



Łochów, 23<sup>rd</sup>–27<sup>th</sup> September 2014

## CALCIUM WAVES SUPPORTED BY STRESS ACTIVATED ION CHANNELS IN THE CELL MEMBRANE

Zbigniew Peradzyński<sup>1</sup>, Bogdan Kaźmierczak<sup>2</sup> and Dominika Nowicka<sup>2</sup>

<sup>1</sup>Faculty of Mathematics, Informatics and Mechanics, University of Warsaw,  
ul. Banacha 2, 02-097 Warszawa,

<sup>2</sup>Institute of Fundamental Technological Research, PAN,  
A. Pawińskiego 5B, 02-106 Warszawa

<sup>1</sup>zperadz@mimuw.edu.pl, <sup>2</sup>bkazmier@ippt.pan.pl, dnowicka@ippt.pan.pl

### ABSTRACT

We propose a mathematical model of fast calcium induced calcium influx waves (so called CICI Waves). They can propagate at relatively high speeds (up to 1300 micrometers/s), due to a mechano-chemical interaction, in which stretching a cell's membrane at one point opens nearby stretch-activated calcium channels. In turn, the resulting influx of calcium implies stretching of a nearby region of the membrane. We provide an asymptotic analysis of the proposed model for thin cylinders modelling long cells.

### REFERENCES

- [1] J.C. J.C. Gilkey, L.F. Jaffe, E.B. Ridgway, and G.T. Reynolds: *A free calcium wave traverses the activating egg of the Medaka, *Oryzias latipes**, J. Cell Biol. **76** (1978), 448–466.
- [2] L. F. Jaffe: *Stretch-activated calcium channels relay fast calcium waves propagated by calcium-induced calcium influx*, Biol. Cell **99** (2007), 175–184.
- [3] W. S. Nishitani: *Molecular mechanisms involved in cell response to mechanical forces*, phd dissertation (2011).
- [4] B. Kaźmierczak and Z. Peradzyński: *Calcium waves with fast buffers and mechanical effects*, J. Math. Biol. **62** (2011), 1–38.
- [5] \_\_\_\_\_: *Calcium waves with mechano-chemical couplings*, Math. Biosci. Eng. **10** (2013), 743–759.