

Perspectives on: Local calcium signaling

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As an ion channel biophysicist studying a Ca^{2+} -permeable channel, I have been poring over the literature trying to figure out better ways to squeeze more information out of my experiments. Like many others, I have become fascinated by Ca^{2+} influx-mediated cell signaling; I also have found the tools in my repertoire sorely lacking. How fast do signals initiate? What terminates them and how fast? How far do they spread? How many channels does it take to kick off a signaling event? These questions, and more, are central for anybody who studies a variety of Ca^{2+} channels, and classical electrophysiology does not provide the tools to answer them.

Luckily, a revolution in measuring Ca^{2+} signals has taken place over the last decade and has really accelerated over just the last few years. The field of Ca^{2+} signaling has benefited from advances in microscopy, Ca^{2+} buffers/dyes, and caged compounds that allow Ca^{2+} signals from single channels to be measured with an accuracy approaching that of single-channel electrophysiology recordings.

The five contributions to this Perspectives series on Ca^{2+} signaling introduce these new technologies and apply them to muscle and nerve cell Ca^{2+} channels.

For both plasma membrane channels and those localized to intracellular membranes, we are learning about how functional diversity arises among channels with identical subunit compositions. The fascinating interconnection between channels and between clusters of channels is being revealed. This nanometer-scale Ca^{2+} signaling underlies essential functional properties that we are only now beginning to understand.

Letters to the editor related to these Perspectives will be published in the November 2010 issue of the Journal. Letters to the editor should be received no later than Friday, September 17, 2010, to allow for editorial review. The letters may be no longer than two printed pages (approximately six double-spaced pages) and will be subject to editorial review. They may contain no more than one figure, no more than 15 references, and no significant references to unpublished work. Letters should be prepared according to the Journal's instructions and submitted via the "Submit" button at <http://www.jgp.org>. This Perspectives series includes articles by Parker and Smith, Xie et al., Prosser et al., Santana and Navedo, and Hill-Eubanks et al.

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