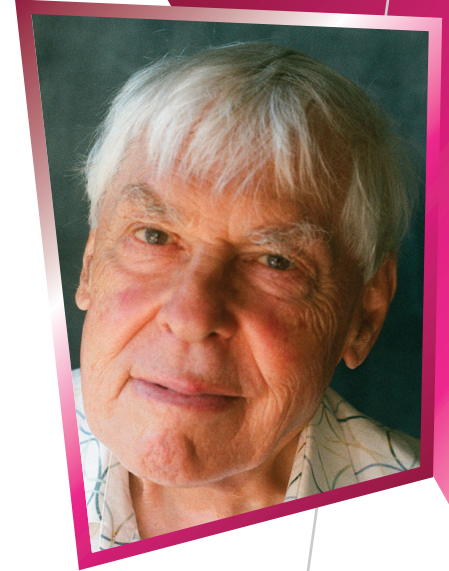


HKIAS Distinguished Lecture

The Heart, Beating in Unison, and the Mathematics of Synchronization

Professor Stephen Smale

Professor Emeritus at University of California, Berkeley
Senior Fellow of CityU HKIAS
Fields Medalist
Wolf Prize Laureate



Date : 4 July 2019 (Thursday)

Time : 10:30am – 12:00nn (*Light refreshments will be served from 10:00am to 10:30am*)

Venue: John Chan Lecture Theatre (LT-11), 4/F, Yeung Kin Man Academic Building
City University of Hong Kong

Abstract

Myocytes, a class of heart cells, when put into a petri dish will oscillate independently, but after some time, nearby cells will have similar oscillatory behaviour. Our goal is to give a mathematical model of synchronization to help understand this phenomenon.

Important work on this subject goes back to Huygens more than 350 years ago (pre-Newton). More recently, Turing (morphogenesis), Winfree, and Strogatz, (a one-time post-doc of my student Nancy Kopell) made contributions to these studies.

Here we focus especially on the work of Kuramoto on the collective behaviour of phases. We will give a geometric analysis of Kuramoto's ordinary differential equations. Starting from the graph Laplacian of the cellular architecture of the heart, and a "hard-wiring" hypothesis of the associated genome dynamics, we obtain a phase setting of Kuramoto equations to obtain a "beating in unison" result. Still the geometry leads to interesting unsolved problems of this dynamics.

This is a joint work with Charles Pugh and Indika Rajapakse.

Biography

Professor Smale is a Member of the US National Academy of Sciences. He is one of the few mathematicians to win both the Fields Medal and Wolf Prize in mathematics. He obtained his PhD in 1957 at the University of Michigan and the next year astounded the mathematical world with a proof of a sphere eversion. He was awarded the Fields Medal in 1966 and spent three decades at UC Berkeley. After retiring from UC Berkeley in 1994, Professor Smale served as a University Distinguished Professor at the City University of Hong Kong from 1995 to 2001 and from 2009 to 2016. He is presently Senior Fellow of Hong Kong Institute for Advanced Study and Honorary Professor at the City University of Hong Kong.



All are welcome

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