



UNIVERSITY OF
BAGHDAD



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of Engineering

Bio Inspired Robot

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Definition of bio-inspired robots

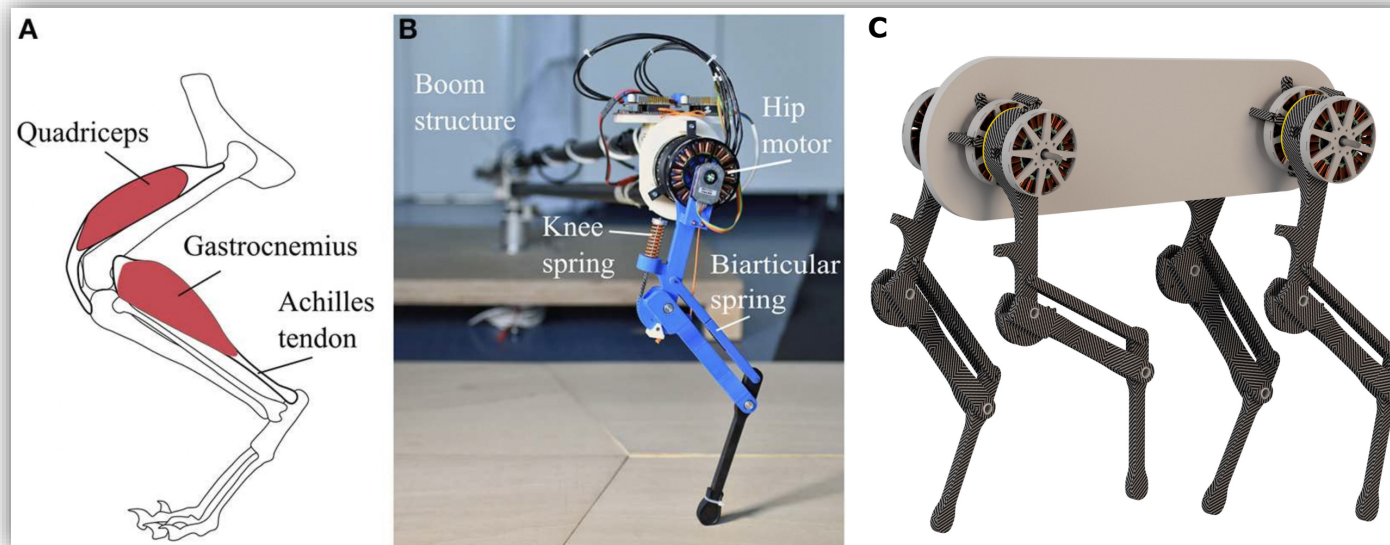
- ▶ Bio-inspired robots draw inspiration from the natural world to design and develop robots that mimic the behaviors, mechanisms, and structures found in various living organisms. These robots often combine engineering principles with insights from biology to create innovative solutions for various applications.

How bio inspired robots are inspired by nature

- ▶ Bio-inspired robots draw inspiration from the natural world, mimicking the structures, behaviors, and functionalities found in biological organisms. This approach create robots that are more efficient, adaptable, and versatile in various environments. Here's a brief explanation of how bio-inspired robots are inspired by nature:

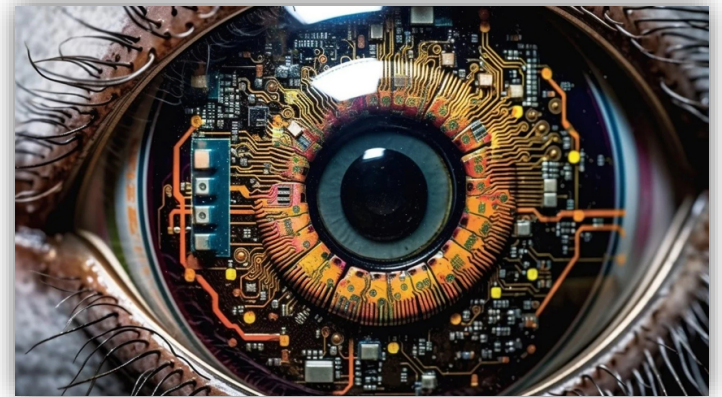
Biomimicry:

- ▶ Bio-inspired robots often replicate the physical characteristics and movements of animals, plants, and even microorganisms.



