



ENVIRONMENTAL ROBOTICS

Background, Interesting Designs, and
Philosophical Dilemmas

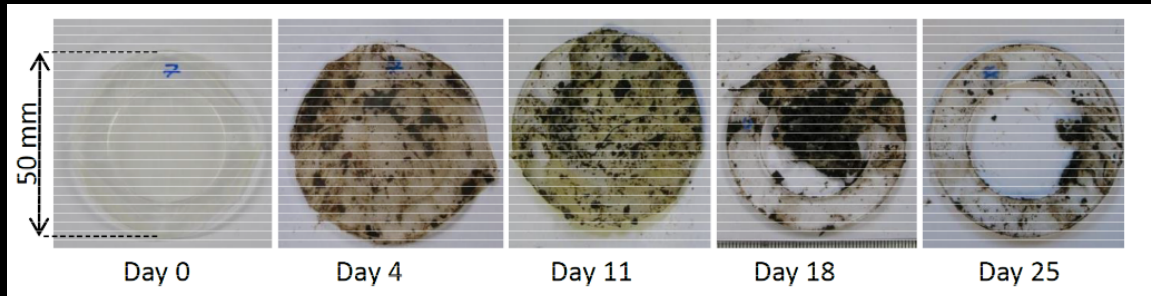


A close-up photograph of a robotic arm, likely from a Mars rover, resting on a sandy surface. The arm is primarily gold and black, with a camera lens visible at its tip. The background is a soft-focus, light-colored sand. Overlaid on the lower-left portion of the image is the text "NATURE-INSPIRED" in white and "ROBOTS" in yellow.

