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Experimental test of temporal reversibility in a memory-driven system STEPHANE PERRARD, University Paris-Diderot, France, MATTHIEU LABOUSSE, EMMANUEL FORT, ESPCI, France, YVES COUDER, University Paris-Diderot, France, UNIVERSITY PARIS-DIDEROT, FRANCE COLLABORATION, ESPCI, FRANCE COLLABORATION — A droplet bouncing subharmonically on a vibrated liquid bath can be self-propelled by its interaction with the waves it generates. The resulting "walker" is characterized by the structure of the information loop linking the particle with its pilot wave. The particle can be considered as encoding positional information in the waves it generates. These waves, being sustained for some time, superpose so that the global wave field contains a stored memory of the past trajectory. At its next bounce the drop "reads" this information, which will determine its next move. Is this reading process time reversal? This question is addressed using an experimental trick. A pi phase shift is imposed to the drop, so that the associated wave is reversed. The droplet then "reads" the path-memory phase shifted by pi, so that it comes back on its own previous trajectory. As new emitted waves are pi-shifted, they interfere destructively with the forward path, erasing progressively the recorded memory. The possible application of wave-mediated drop computation will then be discussed.

Stephane Perrard
University Paris-Diderot

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