

# OpenNest

**A modular experimental setup for long term studies of collective behavior in ants**

Darryl Linardi, Michael Napoli, Roxy Nadim, Simon Garnier, Maurizio Porfiri

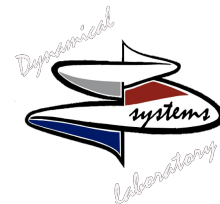
NYU Dynamical Systems Laboratory, NJIT Swarm Lab

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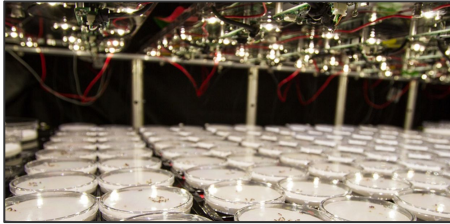
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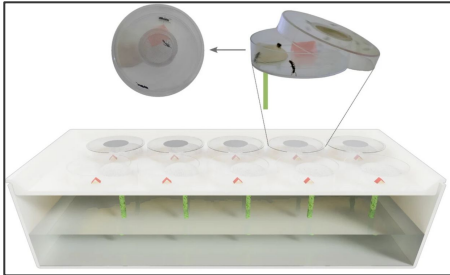
**SwarmLab**

# Existing Experimental Setups

## Petri Dish Matrices



D. Kronauer, *Rockefeller University Laboratory of Social Evolution and Behavior*



L. Pedraza et al., (2023), *Insectes Sociaux*

## Glass Sandwiches



G.N. Doering et al., (2023), *Proceedings of the Royal Society B*



G.T. Chism et al., (2024), *Animal Behaviour*

## More Intricate Setups



J. Graham et al., (2017), *Theoretical Biology*

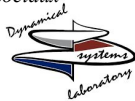


D. Giannetti et al., (2025), *Current Zoology*



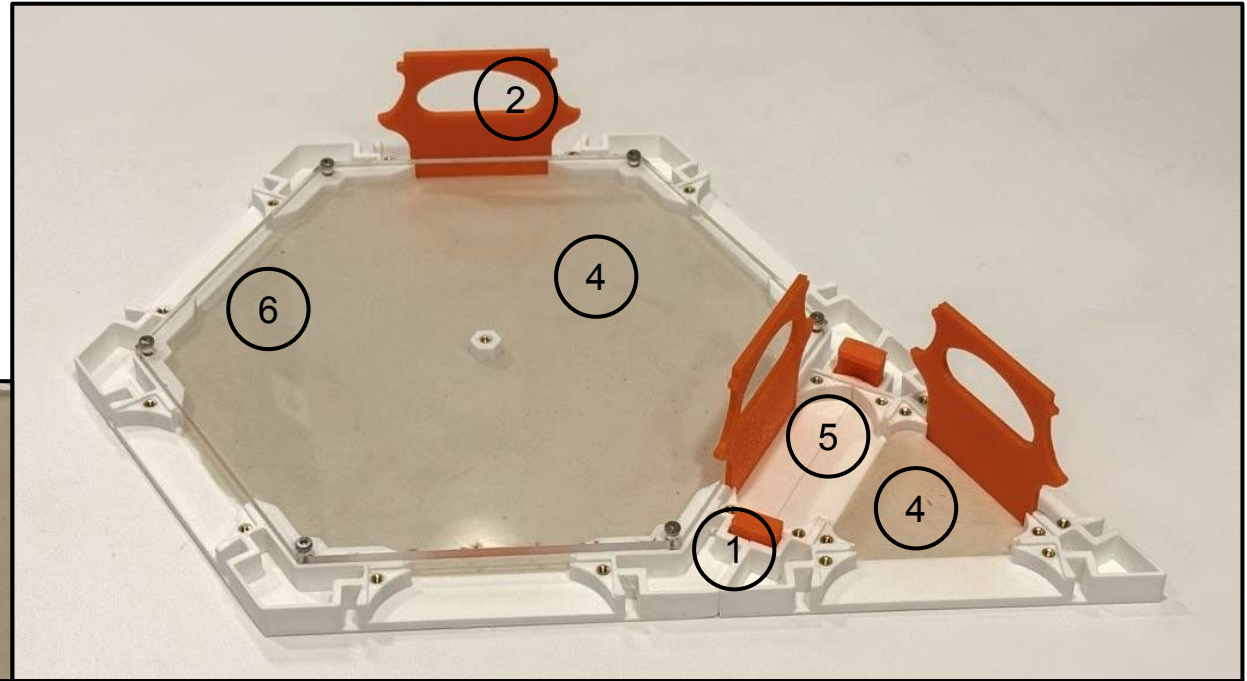
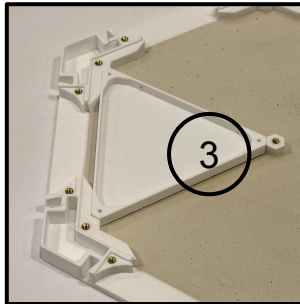
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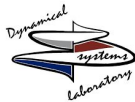
# OpenNest: A Modular Solution

