Sustainability Story: Mycelium Innovation

How Fungi are Changing the Material World.

Interview By Meghann Gregory and Rebecca Wasson

Q: What Inspired you to pursue research, and why is it important right now?
A: Studying art as an undergraduate, I struggled with the accumulation of matter that seemed an inevitable byproduct of the creative process. [...] In practice, I struggled with the disregard of sustainability and health that I witnessed – not enough access, motivation, or code support to facilitate more regenerative approaches. [...] A sudden onset of mold and chemical sensitivities -most often triggered by time spent indoors- was the final push to embodying the urgent importance of completely rethinking the sources and design of the materiality of spaces we inhabit. I'd just become a living example of the vague, and difficult to treat, Building-Related-Illness and Sick Building Syndromes we, as practitioners, learn about.

Close-up images to show robust mycelial skin and mycowelding of the Clasp Stool version 3.0. This version is mycowelded together with no additional binders.

Q: What is mycelium and how can it be used?
A: Mycelium is the filamentous vegetative body of a fungal organism. Usually when we think of fungi, we think of the organism's fruit: a mushroom. If we compare a fungal organism to a tree, the mycelium would be not only the tree's roots, but the whole tree, everything except the fruit it bears. Thinking about this from a proportional perspective illustrates its presence as the majority of the organism. If you've been walking on the earth after a heavy rain, a whitish substance emerging from the dirt was likely mycelium. It's important to remember that we're used to thinking in terms of extractive capitalist practices when we consider the potential 'use' of an organism, like mycelium, to make materials. Fungi are organisms, and as any biologist well knows, working with and studying organisms is like having a non-human collaborator. Ecovative (https://ecovative.com/) is without question, the pioneering and dominate leader, patent-holder, and researcher in the space of mycelim-based-materials. Mycelium has been used to construct lightweight, foam-like materials (think packing materials for shipping, or acoustic tiles), or leather-like fabrics, such as those produced by Ecovative and Mycoworks. My company (https://www.okomwrks.co/) has developed and patented an alternate process for constructing mycelium-based-composites that maintain a low-density, but also have physical characteristics of hardness, ductility, and stiffness. These properties make it more suitable to explore and test for structural applications.

Q: Why is Mycelium a sustainable option, is it renewable? At what rate can it regenerate?
A: Mycelium-based-materials are only as sustainable and regenerative as the ingredients and methods used to make them. What's thrilling is that it is entirely possible to fabricate materials from this organism that don't include environmentally toxic ingredients and which could be composted at the end of their life. When we think about using these materials as a replacement for wood products, a goal in my research, it's staggering to consider how a tree can take a decade or more to grown the same quantity of mycelium-based-material that could be grown in a lab in a matter of days or weeks.

Q: Can Mycelium be composted or broken down and how does that impact its strength and longevity?
A: We need to remember that we actually WANT materials that can be composted, broken down, and that don't outlive us! If a material can be grown in days instead of years, pose no health threats to users, and healthfully return to the earth after use, I'd say we've done an excellent job as a specifier! As these materials are still new, there isn't much public data yet regarding how their performance changes over time or their rate of decay.

Q: Where do you see the largest impact of mycelium on AEID?
A: Currently available MBC products are primarily design for acoustics and insulation. This is a great place to start, especially when you consider the carbon-intensive and chemical-intensive nature of many of our most common insulation products. Furniture applications are starting to emerge (my research included), and I see interiors as being the most impactful place to incorporate these innovations. I think with increased engagement from code officials and funding for material testing, we could soon have a range of products readily available on the market for acoustic and wall panels, flooring, furniture, furniture systems, lighting and interior partitions.

Q: What is your research in mycelium focused on? Who do you see benefiting from this work?
A: My company is most focused on scaling and bringing our technology to market for use in the built environment. My research at Kent State, some of which is in association with my company's technology, is currently exploring both technical and applied aspects of the material development for interior applications ranging from production protocols and surface finishing techniques to furniture pieces and interior structures.

Clasp Stool version 1.0. As object and demonstrating weight-bearing capacity (has supported a minimum of 200 pounds). Mycowelding failed during grow; bound together with hemp cord. Subsequent versions have welded successfully with same or greater weight bearing capacity.

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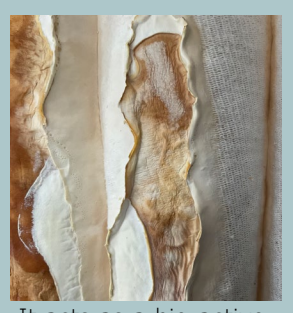
At the University of Virginia, Britta Bielak studied psychology and studio art as an undergraduate, focusing on performative installation art and sculpture. This provided a strong foundation to later lead to her graduate studies at the interior and human scale. She later earned her MFA in Interior Environments from Virginia Commonwealth University. While in practice, she started teaching part time in 2016, and has held full-time teaching positions at the Design Institute of San Diego and now at Kent State. Joining her startup company in 2020, a move that marked the formal beginning of both her biomaterial and mycelium research, though she remarks retrospectively, the experimental biomaterial palette of her undergraduate studies undoubtedly laid a framework for future material studies. Bielak believes that mycelium has much to offer us both in terms of wisdom and material creation. Stating that research with fungi, and other microbes, is essential for designing a truly regenerative spatial future, but it's important to pursue this work -and the integration of these materials- through a lens of collaboration, not extraction.

What is Mycowelding?



Mycowelding is an innovative, sustainable, and organic construction technique that uses live mycelium (the root structures of mushrooms) to bind separately formed units together into a single living structure. It acts as a bio-active adhesive, allowing fungi to grow across joints, creating strong biodegradable sustainable structures without traditional fasteners or adhesives.

Whats Next?

This spring and summer, Bielak will expand her mycelium furniture design and fabrication work through the design, build, and growth of a new interior-scale applied structure. In collaboration with biological science partners at Kent State University, she is pursuing regional and national partnerships and funding to advance research initiatives including testing hyper-regional waste streams as material inputs, tuning mycelial behavior, exploring surface finishes, and developing design/build projects that investigate new forms while engaging and educating the public.

We were thrilled to have the opportunity to interview Bielak and look forward to following her work and hearing more about her research in the future.