

FORM CARRIES THE SYSTEM

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Across soft robots, wearable sensors, assistive interfaces, and multifunctional materials, more capability is moving into geometry and fabrication. The strongest work does not erase control; it decides which complexity belongs in the object and which limits must remain visible.



PHYSICAL INTELLIGENCE AND
BOUNDED ADAPTATION

A system becomes calmer when form carries the work without hiding its limits.

01



A Nature Communications study changed collective robot behavior by changing exoskeleton geometry around otherwise limited Kilobots. Another Nature Communications paper demonstrated a six-spoke soft robot that switches among more than nine locomotion modes and folds to reduce occupied volume by 79%. A Biomicrofluidics paper then embedded soft pneumatic valves inside elastomeric actuator networks so deformation modes could be selected locally without rigid switching components in the moving body. These are controlled demonstrations, not autonomous deployed systems. Across scales, the body narrows the control problem before software or a person has to resolve it.

A QUESTION FOR DESIGN

**SHAPE
WRITES THE
FIRST
COMMAND**

Could geometry define a small, useful set of behaviors while keeping external power, control, and failure boundaries visible? ^{*1 *2 *3}

02



Hooked makes crochet patterning determine both garment form and capacitive sensing geometry. HeaTrace turns heater traces, a thermal model, and fabrication toolpaths into one workflow for programming soft-robot behavior. A preprint prints a pneumatic actuator and force-sensing structure from one conductive material, while a volumetric-printing study encloses a magnetic core inside a cured robot shell in one manufacturing event. The records range from peer-reviewed prototypes to one preprint, and none establishes production yield. Their shared move is to make the fabrication description carry functional intent instead of adding behavior through a separate assembly and configuration layer.

A QUESTION FOR DESIGN

FABRICATION BECOMES AN INTERFACE

Could a fabrication file become a legible behavioral specification without making repair, calibration, or material separation harder? ^{*4 *5 *6 *7}

03



Interviews with 15 autistic people and people with ADHD frame control over sensory intensity as a condition of access in virtual reality. A conformal inertial interface recognized a fixed vocabulary from lip movement without audio or clear camera vision. A year-long single-case wheelchair-arm project reduced explicit rotational commands through co-design, and the University of Utah moved a bidirectional neuroprosthetic arm into its first year-long home trial with one participant. The evidence is deliberately specific and does not establish universal preferences or clinical effectiveness. It shows that fit emerges through adjustable intensity, conformal sensing, shared control, and use in ordinary routines.

A QUESTION FOR DESIGN

ADAPTATION FITS A PARTICULAR BODY

How might an adaptive interface learn from one body without turning that person into the permanent operator, calibrator, and exception handler? ^{*8 *9 *10 *11}

04



A self-healing GelMA hydrogel restored the reported sensing range after repair and remained functional under cold and drying tests. A sweat-sensing platform separated its disposable sensor from reusable electronics through a deliberate soft-to-rigid connector and sustained 51 minutes of monitoring during exercise. A stochastic framework for topological waveguides modeled dimensional and material variation before fabrication, though it remains a numerical result. Durability is being located in material recovery, replaceable junctions, and tolerance analysis rather than left as an after-sale burden. The records do not yet prove field lifetimes.

A QUESTION FOR DESIGN

DURABILITY GETS A PHYSICAL ADDRESS

Could a product reveal where it heals, disconnects, or falls out of tolerance so maintenance becomes part of its form rather than hidden labor? ^{*12} ^{*13} ^{*14}

05



A heterogeneous titanium lattice distributed load-bearing and thermal-insulation roles through one continuous geometry, although the paper evaluated those roles separately. A hydrogel combined electrolyte, strain sensing, adhesion, water retention, and low-temperature tolerance in laboratory devices. A preprint reconstructing U.S. road-vehicle fleets found that installed power and material do not necessarily translate into useful activity, using a utilization measure to expose oversizing and redundancy. Multi-function integration can remove parts and interfaces, but capability that is rarely used can lock more material into the system.

A QUESTION FOR DESIGN

**CAPABILITY
MUST EARN
ITS
MATERIAL**

What evidence should a new capability provide before it earns permanent material, energy, and maintenance inside the object? ^{*15} ^{*16} ^{*17}

AUXETIC LENS

EXPAND WITHOUT EXCESS.

The most useful future is not the one with the most technology, but the one that adapts to benefit all forms of intelligence.

01

Which decisions become calmer when geometry or fabrication has already narrowed the object's available behavior?

02

How can adaptation fit a particular body without making that person responsible for permanent calibration and exception handling?

03

Could repair points, tolerance limits, and external dependencies remain legible even as intelligence moves into the material?

