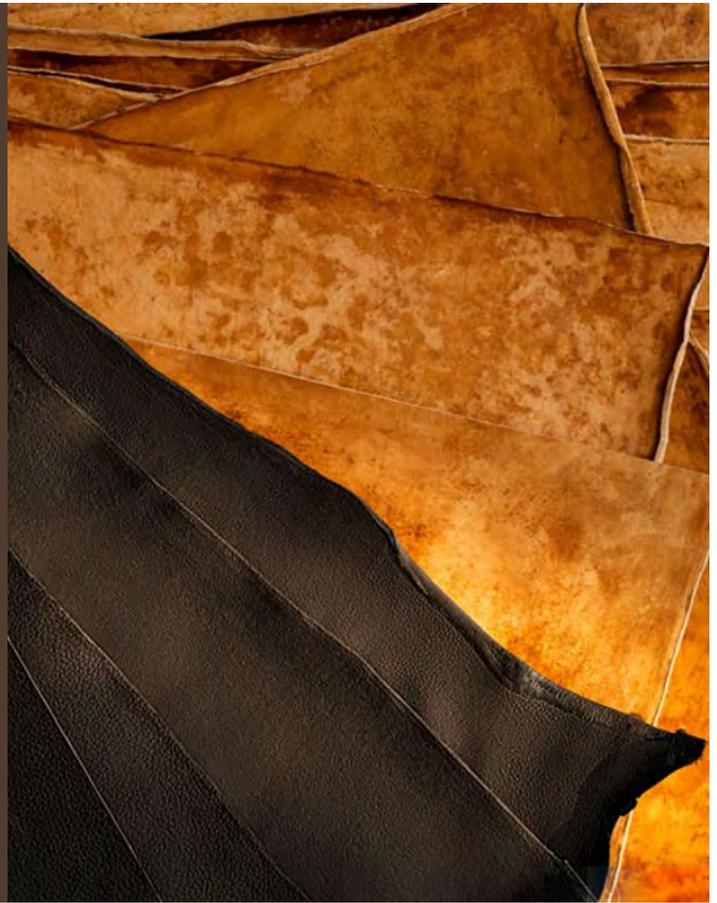


MATERIALS

Fungi

September 2021
Pulse

MaterialConneXion
BEAUTYSTREAMS

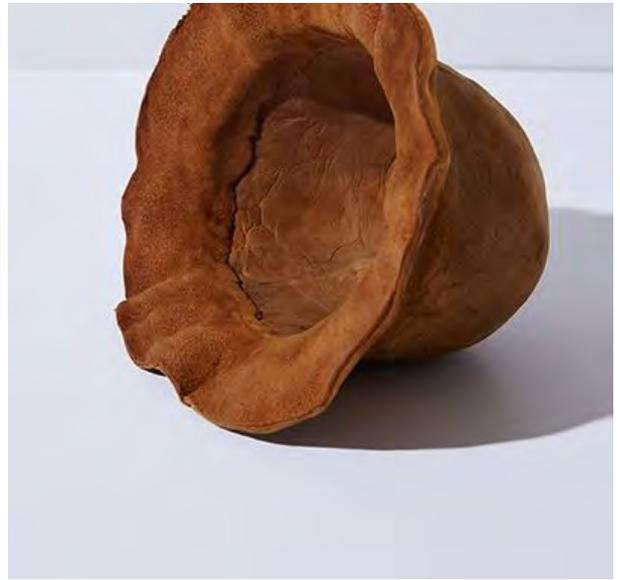
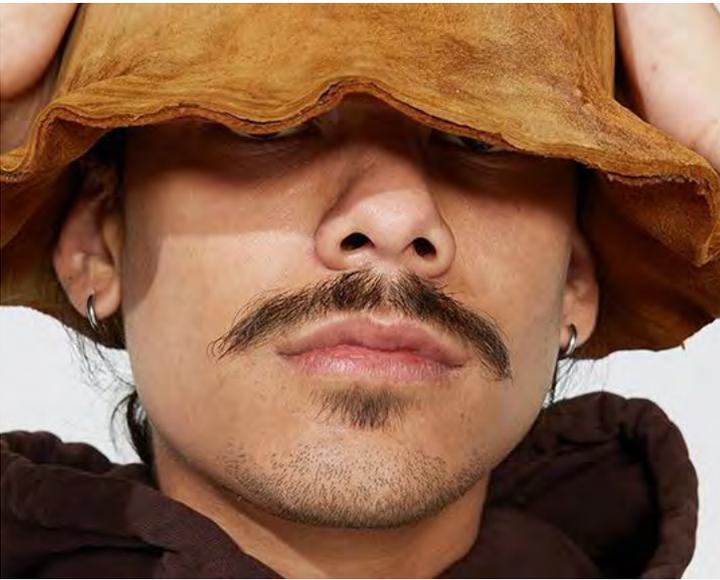


