



Folding Biophysics, Design, and Stabilization with Applications to Disease

June 4 - 9, 2017

Chair

James U. Bowie

Vice Chairs

Charles R. Sanders

Stonehill College

320 Washington Street

Easton, MA, US

Conference Description

An understanding of protein folding is essential for most of the major quests of structural biology, including learning how to predict structure, how proteins evolve, how mutations cause disease and how to design novel proteins. As a result, protein folding has been a major field of investigation for the past 50 years. In this effort, however, membrane proteins have been largely ignored. In-depth folding experiments on membrane proteins have lagged behind their soluble counterparts not because membrane proteins are unimportant, but because they are simply hard to study. This conference will bring together cellular, biophysical and computational investigations of membrane protein folding and design with the purpose of sharing expertise and solutions to this challenging problem.

Conference Program

Sunday	
2:00 pm - 9:00 pm	Arrival and Check-in
6:00 pm - 7:00 pm	Dinner
7:30 pm - 7:40 pm	Introductory Comments by GRC Site Staff / Welcome from the GRC Chair



7:40 pm - 9:30 pm	Membrane Integration and Removal of Helical Membrane Proteins Discussion Leader: James Bowie (University of California, Los Angeles, USA)
7:40 pm - 7:45 pm	Opening Remarks
7:45 pm - 8:10 pm	Stephen White (University of California, Irvine, USA) "Translocon Recognition and Membrane Stability of Transmembrane Helices"
8:10 pm - 8:20 pm	Discussion
8:20 pm - 8:45 pm	Joachim Herberle (Freie Universitat Berlin, Germany) " <i>In-Situ</i> Observation of Membrane Protein Insertion and Folding During Cell-Free Expression by SEIRAS"
8:45 pm - 8:55 pm	Discussion
8:55 pm - 9:20 pm	Ryan Baldrige (Harvard Medical School, USA) "Mechanism of ER-Associated Protein Degradation (ERAD)"
9:20 pm - 9:30 pm	Discussion
Monday	
7:30 am - 8:30 am	Breakfast
8:30 am - 9:00 am	Group Photo
9:00 am - 12:30 pm	Biophysics of Helical Membrane Protein Folding Discussion Leader: Charles Deber (University of Toronto, Canada)
9:00 am - 9:25 am	Paula Booth (King's College London, United Kingdom) "Folding Alpha Helical Membrane Proteins: Thermodynamics, Lipid Bilayer Mechanics and Co-Translational Folding"
9:25 am - 9:35 am	Discussion
9:35 am - 9:45 am	Dieter Langosch (Technical University of Munich, Germany) "BLaTM, a Genetic Tool to Measure Homo- and Heterotypic Parallel and Antiparallel Transmembrane Helix-Helix Interactions"



9:45 am - 9:50 am	Discussion
9:50 am - 10:15 am	Tetiana Serdiuk (ETH Zurich, Switzerland) "Observing the Insertase-Assisted Insertion and Folding Steps of Single Membrane Proteins"
10:15 am - 10:25 am	Discussion
10:25 am - 10:35 am	Duyoung Min (University of California, Los Angeles, USA) "Folding of CIC Chloride Transporter Retains Memory of Its Evolutionary History"
10:35 am - 10:40 am	Discussion
10:40 am - 11:05 am	Coffee Break
11:05 am - 11:30 am	Thomas Perkins (JILA, University of Colorado Boulder / National Institute of Standards and Technology, USA) "Hidden Dynamics in the Unfolding of Individual Bacteriorhodopsin Proteins"
11:30 am - 11:40 am	Discussion
11:40 am - 11:50 am	Ana Nicoleta Bondar (Freie Universitaet Berlin, Germany) "Mechanism by Which Lipids Shape Reaction Coordinates of Rhomboid Proteases"
11:50 am - 11:55 am	Discussion
11:55 am - 12:20 pm	Jebrell Glover (Lehigh University, USA) "Biophysical and Biochemical Insights into Caveolin-1"
12:20 pm - 12:30 pm	Discussion
12:30 pm - 1:30 pm	Lunch
1:30 pm - 4:00 pm	Free Time



