

# Galway mathematicians have found a way of making Batman's cape

NUI Galway mathematicians' research makes Batman that bit more real.

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RESEARCHERS AT NUI Galway have discovered a formula that will allow them to make Batman's cape a reality.

Applied mathematicians from NUI Galway published a formula on Friday that works out how much voltage soft conductive materials or 'dielectric' membranes can take before they break.

Dielectric membranes are lightweight soft materials that can deploy (or expand) and stiffen when put under high voltage, but until now, there has been a big challenge in knowing what the breaking point of these membranes is.

Professor Michel Destrade, at the School of Mathematics, Statistics and Applied Mathematics in NUI Galway explains how it works:

If you can remember the scene in **Batman Begins** where this huge bat cape emerges from a tiny folded piece of material, that's the kind of technology which is being developed currently in some labs around the world, especially in Harvard University and in China.

"It's the electric voltage that allows these special membranes to expand. Until now it was not fully understood how much voltage these membranes could sustain.

"Some are a millimetre thick, but if they thin out too much when they stretch with the voltage, it can lead to a short-circuit and a catastrophic breakdown. We hope our mathematical formula will help advance science in this area."

Dr Giuseppe Zurlo of NUI Galway, co-author of the study, adds: "The very near and real applications for these materials are artificial human muscles, or soft robots which can help organs function."

Together with collaborators at Politecnico di Bari in Italy, the mathematicians worked out a simple formula to link the physical properties of the membrane to the breakdown amount of stretch.

"The final equation is very compact," says Dr Zurlo. "And it will provide most useful safety guidelines for future experiments on these fascinating materials."

The problem had stumped material scientists for years. Now the solution, published in the Physical Review Letters, could pave the way for 'smart' clothes, or making clothes with electronic capabilities.



Great news for fans of the Caped Crusader: his gadgets are coming to life.

Image: The Dark Knight/Screenshot