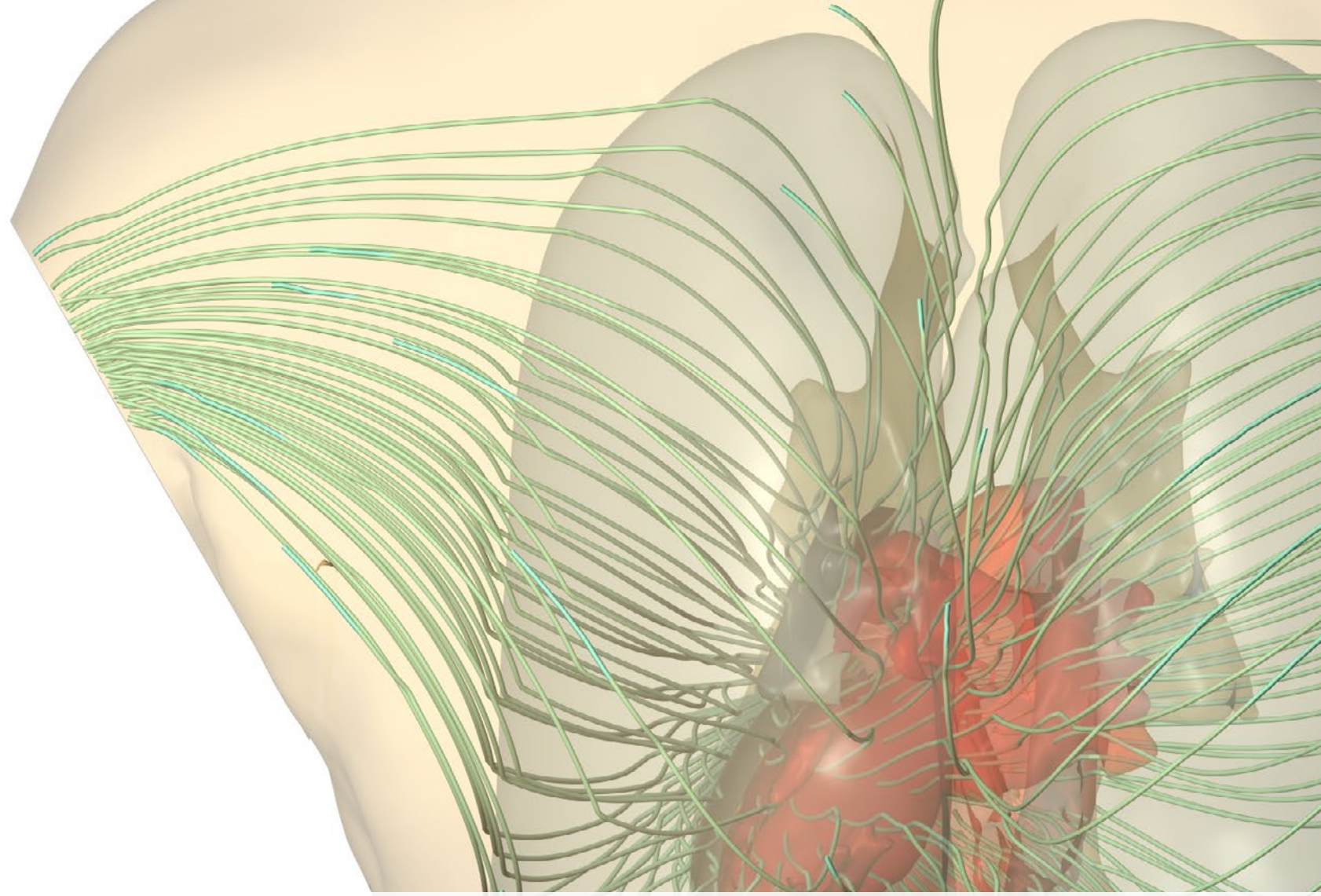




AMERICAN
UNIVERSITY OF BEIRUT
CENTER FOR ADVANCED
MATHEMATICAL SCIENCES



MATHEMATICAL BIOLOGY

A TOUR ON EQUATIONS THAT MODEL CARDIAC ELECTRICAL ACTIVITY, AND SOME RELATED NUMERICAL DIFFICULTIES.

THURSDAY, OCTOBER 6, 2022

5:00 pm (Beirut time) | ONLINE

The heart's function consists in pumping blood into the body. It is a complex muscle whose efficiency is obtained by synchronizing its cavities. This is achieved because a fast progressive wave of cardiac action potential spreads rhythmically over its cavities, in a well-organized manner. This is a complex space and time phenomenon that depends on the muscle's micro-structural organization, the individual behavior of cardiac cells, and how they are connected. I will give an overview of some of the equations used to help understand this mechanism: nonlinear differential equations of cardiac electrophysiology, including old models and recent ones, and reaction-diffusion equations modeling its microstructure. I will also explain the difficulties that have to be solved in order to compute approximate solutions for these equations, so as to provide a coarse overview of numerical modeling for electrocardiology.



YVES COUDIÈRE

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Yves Coudière received an engineering diploma in aeronautics in 1994, and a Ph.D. from University Toulouse 3 in 1999. He has been an assistant professor at the University of Nantes until 2012. He currently holds a full professor position at the University of Bordeaux, where he leads the INRIA Carmen team within the Electrophysiology and Heart Modeling Institute (Liryc). His main research interests are numerical methods, scientific computing, and computational cardiac electrophysiology. He is in particular interested in the analysis of finite volume discretization methods, analysis of cardiac models, and their applications to computational simulation studies of cardiac arrhythmias.