1. Connector Keys
2. Gates
3. Sub Chambers
4. Plaster Flooring
5. Walkways
6. Acrylic Lids

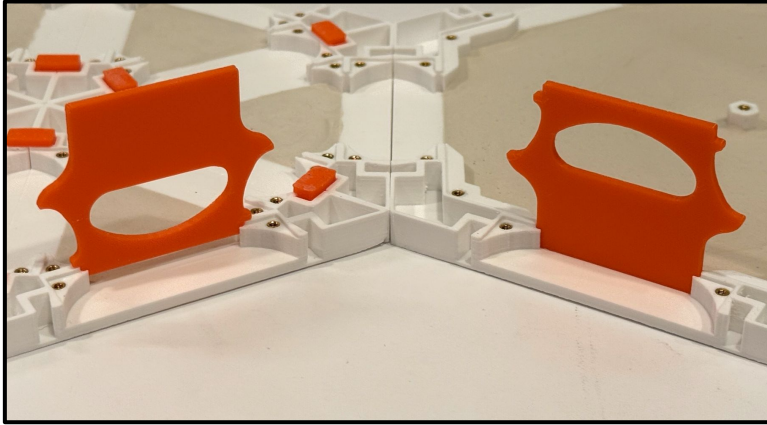


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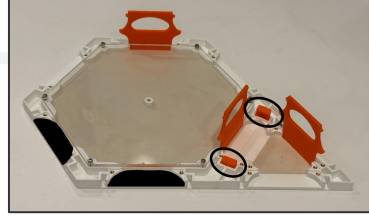
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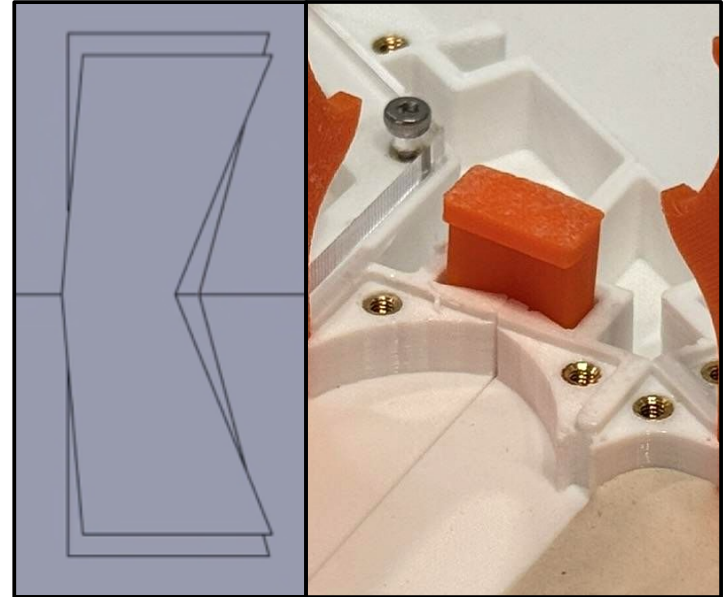
# Preventing Jailbreaks



Head profile plugs the ceiling gap when gates are removed.

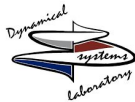


Internal force in the key bits pull chambers together at all times, closing any gaps.

