

## The Beat of Math

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Mathematical models based on first principles are devised for the description of the blood motion in the human circulatory system, as well as for the simulation of the interaction between electrical, mechanical, and fluid-dynamical processes occurring in the heart. This is a classical environment where multi-physics and multi-scale processes have to be addressed.

Appropriate systems of nonlinear differential equations (either ordinary and partial) and efficient numerical strategies must be devised to allow for the analysis of both heart function and dysfunction, and the simulation, control, and optimization of therapy and surgery.

This presentation will address some of these issues and a few representative applications of clinical interest.

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