PURSUIT OF ZΩH — THE WEEKLY

This Week in

Mechanical Engineering

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THIS WEEK

Designed to give: networks, rubber blades, robot trunks

Beams of many sizes make a tougher metamaterial, rubber tidal-turbine blades bend to shed load, cable-and-rod robots team up like trunks, and light-heated muscles paddle a printed frog.

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01

MECHANICAL METAMATERIALS

Beams of every size make a tougher metamaterial

Most mechanical metamaterials repeat one unit cell over and over.[1] A team from Northeastern University, MIT and Utrecht University instead grew beam networks whose lengths, thicknesses and connections span orders of magnitude, set by just two parameters.[1] In 3D-printed samples tested against square, hexagonal and Voronoi lattices, these scale-rich networks deformed more evenly and absorbed impacts better, and a pomelo-inspired density gradient shielded a fragile insert.[1]

> WHY IT MATTERS
> *Spreading damage instead of letting it collect in bands suits helmets, packaging and armor.*[1]

CAVEAT *The drop in stress on the protected insert comes from simulations.*[1]

[1] doi:10.1038/s41586-026-11191-2

37%

lower strain localization than a disordered Voronoi lattice, through 25% strain (experiments)

SOURCE 1

ON THE ROAD?

Listen to this issue

7-minute episode, read aloud: the same four stories, written for the ear. Stream it, or download the MP3, from the Mechanical Engineering page.

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02

MARINE ENERGY

Rubber tidal-turbine blades bend to shed the load

Large tidal turbines rely on complex, expensive active pitch systems to ride out fluctuating loads.[2] Engineers at the University of Edinburgh and Michelin molded rubber blades around a steel spar, so the trailing edge bends and flattens the blade's camber under load.[2] Testing a 1.26 m model turbine in Edinburgh's FloWave tank over simulated tidal cycles, they matched the energy yield of rigid pitch-controlled blades and cut high-frequency, fatigue-inducing load swings by up to one-third.[2]

WHY IT MATTERS

Passive blades could take costly, complex pitch machinery out of a turbine that works underwater.[2]

CAVEAT *Only the model turbine was tested; the 20 m utility-scale turbine is a simulation.*[2]

[2] doi:10.1038/s41586-026-11278-w

one-third

maximum cut in high-frequency load fluctuations vs rigid blades with active pitch control

SOURCE 2

03

ROBOTICS

Cable-and-rod robots bend like trunks and link up

Modular robots usually dock rigid blocks, while continuum robots bend but cannot split up and regroup.[3] A Colorado State University team built tube-shaped robots on tensegrity, stiff rods held by tensioned cables, with a claw at each end.[3,4] Each can move and handle objects alone or hook onto partners as chains, loops and branches.[3,4] Groups moved objects together and combined locomotion with manipulation in real-world settings.[3]

WHY IT MATTERS

Shape-changing teams could suit manufacturing, search-and-rescue or space work.[3]

CAVEAT *For now a human pilots the robots, though two have found each other and connected on their own.*[4]

[3] doi:10.1038/s42256-026-01335-4 · [4] eurekalert.org

MECHANISM

Rods held by tensioned cables

↓

Body bends like a trunk

↓

Claws grip partners

↓

Teams form chains, loops, branches

04

SOFT ROBOTICS

Light-heated muscles paddle a 3D-printed frog

Liquid crystal elastomers contract when heated and relax as they cool, making them candidates for artificial muscle.[5,6] An Aarhus University team tuned these elastomer inks to print well and switch below 80 °C, adding graphene oxide so near-infrared light supplies the heat.[5] Printed into silicone bodies, one muscle waved a whale-like robot's tail, and six working in step paddled a frog across water.[5,6] The frog covered 8 centimeters in almost two minutes.[6]

WHY IT MATTERS

Clear links between ink chemistry, printing and motion could spare soft-robot builders trial and error.[6]

CAVEAT *Paper online 21 October 2026, included for this week's Aarhus release.*[5,6] *The robots need an external lamp and cannot yet steer.*[6]

[5] doi:10.1002/admt.71401 · [6] techxplore.com

MECHANISM

Lamp lights a leg muscle

↓

Graphene oxide turns light to heat

↓

Elastomer contracts, then relaxes

↓

Six muscles paddle in step

WORDS THIS WEEK

Mechanical metamaterial
A material whose mechanical behavior comes mainly from its designed internal architecture.

Tensegrity
Stiff struts held in shape by cables in tension, so the structure can flex and spring back.

Strain localization
Deformation piling up in a narrow band instead of spreading evenly.

Liquid crystal elastomer
A rubbery polymer with aligned rod-like molecules that contracts when heated.

Pitch control
Machinery that rotates a turbine blade about its long axis to change the load it takes.

SOURCES

1. PAPER C. Both et al., “Scale-rich network-based metamaterials,” Nature (11 Nov 2026). doi:10.1038/s41586-026-11191-2
2. PAPER Z. Zhang et al., “Flexible rubber blades for tidal turbines,” Nature (11 Nov 2026). doi:10.1038/s41586-026-11278-w
3. PAPER M. H. Saikot et al., “Tensegrity continuum robots enable task-adaptive morphologies for cooperative behaviours,” Nature Machine Intelligence (11 Nov 2026). doi:10.1038/s42256-026-01335-4
4. RELEASE “Inspired by elephant trunks, these shape-shifting robots bend, grab and team up,” Colorado State University news release via EurekAlert (11 Nov 2026). https://www.eurekalert.org/news-releases/1151140
5. PAPER C. Ryberg et al., “3D-Printed Actuator Powered by Liquid Crystal Elastomer Muscles at the Water–Air Interface,” Advanced Materials Technologies (21 Oct 2026). doi:10.1002/admt.71401
6. RELEASE “3D-printed robotic frog swims using six artificial muscles powered by light,” Aarhus University, via Tech Xplore (11 Nov 2026). https://techxplore.com/news/2026-11-3d-robotic-frog-artificial-muscles.html

How this is made. Each story comes from the past seven days of journal, agency and society releases and is written fresh for curious minds, with a source for every claim. Superscripts refer to the list above. Spotted an error? Tell us through the contact page; corrections run in the next issue.

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