Gordon Research Conference in Bioenergetics  
 SMYTE meeting on Transport and Energetics, Prague, CR
- 2007 Annual Meeting of the Biophysical Society, Baltimore, MD  
 Gordon Research Conference on Mechanisms of Membrane Transport, NH  
 International Conference on Plant Transport and Bioenergetics, Valencia, Spain  
 University of Nebraska, Lincoln, NE  
 Public Health Research Institute & UNDNJ, Newark, NJ  
 Emory University, Atlanta, GA
- 2008 Annual Meeting of the Biophysical Society, Long Beach, CA  
 FISEB/Ilanit meeting, Israel  
 Wayne State University, Detroit, MI  
 International meeting on P-type ATPases, Arhus, Denmark  
 SMYTE meeting on Transport and Energetics, Braga, Portugal  
 10<sup>th</sup> Symposium of the European Calcium Society, Brussels, Belgium  
 ASBMB Special meeting on Cellular Lipid Transport, Alberta, Canada Max  
 Planck Institute for Biophysics, Frankfurt, Germany
- 2009 Annual Meeting of the Biophysical Society, Boston, MA  
 Department of Biochemistry, SUNY Syracuse, NY Department of  
 Biology, Kansas State Univ., Manhattan, KS
- 2010 Annual Meeting of the Biophysical Society, San Francisco, CA  
 FASEB Transport ATPases, Snowmass, CO  
 Gordon Research Conference on Membrane Transport, Biddeford, ME  
 SMYTE, New Delhi, India  
 EMBO conference on ER, Girona, Spain
- 2011 HHMI Med into Grad Conference, MD  
 Conference on P-type ATPases, Asilomar, CA  
 Catholic University, Washington DC
- 2012 Biophysical Society  
 FASEB Summer Research Conference on Transport ATPases, Snowmass, CO  
 Gordon Research Conference on Membrane Transporters, Les Diablerets, Switzerland  
 University of Edmonton, Canada  
 Calcium Signaling Symposium, Barcelona, Spain  
 International Plant Biology Conference, Jeju, South Korea
- 2013 Gordon Research Conference on Salivary Glands and Endocrine Biology, Galveston, TX  
 Biophysical Society, Philadelphia, PA  
 University of Bern, Symposium on Excellence of Women in Science, Bern, Switzerland  
 FASEB Summer Research Conference on Ion Channel Regulation, Nassau, Bahamas

- 2014 20 Years of CDR1 Research, New Delhi, India  
Gordon Research Conference on Membrane Transport Proteins, Mt. Snow Resort, VT  
Na<sup>+</sup>/K<sup>+</sup>-ATPase and Related ATPases, Luntenen, Netherlands  
National Institutes of Health, NINDS, Bethesda, MD
- 2015 Biophysical Society Annual Meeting, Transport and Selectivity Subgroup  
University of Nebraska Medical Center, Omaha  
Gordon Research Conference Organellar Transporters, Bentley College, MA  
European Calcium Society, Tours, France  
Gordon Research Conference, Mechanisms of Membrane Transport, Bates College, ME  
Christianson's Foundation Conference, Houston, TX  
Biomedical Transporters, Lugano, Switzerland  
SBF35 Symposium, Vienna, Austria
- 2016 Biophysical Society Annual Meeting  
Temple University  
Gordon Research Conference on Protein Processing  
University of Buffalo  
University of Texas, Lubbock  
Max Planck Inst. Biophysics, Frankfurt, Germany
- 2017 University of Maryland, College Park  
BioXFEL conference, Las Vegas  
Acta Physiologica Symposium on H<sup>+</sup> and HCO<sub>3</sub><sup>-</sup> Transport, Sandbjerg Estate, Denmark  
The Novo Nordisk Prize Symposium, Mosegaard Museum, Denmark  
Gordon Research Conference on Mechanisms in Membrane Transport, NH Christianson  
Syndrome Conference, Montreal, Canada.  
National University of Singapore, Dept. of Pharmacology  
P-type ATPases Conference, Otsu, Japan
- 2018 Department of Biology, Morgan State University, Baltimore  
Membrane Transporters Conference, Banff, Canada  
Gordon Conference on Membrane Transport Proteins, Maine, USA  
36<sup>th</sup> Annual SMYTE conference on Yeast Transporters, Martina Franca, Italy  
World Life Science Conference, Beijing, China  
University of Connecticut, Farmington, CT
- 2019 AAAS Panel on Open Access Publishing  
Icahn School of Medicine, Mount Sinai, Department of Pharmacology  
History of Biology and Medicine Distinguished Lecture Series, Sidney Kimmel Comprehensive Cancer  
Center, Johns Hopkins University School of Medicine  
Charles University, Prague, Czech Republic  
Medical University of Vienna, Vienna, Austria  
RESOLUTE conference, Krems, Austria  
University of Leuven, Belgium  
BioParadigms, Biomedical Transporters Conference, Lucerne, Switzerland
- 2020-22 *(Cancelled due to COVID-19, rescheduled for 2022)*  
(Virtual) University of Maryland School of Medicine, Baltimore  
DMV-CAPS conference of American Physiological Society, GWU, Washington DC (Keynote)

65<sup>th</sup> Canadian Society for Molecular Biosciences, Banff  
Gordon Research Conference on Membrane Transporters, Spain  
RESOLUTE conference, Paris  
16<sup>th</sup> International Conference on P-Type ATPases, Banff  
Europhysiology, Copenhagen, Denmark  
Angelman Syndrome Conference, Vienna

2023  
Biophysical Society Annual Meeting, San Diego, Symposium on Organellar Proton Transport  
Department of Biochemistry, Virginia Tech, VA  
Department of Physiology and Biophysics, University of Virginia Charlottesville, VA  
Penn State University, Department of Cellular & Molecular Physiology  
Gordon Research Conference in Bioenergetics (Andover, NH)  
Gordon Research Conference in Mechanisms of Membrane Transport (Les Diablerets, Switzerland)  
Gordon Research Conference in Organellar Channels and Transporters (Castelldefels, Spain)  
The Brain in Flux Conference, International Society for Neurochemistry, Portugal (Keynote)  
38<sup>th</sup> SMYTE in Yeast Transporters and Energetics, Blankenberge, Belgium (Keynote, declined)  
RESOLUTE Conference, Vienna  
Department of Physiology and Biophysics, Weill Cornell Medicine, NYC  
Department of Physiology and Biophysics, University of Miami, FL

2024  
University of Chicago Interdisciplinary Research Seminar Series, Chicago, IL  
30 Years of CDR1 Research Symposium, New Delhi, India  
SASTRA University, Thanjavur, India  
Annual Meeting of the Society for Investigative Dermatology, Symposium on Acantholytic Disorders, Dallas, TX  
Gordon Research Conference in Membrane Transport Proteins (Discussion Leader), Maine  
Gordon Research Conference in Calcium Signaling, Italy  
VIII Meeting of Cardiotonic Steroid and the Na pump, Brazilian Society of Pharmacology and Experimental Therapeutic Society, Goiania, Brazil