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Maths flaw found after 140 years

By Roger Highfield, Science Editor
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A professor has fixed a crucial flaw in an equation used for 140 years in a vast range of fields, from visualising the structure of the human brain to working out the flow of air over the wings of aircraft.

An existing mathematical equation, now known as the Schwarz-Christoffel formula, was independently discovered by two mathematicians in the 1860s to enable them to translate the unusual and angular shapes of the real world, whether brains or aircraft wings, into a simpler circular shape so that they are much easier to model and analyse.

However, all this time there has been a deficiency in this formula, which is well known to all engineering undergraduates: it only worked for shapes that did not contain any holes or irregularities. Now a missing factor has been found by Prof Darren Crowley of Imperial College London.

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This extra term fixes the problem so that the formula is much more flexible. "It looks simple but this has been evading people for a long time. It is a kind of weighting factor and it is crucial."

"This formula is an essential piece of mathematical kit which is used the world over," he says. "Now, with my additions to it, it can be used in far more complex scenarios than before. In industry, for example, this mapping tool was previously inadequate if a piece of metal or other material was not uniform all over - for instance, if it contained parts of a different material, or had holes."

Prof John Elgin, head of the Department of Mathematics at Imperial, says: "Darren is perhaps the world's leading experts in solving challenging problems involving multiply connected geometries."

"This long-standing classical problem was a natural one for him to tackle. It is an important result: his new formula will appear in the next generation of textbooks."

The Society for Industrial and Applied Mathematics in America describes the work as a "breakthrough" that will have an impact on in all kinds of applications ranging from traditional engineering disciplines such as aeronautics through to modern areas such as string theory, used in the quest by physicists to create a "theory of everything" to describe all the forces and particles in the universe.

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