

3-dimensional behavioral arenas for *C. elegans*

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Motivation

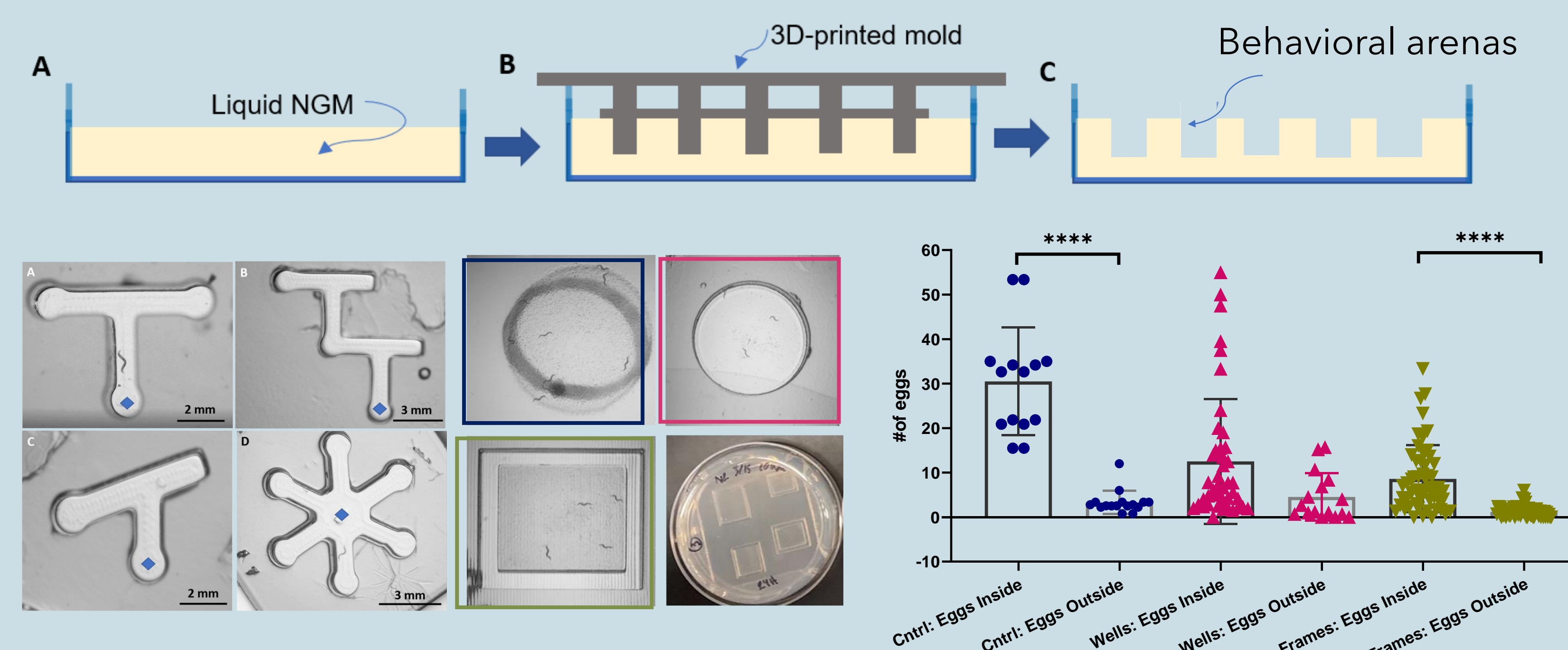
C. elegans are maintained in **liquid cultures** or on **flat NGM** (agar-based) plates.

However, in nature, they live in **rich 3-dimensional environments**.

