



OXMAN and Percival Scientific Create Elegant Climate-Controlled Capsules With Unparalleled Customization



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In June of 2024, Percival Scientific engineers added the finishing touches to four identical climate-controlled experiment rooms unlike anything they had designed before. The rooms are housed inside OXMAN, a 36,000-square-foot design studio and laboratory headquartered in New York City. Founded by designer, inventor, and CEO Neri Oxman, Ph.D., the lab is dedicated to “rethinking design to empower a future of complete synergy between nature and humanity.”

When Henry Imberti, senior vice president of engineering at Percival Scientific, first took the call from OXMAN in 2020, he thought it was a prank. “The scope of what was being described just sounded really out there,” he said. “Nothing was making sense to me.” But after doing some



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online research during the call, he realized that it was a real inquiry and had the potential to be the most unconventional and prestigious customized project Percival had ever taken on.

“Our ask was wild,” said CEO Neri Oxman. “We aimed to create a life-support system for an extinct yet ecologically robust ecosystem, along with the environmental protocols to bring it back to life and sustain it.”

Why would a forward-thinking New York design and innovation company call up an environmental chamber manufacturer in the small town of Perry, Iowa, about a project of this magnitude?

“Someone at Jacobs Lab Planning had worked with us on a very large and innovative building project we did for Cornell University years ago and recommended us,” said Imberti. That lab project involved re-engineering 22 plant growth chambers with a lake water cooling system that reduced energy use and helped Cornell win the Leadership in Energy and Environmental Design (LEED) Gold Certified designation for the university’s Weill Hall Life Sciences Technology Building.

The Search for a Chamber Manufacturer With a Passion for Customization

OXMAN, a supremely visionary organization, was hunting for a climate chamber company with the right expertise,

history, and heart for the elaborate project they were planning — a company that specialized in customization with people willing to tackle challenges that would stretch their skill sets.

That’s the fun of working at Percival,” said Senior Design Engineer Trevor Volz. “We take on many never-been-done-before projects, which makes us stand out. We love turning over new stones and solving new problems with each project.”

Recognizing this mutual passion for problem-solving, OXMAN proposed a partnership with Percival while the lab was still in the planning stages. Percival joined OXMAN from the outset of the two-story lab’s construction on the 9th and 10th floors of a retrofitted 1920s car manufacturing facility on Manhattan’s West Side. For the planned wet lab space, OXMAN tasked Percival with creating four tissue culture rooms with transformable modular interiors that would accommodate nearly any experiment the lab team dreamed up.

However, OXMAN wasn’t creating a typical lab where research chambers sit behind closed doors. Instead, Neri Oxman intended to prominently display them as showcase “capsules” that reflected the aesthetic beauty of the overall lab design.

They were slated as central features of Project ALEF, an area within the lab that “explores a wide breadth of ecological research at the molecular and ecosystem scales with the long-term goal of deepening our understanding of interspecies communication and overall ecosystem health,” as stated on the OXMAN website.

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Climate Rooms Designed to Perform as Beautifully as They Look

As one of OXMAN's key manufacturers, Percival welcomed the challenge of creating climate rooms that would meet the project's strict visual design standards and perform precisely and reliably to propel the company's revolutionary research.

One of the first engineering feats was accommodating OXMAN's vision of "capsules" with all-glass walls. A primary concern was that the insulation value of glass is significantly lower than that of the solid wall panels Percival Scientific typically uses to construct its chambers. Replacing these panels with glass raised questions about potential condensation, heat loss, and maintaining a uniform controlled environment inside the capsules.

To address these issues, Percival brainstormed with the rest of the adept collaboration team, which included the OXMAN project team, the architecture firm Foster + Partners, a project integrator, the general contractor, and various aligned vendors. As a solution, Percival designed a modified chamber box with three standard side walls and, with help from the team, sourced a glass wall specialist to create a fourth front wall that could maintain acceptable insulation values. To prevent condensation on the glass, Percival calculated new humidity and temperature ranges for the capsules.



