

Not-So-Micro Plastic

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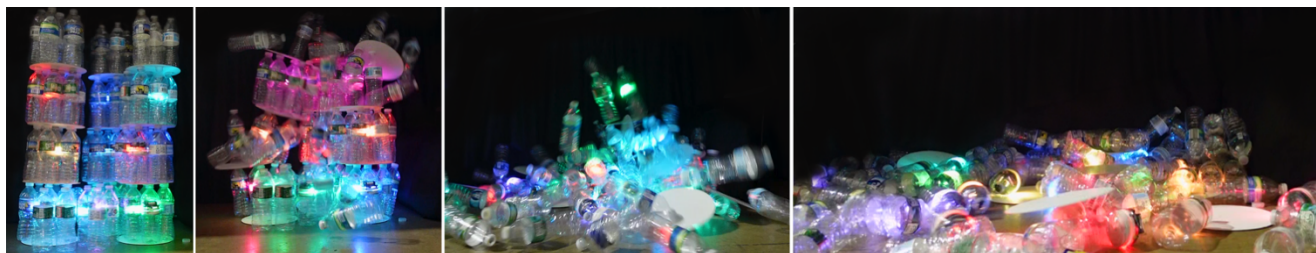


Figure 1: Stills from a video of the robotic water bottles performing at ICRA. © Diedra Krieger

We present a robotic art installation that reckons with the ongoing proliferation of micro- and nano-plastics. Since the dawn of the Plastic Age in the early 1900s, humans have produced and discarded billions of tons of plastic. Through the process of photodegradation, Plastic breaks up into smaller and smaller pieces; never going away; infiltrating our air, our food, our blood. Plastic began its life as a deliberate product of our scientific ingenuity, a hallmark of our ability to bend nature's very constituent components to our will. Now, however, plastic has an agency of its own. We have lost control.

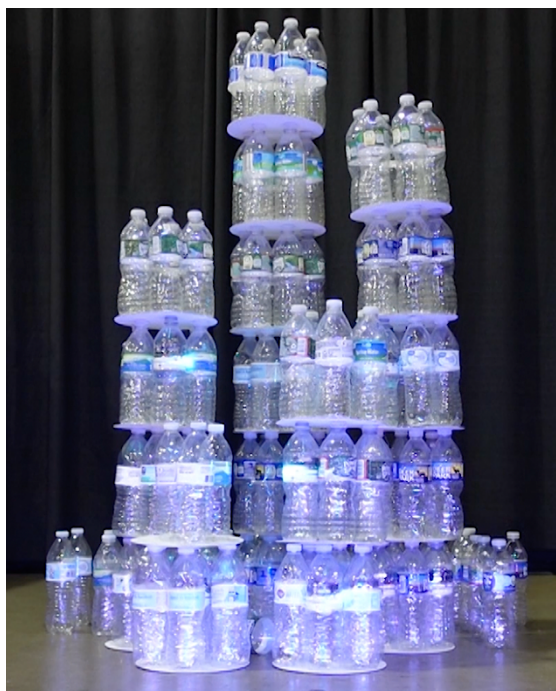


Figure 2: Piece at ICRA 2025.

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In *Not-So-Micro Plastic*, we viscerally communicate the idea of Plastic as Monster by granting agency to post-consumer plastic water bottles—transforming them into a robotic swarm. The piece, shown in Figures 1 and 2, is performed in parts:

1. **Production:** A column of seemingly static water bottles sits at rest; no robotic components are visible.
2. **(Photo-) Degradation:** The water bottles begin to be illuminated by gently pulsing blue light. Suddenly, the lights begin to flash violently, and the water bottles begin spinning, causing the column to dramatically break apart.
3. **Permeation:** Now on the floor, the water bottles writhe and scatter into the surrounding space.
4. **Persistence:** The water bottles are picked up and handed to the viewers, who experience the bottles' flashing lights and forceful spinning close up.
5. **Permanence:** The water bottles suddenly stop spinning and lighting up. The viewers are left holding the bottles that have returned to their everyday static state.



Figure 3: The robotic water bottles installed in a larger structure part of *Plastic Fantastic* at New Paltz High School, 2025. © James Bern

Each robot, shown up close in Figure 3, is fabricated by first cutting a water bottle in half and then reassembling it with a custom internal actuation and lighting package, shown in Figure 4.

Each puck-shaped actuation and lighting package consists of a DC motor, which is supported by a large bearing to endure falls from height, LED's, batteries, and a custom circuit board with a microcontroller for wireless communication and supporting electronics. The batteries are positioned asymmetrically to encourage the water bottle to topple. The entire puck is designed to have the same vertical height and placement as the label on a typical disposable plastic water bottle, such that the bottle appears to unmodified when viewed from a moderate distance. The assembled robot is safe to hold, though a consequence of its mechanical design is that the viewer must be instructed to only hold the robot from either the bottom or the top; if held in the middle, the robot will be unable to spin. A future iteration could address this limitation as well as remove the need to cut the bottles in half.



Figure 4: Before the final assembly.
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