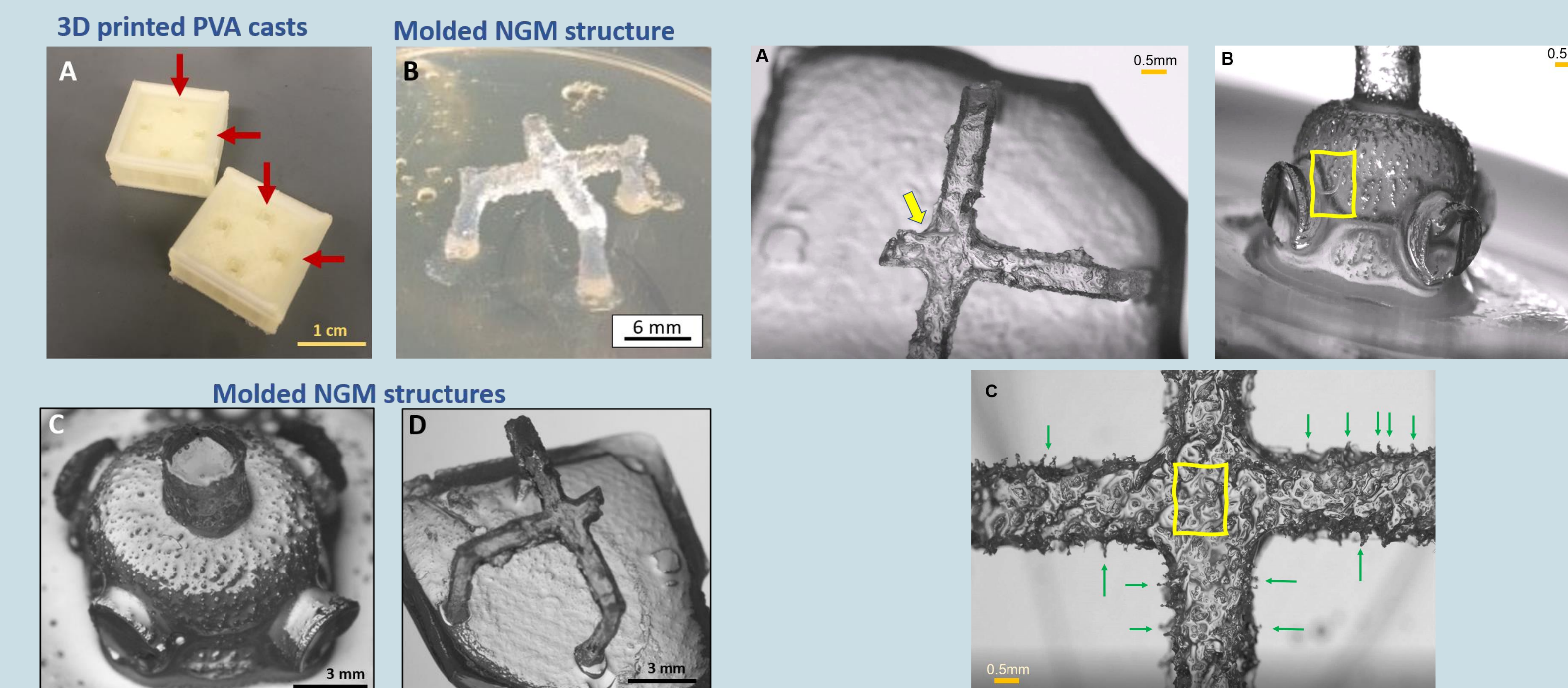
It is very hard to assess spatial and 3-dimensional behavior on a 2-dimensional **terrain that lacks structural cues**.

What if we could build worm-friendly 3-dimensional behavioral arenas?

