

Bioinspired Soft Electroreceptors for Artificial Pre-Contact Somatosensation

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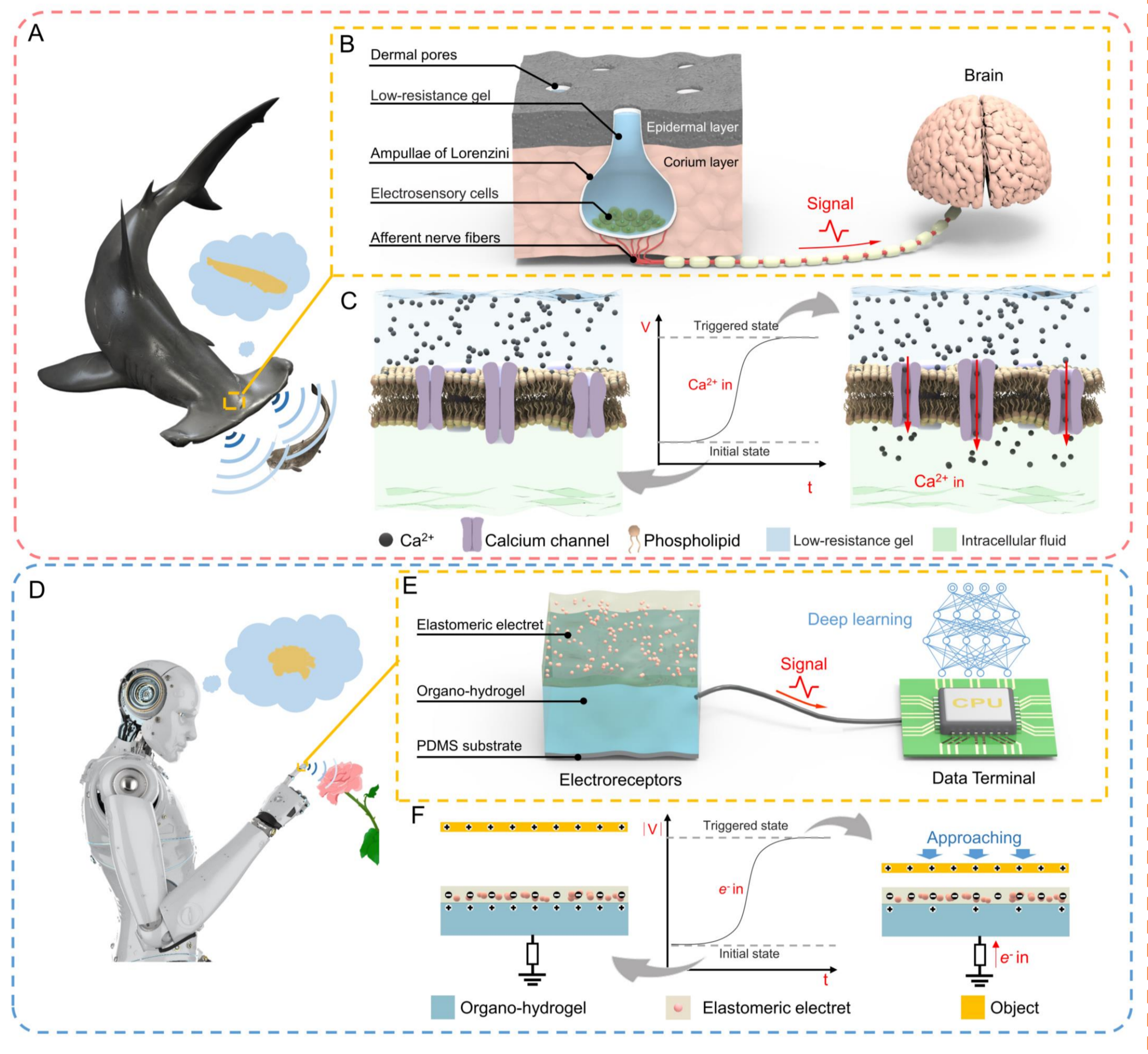
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Introduction