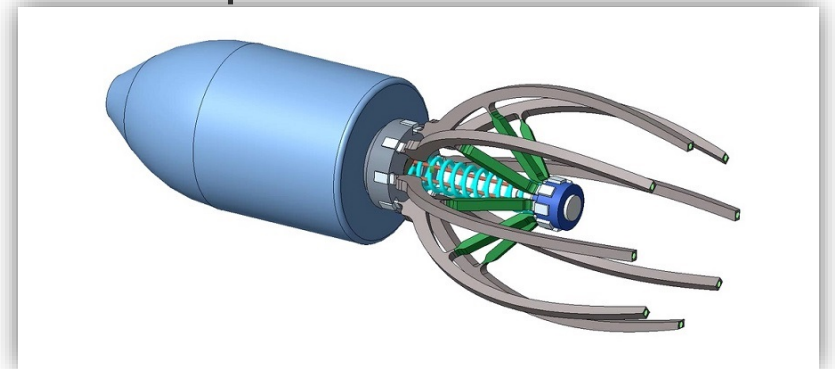
Functional Mimicry:

- ▶ Engineers study the unique functions and capabilities of organisms to inform the design of robotic systems. This can include replicating the sensory systems of animals, such as vision or touch, to enhance the perception and interaction abilities of robots.



Adaptation to Environment:

- ▶ Many bio-inspired robots are designed to navigate and operate in specific environments, such as underwater, aerial, or terrestrial habitats. By emulating the features and behaviors of organisms that survive in these environments, robots can better adapt to challenging conditions.



Efficiency and Energy Optimization:

- ▶ Bio-inspired robots aim to replicate these mechanisms to improve energy efficiency and endurance. For example, some robots mimic the efficient locomotion of animals like birds or insects to conserve energy during movement.