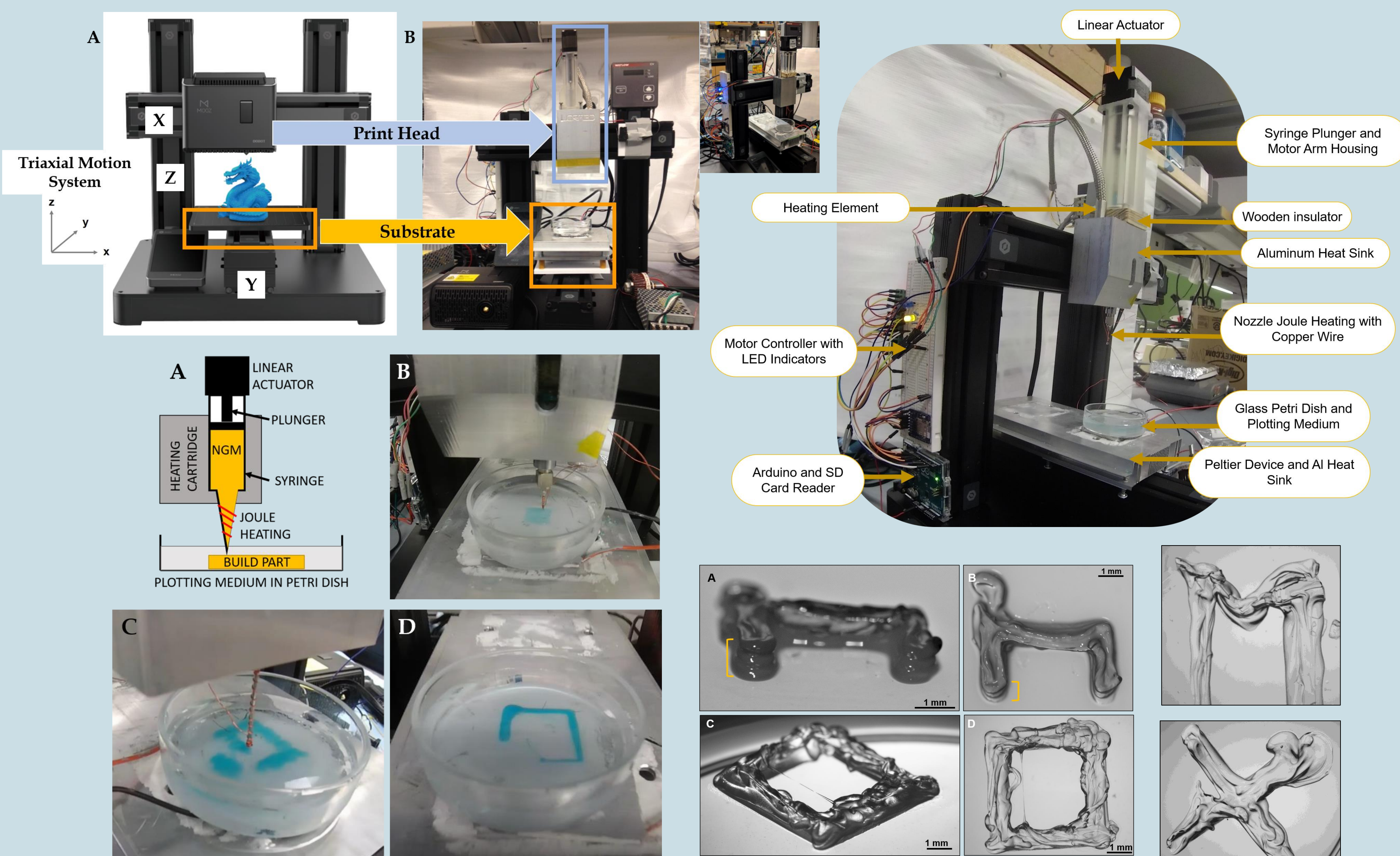
Method #1: 3D-printed molds combined with NGM