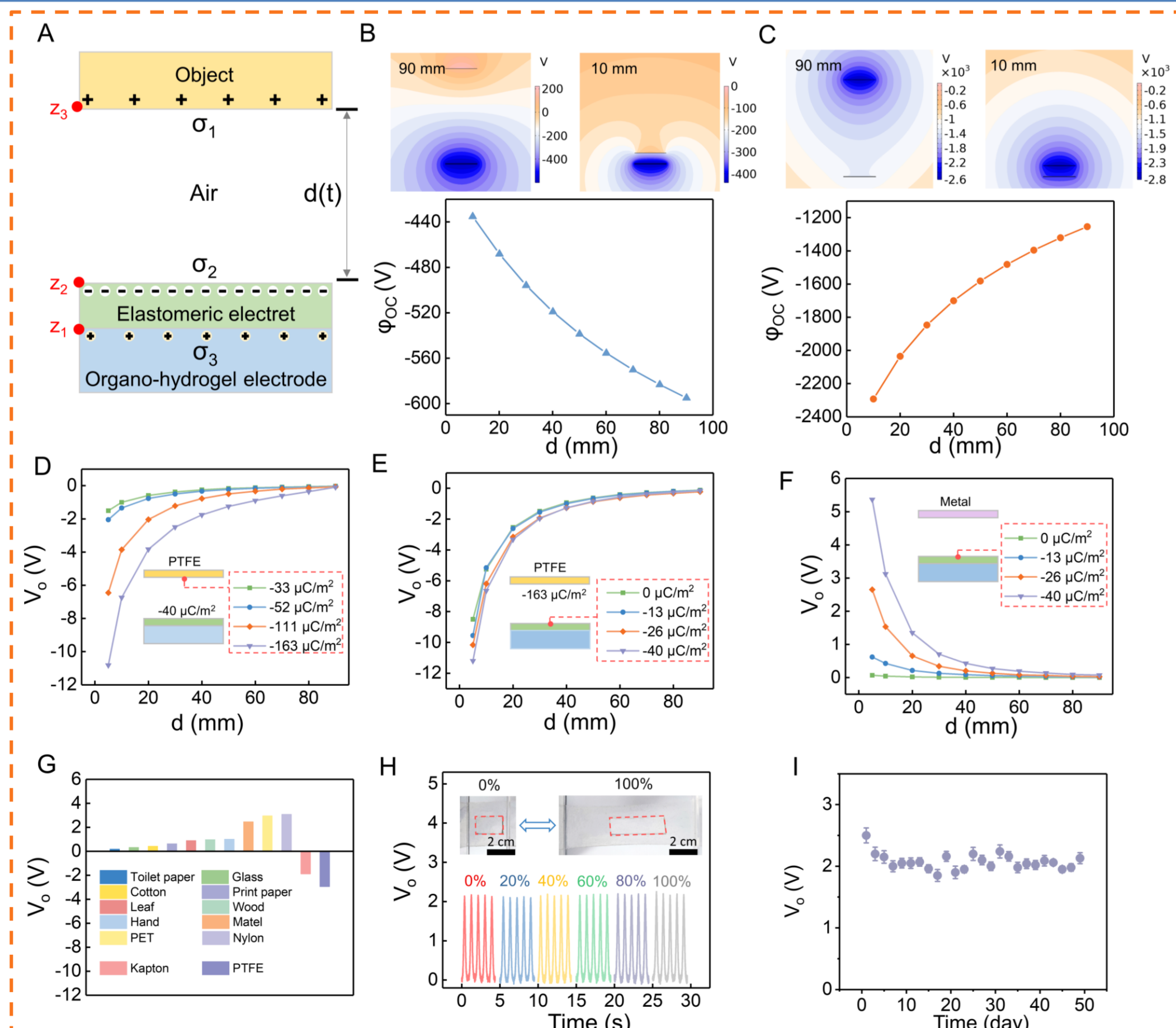
Artificial haptic sensors form the basis of touch-based human-interfaced applications, which, however, are unable to respond to remote events before physical contact. Some elasmobranch fishes, such as sharks in seawater, employ electroreception somatosensory system for remote environmental perception. As inspired by this ability, we design a soft artificial electroreceptor for sensing approaching targets.

