

2008 Biophysical Society Discussions Meeting Program

Calmodulin Modulation of Ion Channels
Asilomar Conference Center, Asilomar, California
October 30 – November 2, 2008

Organizing Committee:

Nikolai M. Soldatov, NIA, NIH, Chair
Mark E. Anderson, University of Iowa
David L. Armstrong, NIEHS, NIH
Lutz Birnbaumer, NIEHS, NIH
William A. Catterall, Washington University
Susan L. Hamilton, Baylor College of Medicine
Geoffrey S. Pitt, Duke University
Joerg Striessnig, University of Innsbruck
Richard W. Tsien, Stanford University
David T. Yue, Johns Hopkins University

Ion channels are principal molecular determinants responsible for many vital functions including cell excitability, signal transduction, excitation-contraction coupling, secretion, and even transcription. Calmodulin is the prototypic calcium-sensing protein, and in the past decade it has become especially clear that calmodulin interacts with a remarkably large (and growing) number of ion channels, sometimes with yet unknown functional consequences. The fundamental role of calmodulin in signal transduction requires understanding of the underlying mechanisms, molecular determinants, and functional links.

The 2008 Discussions will address the regulatory roles of calmodulin in ion channel function with a focus on mechanisms of modulation, molecular determinants, structural principles of organization, and mediated signal transduction events. The Meeting will culminate with the session honoring Professor Harald Reuter's remarkable career in science and will be devoted to summarizing the results of 10 years of research in calmodulin modulation of ion channels.

The meeting takes place over a three-and-a-half-day period, with talks in the morning and evening, and the afternoons set aside for informal interactions. The Organizing Committee will announce if it can offer tentative partial support to speakers, but the amount will be decided at the time of the Meeting or shortly before, based on available funds and the individual requests.

The Meeting will be organized in six sessions. The presentations (15 minutes each) by leading experts in the fields will set the stage for the discussions during which the participants will exchange their results and ideas. This exchange also includes an afternoon poster session on the main topics of the meeting. The Chairs organize and moderate the discussions.

2008 Program

Thursday, October 30, 2008

3:00 PM Check-In.

5:00 PM Reception.

6:00 PM Dinner.

7:30 – 9:00 PM

Ten Years of Calmodulin Research in Ion Channels: The Past and the Future.

A Special Event Session Honoring Professor Harald Reuter's Remarkable Career in Science.
Nikolai M Soldatov, NIA, NIH, Introduction.

7:45 PM

Chairs: Harald Reuter, University of Bern, Switzerland, and Richard W. Tsien, Stanford University.

In this opening session of the Meeting, discussion will focus on where we stand regarding the many established facts and loose ends of calmodulin's functional significance in ion channel regulation.

Speakers: Lutz Birnbaumer, NIEHS, NIH, Research Triangle Park.
William A. Catterall, University of Washington Medical School.
Richard W. Tsien, Stanford University.

Friday, October 31, 2008

7:30 – 8:30 AM Breakfast.

9:00 AM General Introduction.

Lutz Birnbaumer, NIEHS, NIH, Research Triangle Park.

9:15 AM – Noon

Session 1. Mechanisms of Modulation of Ion Channels by Calmodulin.

Chairs: Lutz Birnbaumer, NIEHS, NIH, and William A. Catterall, University of Washington Medical School, Seattle, WA.

Issues and overview: Modulation of ion channels by calmodulin has been a focus in the investigation of calcium and calcium-dependent potassium channels for the last 10 years. However, new principles of modulation of other channels and new roles emerged recently. The speakers will address specific questions related to these recent discoveries on the issues listed below.

9:15 AM

L-Type Calcium Channels: Overview of What We Know and What We Need to Know.
Mark E. Anderson, University of Iowa.

9:45 AM

Calmodulin-dependent Regulation of $Ca_v1.2$ through Reversible Protein Phosphorylation.
David L. Armstrong, NIEHS, NIH, Research Triangle Park.

Discussion: Franz Hofmann, Technische Universitaet Muenchen, Germany.

10:15 AM Coffee Break.

10:30 AM

K Channels and Calmodulin.
Yoshihisa Kurachi, Osaka University, Japan.

