

THE CARTILAGE CALCULATOR

TakeAIM Winner 2013:
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*40*20*1 mm, 2 MPa peak stress, right knee, female, 34 yrs. The technician looks at the screen as the specification comes up. He jots down a few notes, steps over to the computer on his right and makes his selections; female, 34, knee, articular cartilage and adds the stress. A recipe for a perfect personalised cartilage appears. He walks along the shelves of the lab, picking out aggrecan, collagens, salts, cells and a mould, heading into the tissue culture room.*

The scenario above is a dream scenario. A dream scenario my research aims to make reality. Using an innovative approach, I'm matching the contents of cartilage to its behaviour via mathematical modelling. Pairing different physical events and understanding how water and organic molecules interact are key to describing the tissue mathematically. This is particularly important for sudden impact, such as traumatic injury, which could potentially cause long-term damage. My model will be the first to predict how cartilage works with a basis in what it is made up of.

A week later. The cells have happily grown inside the gel the technician made; the tissue engineered cartilage is ready to be transferred into the patient's knee. She is only one of thousands undergoing this surgery every year. The 6 million plus people who used to suffer with osteoarthritis no longer have to limp down the street or struggle opening jars. Patients from all walks of life are, with the help of some maths, living a happy pain free life.

Competition sponsors:



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MATHEMATICS**

The use of mathematics has profound consequences in all walks of life, but the opportunities that it opens up often go unrecognised or underexploited. The Industrial Mathematics KTN, enabled by the generous sponsorship of six leading corporate partners, ran the third annual TakeAIM competition in 2013 to make visible the crucial role that mathematics will increasingly play in all aspects of our lives. The competition was open to all undergraduate and postgraduate students working in the mathematical sciences. Authors of the best two entries each received a MacBook Air as their prize, with additional prizes being awarded to two runners-up.