Design and working mechanism of the artificial electroreceptor



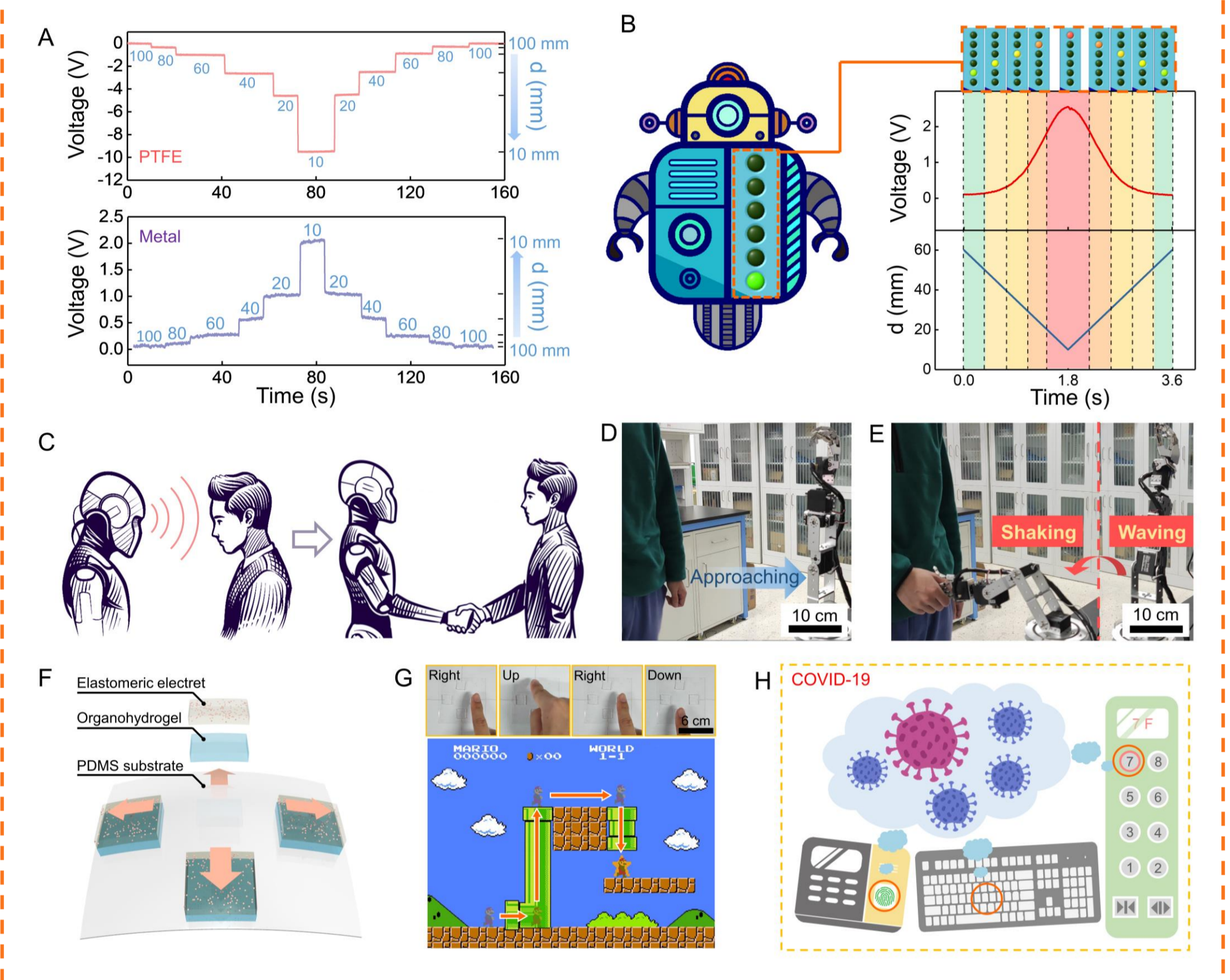
- ✓ The artificial electroreceptor was inspired by the shark's electroreceptive system.
- ✓ The electroreceptor adopts a single-electrode configuration.
- ✓ The key working principle of the artificial electroreceptor lays of electrostatic induction effect.