04

What evidence should capability provide before it earns permanent material, energy, and maintenance inside a product?

Images: editorial illustrations, not prototype photography.

***1**

DOI.ORG / 2026-09-16T12:15:31Z

LEVERAGING DESIGN FOR COLLECTIVE PHOTOTAXIS IN MORPHOLOGICAL SWARM ROBOTICS

[Open source ↗](#)

***2**

DOI.ORG / 2026-09-21T06:43:49Z

A FOLDABLE SMALL-SCALE SOFT ELECTROMAGNETIC ROBOT FOR MULTIMODAL NAVIGATION IN CONFINED AND UNSTRUCTURED ENVIRONMENTS

[Open source ↗](#)

***3**

DOI.ORG / 2026-09-22T17:19:54Z

LOCALLY ADDRESSABLE PNEUMATIC ACTUATION WITH EMBEDDED SOFT VALVES

[Open source ↗](#)

***4**

DOI.ORG / 2026-09-16T20:25:36Z

HOOKEED: PROGRAMMABLE, CAPACITIVE SENSING THROUGH CROCHET AS A MEDIUM FOR GARMENTS WITH TACTILE INTERACTION

[Open source ↗](#)

***5**

DOI.ORG / 2026-09-21T07:51:55Z

HEATRACE: A PARAMETRIC DESIGN-TO-FABRICATION WORKFLOW FOR THERMALLY PROGRAMMABLE SOFT ROBOTS

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***6**

ARXIV.ORG / 2026-09-21T12:40:04Z

A MONOLITHIC FORCE-PROPRIOCEPTION SOFT ACUTUATOR ENABLED BY SINGLE-MATERIAL 3D PRINTING

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Images: editorial illustrations, not prototype photography.

***7**

DOI.ORG / 2026-09-23T02:15:35Z

A NOVEL EMBEDDED VOLUMETRIC 3D PRINTING FOR ADDITIVE MANUFACTURING OF MAGNETIC CORE-SHELL ROBOTS

[Open source ↗](#)

***8**

DOI.ORG / 2026-09-17T21:01:52Z

IMMERSIVE TECHNOLOGY THROUGH THE LENS OF NEURODIVERGENCE: A QUALITATIVE EXPLORATION OF HOW PEOPLE WITH ADHD AND AUTISTIC PEOPLE EXPERIENCE VIRTUAL REALITY

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***9**

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SKIN-CONFORMAL INERTIAL SENSING INTERFACE FOR CONTINUOUS SILENT SPEECH RECOGNITION

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***10**

DOI.ORG / 2026-09-19T01:15:43Z

CO-DESIGN OF A WHEELCHAIR-MOUNTED ROBOTIC ARM FOR FUNCTIONAL AUTONOMY: A CYBATHLON CASE STUDY IN USER-DRIVEN ASSISTIVE ROBOTICS

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***11**

TECHXPLORE.COM / 2026-09-22T14:25:07Z

FROM LAB TO LIVING ROOM: BIONIC ARM ENTERS FIRST HOME TRIAL

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***12**

DOI.ORG / 2026-09-17T05:51:07Z

MECHANICALLY ROBUST, SELF-HEALABLE, AND CRYOTOLERANT GELMA HYDROGEL FOR WEARABLE TACTILE SENSORS WITH ENHANCED DURABILITY, LIFETIME, AND ENVIRONMENTAL STABILITY

[Open source ↗](#)

SOURCES

Images: editorial illustrations, not prototype photography.

***13**

DOI.ORG / 2026-09-16T10:47:23Z

A MECHANICALLY ROBUST WEARABLE SWEAT ANALYSIS PLATFORM WITH PLUG-AND-PLAY INTERCONNECTS FOR CONTINUOUS BIOMARKER PROFILING

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***14**

ARXIV.ORG / 2026-09-21T16:02:59Z

A STATE-SPACE FRAMEWORK FOR TRIVIAL AND TOPOLOGICAL METAMATERIAL STOCHASTIC ANALYSIS

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***15**

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BIOINSPIRED TOPOLOGY-PHYSICAL-FIELD CO-DRIVEN DESIGN OF MULTI-MORPHOLOGY TPMS LATTICES FOR LOAD-BEARING AND THERMAL INSULATION

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***16**

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FLEXIBLE AND ANTI-FREEZING $\text{Cu@Fe}_3\text{O}_4$ -PANI/POLYVINYL ALCOHOL/PHYTIC ACID/LICL HYDROGEL ELECTROLYTES IN HIGH-PERFORMANCE ALL-SOLID-STATE SUPERCAPACITORS

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***17**

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UNUSED POWER SURGE COMPROMISES U.S. ROAD VEHICLES SUSTAINABILITY

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