3:00 pm - 4:00 pm	<p>Power Hour</p> <p><i>The GRC Power Hour is an optional informal gathering open to all meeting participants. It is designed to help address the challenges women face in science and support the professional growth of women in our communities by providing an open forum for discussion and mentoring.</i></p> <p>Organizer: Karen Fleming (Johns Hopkins University, USA)</p>
4:00 pm - 6:00 pm	Poster Session
6:00 pm - 7:00 pm	Dinner
7:30 pm - 9:30 pm	<p>Membrane Protein Structure Prediction and Design</p> <p>Discussion Leader: Hang "Hubert" Yin (University of Colorado Boulder, USA)</p>
7:30 pm - 7:55 pm	<p>Jens Meiler (Vanderbilt University, USA)</p> <p>"Simulating Membrane Protein Folding from Limited Experimental Data"</p>
7:55 pm - 8:05 pm	Discussion
8:05 pm - 8:30 pm	<p>Sarel Fleishman (Weizmann Institute of Science, Israel)</p> <p>"An Energy Function for Design and Structure Prediction in Membrane Proteins"</p>
8:30 pm - 8:40 pm	Discussion
8:40 pm - 8:50 pm	<p>Patrick Barth (Baylor College of Medicine, USA)</p> <p>"Enhancing Membrane Protein Structure Prediction and Design with Explicit Solvent-Protein Interactions"</p>
8:50 pm - 8:55 pm	Discussion
8:55 pm - 9:20 pm	<p>Nicholas Schafer (Rice University, USA)</p> <p>"Predictive Energy Landscapes for Folding Membrane Proteins"</p>
9:20 pm - 9:30 pm	Discussion
Tuesday	
7:30 am - 8:30 am	Breakfast



9:00 am - 12:30 pm	Membrane Protein Folding in Disease Discussion Leader: Radhakrishnan Mahalakshmi (Indian Institute of Science Education and Research, Bhopal, India)
9:00 am - 9:25 am	Jonathan Schleich (Indiana University, USA) "Elucidation of Bottlenecks in the Quality Control and Cellular Trafficking of PMP22"
9:25 am - 9:35 am	Discussion
9:35 am - 9:45 am	Oliver Zerbe (University of Zurich, Switzerland) "NMR Methods to Study the Structure and Folding of GPCRs"
9:45 am - 9:50 am	Discussion
9:50 am - 10:15 am	Hang "Hubert" Yin (University of Colorado Boulder, USA) "Rational Design of Membrane Curvature Sensors"
10:15 am - 10:25 am	Discussion
10:25 am - 10:35 am	Laurent Catoire (CNRS / Paris Diderot University, France) "Refolding of <i>E. coli</i> Expressed GPCR into Nanodisks Using Amphipols"
10:35 am - 10:40 am	Discussion
10:40 am - 11:05 am	Coffee Break
11:05 am - 11:30 am	Gergely Lukacs (McGill University, Canada) "Structural and Proteostatic Determinants of CFTR Functional Expression at the Cell Surface"
11:30 am - 11:40 am	Discussion
11:40 am - 11:50 am	Michael Schlierf (TU Dresden, Germany) "smFRET Reveals Structural Basis for Conformational Misfolding of a Cystic Fibrosis Mutation in CFTR"
11:50 am - 11:55 am	Discussion
11:55 am - 12:20 pm	Sabine Hadida (Vertex Pharmaceuticals, USA) "Correcting CFTR Protein Processing and Trafficking to Treat the Underlying Cause of Cystic Fibrosis"