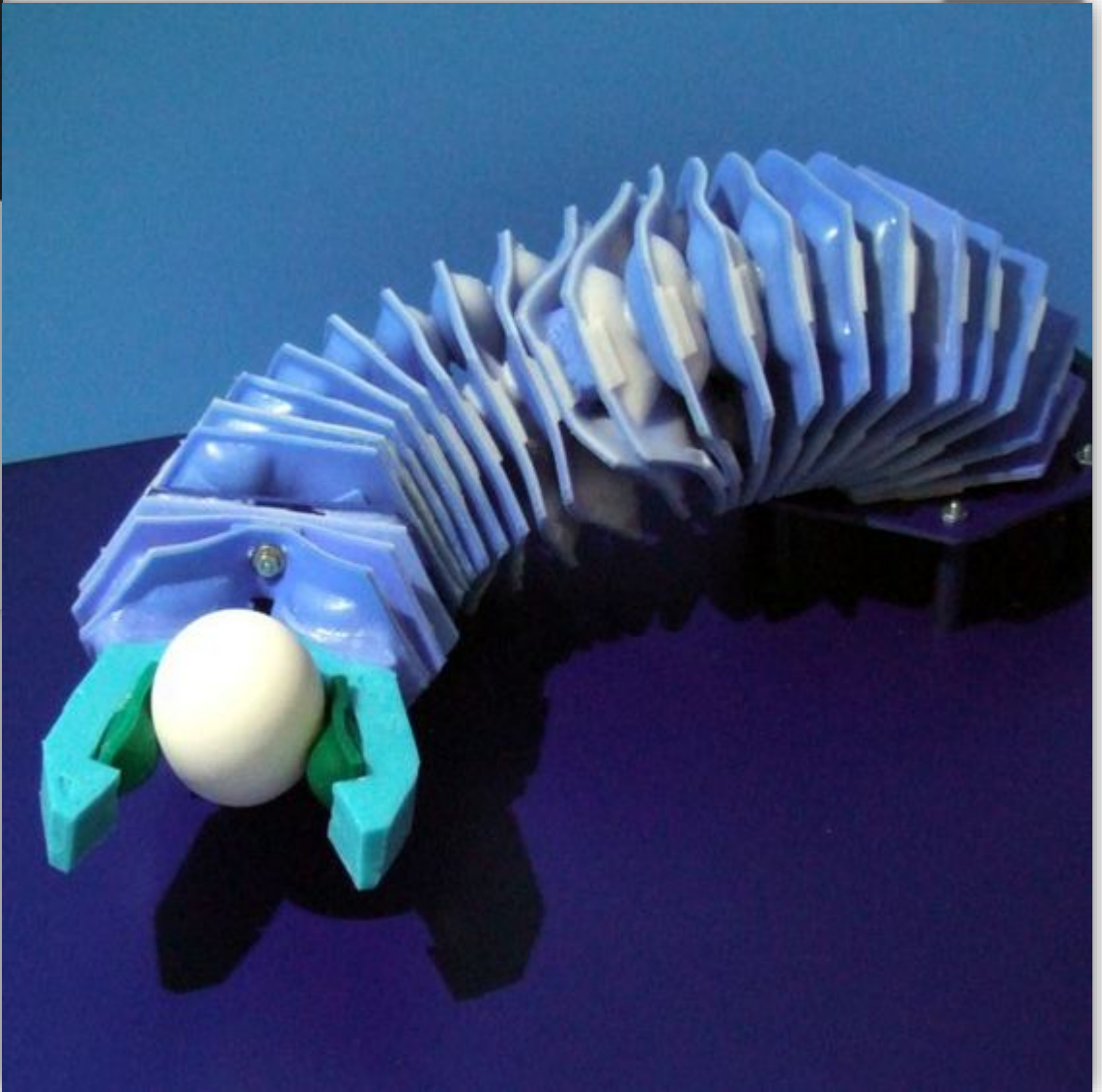
Flexibility and Robustness:

- ▶ By studying biological systems, engineers can design robots that exhibit greater flexibility, and adaptability to changing conditions and unexpected challenges.



