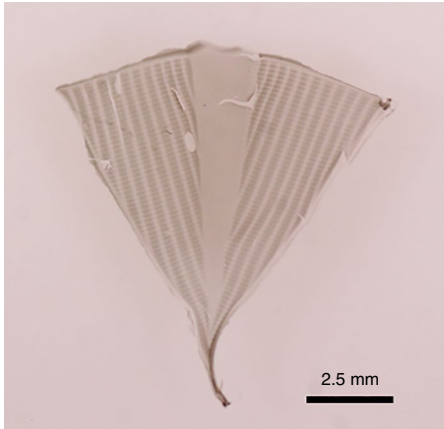


### SOFT ROBOTICS

## Electrically driven stingrays

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Credit: Wiley

Nature is often an inspiration, and resource, for the design of soft robots. Bio-synthetic hybrid devices have, for example, been developed that rely on living cells for actuation and can move or change shape in response to their environment. Such approaches have led, in particular, to the creation of robots that behave like ray fish and can be guided by light. However, the optogenetic technique that is employed here has a number of drawbacks including a complicated development processes. Su Ryon Shin, Ali Khademhosseini and colleagues have now created an electrically driven soft robot that can mimic the movement of a stingray.

The researchers — who are based at institutes in the US, Sweden, South Korea, Italy, Switzerland and Saudi Arabia — built robots that consisted of two flexible hydrogel layers with gold microelectrodes in between them. Rat heart cells were used for actuation and sat on the top flexible layer, which was embedded with carbon nanotubes to help the cells mature. The hydrogel layers were micropatterned with an optimized design that enhanced the motion of the stingray's fins during the contraction and relaxation of the cells. By applying electrical voltages, the team were able to control the beating behaviour of the cells and could make the stingray deform at frequencies of up to 1 Hz.

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