Discussion: John. P Adelman, Vollum Institute and William N. Zagotta, HHMI, University of Washington.

11:00 AM

$Ca_v1.4$ Channel.
Joerg Striessnig, University of Innsbruck, Austria.

Discussion: Christian Wahl, Ludwig-Maximilians Universitaet Muenchen, Germany.

11:30 AM

Calcium Channel, Calmodulin, and Signaling to the Nucleus.
Richard W. Tsien, Stanford University.

12:00 – 1:00 PM Lunch.

2:00 – 4:00 PM **Poster Session.**

6:00 – 7:00 PM Dinner.

Friday Evening, October 31, 2008

7:30 – 9:45 PM

Session 2. Regulation of Neuronal Channels.

Chairs: Annette C. Dolphin, University College London, and Franz Hofmann, Technische Universitaet Muenchen, Germany.

7:30 PM

Calcium Channels and Short-Term Synaptic Plasticity.

William A. Catterall, University of Washington Medical School.

8:00 PM

Calmodulin Regulation of Neuronal Ion Channels.

Geoffrey S. Pitt, Duke University Medical Center.

8:30 PM Coffee Break.

8:45 PM

The Role of Alpha2-delta Auxiliary Subunits in Calcium Channel Function.

Annette C. Dolphin, University College London, UK.

9:15 PM

Characterization of the CaMKII Activation of the Chloride Channel CIC-3, Which in Neurons Modulates Synaptic Strength at Glutamatergic Synapses.

Deborah Nelson, University of Chicago.

Discussion: Ilya Bezprozvanny, University of Texas Southwestern Medical Center at Dallas; Henry M. Colecraft, Columbia University; Philippe Lory, CNRS, Montpellier, France; and Gerald W. Zamponi, University of Calgary, Canada.

Saturday, November 1, 2008

7:30 – 8:30 AM Breakfast.

9:00 AM – Noon

Session 3. Molecular Determinants.

Chairs: John P. Adelman, Vollum Institute, and David T. Yue, Hopkins University.

Issues: Calmodulin binds to the channels in a calcium-dependent manner and with different lobes. What do we know about common and specific patterns of these interactions? How do other molecular parts affect these interactions? How many calmodulins are interacting with a single channel? Do accessory subunits affect calmodulin regulation? What could be the role of channels clustering?

9:00 AM

SK Channels and Calmodulin.

John. P Adelman, Vollum Institute, Oregon Health Sciences University.

9:30 AM

Ca_v1 and Ca_v2 Channels and Calmodulin.

David T. Yue, Johns Hopkins University School of Medicine.

Discussion: Gerald W. Zamponi, University of Calgary, Canada.

10:00 AM

Calcium-Dependent Inactivation is Mediated by Multiple Determinants.

Nikolai M. Soldatov, National Institute on Aging, NIH.

Discussion: Veit Flockerzi, University of Saarland, Homburg, Germany, James Maylie, Vollum Institute, and Joel Nargeot, Institut de Génétique Humaine, CNRS, Montpellier, France.

10:30 AM Coffee Break.

10:45 AM

L-Channel N-Tail: Modulation by Calmodulin.

Nathan Dascal, Tel Aviv University, Israel.

Discussion: Martin Biel, Ludwig-Maximilians Universitaet Muenchen, Germany, and David T. Yue, Johns Hopkins University.

11:15 AM

Mechanism of Ca²⁺/Calmodulin Regulation of TRP Channels.

Sharona E. Gordon, University of Washington.

Discussion: Indu S. Ambudkar, NIDCR, NIH; James Putney, NIEHS, NIH, Research Triangle Park; and Christoph Romanin, University of Linz, Austria.

11:45 AM

Calcium/Calmodulin-mediated Inhibition of Gap Junction.

Jenny J. Yang, Center for Biotechnology and Drug Design, Georgia State University

12:00 – 1:00 PM Lunch.

Saturday Afternoon, November 1, 2008

2:30 – 4:15 PM

Session 4. A More General Picture: Non-Channel Calmodulin.

Chairs: Martin Morad, Georgetown University, and M. Neal Waxham, University of Texas Houston Medical School.