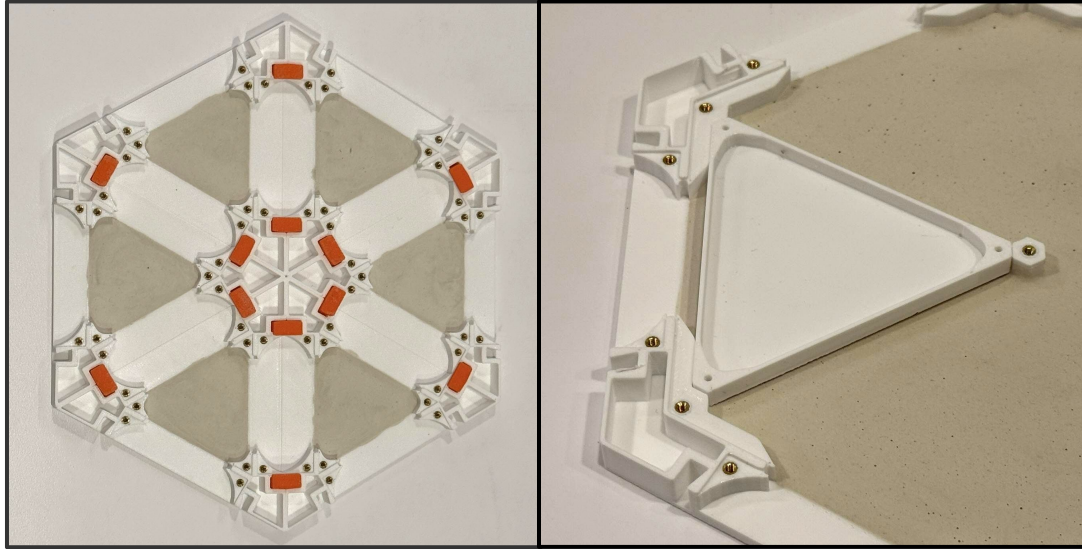
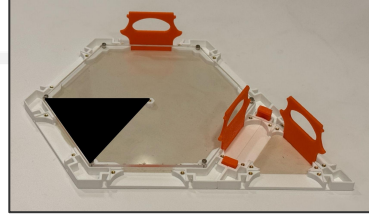


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# Symmetry Creates Adaptability

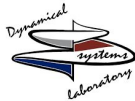


Symmetry allows construction of a modular environment from smaller, simpler shapes: 6 triangles  $\rightarrow$  1 hexagon.



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# Keeping Residents Comfortable

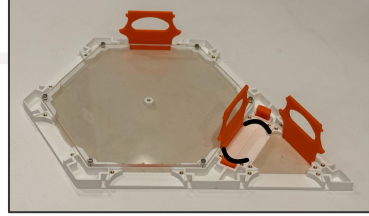
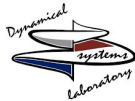


Ants like to corner clump.  
Curves prevent this.

