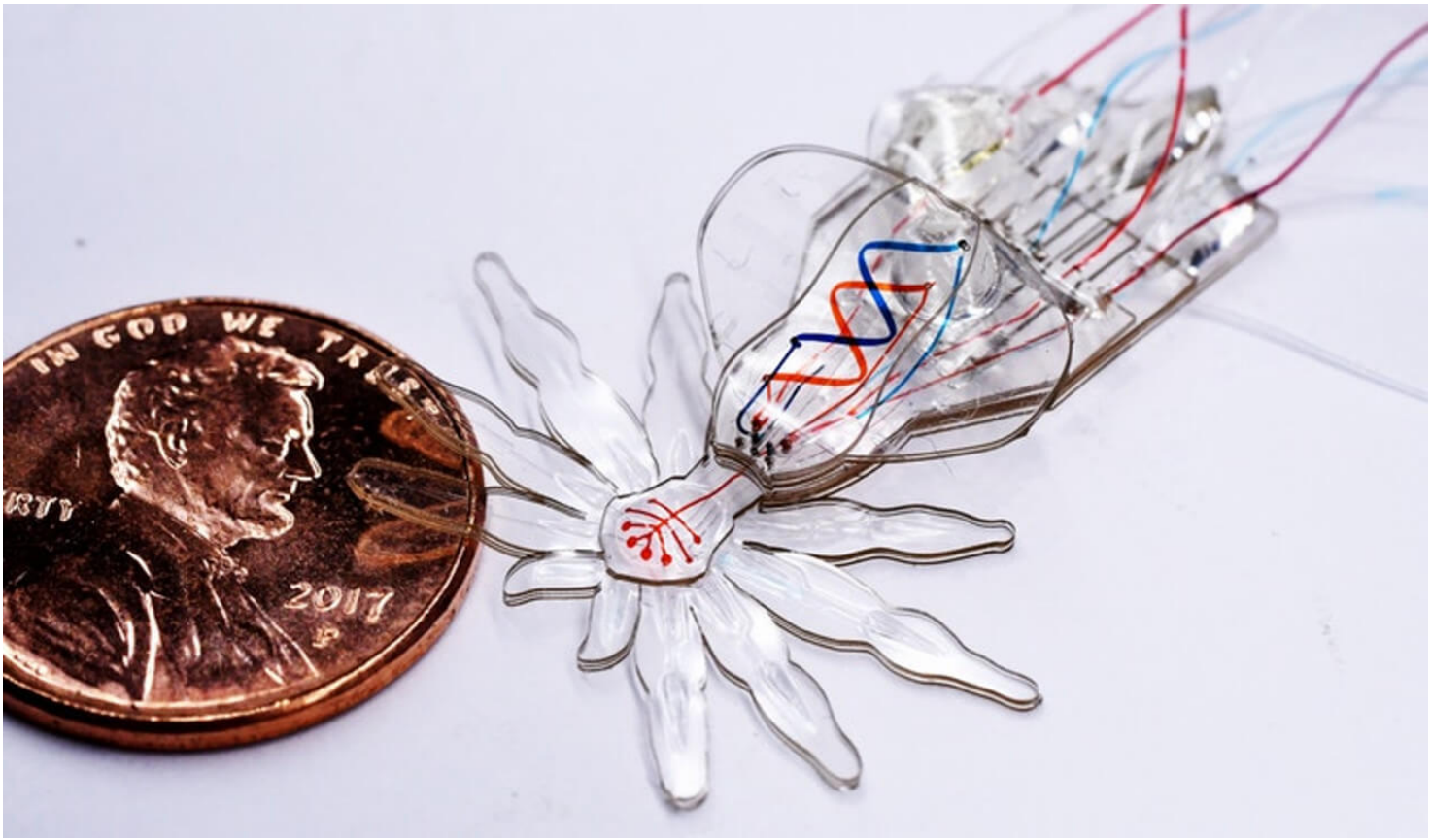

Dragonfly

SOFT ROBOTS OFFER A MULTI-FUNCTIONAL FUTURE

SCIENCE & ENVIRONMENT

A new approach for fabricating soft materials at the millimetre scale could lead to a new generation of flexible micro-robots

Robotics is an exciting area of innovation, offering huge potential in terms of working directly with humans. Springwise has therefore covered a number of innovative robotic designs. These have included a robot with undulating fins and robotic insects, both of which take inspiration from nature for improved design features.

Similarly, researchers at Harvard University's Wyss Institute for Biologically Inspired Engineering, together with the John A. Paulson School of Engineering and Applied Sciences (SEAS) and Boston University, are developing very small, soft, animal-inspired robots. The researchers have developed a fabrication process which they hope will enable the design of soft robots on the millimetre scale, with micrometre-scale features.

The team first uses a soft lithography technique to generate 12 layers of elastic silicone. These layers make up the robots' base and each also includes a network of hollow channels. The layers bend to their final configuration using a technique called injection induced self-folding. In this technique, a curable resin is injected into the channels at pressure, causing the layers to bend into their final configuration. When the resin hardens, the shape fixes in place. The technique is termed Microfluidic Origami for Reconfigurable Pneumatic/Hydraulic devices, or MORPH. The entire fabrication process takes a few days to complete.

Currently, very small, soft robotic systems are very simple, and can therefore only make one type of movement. According to Sheila Russo, a senior researcher on the project, “By developing a new hybrid technology that merges three different fabrication techniques, we created a soft robotic spider made only of silicone rubber with 18 degrees of freedom, encompassing changes in structure, motion, and color, and with tiny features in the micrometer range.”

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Takeaway:

The new soft robots developed by Wyss are designed to be used in environments where such rigid robots cannot be used. These could include inside the human body or spaces that are too small or too dangerous for humans. What uses might there then be for miniature soft robots with larger degrees of movement and flexibility?