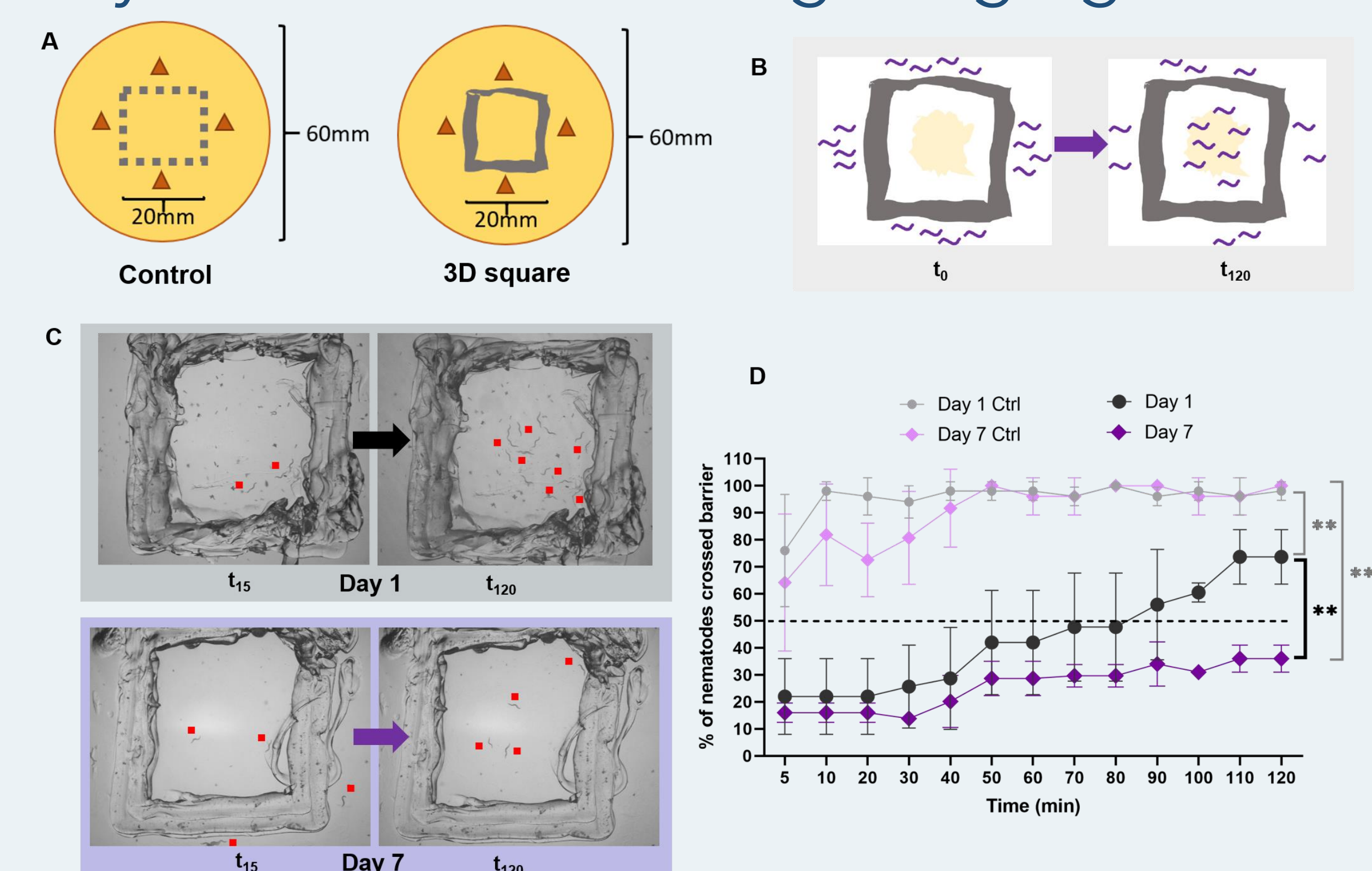
Method #2: PVA casting (Poly-Vinyl-Alcohol)



