Stanford

Suzanne Pfeffer

Emma Pfeiffer Merner Professor of Medical Sciences

Biochemistry

Bio

ACADEMIC APPOINTMENTS

- Professor, Biochemistry
- Member, Bio-X
- Member, Wu Tsai Human Performance Alliance
- Faculty Fellow, Sarafan ChEM-H
- Member, Stanford Cancer Institute
- Member, Wu Tsai Neurosciences Institute

ADMINISTRATIVE APPOINTMENTS

- Assistant Professor, Stanford University School of Medicine-Biochemistry, (1986-1992)
- Associate Professor, Stanford University School of Medicine - Biochemistry, (1992-1998)
- Associate Chairman, Stanford University School of Medicine-Biochemistry, (1997-1998)
- Chairman, Stanford University School of Medicine - Biochemistry, (1998-2006)
- Professor, Stanford University School of Medicine-Biochemistry, (1998- present)
- Emma Pfeiffer Merner Professor of Medical Sciences, Stanford University School of Medicine, (2012- present)
- Chairman, Stanford University School of Medicine - Biochemistry, (2013-2019)

HONORS AND AWARDS

- Presidential Young Investigator Award, National Science Foundation (1988-1993)
- Fellow, American Association for the Advancement of Science (1992)
- Merit Award, National Institute of Diabetes and Digestive and Kidney Disorders (1999-2009)
- President, American Society for Cell Biology (2003)
- President, American Society for Biochemistry and Molecular Biology (2010-2012)
- Fellow, American Academy of Arts and Sciences (2013)
- Fellow, American Society for Cell Biology (2017)
- Senior Editor, eLife (2019-2023)

PROFESSIONAL EDUCATION

- A.B., U.C. Berkeley , Biochemistry (1978)
- Ph.D., U.C. San Francisco , Biochemistry (1983)

- Postdoctoral, U.C. San Francisco , Biochemistry (1984)
- Postdoctoral, Stanford University , Biochemistry (1985)

LINKS

- Pfeffer Lab Site: http://pfeffer.stanford.edu

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

The major focus of our research is to understand the molecular basis of inherited Parkinson's Disease (PD). Pathogenic mutations in the LRRK2 kinase increase phosphorylation of Rab GTPases. We have found that phosphorylation of Rab10 blocks primary cilia formation in culture and in certain brain regions and we would like to understand how this leads to Parkinson's disease. We also study the NPC1 protein that is essential for cholesterol transport in humans and can lead to Niemann Pick C disease when mutated.

Teaching

COURSES

2023-24

- Advanced Cell Biology: BIO 214, BIOC 224, MCP 221 (Win)
- Biochemistry Mini-Course: BIOC 202 (Aut)

2022-23

- Advanced Cell Biology: BIO 214, BIOC 224, MCP 221 (Win)
- Biochemistry Mini-Course: BIOC 202 (Aut)

2021-22

- Advanced Cell Biology: BIO 214, BIOC 224, MCP 221 (Win)
- Biochemistry Mini-Course: BIOC 202 (Aut)
- Frontiers in Biological Research: BIOC 215, DBIO 215, GENE 215 (Aut, Win, Spr)

2020-21

- Advanced Cell Biology: BIO 214, BIOC 224, MCP 221 (Win)

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

Martha Kahlson

Postdoctoral Faculty Sponsor

Ayan Adhikari, Ebsy Jaimon, Yu En Lin, Sreeja Vijayan Nair

Doctoral Dissertation Advisor (AC)

Claire Chiang

GRADUATE AND FELLOWSHIP PROGRAM AFFILIATIONS

- Biochemistry (Phd Program)
- Cancer Biology (Phd Program)
- Molecular and Genetic Medicine (Fellowship Program)

- Neurosciences (Phd Program)

Publications

PUBLICATIONS

- **Leucine-Rich Repeat Kinases.** *Annual review of biochemistry*
  Alessi, D. R., Pfeffer, S. R.
  2024

- **Loss of primary cilia and dopaminergic neuroprotection in pathogenic LRRK2-driven and idiopathic Parkinson's disease.** *bioRxiv : the preprint server for biology*
  Khan, S. S., Jaimon, E., Lin, Y., Nikoloff, J., Tonelli, F., Alessi, D. R., Pfeffer, S. R.
  2024

