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VIDEO: NUI Galway solve problem of artificial muscles and Batman's cape that stumped scientists for years

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A team of Irish scientists have made a breakthrough in relation to artificial human muscles, which will be of huge benefit to materials scientists and soft robotics engineers.

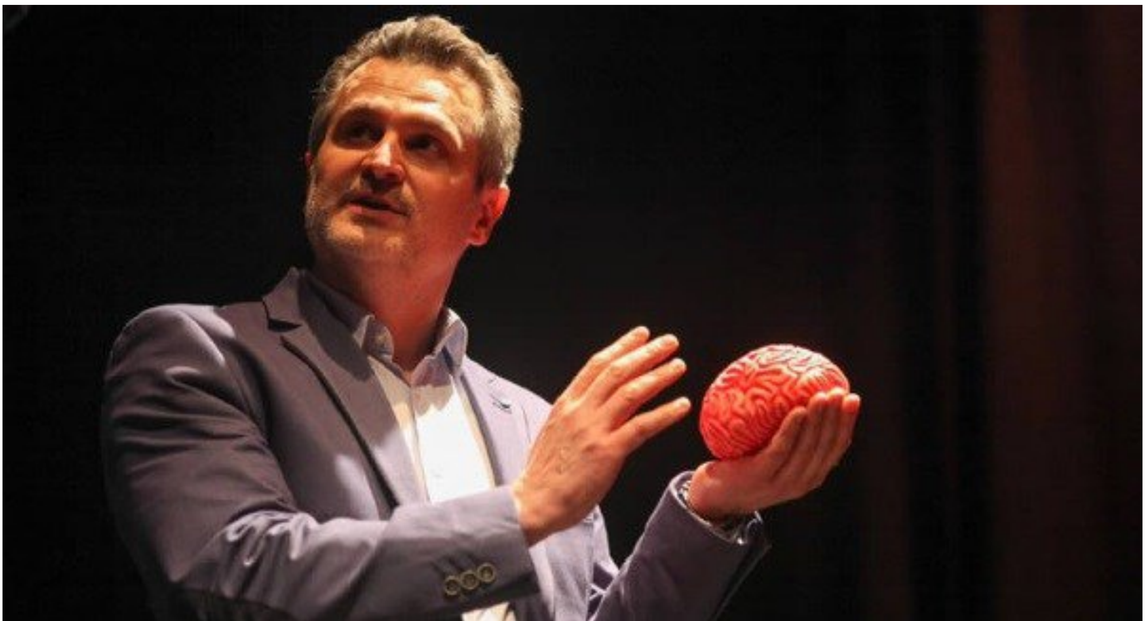
Applied mathematicians from NUI Galway have today published a formula which works out how much voltage and deformation soft 'dielectric' membranes can take before they break.

These membranes are used on the cutting edge of science to develop artificial muscles, soft robotics, energy harvesters and 'smart clothes'.

These lightweight soft materials deploy 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 of NUI Galway compared the use of this technology to a scene in Batman Begins.

"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," he said.



Professor Michel Destrade, School of Mathematics, Statistics and Applied Mathematics, NUI Galway

"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."

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 and it will provide most useful safety guidelines for future experiments on these fascinating materials," says Dr Giuseppe Zurlo of NUI Galway, co-author of the study.

The problem had stumped material scientists for years and its solution is published today in the prestigious Physical Review Letters. Professor Destrade and Dr Zurlo are now working on experiments with engineering colleagues at Xi'an Jiaotong University in China.