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A vision towards bioinspired sustainable robotics - Prof. B. Mazzolai, Istituto Italiano di Tecnologia

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Natural organisms are inherently adaptive, continuously learning, and evolving. By studying their life processes and evolutionary strategies, engineers can extract key principles to design functional embodiments and energy-efficient behaviors—essential for artificial machines operating in unstructured and challenging environments. With this vision, our approach draws inspiration from plants and soft-bodied animals to develop robots with high morphological adaptability, distributed sensory systems, and energy-efficient mechanisms. Specifically, in this talk, I will explore how nature provides insights into multifunctional materials for morphological adaptation and computation, mechanisms for movements through growth, strategies for climbing and adhesion, multi-sensory information processing, distributed architectures of functionalities, and novel sustainable energy sources. These bioinspired robots—eco-robots—have potential applications in environmental exploration, monitoring, precision agriculture, and expanding our understanding of natural phenomena.