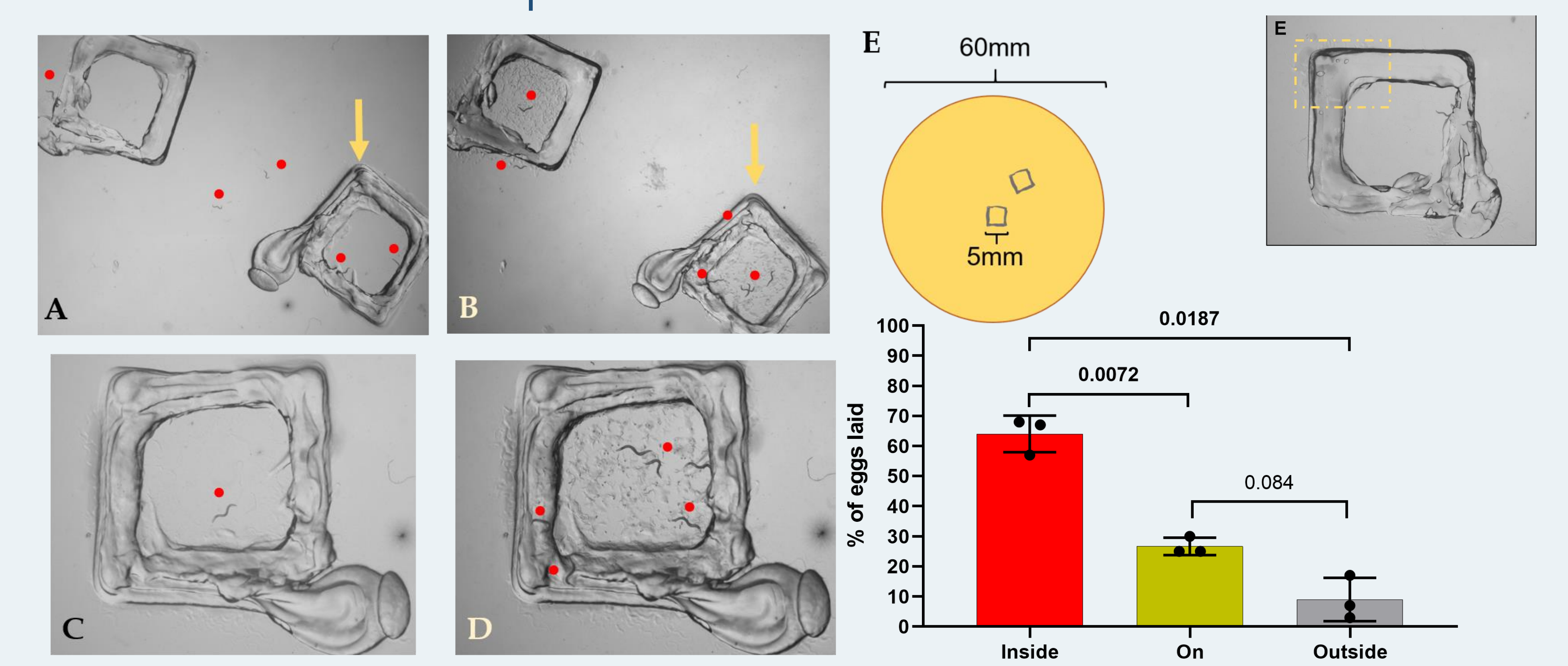
Method #3: Customized 3D printer-The Parnon Printer