12:20 pm - 12:30 pm	Discussion
12:30 pm - 1:30 pm	Lunch
1:30 pm - 4:00 pm	Free Time
4:00 pm - 6:00 pm	Poster Session
6:00 pm - 7:00 pm	Dinner
7:30 pm - 9:30 pm	Membrane Protein Stabilization Discussion Leader: Karen Fleming (Johns Hopkins University, USA)
7:30 pm - 7:55 pm	Pil Seok Chae (Hanyang University, South Korea) "Novel Detergent Tools for GPCR Structural Study"
7:55 pm - 8:05 pm	Discussion
8:05 pm - 8:30 pm	Linda Columbus (University of Virginia, USA) "Protein-Surfactant Interactions Do Determine Fold"
8:30 pm - 8:40 pm	Discussion
8:40 pm - 8:50 pm	Amanda Duran (Vanderbilt University, USA) "An Improved Rosetta Energy Function for Predicting Mutation-Induced Stability Changes in Membrane Proteins"
8:50 pm - 8:55 pm	Discussion
8:55 pm - 9:20 pm	Andreas Plueckthun (University of Zurich, Switzerland) "Stabilizing GPCRs"
9:20 pm - 9:30 pm	Discussion

Wednesday

7:30 am - 8:30 am	Breakfast
9:00 am - 12:30 pm	Folding of Beta Barrels and Others Discussion Leader: Linda Columbus (University of Virginia, USA)
9:00 am - 9:25 am	Karen Fleming (Johns Hopkins University, USA) "Driving Forces for Sorting and Folding of Outer Membrane Proteins"



9:25 am - 9:35 am	Discussion
9:35 am - 9:45 am	Antoniya Aleksandrova (National Institute of Neurological Disorders and Stroke, NIH, USA) "Systematic Analysis of Symmetry in Membrane Proteins"
9:45 am - 9:50 am	Discussion
9:50 am - 10:15 am	Zengyi Chang (Peking University, China) "The Biogenesis and Quality Control of Beta Barrel Outer Membrane Proteins as Explored in Living Cells"
10:15 am - 10:25 am	Discussion
10:25 am - 10:35 am	William Wimley (Tulane University School of Medicine, USA) "Synthetic Molecular Evolution of Membrane Active Peptides"
10:35 am - 10:40 am	Discussion
10:40 am - 11:05 am	Coffee Break
11:05 am - 11:30 am	Radhakrishnan Mahalakshmi (Indian Institute of Science Education and Research, Bhopal, India) "Interface Energetics and Beta Barrel Folding"
11:30 am - 11:40 am	Discussion
11:40 am - 11:50 am	Matthias Buck (Case Western Reserve University, USA) "Dynamic Protein-Membrane Complexes: NMR and Simulation Studies on Transmembrane Receptors and Ras GTPases"
11:50 am - 11:55 am	Discussion
11:55 am - 12:20 pm	Sheena Radford (University of Leeds, United Kingdom) "Mechanistic Insights into Outer Membrane Protein Folding"
12:20 pm - 12:30 pm	Discussion
12:30 pm - 1:30 pm	Lunch
1:30 pm - 4:00 pm	Free Time
4:00 pm - 6:00 pm	Poster Session



6:00 pm - 7:00 pm	Dinner
7:00 pm - 7:30 pm	Business Meeting <i>Nominations for the Next Vice Chair; Fill in Conference Evaluation Forms; Discuss Future Site and Scheduling Preferences; Election of the Next Vice Chair</i>
7:30 pm - 9:30 pm	Membrane Protein Folding in Amyloid Disease Discussion Leader: Charles Sanders (Vanderbilt University, USA)
7:30 pm - 7:55 pm	Celine Galvagnion (German Center for Neurodegenerative Diseases (DZNE), Germany) "Amyloid Proteins - Membrane Interactions: The Influence of the Lipid Composition on the Kinetics of Aggregation"
7:55 pm - 8:05 pm	Discussion
8:05 pm - 8:30 pm	Katsumi Matsuzaki (Graduate School of Pharmaceutical Sciences, Kyoto University, Japan) "Mechanisms of Abnormal Aggregation and Toxicity of Alzheimer's Amyloid Beta-Protein on Neuronal Membranes"
8:30 pm - 8:40 pm	Discussion
8:40 pm - 8:50 pm	Antje Pokorny (University of North Carolina at Wilmington, USA) "Isoleucine-Rich Amphipathic Peptides Bind Significantly Better to Lipid Bilayers than Leucine-Rich Peptides"
8:50 pm - 8:55 pm	Discussion
8:55 pm - 9:20 pm	Jennifer Lee (National Institutes of Health, USA) "Membrane Interactions and Amyloid Formation of α -Synuclein"
9:20 pm - 9:30 pm	Discussion
Thursday	
7:30 am - 8:30 am	Breakfast
9:00 am - 12:30 pm	Assembly of Membrane Protein Complexes Discussion Leader: Paula Booth (King's College London, United Kingdom)

