Intro

It was only a matter of time in this series before the wonders of fungi, or mycelium, were presented. In just a few years, following the formation of the originators, [Ecovative Design](#), in 2007, this wholly natural, completely circular-economy, living "material" has expanded from an intriguing albeit abstract concept to a viable solution to challenges in packaging, leather alternatives, flooring, toxic waste remediation, beauty tools, and lighting fixtures. Because fungi are their own "kingdom" in comparison to plants, animals, and bacteria, they have a much wider range of types than other natural materials such as wood, cotton, bamboo, and thus can be engineered with vastly different properties.

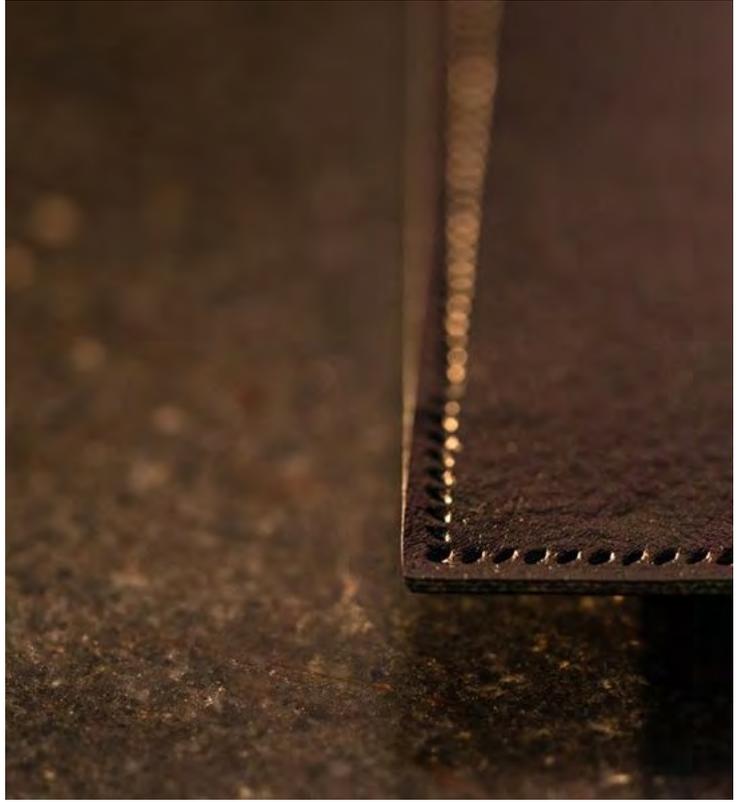
The increasing range of applications for which fungi are being used allows us to consider the material very differently than that original "styrofoam alternative" that Ecovative Design developed. It can be grown to have a very hard yet lightweight structure similar to bone, it can have truly leather-like properties, both as a single organism (mushroom) or as a composite form, and it can be used as a binder in creating rigid, particle-board sheets, consolidating the stiffening properties of an agricultural waste fiber or wood fiber with the fungi as "glue" that grows between and brings those fibers together.