Design Obstacles as Catalysts for Creative New Solutions

As the project progressed, nearly every step of the design required modification. "We were basically redesigning an environmental room from the ground up, right down to the fasteners, which had to be beautiful as well as functional," said Vice President of Engineering Dan Kiekhaefer.

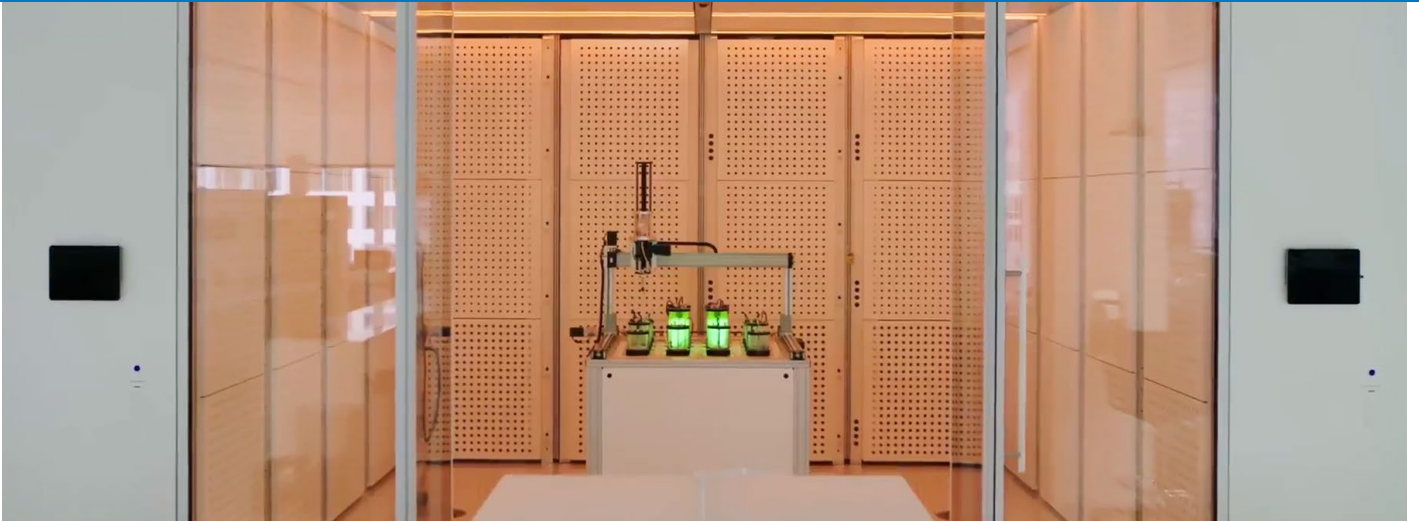
To achieve flexible lighting with the broadest color spectrum possible, OXMAN worked with Percival to create proprietary 8-color LED lighting panels that could be moved and mounted in custom configurations. But this introduced an obstacle for distributing power throughout the capsule.



Top: Capsule before custom configuration
Middle: Capsule configured for forest ecology growth
Bottom: Plant growth under proprietary 8-color configurable LED panels

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So, instead of wiring the chamber with a few standard power connections for the lighting, Percival engineers redesigned the capsule's circuitry with multiple connection ports, allowing the LED panels to plug into different locations on the ceiling for varied configurations.

The airflow system also needed to be reimaged several times as OXMAN and the architects continuously made detailed adjustments to the capsules' interior design. For example, changing the size of the holes in the modular surface of the walls required additional airflow studies and system modifications. "Each small design change on top of others added a large amount of complexity and uniqueness to the project," said Volz.