Questions: Is calmodulin sequestered in cells and in what form? Is it freely available to the signaling or does its availability direct the signaling event? How mobile is calmodulin once it is released at some point in the cytoplasm? Does the concentration of calmodulin change during the cell cycle, in evolution or during development? Molecular motors related to calmodulin and their signaling role.

2:30 PM

Limiting Calmodulin Revealed by Image Correlation Spectroscopy.
M. Neal Waxham, University of Texas Houston Medical School.

3:00 PM Coffee Break.

3:15 PM

CaMKII Regulation.
Paula Q. Barrett, University of Virginia Health System.

3:45 PM

Dynamic Ca-CaM signals in Cardiac Myocytes targeting CaMKII and Calcineurin.
Donald M. Bers, University of California, Davis.

Discussion: Deborah Nelson, University of Chicago.

6:00 – 7:00 PM Dinner.

Saturday Evening, November 1, 2008

7:10 PM – 9:45 PM

Session 5. Signal Transduction Events Mediated by Calmodulin-Ion Channels Coupling.

Chairs: Ernesto Carafoli, University of Padova, Italy, and William N. Zagotta, HHMI, University of Washington.

Issues: Among many processes mediated by calmodulin, the regulation of intracellular calcium release and transcription regulation are the focus of recent studies. Are calcium sensors available to the cytosolic calcium, e.g., released from the SR? What do we know about the organization of the underlying events? How is the coupling of the ion channel activity mediated to alter signaling? What may be the role of calmodulin-like proteins? These questions will be addressed in the topics listed below.

1. Excitation-contraction Coupling.

7:10 PM

Unresolved Issues of Calmodulin Modulation of Ryanodine Receptors.

Gerhard Meissner, University of North Carolina, Chapel Hill.

7:30 PM

Calmodulin-mediated Coupling between Cardiac L-Channels and Intracellular Calcium Release.

Martin Morad, Georgetown University.

Discussion: Susan L. Hamilton, Baylor College of Medicine, and Isaac Pessah, University of California, Davis.

2. Transcriptional Events Mediated by Calcium Channels and Calmodulin.

7:50 PM

Transcription Factor Activity of the L-Type Calcium Channel.

Ricardo E. Dolmetsch, Stanford University.

8:10 PM Coffee Break.

8:25 PM

Calmodulin/L-Type Calcium Channel-mediated Activation of CREB-dependent Transcription in Nuclear Microdomains.

Evgeny Kobrinsky, National Institute on Aging, NIH.

8:45 PM

3. Calmodulin-like Proteins and Non-Channel Calmodulins.

Ernesto Carafoli, University of Padova, Italy.

9:15 PM

CaBP1 and CaBP4 Modulation of Ca_v1 Channels: Regulation of Calcium Feedback to Ca_v2.1 Channels by Parvalbumin/Calbindin.

Amy Lee, Emory University.

Discussion: Toni Schneider, University of Cologne, Germany, and Alexej Verkhratsky, University of Manchester, United Kingdom.

Sunday, November 2, 2008

7:30 – 8:30 AM Breakfast.

9:00 – 11:00 AM

Session 6. Structural Principles of Organization.

Chairs: Susan L. Hamilton, Baylor College of Medicine, and Daniel L. Minor, Jr., University of California, San Francisco.

Issues: What do we know about the molecular organization of calmodulin binding sites? How does calcium affect the structure of calmodulin in binding sites?

9:00 AM

Structural and Mechanistic Studies of Calmodulin Regulation of Voltage-gated Calcium Channels.

Daniel L. Minor, Jr., University of California, San Francisco.

9:30 AM

Structural Analysis of Calmodulin Interactions with Ion Channels.

Susan L. Hamilton, Baylor College of Medicine.

10:00 AM Coffee Break.

10:15 AM

Structural Studies of CaM Interaction with L-Type Calcium Channels and RyRs.

Ashraf Kitmitto, University of Manchester, United Kingdom.

Discussion: John P. Adelman, Vollum Institute; Ernesto Carafoli, University of Padova, Italy; and Madeline A. Shea, University of Iowa.

10:45 AM

Meeting Wrap Up, Closing Remarks.

William A. Catterall, University of Washington Medical School.

Harald Reuter, University of Bern, Switzerland.