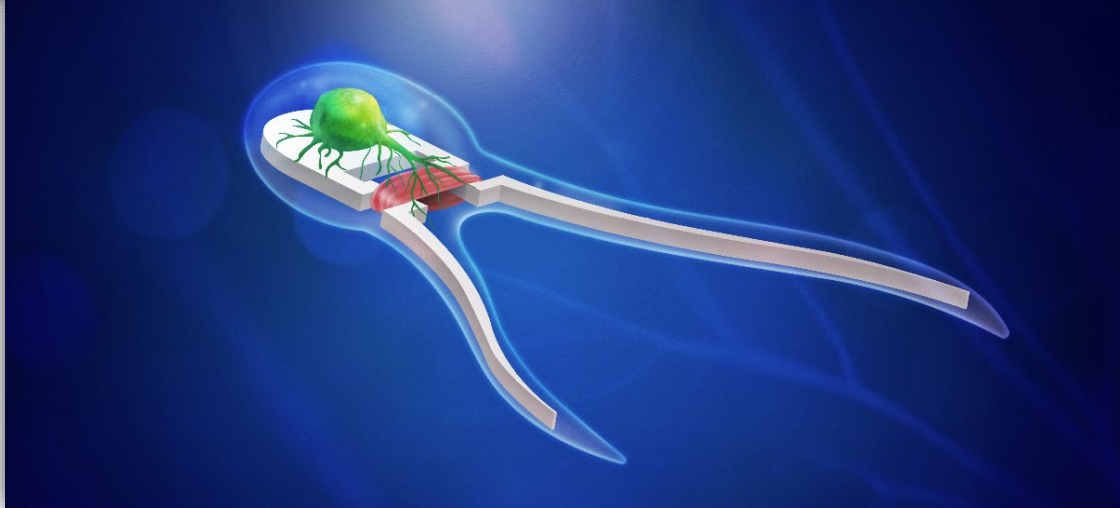
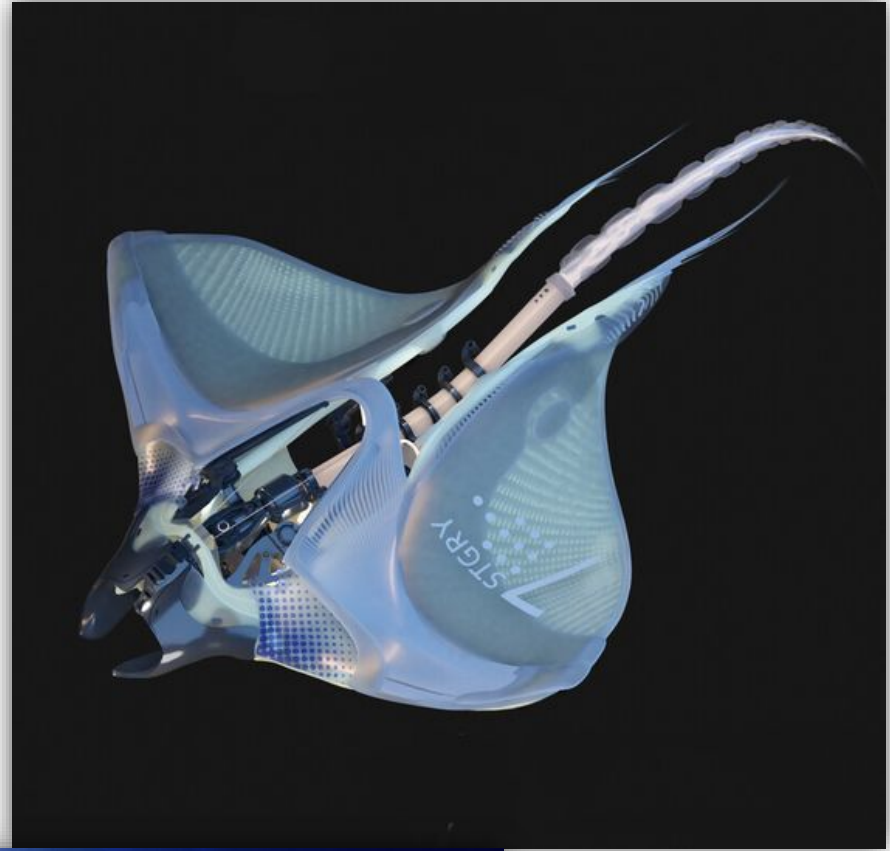