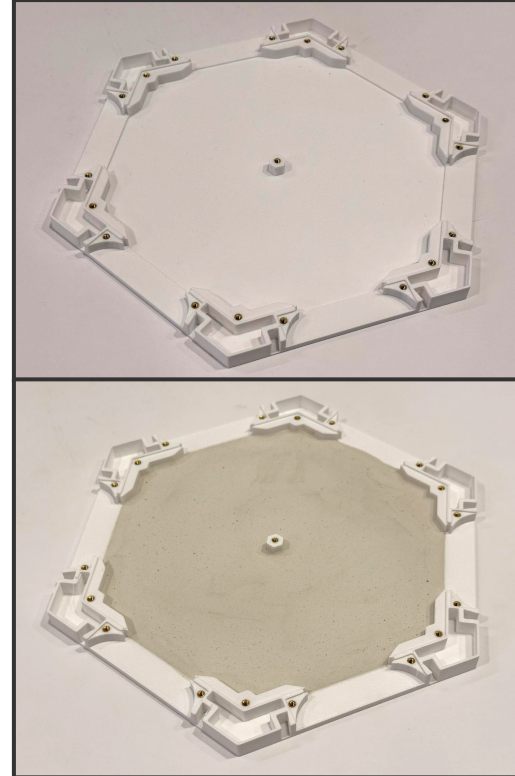


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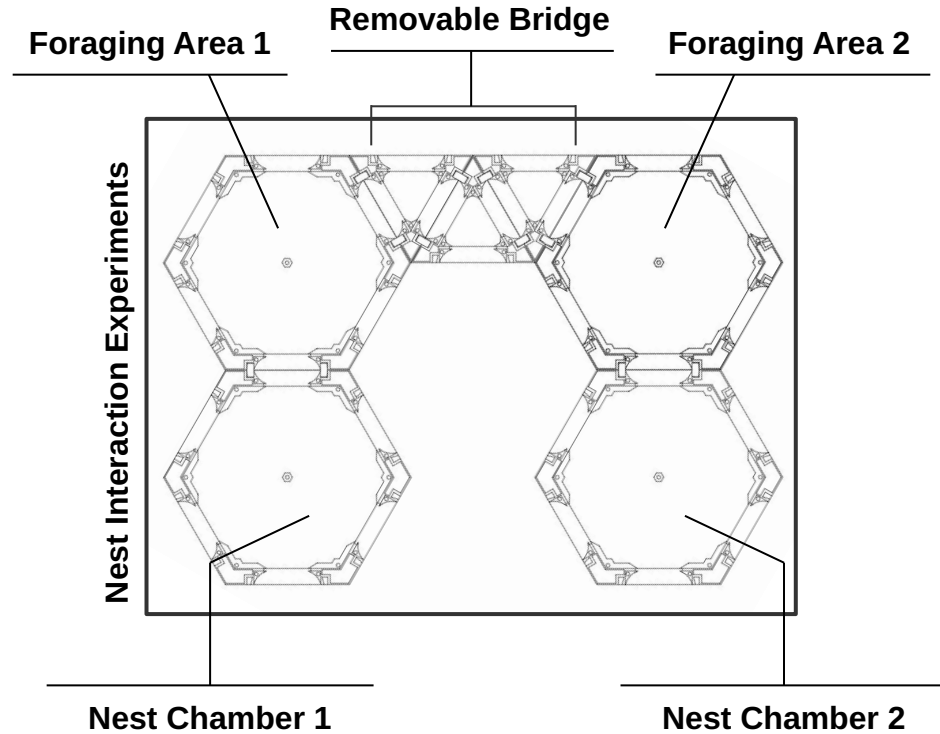
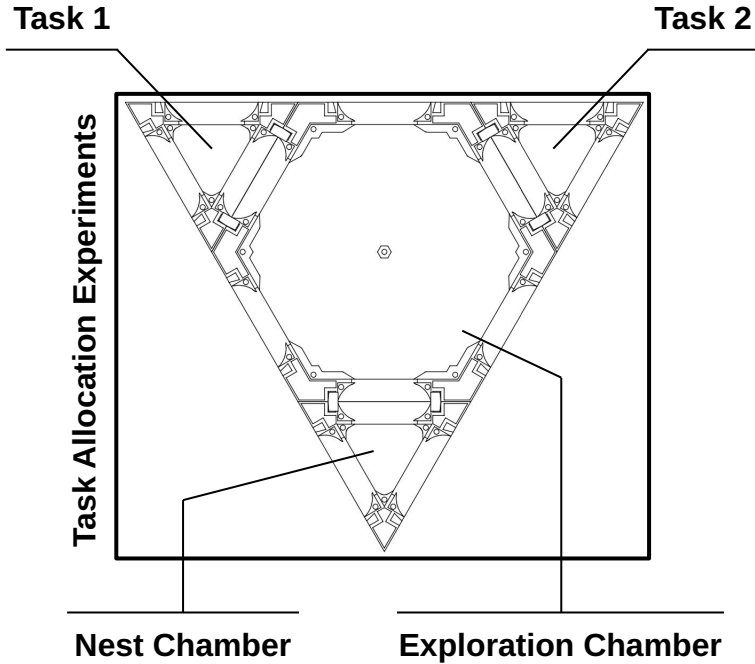
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Plaster floors  
help control  
grip and  
humidity.

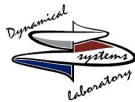


# Future Experiments



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# Questions?

**Github Repository:** <https://github.com/dynamicalsystemslaboratory/opennest.git>



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