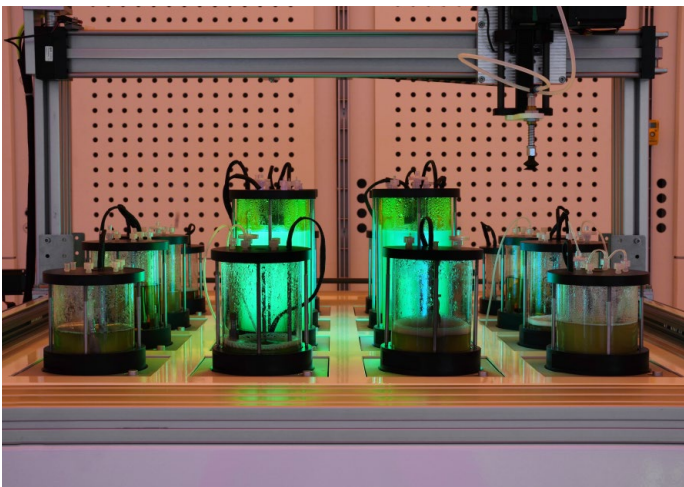
Possibly the largest engineering hurdle was that the ceiling-mounted air conditioning units inside the capsules needed to fit into a much smaller space than usual, be configured around other architectural building elements, and operate at a significantly quieter decibel level than Percival's standard cooling units.

Kiekhaefer explained that the cooling unit challenge required many extensive design iterations, but that it helped them become more inventive during the build. "We had to deploy a lot of creative solutions in all aspects of the HVAC design, including mechanical, refrigeration, airflow, and electrical systems," he said. "In the end, we came up with a bespoke cooling unit that outperforms our standard evaporator systems."

The Collaborative Spirit Behind Unprecedented Customization

Despite many false starts and times when physical limitations forced some compromise in the aesthetic design, the collaboration team diligently pushed through every challenge. "I don't think I've seen anything in my career that comes anywhere close to this amount of collaboration. We always found ways to work through whatever was in front of us," said Kiekhaefer. "The end goal was bigger than any problem we encountered."

Looking back, Kiekhaefer said he understands what made the Percival partnership with OXMAN successful: "Philosophically, their approach to scientific research is similar to how we design and build chambers. They embrace the exploration of new methods, they're committed to being cutting-edge, and they thrive on collaboration."



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Four Elegant Climate Capsules Contributing to Scientific Discovery

In addition to their stunningly elegant appearance, the four capsules feature configurable lighting, modular walls for attachments and shelving, a removable robotic arm, an extended temperature range, and advanced software that replicates historical climates.

“Grow rooms are often designed for a single organism, not an entire polyculture,” said Oxman. “Together with Percival, we built a grow ‘computer,’ with precisely tunable environmental parameters such as heat, light, humidity, nutritional dispensing, and more. We even created a rain-maker simulating rainfall patterns obtained from archival data.”

The versatility of the rooms allows the OXMAN lab team to perform diverse experiments across many scientific disciplines. For example, in one capsule, the researchers cultivated a revived ancient Oak Tulip Tree forest, while in another, they analyzed the chemical signals released by an entire ecosystem to create natural scent or flavor designs.

“We used terms such as ‘food computers,’ ‘fragrance computers,’ and ‘biodiversity engines,’” said Oxman, “but it was not until we finally brought the Oak Tulip Tree Ecosystem to life when it all came together. Reflecting upon our partnership with Percival, what began as a sophisticated growth chamber ended up as a time capsule, allowing us to grow 400-year-old blueberries and produce the smell of an ancient polyculture — so vital for our livelihood and sustenance.”

Confidence That Carries Into Future Custom Builds

Accomplishing a chamber build with such immense complexity confirmed for Percival engineers that their approach to collaborating and customizing has always been right. Still, it caused them to grow personally and changed their thinking for future builds.

“We learned to be even more flexible and open-minded,” said Imberti. “There’s always more than one way to do things, and nothing is impossible as long as you don’t break the laws of physics.”

Using the knowledge they gained, the Percival engineering team plans to reinvent some of their older standard parts, use new suppliers, and examine their chamber designs with fresh eyes. “I think we have more consideration now for integrating visual appeal into our designs and not just focusing primarily on functionality,” said Volz.

The increased appreciation for visual appeal is why the Percival team takes as much pride in the appearance of the OXMAN capsules as it does in the astounding mechanical and electrical customization achieved.

“It’s the most beautiful chamber project I’ve ever seen, for sure,” said Imberti. “It’s so incredible.”

For more information, visit percival-scientific.com, contact us for a [free consultation](#) or call 800.695.2743.



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