

凝聚态物理-北京大学论坛

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Non-linear waves and cardiac arrhythmias

Prof. A.V. Panfilov

时间: 4月18日 (星期四) 15:00—16:30

地点: 北京大学物理大楼中212教室

•摘要: Sudden cardiac death as a result of cardiac arrhythmias is the leading cause of death in the world. Although cardiac arrhythmias has been studied well over a century, their underlying mechanisms remain largely unknown. One of the main problems is that cardiac arrhythmias occur at the level of the whole organ only, while in most of the cases only single cell experiments can be performed. Due to these limitations alternative approaches, such as multiscale computer modelling of the heart, are currently of great interest. From mathematical point of view excitation of the heart is described by a system of non-linear parabolic PDEs of the reaction diffusion type with anisotropic diffusion operator. Cardiac arrhythmias correspond to the solutions of these equations in form of 2D or 3D vortices characterized by their filaments.

•In this talk, the mechanisms of cardiac arrhythmias will be explained from the point of view of basic scientist and the main ideas behind the multi-scale computer modelling of the heart will be presented. Then, the research directions of my group, specifically on development of virtual human heart model and its application to studies the mechanisms of sudden cardiac death will be reported. Also, the details of how modelling can be used in combination with new experimental technologies in the field, such as cardiac cell cultures and optogenetics and their possible application for treatment of cardiac arrhythmias will also be discussed.

•报告人简介: A.V. Panfilov, Professor of Gent University, Belgium, has been working on the fields of systems biology of the heart, virtual heart, anatomical cardiac modeling, mechanisms of cardiac arrhythmias in the human heart, models for human cardiac cells. He is Honorary Professor of University of Dundee since 2004, Guest Professor at the Heart Lung Centre at Leiden University Medical Centre, Netherlands since 2018. He serves as section editor of PLOS One, associate editor of Frontiers in Computational Physiology, and referee for PNAS, Circulation Reserch, Physical Review Letters, Nature, etc. He has published 193 papers, total citations is over 6400 (according to WoS) with h-index 44. Google-scholar citation is around 11600, h-index is 53, i10-index is 134.

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