- **Parkinson's VPS35[D620N] mutation induces LRRK2-mediated lysosomal association of RILPL1 and TMEM55B.** *Science advances*
  Pal, P., Taylor, M., Lam, P. Y., Tonelli, F., Hecht, C. A., Lis, P., Nirujogi, R. S., Phung, T. K., Yeshaw, W. M., Jaimon, E., Fasimoye, R., Dickie, E. A., Wightman, et al
  2023; 9 (50): eadj1205

- **Localization of PPM1H phosphatase tunes Parkinson's disease-linked LRRK2 kinase-mediated Rab GTPase phosphorylation and ciliogenesis.** *Proceedings of the National Academy of Sciences of the United States of America*
  Yeshaw, W. M., Adhikari, A., Chiang, C. Y., Dhekne, H. S., Wawro, P. S., Pfeffer, S. R.
  2023; 120 (44): e2315171120

- **Genome-wide screen reveals Rab12 GTPase as a critical activator of Parkinson's disease-linked LRRK2 kinase.** *eLife*
  Dhekne, H. S., Tonelli, F., Yeshaw, W. M., Chiang, C. Y., Limouse, C., Jaimon, E., Purlyte, E., Alessi, D. R., Pfeffer, S. R.
  2023; 12

- **A feed-forward pathway drives LRRK2 kinase membrane recruitment and activation.** *eLife*
  Vides, E. G., Adhikari, A., Chiang, C. Y., Lis, P., Purlyte, E., Limouse, C., Shumate, J. L., Spinola-Lasso, E., Dhekne, H. S., Alessi, D. R., Pfeffer, S. R.
  2022; 11

- **LRRK2 phosphorylation of Rab GTPases in Parkinson's disease.** *FEBS letters*
  Pfeffer, S. R.
  2022

- **CRISPR screens for lipid regulators reveal a role for ER-bound SNX13 in lysosomal cholesterol export.** *The Journal of cell biology*
  Lu, A., Hsieh, F., Sharma, B. R., Vaughn, S. R., Enrich, C., Pfeffer, S. R.
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- **Pathogenic LRRK2 control of primary cilia and Hedgehog signaling in neurons and astrocytes of mouse brain** *ELIFE*
  Khan, S. S., Sobu, Y., Dhekne, H. S., Tonelli, F., Berndsen, K., Alessi, D. R., Pfeffer, S. R.
  2021; 10

- **Pathogenic LRRK2 regulates ciliation probability upstream of tau tubulin kinase 2 via Rab10 and RILPL1 proteins.** *Proceedings of the National Academy of Sciences of the United States of America*
  Sobu, Y., Wawro, P. S., Dhekne, H. S., Yeshaw, W. M., Pfeffer, S. R.
  2021; 118 (10)

- **LRRK2-phosphorylated Rab10 sequesters Myosin Va with RILPL2 during ciliogenesis blockade.** *Life science alliance*
  Dhekne, H. S., Yanatori, I., Vides, E. G., Sobu, Y., Diez, F., Tonelli, F., Pfeffer, S. R.
  2021; 4 (5)

- **Rab29 Fast Exchange Mutants: Characterization of a Challenging Rab GTPase.** *Methods in molecular biology (Clifton, N.J.)*
  Gomez, R. C., Vides, E. G., Pfeffer, S. R.
  2021; 2293: 19-25

- **Inter-domain dynamics drive cholesterol transport by NPC1 and NPC1L1 proteins.** *eLife*
  Saha, P. n., Shumate, J. L., Caldwell, J. G., Elghobashi-Meinhardt, N. n., Lu, A. n., Zhang, L. n., Olsson, N. E., Elias, J. E., Pfeffer, S. R.

