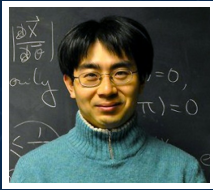


# Mathematical Physiology: Solving the Hard Problems



Yoichiro Mori  
Associate Professor, School of Mathematics

## CURRENT RESEARCH

Computational simulations help scientists understand biological mechanisms

Electrical currents are passing through our bodies constantly; they direct the functioning of many organs and systems including the heart, brain, muscles, sensory systems, and hormonal glands. Dr. Yoichiro Mori, of the University of Minnesota, is a mathematical physiologist that hopes to bring the power and the beauty of mathematics to bear on the complex, fascinating, and important problems in physiology and medicine, especially in electrophysiology. His current research in cortical spreading depression in the brain and cardiac arrhythmias in the heart has the potential to lead to new understandings in physiology and treatment of diseases. Dr. Mori arguably has the best mathematical model and technical prowess for cortical spreading depression (CSD) and expects to make significant progress. Many people suffer from brain diseases related to CSD including migraines, strokes, seizures, as well as cardiac arrhythmias, and a better understanding of these conditions will lead to improved therapies and management strategies. In addition, a better understanding of these various mechanisms has great scientific merit which will lead to a more accurate picture of how the brain and heart work thereby opening new doors in medicine.

Current research projects include:

- Cortical Spreading Depression (CSD): CSD is a pathological condition of the brain that is the basis of migraine aura (defects in the visual field that many migraine patients experience prior to headache attack) and closely related to other brain diseases such as stroke, trauma, and seizures. Understanding CSD will lead to a better understanding and eventually management and therapy of many brain diseases, and will also enhance our...

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## AFFILIATION

 University of Minnesota

## EDUCATION

- Ph.D., in Mathematics, 2006, New York University
- M.D., in Medicine, 2002, University of Tokyo, Japan

## AWARDS

- McKnight Land Grant Professorship, 2010-2012
- Alfred P. Sloan Foundation Fellow, 2009-2011
- Leslie Fox Prize in Numerical Analysis (First Prize), 2007
- Kurt O. Friedrichs Prize for Outstanding Dissertation, 2007
- Moses A. Greenfield Research Award for Interdisciplinary Research, 2006

## RESEARCH AREAS

Technology, Computational Sciences / Mathematics, IOT, Devices, Data, Neurological / Cognitive

## FUNDING REQUEST

Your contributions will support Dr. Mori's research in mathematical physiology as he seeks to understand how the electrical activity is central to the functioning of many organs. Your donations will fund the annual expenses of travel, salaries, graduate students, and postdoctoral fellows required for continued research. While \$10K can make a significant difference, \$100K can have a tremendous impact. Your help will allow Dr. Mori and his team to understand important biological mechanisms.