New 'soft' motor made from artificial muscles

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The electrostatic motor, used more than 200 years ago by Benjamin Franklin to rotisserie a turkey, is making a comeback in a promising new design for motors that is light, soft, and operates without external electronic controllers.

"Perhaps the earliest public demonstration of an electric motor," writes a team of researchers from the University of Auckland in New Zealand, "involved the automatic rotation of a turkey on a spit over a fire" at a party put on by Benjamin Franklin in 1749. Franklin's electrostatic motor was self-commutating, meaning that it was able to provide a continuous torque while it turned without requiring external electronics to control its progress. Using artificial muscles, hyper-elastic materials that expand when a charge is applied, the New Zealand team has made a prototype for a self-commutating artificial muscle motor that does not require external electronics or hard metal parts. The researchers describe the device in a paper accepted to the American Institute of Physics' journal Applied Physics Letters.

The team's proof-of-concept motor is controlled with carbon-based switches whose resistances change when they are compressed, which activates artificial muscles that rotate a shaft. The artificial muscles, in turn, are able to activate the switches by their movements. All that is required to operate the device is a direct current input voltage. Among the advantages of these electrostatic motors compared to their harder, bulkier electromagnetic cousins, the authors write, is that they are capable of delivering higher torque, require low currents instead of high,

and can have a flatter profile. The new motor in its current state is inefficient, but the authors hope their prototype will open the door to a softer, lighter future for electrostatic motors, with applications in areas such as prosthetics and soft robots – applications well beyond "simply barbecuing poultry."

More information: "Rotating turkeys and self-commutating artificial muscle motors" is accepted for publication in *Applied Physics Letters*.

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