2020; 9

- **PPM1H phosphatase counteracts LRRK2 signaling by selectively dephosphorylating Rab proteins.** *eLife*
  Berndsen, K., Lis, P., Yeshaw, W. M., Wawro, P. S., Nirujogi, R. S., Wightman, M., Macartney, T., Dorward, M., Knebel, A., Tonelli, F., Pfeffer, S. R., Alessi, D. R.
  2019; 8

- **Membrane association but not identity is required for LRRK2 activation and phosphorylation of Rab GTPases.** *The Journal of cell biology*
  Gomez, R. C., Wawro, P., Lis, P., Alessi, D. R., Pfeffer, S. R.
  2019

- **NPC intracellular cholesterol transporter 1 (NPC1)-mediated cholesterol export from lysosomes.** *The Journal of biological chemistry*
  Pfeffer, S. R.
  2019; 294 (5): 1706–9

- **NPC intracellular cholesterol transporter 1 (NPC1)-mediated cholesterol export from lysosomes** *JOURNAL OF BIOLOGICAL CHEMISTRY*
  Pfeffer, S. R.
  2019; 294 (5): 1706-1709

- **Genome-wide interrogation of extracellular vesicle biology using barcoded miRNAs.** *eLife*
  Lu, A., Wawro, P., Morgens, D. W., Portela, F., Bassik, M. C., Pfeffer, S. R.
  2018; 7

- **Genome-wide interrogation of extracellular vesicle biology using barcoded miRNAs** *ELIFE*
  Lu, A., Wawro, P., Morgens, D. W., Portela, F., Bassik, M. C., Pfeffer, S. R.
  2018; 7

- **LRRK2 and Rab GTPases** *BIOCHEMICAL SOCIETY TRANSACTIONS*
  Pfeffer, S. R.
  2018; 46: 1707–12

- **LRRK2 and Rab GTPases.** *Biochemical Society transactions*
  Pfeffer, S. R.
  2018

- **A pathway for Parkinson's Disease LRRK2 kinase to block primary cilia and Sonic hedgehog signaling in the brain.** *eLife*
  Dhekne, H. S., Yanatori, I., Gomez, R. C., Tonelli, F., Diez, F., Schule, B., Steger, M., Alessi, D. R., Pfeffer, S. R.
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- **A pathway for Parkinson's Disease LRRK2 kinase to block primary cilia and Sonic hedgehog signaling in the brain** *ELIFE*
  Dhekne, H. S., Yanatori, I., Gomez, R. C., Tonelli, F., Diez, F., Schule, B., Steger, M., Alessi, D. R., Pfeffer, S. R.
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  Purlyte, E., Dhekne, H. S., Sarhan, A. R., Gomez, R., Lis, P., Wightman, M., Martinez, T. N., Tonelli, F., Pfeffer, S. R., Alessi, D. R.
  2018; 37 (1): 1–18

- **Systematic proteomic analysis of LRRK2-mediated Rab GTPase phosphorylation establishes a connection to ciliogenesis** *ELIFE*
  Steger, M., Diez, F., Dhekne, H. S., Lis, P., Nirujogi, R. S., Karayel, O., Tonelli, F., Martinez, T. N., Lorentzen, E., Pfeffer, S. R., Alessi, D. R., Mann, M.
  2017; 6

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  Pfeffer, S. R.
  FEDERATION AMER SOC EXP BIOL.2017

- **Rab GTPases: master regulators that establish the secretory and endocytic pathways** *MOLECULAR BIOLOGY OF THE CELL*
  Pfeffer, S. R.
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2017; 1583: 85-95

