Translating seahorse mechanics into robotic applications

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Nature, including the marine environment, has always played a major role in the design and development of tools to solve contemporary challenges. The concept of bio-inspiration, rooted in terms like biomimicry and bionics, involves the translation of biological functions into technological solutions for such practical problems, a translation that builds upon the expertise of bio-scientists. Marine bio-inspired potentials are to be found at all hierarchical biological levels, from molecules to ecosystems. Evolutionary adaptations in marine organisms, exemplified by the transition from rigid to flexible structures in pipehorses and seahorses, can both be inspirational towards the development of tools, as well as engineering sciences can assist to disclose biological and evolutionary conundrums. A key focus is the paradox of rigidity versus flexibility in biological systems, which has implications for soft versus hard robotics. The presentation delves into some biological traits that are key towards robotic design, such as muscle function, body armor strength and tendon-muscle architecture, utilizing in silico evolutionary optimization to model and enhance these biological systems for technological applications.