from the speed of contraction (Fig. 4c). Depending on which one was faster, such individuals moved in the direction of the blunt or pointed end.

5. CONCLUSIONS AND FUTURE WORK

Our system for the evolution of soft-bodied animats allows for GRNs that are not limited in number of elements or connections. The size of the animats is also not limited in principle (although it was, for computational reasons, in the evolutionary runs reviewed here). In neither approach—whether the GRN was inactive during locomotion or would control it in real time—did we impose restrictions on the exact shape of the animat or the mode of control. This lack of restriction allowed for a wide diversity of morphologies and strategies for locomotion to evolve. Even when allowing the GRN to act during locomotion increased the search space, the system remained evolvable. In this second approach it was possible to observe the evolution of a larger diversity of motion strategies, including a pulsating mode not possible with a sine-like actuation under the first approach.

In both approaches, locomotion control was carried out without a nervous system. The approach in which GRN controls the locomotion in real time is especially interesting in this respect, because in principle it could also enable the active control of the *direction* of movement, without the need for special elements similar to biological neurons. We envisioned here a mode of control relying entirely on diffusion of cell products from one part of the body to another. In future work, we wish to continue exploring this mode of control, and better understand and assess its limits in comparison to a set-up where some cells differentiate into artificial neurons controlling the animat's behavior.

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