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Cells anticipate periodic events

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We show that an amoeboid organism can anticipate the timing of periodic events. The plasmodium of the true slime mold *Physarum polycephalum* moves rapidly under favourable conditions, but stops moving when transferred to less-favourable conditions. Plasmodia exposed to unfavourable conditions, presented in three consecutive pulses at constant intervals, reduced their locomotive speed in response to each episode. When subsequently subjected to favourable conditions, the plasmodia spontaneously reduced their locomotive speed at the time point when the next unfavourable episode would have occurred. This implied anticipation of impending environmental change. After this behaviour had been evoked several times, the locomotion of the plasmodia returned to normal; however, the anticipatory response could subsequently be induced by a single unfavourable pulse, implying recall of the memorized periodicity. We explored the mechanisms underlying these behaviours from a dynamical systems perspective. Our results hint at the cellular origins of primitive intelligence and imply that simple dynamics might be sufficient to explain its emergence.