Output characteristics of the artificial electroreceptor



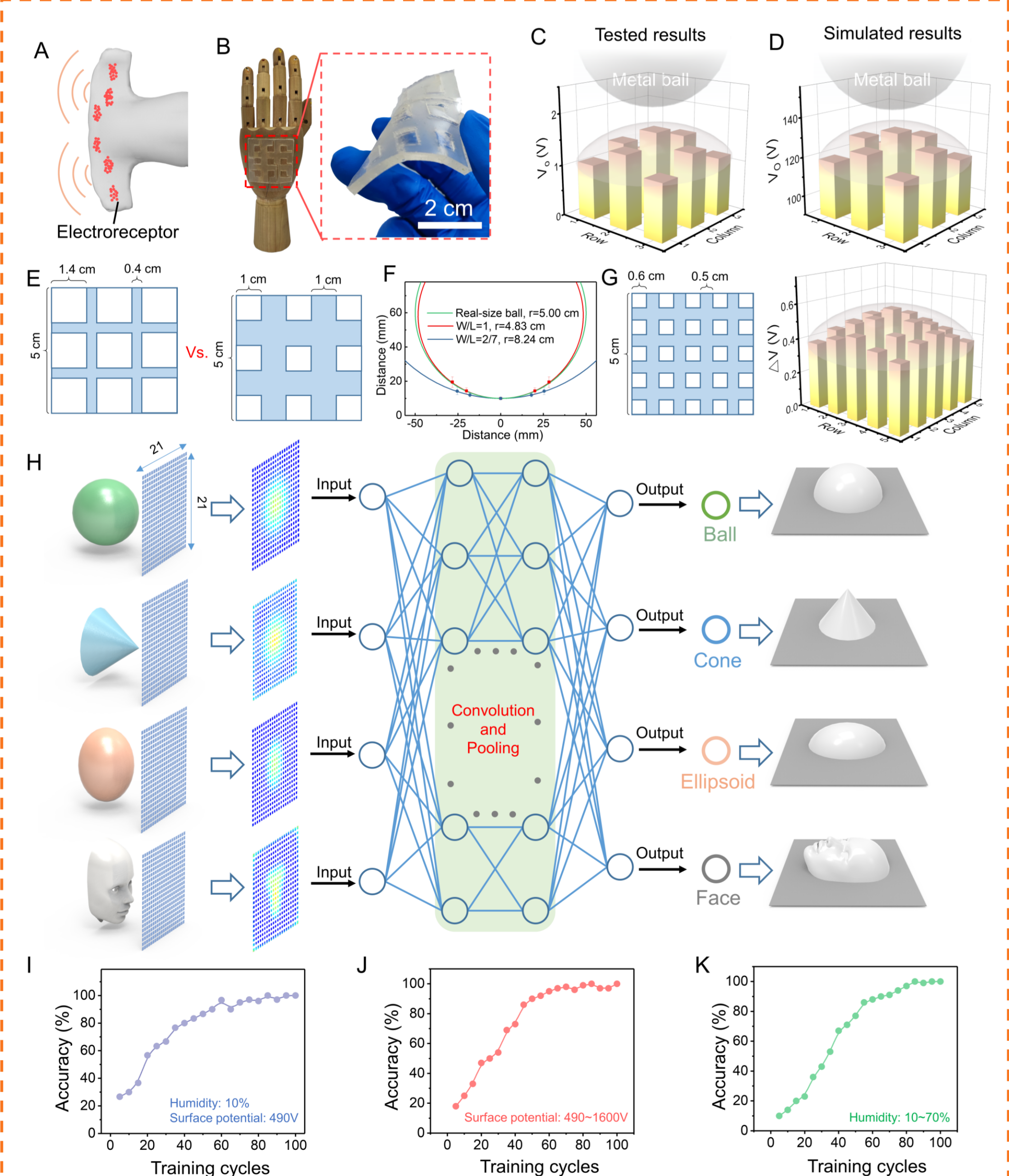
- ✓ The output of artificial receptor rises evidently with the increasing of target surface charge density, shows slight increment with the increase of elastomeric electret surface charge density.
- ✓ The output of artificial receptor will hardly be affected by stretching.
- ✓ The artificial receptor could respond to vast majority of materials in our daily life.
- ✓ The output of artificial receptor have a good durability.

Touchless human-machine interface



- ✓ Versatile touchless human-machine interfaces are designed to orientate targets, manipulate robot arms and play computer games successfully

Machine learning-aided somatosensation system



- ✓ Assisted by machine learning algorithms, it is demonstrated the feasibility of the artificial electroreceptor matrix in distinguishing the surface profiles of the targets.

Conclusion

- ✓ We demonstrate an artificial electroreceptor to detect the approaching of target.
- ✓ The artificial electroreceptor could respond to most majority of materials in our daily life.
- ✓ Human-machine interfaces without physical contact are developed including sense approaching targets, manipulate robot arms and play computer games.
- ✓ Combined with machine learning algorithms, the feasibility of using electroreceptor matrix to constructed an artificial proximal somatosensory system for 3D object recognition is demonstrated.

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