Brian Kobilka
Helene Irwin Fagan Chair in Cardiology and Professor, by courtesy, of Chemical and Systems Biology
Molecular & Cellular Physiology

Bio

ACADEMIC APPOINTMENTS
• Professor, Molecular & Cellular Physiology
• Professor (By courtesy), Chemical and Systems Biology
• Member, Bio-X
• Member, Cardiovascular Institute
• Member, Child Health Research Institute
• Member, Stanford Neurosciences Institute

LINKS
• Personal Web site: http://med.stanford.edu/kobilkalab/

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS
My laboratory is involved in studying several aspects of adrenergic receptor biology. Adrenergic receptors form the interface between the sympathetic nervous system and the cardiovascular system and play a critical role in the regulation of cardiovascular function. Specific projects include:

1- RECEPTOR STRUCTURE: We are interested in understanding the three dimensional structure of adrenergic receptors and learning about the conformational changes that mediate signal transduction. We are taking several experimental approaches including mutagenesis, biochemical, and biophysical studies.

2- INTRACELLULAR TRAFFICKING OF ADRENERGIC RECEPTORS: The function of receptors can be modulated by changes in receptor structure (phosphorylation) and by changes in subcellular localization. We are using immunocytochemical approaches to study the targeting of receptors to specific subcellular domains and agonist mediated redistribution of receptors. Our goal is to determine the functional significance of differences in targeting and trafficking that we have observed in several adrenergic receptors, and to identify cellular proteins that mediate receptor trafficking.

3- PHYSIOLOGIC RELEVANCE OF ADRENERGIC RECEPTOR SUBTYPE DIVERSITY: Multiple closely related subtypes of adrenergic receptors have been identified through cloning studies. We are using targeted gene modification in mice to study the physiologic role of these closely related subtypes. We have disrupted the genes for five adrenergic receptors (alpha 2a, alpha 2b, alpha 2c, beta 1, and beta2) and are investigating the consequence of these disruptions on neural and cardiovascular physiology.
Teaching

STANFORD ADVISEES

Postdoctoral Faculty Sponsor

Weijiao Huang, John Janetko, Hideaki Kato, Kaavya Krishna Kumar, Matthieu Masureel, Rabindra Shivnaraine, Aiveliagaram Venkatakrishnan

Doctoral Dissertation Reader (AC)

Thomas Chew

Doctoral Dissertation Advisor (AC)

Rachel Matt

GRADUATE AND FELLOWSHIP PROGRAM AFFILIATIONS

- Biophysics (Phd Program)
- Molecular and Cellular Physiology (Phd Program)
- Neurosciences (Phd Program)

Publications

PUBLICATIONS

- Structure-based discovery of opioid analgesics with reduced side effects. *Nature*
  2016; 537 (7619): 185-?

- Structure-based discovery of opioid analgesics with reduced side effects. *Nature*
  2016; 537 (7619): 185-190

- Allosteric coupling from G protein to the agonist-binding pocket in GPCRs. *Nature*
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- Accessible Mannitol-Based Amphiphiles (MNAs) for Membrane Protein Solubilisation and Stabilisation. *Chemistry-A European Journal*
  2016; 22 (21): 7068-7073

- Highly Branched Pentasaccharide-Bearing Amphiphiles for Membrane Protein Studies. *Journal of the American Chemical Society*
  2016; 138 (11): 3789-3796

- Crystal structures of the M1 and M4 muscarinic acetylcholine receptors. *Nature*
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- Crystal structures of the M1 and M4 muscarinic acetylcholine receptors. *Nature*
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- In meso in situ serial X-ray crystallography of soluble and membrane proteins at cryogenic temperatures. *Acta Crystallographica Section D-Structural Biology*

- **Tandem neopentyl glycol maltosides (TNMs) for membrane protein stabilisation** *CHEMICAL COMMUNICATIONS*
  Bae, H. E., Mortensen, J. S., Ribeiro, O., Du, Y., Ehson, M., Kobilka, B. K., Loland, C. J., Byrne, B., Chae, P. S.
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- **High-density grids for efficient data collection from multiple crystals.** *Acta crystallographica. Section D, Structural biology*
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- **Imaging G protein-coupled receptors while quantifying their ligand-binding free-energy landscape** *NATURE METHODS*
  Alsteens, D., Pfreundschuh, M., Zhang, C., Spoerri, P. M., Coughlin, S. R., Kobilka, B. K., Mueller, D. J.
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- **Imaging G protein-coupled receptors while quantifying their ligand-binding free-energy landscape.** *Nature methods*
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  2015; 12 (9): 845-851

- **Propagation of conformational changes during mu-opioid receptor activation** *NATURE*
  Sounier, R., Mas, C., Steyaert, J., Laeremans, T., Manglik, A., Huang, W., Kobilka, B. K., Demene, H., Granier, S.
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- **Propagation of conformational changes during µ-opioid receptor activation.** *Nature*
  Sounier, R., Mas, C., Steyaert, J., Laeremans, T., Manglik, A., Huang, W., Kobilka, B. K., Déméné, H., Granier, S.
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- **Structural insights into µ-opioid receptor activation.** *Nature*
  2015; 524 (7565): 315-321

- **Structural insights into mu-opioid receptor activation** *NATURE*
  2015; 524 (7565): 315-321

- **Novel Xylene-Linked Maltoside Amphiphiles (XMAs) for Membrane Protein Stabilisation.** *Chemistry (Weinheim an der Bergstrasse, Germany)*
  2015; 21 (28): 10008-10013

- **SIGNAL TRANSDUCTION. Structural basis for nucleotide exchange in heterotrimeric G proteins.** *Science*
  2015; 348 (6241): 1361-1365

- **Structural basis for nucleotide exchange in heterotrimeric G proteins** *SCIENCE*
  2015; 348 (6241): 1361-1365

- **Structural Insights into the Dynamic Process of beta(2)-Adrenergic Receptor Signaling** *CELL*
  2015; 161 (5): 1101-1111

- **Effective Application of Bicelles for Conformational Analysis of G Protein-Coupled Receptors by Hydrogen/Deuterium Exchange Mass Spectrometry** *JOURNAL OF THE AMERICAN SOCIETY FOR MASS SPECTROMETRY*
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• Development and Characterization of Pepducins as Gs-biased Allosteric Agonists. *Journal of Biological Chemistry*
  Carr, R., Du, Y., Quoyer, J., Panettieri, R. A., Janz, J. M., Bouvier, M., Kobilka, B. K., Benovic, J. L.
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• Goniometer-based femtosecond crystallography with X-ray free electron lasers *Proceedings of the National Academy of Sciences of the United States of America*
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• Modified T4 Lysozyme Fusion Proteins Facilitate G Protein-Coupled Receptor Crystallogenesis *Structure*
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  Weichert, D., Kruse, A. C., Manglik, A., Hiller, C., Zhang, C., Hübscher, H., Kobilka, B. K., Gmeiner, P.
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  Kruse, A. C., Li, J., Hu, J., Kobilka, B. K., Wess, J.
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  Kruse, A. C., Kobilka, B. K., Gautam, D., Sexton, P. M., Christopoulos, A., Wess, J.
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• The role of protein dynamics in GPCR function: insights from the beta(2)AR and rhodopsin *Current Opinion in Cell Biology*
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• Activation and allosteric modulation of a muscarinic acetylcholine receptor *Nature*
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  2013; 19 (46): 15645-15651

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  PLOS ONE  
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  CHEMICAL COMMUNICATIONS  
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