- **Lysosomal membrane glycoproteins bind cholesterol and contribute to lysosomal cholesterol export.** *eLife*
  Li, J., Pfeffer, S. R.
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- **Clues to the mechanism of cholesterol transfer from the structure of NPC1 middle lumenal domain bound to NPC2.** *Proceedings of the National Academy of Sciences of the United States of America*
  Li, X., Saha, P., Li, J., Blobel, G., Pfeffer, S. R.
  2016; 113 (36): 10079-10084
- **Clues to NPC1-mediated cholesterol export from lysosomes.** *Proceedings of the National Academy of Sciences of the United States of America*
  Pfeffer, S. R.
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- **Ezetimibe-sensitive cholesterol uptake by NPC1L1 protein does not require endocytosis** *MOLECULAR BIOLOGY OF THE CELL*
  Johnson, T. A., Pfeffer, S. R.
  2016; 27 (11): 1845-1852
- **Lipoprotein secretion: It takes two to TANGO.** *The Journal of cell biology*
  Pfeffer, S. R.
  2016
- **LAMP proteins bind cholesterol and contribute to NPC1-mediated cholesterol export from lysosomes.**
  Li, J., Pfeffer, S. R.
  AMER SOC CELL BIOLOGY.2016
- **Transport Vesicle Tethering at the Trans Golgi Network: Coiled Coil Proteins in Action.** *Frontiers in cell and developmental biology*
  Cheung, P. P., Pfeffer, S. R.
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  Li, J., Deffieu, M. S., Lee, P. L., Saha, P., Pfeffer, S. R.
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- **The Rab6-regulated KIF1C kinesin motor domain contributes to Golgi organization** *ELIFE*
  Lee, P. L., Ohlson, M. B., Pfeffer, S. R.
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- **Measuring Rab GTPase-Activating Protein (GAP) Activity in Live Cells and Extracts.** *Methods in molecular biology (Clifton, N.J.)*
  Nottingham, R. M., Pfeffer, S. R.
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- **Rab6 regulation of the kinesin family KIF1C motor domain contributes to Golgi tethering.** *eLife*
  Lee, P. L., Ohlson, M. B., Pfeffer, S. R.
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- **Molecular and Cellular Characterization of GCC185: A Tethering Protein of the Trans-Golgi Network.** *Methods in molecular biology (Clifton, N.J.)*
  Cheung, P. P., Pfeffer, S. R.
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- **Conformational flexibility of GCC185 is required for vesicle tethering at the trans Golgi.**
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  Lu, A., Pfeffer, S. R.
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  Lu, A., Pfeffer, S. R.
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  Pfeffer, S. R.
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- **Rab GTPase localization and Rab cascades in Golgi transport** *BIOCHEMICAL SOCIETY TRANSACTIONS*
  Pfeffer, S. R.
  2012; 40: 1373-1377
- **The 5-phosphatase OCRL mediates retrograde transport of the mannose 6-phosphate receptor by regulating a Rac1-cofilin signalling module** *HUMAN MOLECULAR GENETICS*
  van Rahden, V. A., Brand, K., Najm, J., Heeren, J., Pfeffer, S. R., Braulke, T., Kutsche, K.
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  Pfeffer, S. R.
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- **GCC185 plays independent roles in Golgi structure maintenance and AP-1-mediated vesicle tethering** *JOURNAL OF CELL BIOLOGY*
  Brown, F. C., Schindelhaim, C. H., Pfeffer, S. R.
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- **Entry at the trans-Face of the Golgi** *COLD SPRING HARBOR PERSPECTIVES IN BIOLOGY*
  Pfeffer, S. R.
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- **How the Golgi works: A cisternal progenitor model** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
  Pfeffer, S. R.
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- **An update on transport vesicle tethering** *MOLECULAR MEMBRANE BIOLOGY*
  Brown, F. C., Pfeffer, S. R.
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- **Membrane traffic Editorial overview** *CURRENT OPINION IN CELL BIOLOGY*
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  Pfeffer, S. R.
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  Pfeffer, S. R.
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- **Recent advances in understanding Golgi biogenesis.** *F1000 biology reports*
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  Pfeffer, S. R.
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  Pfeffer, S. R.

FEDERATION AMER SOC EXP BIOL.2009

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  Nottingham, R. M., Ganley, I. G., Barr, F. A., Lambright, D. G., Pfeffer, S. R.
  FEDERATION AMER SOC EXP BIOL.2009
- **Multiple Rab GTPase Binding Sites in GCC185 Suggest a Model for Vesicle Tethering at the Trans-Golgi** *MOLECULAR BIOLOGY OF THE CELL*
  Hayes, G. L., Brown, F. C., Haas, A. K., Nottingham, R. M., Barr, F. A., Pfeffer, S. R.
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  Hayes, G. L., Pfeffer, S. R.
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  Nottingham, R. M., Pfeffer, S. R.
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  Burguete, A. S., Fenn, T. D., Brunger, A. T., Pfeffer, S. R.
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  Ganley, I. G., Espinosa, E., Pfeffer, S. R.
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