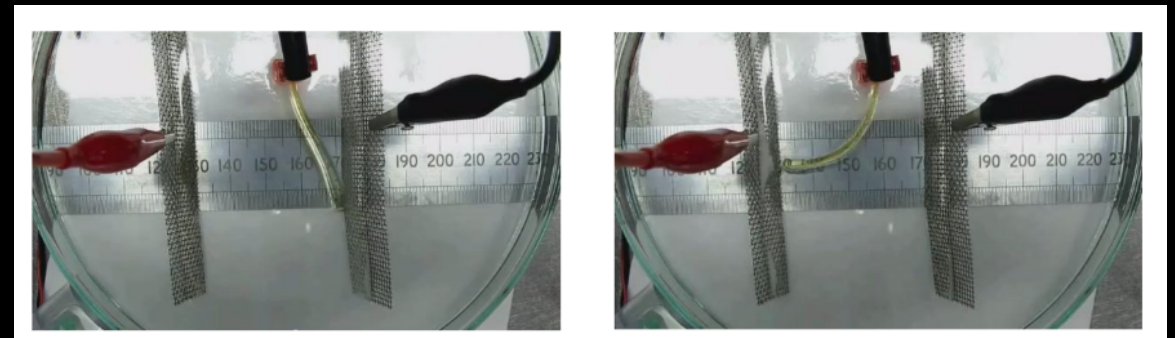
NATURE-INSPIRED
ROBOTS

BIODEGRADABLE ROBOTS

Dielectric Elastomer Actuators



Ionic Polymer Actuators



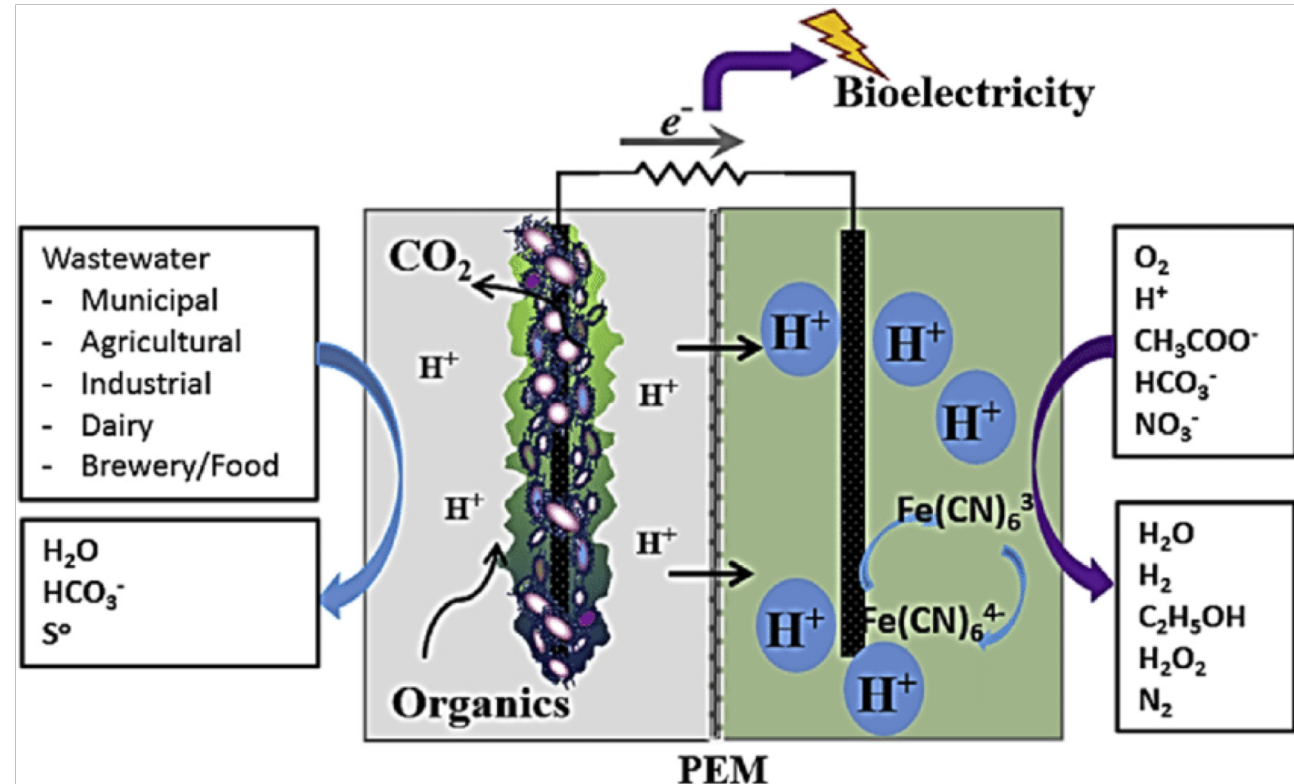
<http://eprints.uwe.ac.uk/30436/1/2016%20Here%20today%20gone%20tomorrow.pdf>

<https://www.reuters.com/article/us-italy-smartmaterials-eco-robots/biodegradable-bodies-for-more-eco-friendly-robots-idUSKCN0UX25V?feedType=RSS&feedName=scienceNews>

https://www.youtube.com/watch?time_continue=15&v=Ga_lafGRWyE

BIO-ELECTRICITY

- A microbial fuel cell (MFC) is a device that converts chemical energy to electrical energy by the action of microorganisms
- The electrons produced during oxidation are transferred directly to an electrode or, to a redox mediator species. The electron flux is moved to the cathode
- Paper, biofilms, & carbon nanotubes are among some of the different materials that can be used to make them
- MFC is capable of energy efficiency far beyond 50%
- Electrodes in some cases need only be 7 μm thick by 2 cm long
- MFCs operate well in mild conditions, 20 $^{\circ}\text{C}$ to 40 $^{\circ}\text{C}$ and also at pH of around 7



INTERESTING TED TALK



WHY MAKE ROBOTS THAT RESEMBLE NATURE?

