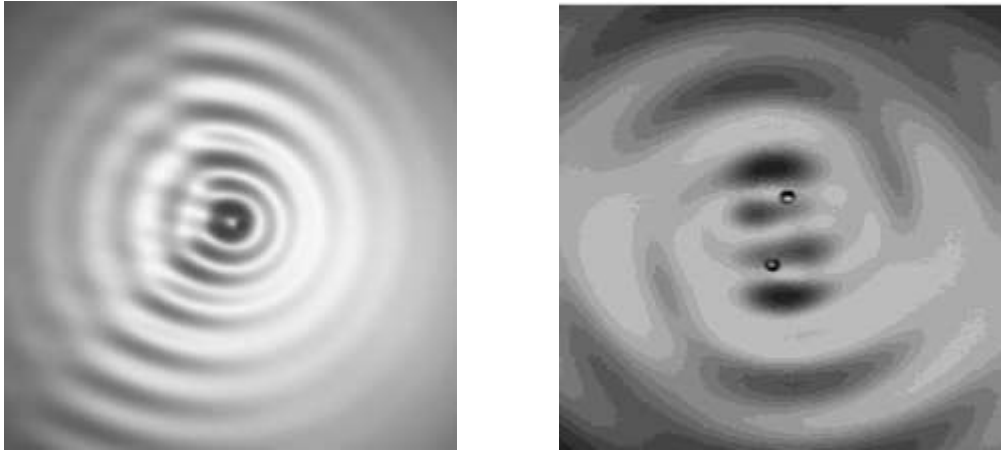


## Walking droplets: a tribute to Yves Couder

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Some three centuries ago, Newton suggested that corpuscles of light generate waves in an aethereal medium like a skipping stone generates waves in water, their motion then being affected by these waves. Today, light corpuscles are known as photons, and the notion of aether has been abandoned. Nevertheless, in certain features of Newton's metaphor still live on in some quantum theories, like in the de Broglie's double solution theory in which "particle" are guided by their own wave.



*Figure: A "walker" composed of a droplet driven by the surface wave it has emitted during the previous bounces (left); Orbiting walkers (right)*

In this talk, I will present the central contribution of Yves Couder in this field by introducing the first macroscopic experimental realization of such a wave-particle dual object, today known as a "walker".

I will discuss the behavior of this unique object in which the particle is a droplet bouncing on the surface of a vertically vibrated liquid bath. Its pilot-wave is composed of the superposition of the surface waves excited during the successive bounces of the droplet. Above an excitation threshold, the droplet becomes self-propelled and this dual object exhibits several features previously thought to be specific to the microscopic realm.

The unexpected appearance of both uncertainty and quantization behaviors at the macroscopic scale originates in the essence of this "classical" duality. I will present some of the benchmarking experiments performed by Yves. I will also insist on the fascinating memory-based dynamics of the droplet which depends on previously visited spots along its trajectory through the surface waves emitted during each bounce. This path memory dynamics gives a walker an intrinsic spatio-temporal non-locality.