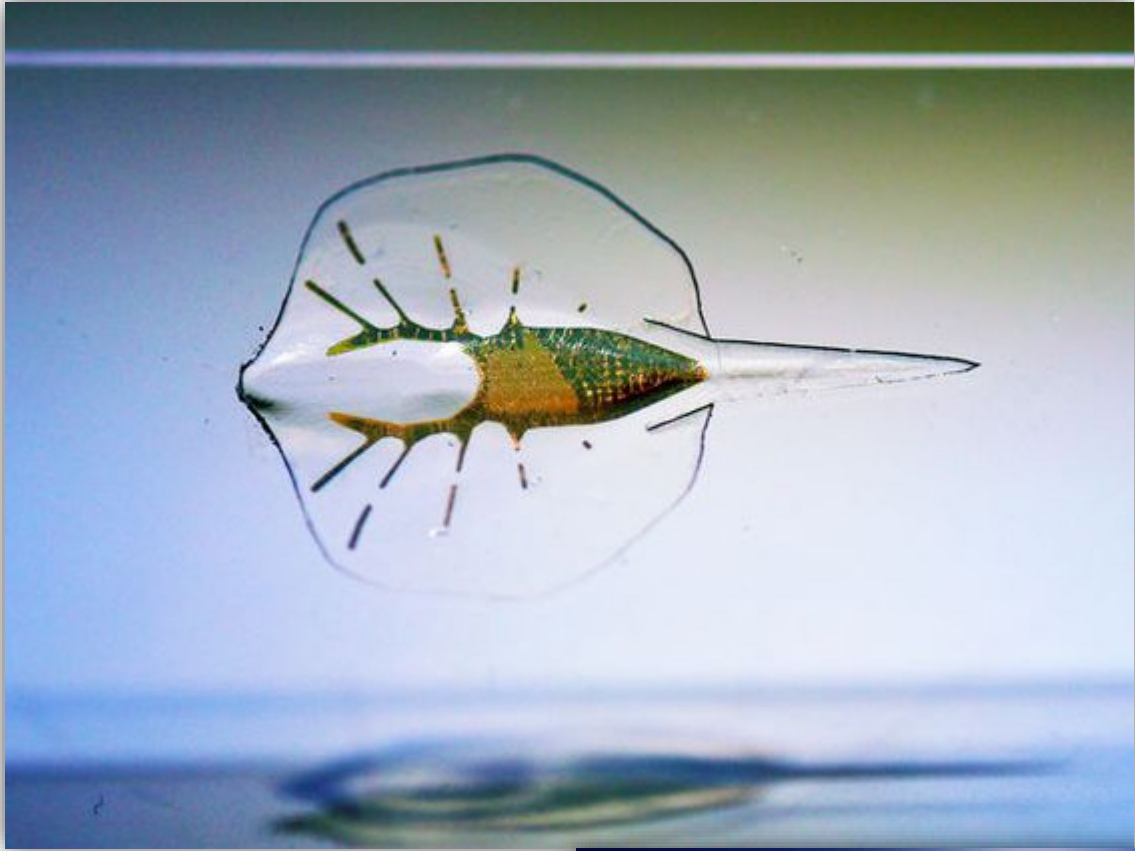
Recent trends in bio robotics

