

# Realization of the Najafi-Golestanian microswimmer

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The development of artificial microswimmers, microscopic robots that swim in a fluid like sperm cells and motile bacteria, could cause a leap forward in various fields such as microfluidics, microsystems, or minimally invasive medicine. Nature provides plenty of examples of efficient microswimmers. However, a bottom-up approach, looking at the simplest ingredients needed to generate a microswimmer, can lead to a deeper understanding of the swimming problem. First described by Najafi and Golestanian<sup>1</sup>, a paradigmatic microswimmer is the three-linked-spheres model, which follows a minimalist approach for propulsion by shape shifting. In this presentation, we describe the experimental realisation of this microswimmer using self-assembled ferromagnetic particle at an air-water interface, powered by an uniform oscillating magnetic field<sup>2</sup>. A model, using two harmonic oscillators, reproduces the experimental findings. Because the model remains general, the same approach could be used to design a variety of efficient microswimmers.

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<sup>1</sup>A. Najafi and R. Golestanian, Phys. Rev. E 69, 062901 (2004)

<sup>2</sup>G. Grosjean, M. Hubert, G. Lagubeau, and N. Vandewalle, Phys. Rev. E 94, 021101(R)