

2008 Biophysical Discussions

The 2008 Biophysical Society Discussions, entitled *Calmodulin Modulation of Ion Channels*, was held October 30 – November 2, 2008, at the Asilomar Conference Center in Pacific Grove, California. This was the 11th such meeting since 1994, the year that the Discussions meeting was organized by Roger Cooke, and the first to focus on ion channels. Although the focus of the meeting was on regulation of ion channels by calmodulin, among approximately 100 participants there were researchers from diverse scientific fields, including electrophysiology and biophysics, molecular biology, neuroscience and cardiology, protein chemistry and structural biology. The format of the 2008 Discussions was somewhat different from the past Discussion meetings. The Meeting was organized in 6 sessions. The presentations (20-30 min) by thirty leading experts in the fields have set the stage for the discussions during which the participants exchanged their results and ideas. This exchange continued at the poster session on the main topics of the meeting. The Chairs organized and moderated Q&A and the discussion.

Ion channels are principal molecular determinants responsible for many vital functions including, cell excitability, signal transduction, excitation-contraction coupling, secretion, and 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. Therefore, the goal of the meeting was to define the current standing of the field regarding the many established facts and loose ends of calmodulin's functional significance in ion channel regulation. The meeting has demonstrated conceptual advances in understanding the calcium- and calmodulin-dependent regulatory mechanisms of calcium, sodium, potassium, CICR and trp channels as well as highlighted the outstanding problems that need to be resolved for the field to advance.

Modulation of ion channels by calmodulin has been in a focus of 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. In two sessions on *Mechanisms of Modulation of Ion Channels by Calmodulin* and *Regulation of Neuronal Channels* the speakers addressed specific questions related to these recent discoveries. Calmodulin binds to the channels in a calcium-dependent manner and with different lobes. The session on *Molecular Determinants* showed our recent advances in understanding common and specific patterns of these interactions, role of other molecular parts as well as channels clustering. The session on *Non-channel Calmodulin* highlighted a more general picture of how calmodulin is sequestered in cells and in what form, whether it is freely available to the signaling or its availability directs the signaling event, how mobile is calmodulin once it is released at some point in the cytoplasm, and other important issues. Among many processes mediated by calmodulin, the regulation of intracellular calcium release and transcription regulation are in the focus of recent studies. The session on *Signal Transduction Events Mediated by Calmodulin-Ion Channels Coupling* was devoted to the functional organization of the underlying events and development of new quantitative biology applications in cell signaling. Finally, the session on *Structural Principles of Organization* highlighted our current knowledge about the molecular organization of calmodulin binding sites and how calcium affects the structure of calmodulin in binding sites. A special session event marked ten years of calmodulin research in ion channels and was devoted to honoring outstanding career in science of Professor Harald Reuter, a 1993 recipient of K.S. Cole Award of the Biophysical Society, featured by his former colleagues Nikolai Soldatov, William A. Catterall

and Richard W. Tsien. David T. Yue put together an entertaining and elegant wrap-up of the meeting.

The Study Book, which was made available to all meeting participants prior to the meeting and served as the basis for discussion during the sessions, is now available at <http://www.biophysics.org/discussions/2008/study-book.htm>.

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