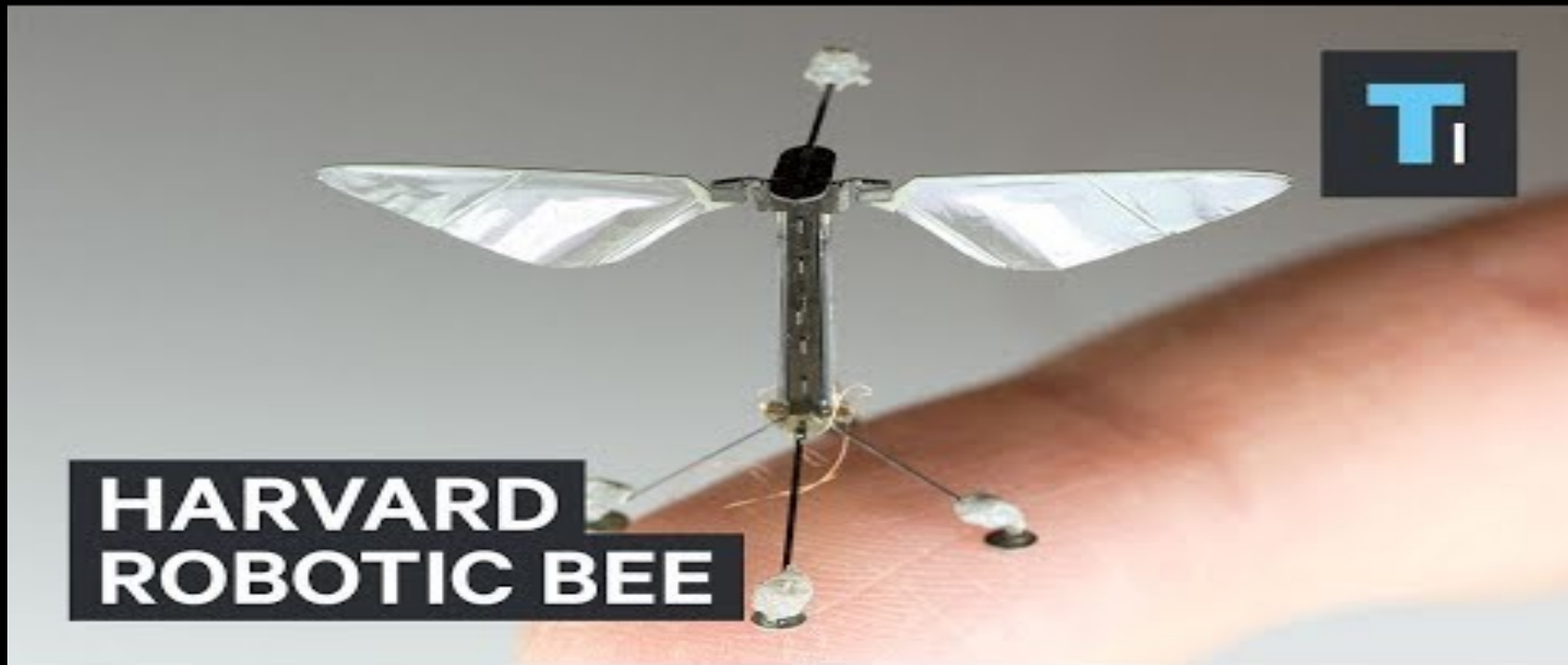
- Human form is not the most efficient form for a robot to mirror
- One doesn't need to create different mechanisms to achieve different movements, but rather find the optimal mechanism that can perform several movements (i.e. salamander robot for walking and swimming)
- Encourages biological research to improve our understanding of nature
- Nature locomotion is more robust and is more viable for hazardous terrains than wheeled robots for example (i.e. spider style or snake style locomotion)
- Nature robots are more energy efficient and are lighter than other robot counterparts (i.e. bat robot)
- Nature robots like the octobot need no batteries or wires for function

<https://www.machinedesign.com/motion-control/7-bio-inspired-robots-mimic-nature>

<https://phys.org/news/2017-02-six-legged-robots-faster-nature-inspired-gait.html>

<https://explorebiotech.com/10-best-robots-inspired-from-nature-biomimicry/>

PHILOSOPHICAL DISCUSSION



WHAT DO YOU THINK?

<https://www.scienceabc.com/nature/bee-extinction-means-end-humanity.html>



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<https://scienceofsingularity.com/2016/11/14/tiny-flying-robots-are-being-built-to-pollinate-crops-instead-of-real-bees/>