BEAUTYSTREAMS



Amadou Leather™

The most basic form of the single mushroom "sheet" is exemplified by [Amadou Leather](#)'s materials that are already being used by luxury brands for hats, slippers, shoes, and accessories. Going from a single spore to a finished "fungi leather" takes only a couple of weeks, it feels like suede to touch with a natural rich brown color and a malleable surface that is lightweight and flexible and stops the proliferation of bacteria. The fungi is grown on recycled sawdust and uses existing edible mushroom cultivation techniques. Products produced from this material are completely compostable at the end of their lifecycle and turn soil into rich soil. The company is compliant with strict internal quality tests to ensure the traceability of the whole supply chain and the compliance with the EU chemicals REACH regulation as well as the ECHA Candidate List of Substances of Very High Concern (SVHC).



Reishi™ from MycoWorks

Also flexible, but aiming to recreate the look and feel of real leather, [MycoWorks](#) Reishi™ is grown in two California production plants while the sheets are finished by tannery partners in Europe (Curtidos Badia of Spain) who use only the best techniques – entirely chrome-free – to bring the signature hand feel of Fine Mycelium™ on par with the performance and appearance of animal leather. Either organic cotton or recycled PET can be used as the "matrix" inlay around which the fungi grow, with two current color options: Black Emboss and Smooth Natural in both "Standard" and "High Strength" editions. French luxury brand Hermès is already using this product for its coveted handbags.

Reshi is probably the most commercially developed of a burgeoning range of mushroom leathers that include Mylea from [Mycotech Lab](#), Flexible Mycelium from [Mogu](#), MycoTEX® from [Neffa](#) in the Netherlands, [Mylo™ Unleather](#) from Bolt Threads, and Fungicel® + Celium® from [Polybion](#), with many more currently on the lab bench or in proof-of-concept phase. Suffice to say, over the next few years, we are going to be rich in potential solutions for leather alternatives from the mycelium world.

Structural Mycelium by Mogu & Okomwrks



Increasingly, mycelium is being used for more rigid, structural elements, grown under duress, somewhat to form tight, interconnected forms that feel more like wood. Though Ecovative is no longer commercially producing their hard mycelium panel mycoboard, [Mogu](#) from Italy has been branching out into wall panels and flooring that has equivalent durability to rubber floors, all produced using their strain of mycelium fungi. And though still in the development phase, Josh English of [Okomwrks](#) has been formulating bone-hard lightweight parts called zerø-frm that suggest we might start seeing molded hard parts for furniture, packaging, and consumer products in the near future. Zerø-frm is structural mycelium, 455% stronger than any other mycelium composite. It is made of three simple ingredients: mycelium (as a matrix), hemp hurd (as a reinforcement), and cotton ("for a little nano magic") alongside a propriety blend of nutrients.



Mycoflex™ by Ecovative Design

And finally, not to miss out on current cosmetic applications, [Ecovative Design](#), the originators of the mushroom boom, have created MycoFlex™, a delightfully soft and foam-like product that can be used as a make-up applicator, sheet and eye mask, as pedicure toe spacers, or spa slippers. Cut to workable shapes, it is velvet-surfaced, spongy, absorbent and hypo-allergenic, as well as being quickly compostable at the end of its life, making it an ideal substitute for polluting plastics in the beauty industry.

Hard, soft, leather-like, foamed or rubbery – you name it, mycelium can be grown into it, using no energy, water or light, and with an end of life that most other materials can only dream of. Consider putting this wonder fungi next on your list of new material investigations.



Dr. Andrew Dent Material ConneXion

Andrew Dent, Ph.D., is one of the world's leading authorities on materials for the design sector. He is EVP of Research at Material ConneXion, a global materials library and consultancy that helps Fortune 500 to start-up companies take their products to the next level through innovative material solutions.

To learn more: MaterialConneXion.com.