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Cell Calcium Special Issue: Preface

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Graphical Abstract

The enclosed submission is a *Preface* for the Cell Calcium Special Issue devoted to the proceedings of the ‘International Conference on Calcium Signaling: from stores to channels’. The conference was held in honor of Dr. James W. Putney who published his seminal work on the hypothesis on Capacitative Calcium Entry (CCE) in *Cell Calcium* in 1986.

Thirty years later, attendees at the conference presented state-of-the-art research on calcium signaling from basic molecular and cellular mechanisms to the physiological and clinical relevance of the process. This Special Issue of Cell Calcium is intended to present much of the exciting work discussed at the conference, illustrating the depth and breadth of our understanding of CCE and calcium signaling.

This submission contains a written *Preface* and is accompanied by three figures. Separately, an image will be sent to the journal offices for its consideration and use on the front cover of this Special issue.

In the summer of 2016, scientific leaders in the field of calcium signaling gathered in Chapel Hill, North Carolina for the “International Conference on Calcium Signaling: from stores to channels” (July 31-August 3 2016). Held at The Carolina Inn, the conference presented an opportunity to honor and celebrate the scientific contributions of Dr. James W. Putney Jr (Figure 1), especially the evolution of Store Operated Calcium Entry (SOCE).

A graduate of the University of Virginia (UVA), Dr. ‘Jim’ Putney received his Ph.D. from the Medical College of Virginia, and held academic posts at Wayne State University and the Medical College of Virginia prior to joining the National Institute of Environmental Health Sciences (NIEHS, NIH) in 1986. Over a period of four decades, Jim has made numerous contributions to the field of calcium signaling in non-excitable cells and stimulus-permeability coupling. Chief among them is his seminal work on developing the hypothesis for the control of calcium entry in non-excitable cells which he named Capacitative Calcium Entry (CCE), and more commonly referred to today as Store-Operated Calcium Entry (SOCE).

In the world that existed before fluorescent calcium indicators and live cell imaging, Jim utilized state-of-the-art radioisotope flux techniques as a surrogate to monitor the biphasic mobilization of intracellular calcium. By monitoring the receptor-activated and calcium

dependent efflux of ^{86}Rb -ions from secretory cells of the parotid salivary gland [1], Jim developed his idea for the coordinated mobilization of intracellular calcium and calcium entry across the plasma membrane. In a landmark review published in 1986 in *Cell Calcium*, Jim elegantly conceptualized the process as Capacitive Calcium Entry (CCE), now known as SOCE (figure 2A) [2]. Later Jim performed a critical experiment that led to wide acceptance of the SOCE concept. The experiment involved the passive depletion of the ER Ca^{2+} store by the SERCA pump inhibitor thapsigargin, which resulted in the same activation of SOCE as observed with the receptor-stimulated cell [3]. Interested readers can visit several publications describing how Jim developed this idea [4, 5], and his current thoughts on the physiological roles for SOCE [6].

The CCE model in 1986 was just the beginning of the story, or Chapter 1 as Jim would say. Thirty years later, the SOCE model (Figure 2B) was further reinforced by the biophysical characterization of the Ca^{2+} -activated Ca^{2+} current (CRAC) and the identification of key molecular players (the STIM and ORAI family proteins). The SOCE model now stands atop a rich field of knowledge and opportunity. Last summer, many of the international scientists who have made important contributions to the understanding of SOCE gathered in Chapel Hill, North Carolina (Figure 3). They presented state-of-the-art research on calcium signaling from basic molecular and cellular mechanisms to the physiological and clinical relevance of the process. This Special Issue of *Cell Calcium* presents much of the exciting work discussed at the conference, illustrating the depth and breadth of our understanding of SOCE and calcium signaling.

On a personal note, I would like to acknowledge the assistance of my colleagues in staging a fantastic scientific conference. They are Drs. Indu Ambudkar, Don Gill, Shmuel Muallem, Anant Parekh, Mohamed Trebak, Pooja Desai, Shilan Wu, Natacha Steinckwich-Besançon and Diane D'Agostin. The conference was made possible by the tremendous support of NIEHS and HORIBA-PTI.

Finally, I would like say it has been a joy to work with Dr. James W. Putney Jr over the years. At work and play, Jim is an incredible role model and the epitome of a *gentleman scientist*. Thoughtful, inquisitive, inspiring, encouraging, ethical and kind. How lucky I feel to have joined his SOCE journey.

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Highlights

The enclosed submission is a *Preface* for the Cell Calcium Special Issue devoted to the proceedings of the 'International Conference on Calcium Signaling: from stores to channels'.

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Figure 1.
Dr. James W. Putney Jr.

Figure 2.

The evolution of CCE. Putney's 1986 original visualization of CCE, left, compared with SOCE today, right. CCE image reproduced from [2] by permission of Elsevier.

Figure 3.
Jim Putney (front middle) joined by international colleagues for the “International Conference on Calcium Signaling: from stores to channels”, July 31-August 3 2016.