

# AMD GPU-accelerated design tools for creating novel lifeforms

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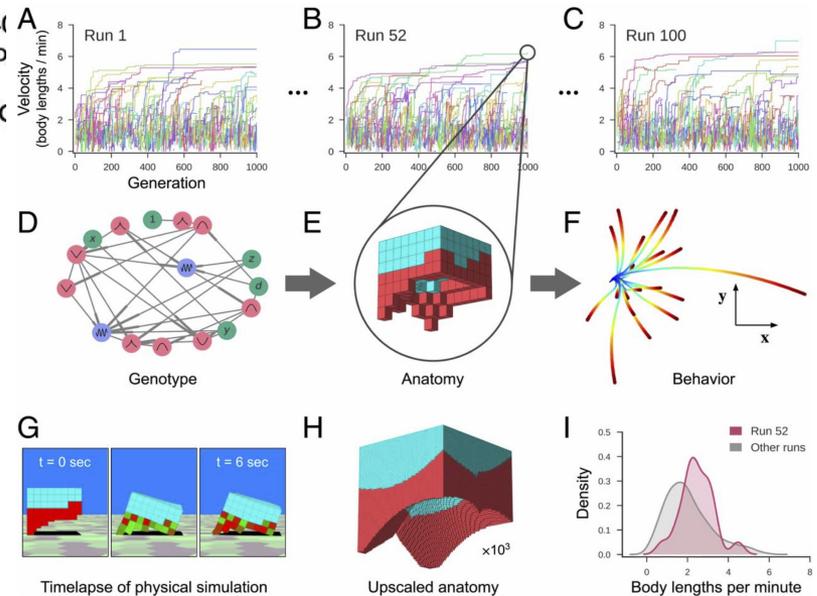
## A scalable pipeline for designing reconfigurable organisms

Sam Kriegman<sup>a,1</sup> , Douglas Blackiston<sup>b,c,1</sup>, Michael Levin<sup>b,c,d</sup>, and Josh Bongard<sup>a,2</sup>

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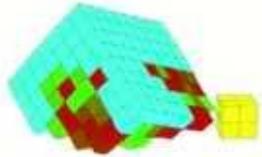
Edited by Terrence J. Sejnowski, Salk Institute for Biological Studies, La Jolla, CA

Living systems are more robust, diverse, complex, and supportive of human life than any technology yet created. However, our ability to create novel lifeforms is currently limited to varying existing organisms or bioengineering organoids in vitro. Here we show a scalable pipeline for creating functional novel lifeforms: AI methods automatically design diverse candidate lifeforms in silico to perform some desired function, and transferable designs are then created using a cell-based construction toolkit to realize living systems with the predicted behaviors. Although some steps in this pipeline still require manual intervention, complete automation in future would pave the way to designing and deploying unique, bespoke living systems for a wide range of functions.



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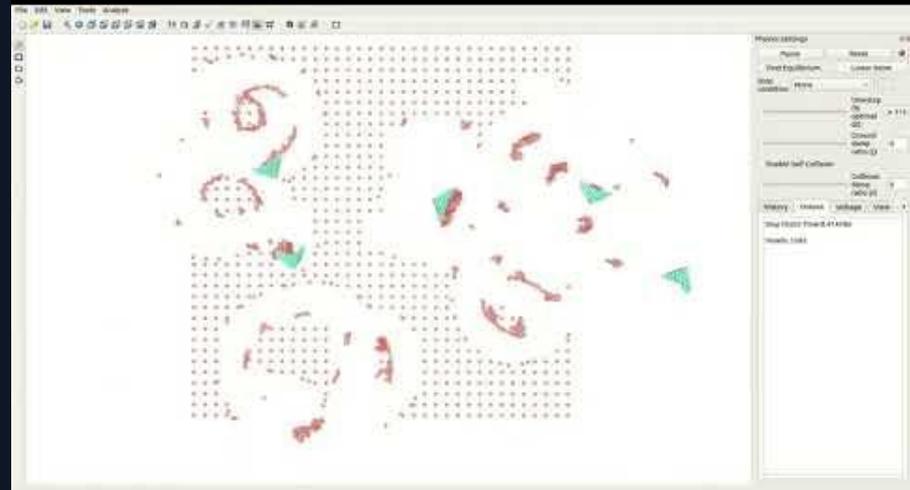
Object  
manipulation



*in silico*



*in vivo*



NORTHEAST  
CYBERTEAM



# AMD GPU-accelerated design tools for creating novel lifeforms

- Goals

- Develop cross platform GPU accelerated tools for the design of computer designed organisms.

# AMD GPU-accelerated design tools for creating novel lifeforms

- Timeframe
  - 03 August 2021
  - 31 August 2021



# AMD GPU-accelerated design tools for creating novel lifeforms

- What I hope to learn
  - Learn to develop GPU accelerated software which can run on either AMD or NVIDIA GPUs.



# AMD GPU-accelerated design tools for creating novel lifeforms

- Porting Voxcraft
  - AMD ROCm does not support:
    - Dynamic Parallelism
    - Device side memory allocation

# AMD GPU-accelerated design tools for creating novel lifeforms

- New Phototaxis Simulator
  - Investigate the mechanics of how Xenobots respond to light stimuli
  - Control Xenobot locomotion via light:
    - e.g. navigate through maze



# AMD GPU-accelerated design tools for creating novel lifeforms

- Goals for Next Month
  - Compile Phototaxis simulator for NVIDIA V100 GPUs.
  - Benchmark relative performance of the simulator on AMD Radeon Instinct MI50 and NVIDIA V100 GPUs.



# AMD GPU-accelerated design tools for creating novel lifeforms

- Help needed (if any)
  - None needed
  - Open to advice + feedback

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