- ▶ **1. Soft Robotics:** These robots use soft materials such as silicone or elastomers, allowing them to interact safely with humans and delicate objects. Advancements in soft robotics have led to applications in healthcare, prosthetics, and human-robot interaction.



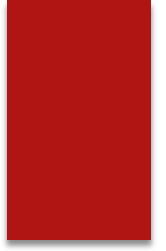
Recent trends in bio robotics

- ▶ **2. Bio-Hybrid Robots:** Bio-hybrid robots combine biological components, such as living cells or tissues, with synthetic materials to create hybrid systems that exhibit lifelike behaviors. For example, scientists have developed bio-hybrid robots powered by muscle cells that can move autonomously.



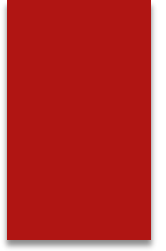
Recent trends in bio robotics

- ▶ **3. Neuromorphic Engineering:** Recent trends in neuromorphic hardware and algorithms have enabled the development of robots with more efficient and adaptable neural networks. These robots can learn from experience, recognize patterns, and make decisions in real-time, opening up new possibilities for autonomous robotics.



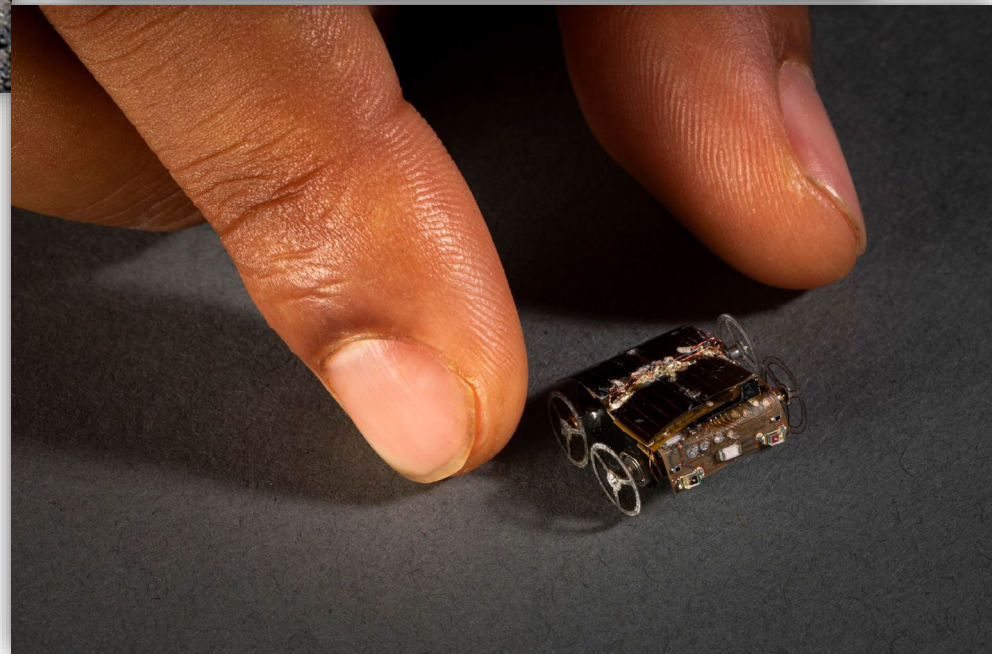
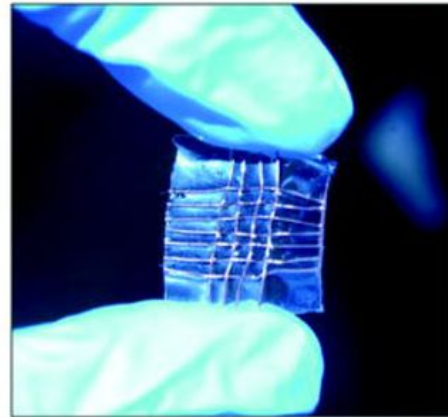
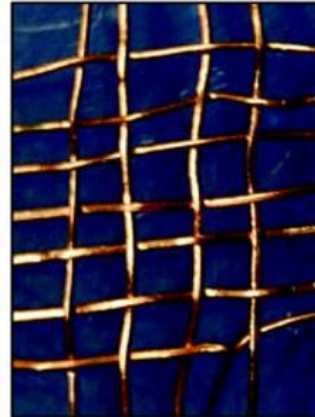
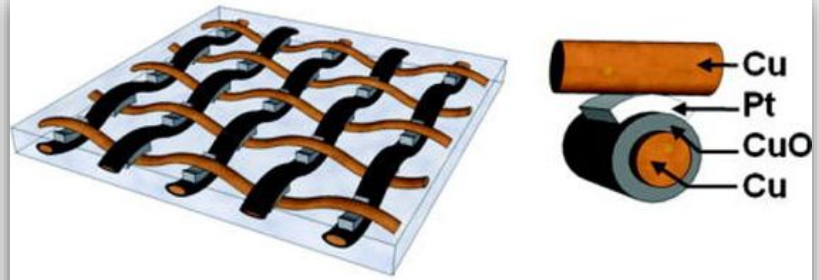
Recent trends in bio robotics

- ▶ **4. Bio-Inspired Locomotion:** Advancements in bio-inspired locomotion include robots that mimic the crawling of insects, the swimming of fish, and the flying of birds. These robots demonstrate improved efficiency, and adaptability, making them well-suited for tasks such as search and rescue, exploration, and environmental monitoring.



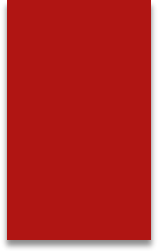
Recent trends in bio robotics

- ▶ **5. Energy Harvesting:** Researchers have developed robots that generate power from sunlight, wind, or vibrations, allowing them to operate autonomously for extended periods without the need for external power sources. These advancements contribute to the development of sustainable and self-sufficient robotic systems.



Recent trends in bio robotics

- ▶ **6. Swarm Robotics:** Swarm robotics involves coordinating large numbers of simple robots to perform complex tasks collectively. Recent advancements in swarm robotics algorithms and coordination mechanisms have led to improved scalability, robustness, and efficiency in swarm-based systems. These robots have applications in disaster response, surveillance, and agriculture.



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Thanks for Listening

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