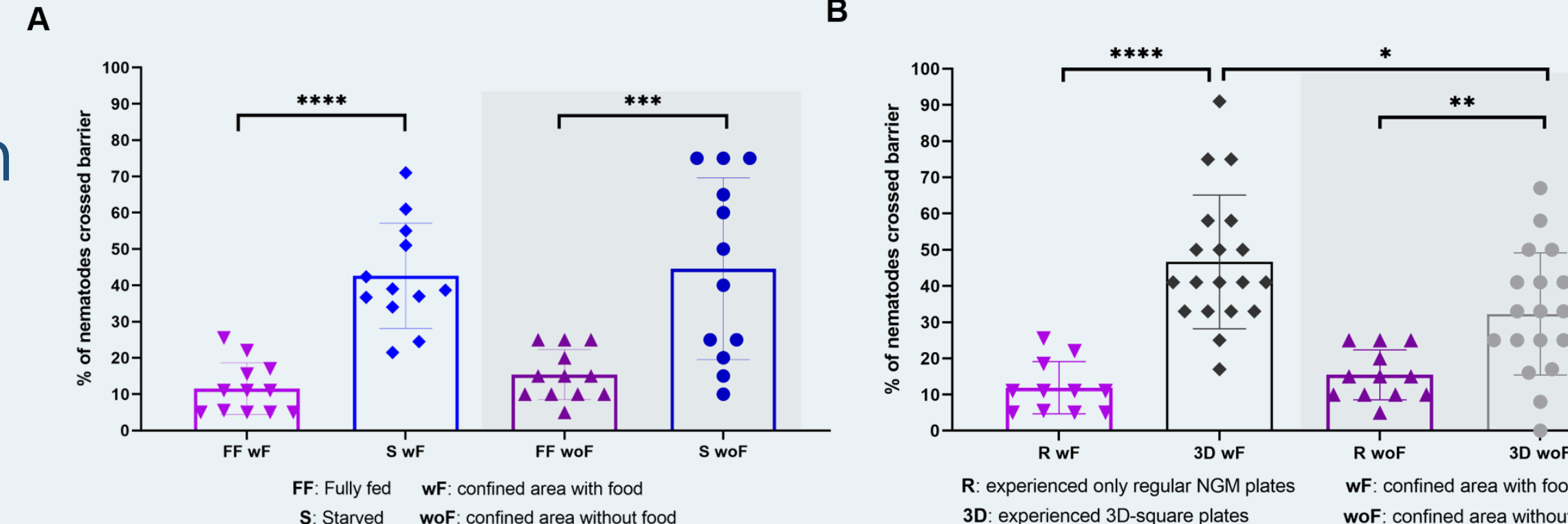
Physical barrier crossing in aging worms