9:00 am - 9:25 am	Charles Brooks (University of Michigan, USA) "The Role of pH in Modulating Membrane Protein Structure and Function"
9:25 am - 9:35 am	Discussion
9:35 am - 9:45 am	Raphael Trenker (The Walter and Eliza Hall Institute of Medical Research, Australia) "Screening and Crystallographic Analysis of Intramembrane Helix Interactions Using Lipidic Cubic Phase (LCP) Techniques"
9:45 am - 9:50 am	Discussion
9:50 am - 10:15 am	Adam Smith (University of Akron, USA) "Resolving the Dimerization Interface of Visual Opsins with PIE-FCCS"
10:15 am - 10:25 am	Discussion
10:25 am - 10:45 am	Coffee Break
10:45 am - 11:10 am	Charles Deber (University of Toronto, Canada) "Peptide-Based Approaches to Inhibiting Protein-Protein Interactions in Membranes"
11:10 am - 11:20 am	Discussion
11:20 am - 11:45 am	Arthur Laganowsky (Texas A&M University, USA) "Probing Membrane Protein-Lipid Interactions by Native Ion Mobility Mass Spectrometry"
11:45 am - 11:55 am	Discussion
11:55 am - 12:20 pm	William Degrado (University of California, San Francisco, USA) "Understanding Transmembrane Signal Transduction in Bacterial Histidine Kinases"
12:20 pm - 12:30 pm	Discussion
12:30 pm - 1:30 pm	Lunch
1:30 pm - 4:00 pm	Free Time



4:00 pm - 6:00 pm	Poster Session
6:00 pm - 7:00 pm	Dinner
7:30 pm - 9:30 pm	Membrane Protein Design for Disease Therapy Discussion Leader: Kalina Hristova (Johns Hopkins University, USA)
7:30 pm - 7:55 pm	Daniel Dimaio (Yale University, USA) "Building Transmembrane Proteins with Minimal Chemical Complexity"
7:55 pm - 8:05 pm	Discussion
8:05 pm - 8:30 pm	Kalina Hristova (Johns Hopkins University, USA) "Heterodimerization of Receptor Tyrosine Kinases in Health and Disease"
8:30 pm - 8:40 pm	Discussion
8:40 pm - 8:50 pm	Jonathan Sachs (University of Minnesota, USA) "Thermodynamics of Transmembrane Domains Can Be Exploited to Manipulate TNF Receptor Function"
8:50 pm - 8:55 pm	Discussion
8:55 pm - 9:20 pm	Donald Engelman (Yale University, USA) "pHLIP®: Uses in Measuring Cell Surface pH, Imaging Tumors, and Delivering Therapeutics"
9:20 pm - 9:30 pm	Discussion
Friday	
7:30 am - 8:30 am	Breakfast
9:00 am	Departure

Contributors



 <p>Gordon Research Conferences</p>	 <p>Carl Storm Underrepresented Minority Fellowship</p>	 <p>Avanti[®] POLAR LIPIDS, INC.</p>
 <p>CYSTIC FIBROSIS FOUNDATION</p>	 <p>jmb Journal of molecular biology</p>	 <p>NEW ENGLAND BioLabs[®] Inc.</p>
 <p>Development</p>	 <p>Biochemistry</p>	 <p>VANDERBILT  UNIVERSITY</p>
 <p>anatrace</p>	 <p>PROTEIN SCIENCE</p>	 <p>Genentech A Member of the Roche Group</p>
 <p>VERTEX</p>		

