

[Subject category: Health and Medicine]

## HEART OF THE MATTER

Oxford University scientists have launched an ambitious project to develop new software to simulate the way that electrical impulses travel around the heart. If the work is successful it could give important insights into how the heart works and how best to correct the heart's electrical activity when it goes awry. Because the physiology of the heart is so complex, the model will be constructed on the UK's new supercomputer, HeCTOR, based in Edinburgh.

Dr Joe Pitt-Francis is one of the scientists leading the project. "For the past two years we have been developing new programming codes that model the heart's electrical and mechanical activity," he says. "We are now ready to test these on the supercomputer and if we can build a reliable and robust model we can hopefully experiment with new ways to control this activity – which might eventually lead to better technology to treat arrhythmias for example."

The contraction of heart muscle is precisely governed by the electrical activity of the heart's millions of muscle cells. These electrical impulses themselves are dictated by a large number of physiological factors, such as the transport of different ions across the outer membranes of the cells.

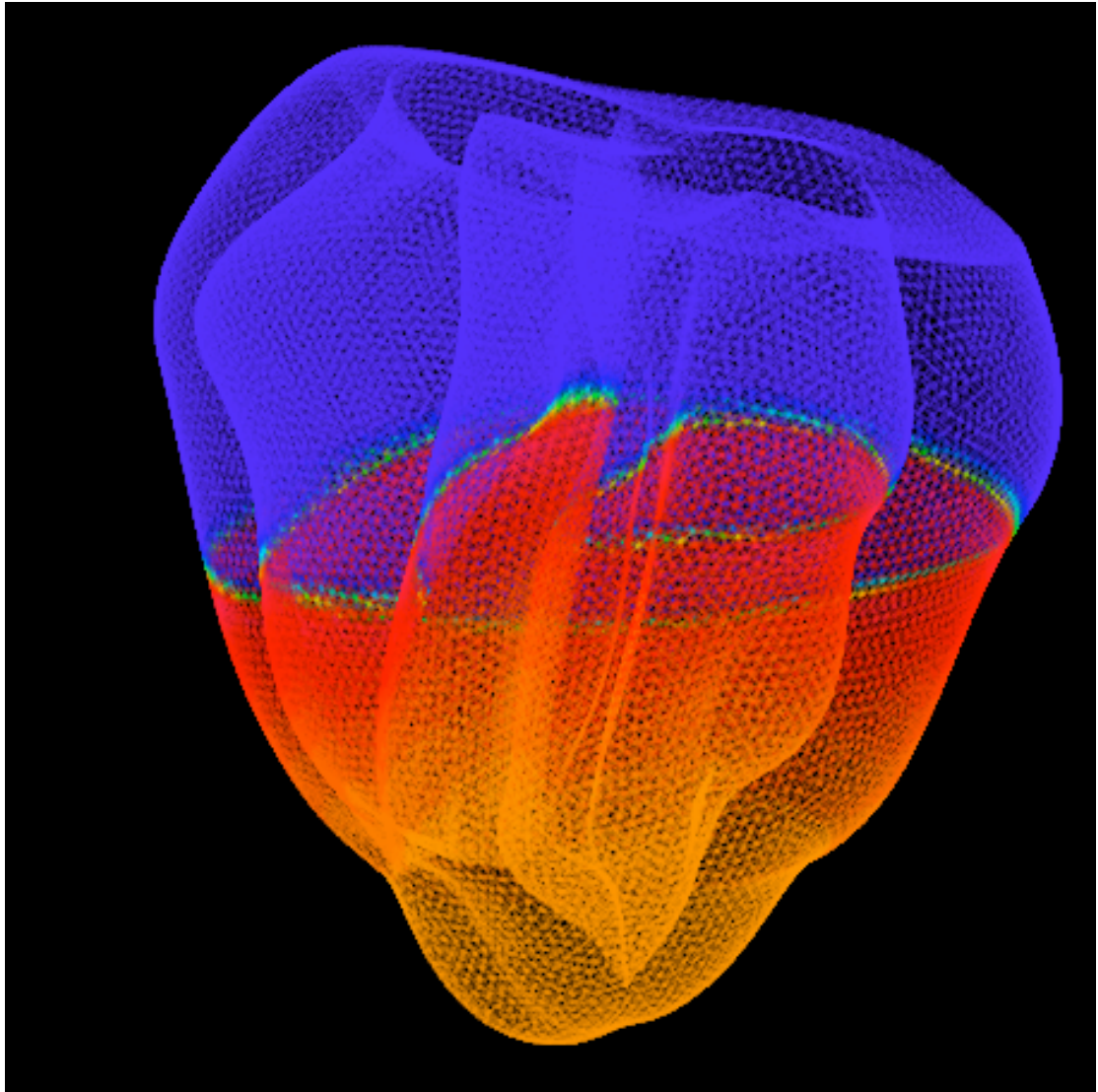
"These key physiological processes can be described by a series of equations, and because each cell is influenced by its neighbour the system becomes highly complex," Dr Pitt-Francis says.

Ultimately it could be possible to use the model to perform a series of 'virtual' experiments, by, for example, giving the model heart a 'mathematical' electric shock and observe the consequences, or test a virtual pacemaker to observe how different patterns of electrical stimulation delivered to the heart affects its activity.

"To carry out these calculations and generate a realistic pattern of the electrical waves we need very powerful computing ability," Dr Pitt-Francis says.

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Acting on impulse...computer representation of a wave of electrical activity moving through heart tissue