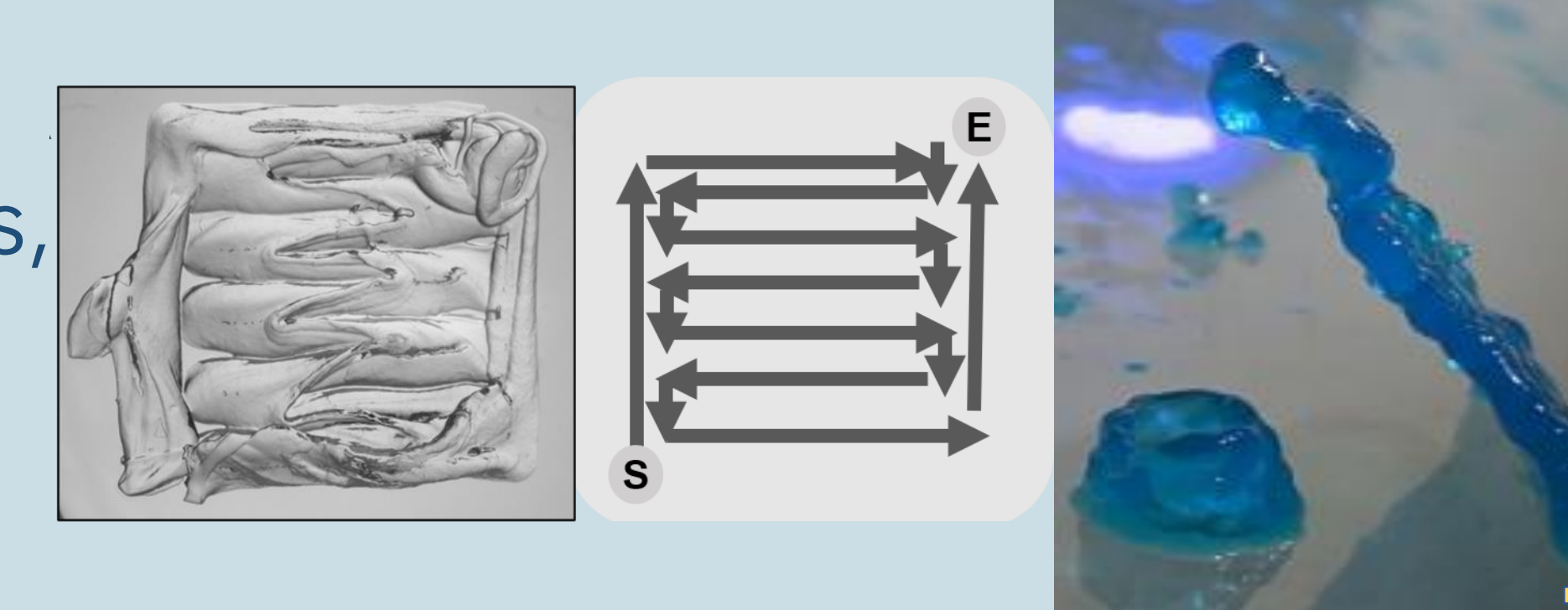
Spatial control of behavior



Barrier crossing in starved & 3D-grown worms



To improve: printing paths, number of layers

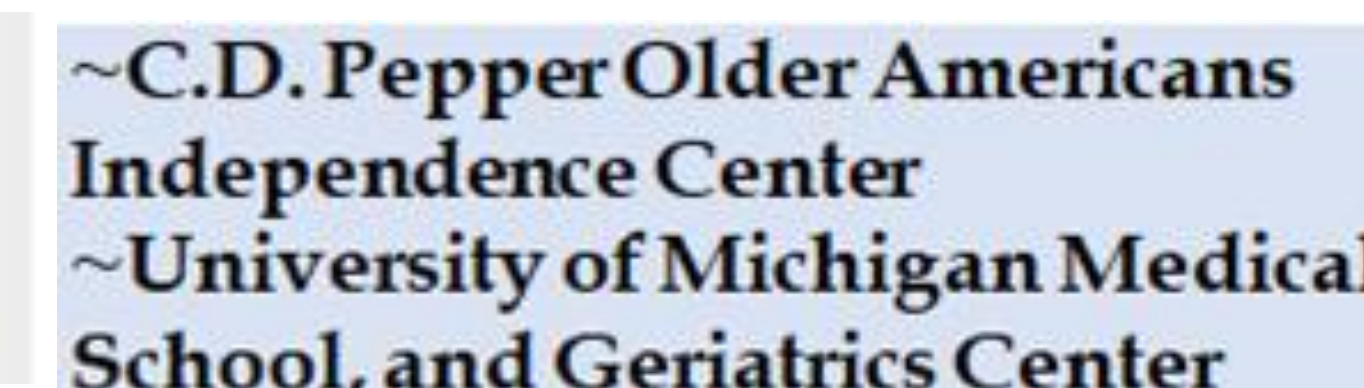


Conclusions

- ✓ The custom-made **Parnon Printer** can generate 3-dimensional behavioral arenas
- ✓ 3-dimensional playgrounds can spark **discovery of new behaviors**
- ✓ Experimental means can **shape questions** and research directions

Acknowledgements

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References

- ~Cardoza S.N., Tse L.Y.L., Barton K., Gourgou E.*: "3-dimensional arenas for the assessment of *C. elegans* behavior", *: corresponding author. *Under revision*.
- ~Gourgou E*., Adiga K., Goettmoeller A., Chen C., Hsu A-L*.: " *C. elegans* learning in a structured maze is a multisensory behavior", *: co-corresponding authors. *iScience*, 2021.