

Abstract Book

BUILDING WITH FUNGI

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Plenary Talks

Tuesday, 13 October

Talk 1

Welcome Address and Opening Speech

Vera Meyer

Biotechnologist & Artist | Technische Universität Berlin (GER)

Short bio

Vera Meyer runs the Department Molecular and Applied Microbiology at Technische Universität Berlin since 2011. The focus is on researching and optimising fungal cell factories, with the aim of making more effective use of fungal metabolic potentials for the production of medicines, platform chemicals, enzymes and biomaterials. Together with her team, she pursues a holistic approach and develops and combines methods from systems biology and synthetic biology. Her inter- and transdisciplinary research projects combine natural and engineering sciences with art, design and architecture and create bio-based scenarios for possible living environments of the future. Vera Meyer is also active as a visual artist under the pseudonym V. meer and uses the means of art to make society more aware of the potential of fungi for a sustainable future.

Talk 2

Reform:Transform - Paths to a More Rotten Future

Phil Ross

Artist & Entrepreneur | Open Fung (USA)

Phil Ross will share how different encounters with fungi shaped his understanding of them as organisms and as possible materials. As an ingredient, a medicine, a technology, and a manufacturing platform, each taught a different language and method of cultivation. How does what a maker learns actually move into the world? Growing sculpture, teaching workshops and classes, writing how-to articles, technical papers, patents, and eventually the translation of a craft into industrial-scale production; each idiomatic form carries the knowledge outward at a different speed, and each is limited in reach and scope by technical and institutional obstacles.

This keynote follows the path toward Open Fung and the effort to radiate fungal knowledge out into the world while inviting more people in. Ross will describe the making of a decentralized institution: one with easily accessible data and trusted instructions, that instigates and engages with art as a way to create meanings and values, and that is generative of shared standards and robust, repeatable protocols addressing urgent global needs.

Short bio

Philip Ross is an artist, inventor, and a scholar of bioengineering. In 2013, he co-founded MycoWorks to develop commercial mycelium-materials, and in 2024 co-founded Open Fung, an organization that builds collective resources for advancing fungal technology and the arts. Philip's creative work has been featured internationally, including at the Nobel Prize Museum and the Venice Biennale of Architecture.

Talk 3

THE NATURE OF RELATIONSHIP - Living Collaborators & Industrial Standards

Maurizio Montalti

Designer & Entrepreneur | SQIM (IT)

Drawing on more than fifteen years of practice in collaboration with fungal organisms — from experimental artistic approaches at Officina Corpuscoli in the Netherlands to running SQIM, an Italy-based material innovation company producing mycelium-based products through its two brands, Mogu and Ephea — this talk examines what is lost and gained when a living collaborator is scaled into manufacturing. As a living agent, fungal mycelium does not simply execute instructions; it responds to conditions, negotiating them into visible form. What traditional standards read as defect might instead be understood as opportunity and value. Bringing innovative mycelium-based materials to market at meaningful volume therefore demands compromise — compromise shaped by the transitional phase we are in today, by ongoing developments, and by slow cultural shifts. The talk will explore the nature of these compromises while also cautioning against them, reflecting on what it actually means to work with a living system. Thus, ultimately asking what genuine cooperation with a non-human, microbial collaborator requires — and how a different approach might reshape not only material standards, but the organisations and societies that produce them.

Short bio

Maurizio Montalti is a designer, researcher, and entrepreneur working at the intersection of design and biotechnology. Since 2010, through his practice Officina Corpuscoli (NL), he has pioneered a relational approach with living systems, integrating it into material innovation, exploring new ecologically-driven paradigms that merge design, ethics, aesthetics, and technology. In 2015, he co-founded SQIM Srl (IT), where as Chief Mycelium Officer and today as CMO he leads the development of mycelium-based biomaterials under its two brands, Ephea and Mogu — redefining fashion and interior design/architecture, respectively, through naturally-grown materials and products. He has an extensive background in education, having taught and mentored at various academies and universities internationally, and his work has received numerous awards, with wide recognition across major international media, museums, and institutions.

Talk 4a

FROM ENCROACHER BUSH BIOMASS TO FOOD AND HOUSING (MYCOHAB NAMIBIA)

Hilma Nashandi

Microbiologist | MYCOHAB | University of Namibia (NAM)

The challenge of bush encroachment facing Namibia has been transformed into an opportunity for sustainable building materials, with the invasive bush covering about 32% of the country's rangelands and savannahs. The existing bush control and value chain approaches still leave tons of under-utilized bush biomass. Namibia is also no exception to global concerns of increasing material demand and environmental impacts of conventional construction. This lecture explores how MycoHAB Namibia used saprophytic fungal mycelium to transform its under-utilized invasive bush biomass into mycelium-based building materials, while contributing to a circular economy approach. The sustainably harvested Encroacher bush biomass is transformed into mycelium based composites (MycoBlocks) through mushroom cultivation and mycelium growth processes.

The MycoHAB process pays attention to how fungal species, substrate properties, biological growth, material processing and interactions between biology, engineering, architecture and design played a role in the constructed MycoHouse. MycoHAB experienced how fungi can connect utilisation of woody biomass, spent mushroom substrate (SMS) production, mycelium based material innovation and sustainable construction. It is a representation of how mycelium composites demonstrate their potential as bio-based alternatives for various construction applications. It also highlights the opportunities, technical challenges, and the interdisciplinary collaboration required to move MBCs experimentation to real-world construction.

Short bio

I am Hilma Nashandi, born and raised in a small village in northern Namibia. In 2016, I moved to city to pursue a Bachelor's degree in Microbiology, where my mycology lecturer's passion for mushrooms sparked my curiosity. I became fascinated by how much these organisms could teach us about biology and the world around us. One internship led me to a mushroom project and eventually to my first job in mushroom research, which opened the door to pursuing a MSc in Microbiology. I explored 3 fungi and 2 bush biomass substrates for sustainable innovations. My journey in science has been an adventure with the creator. I believe everything we need nature has it; we simply need to discover it. For me, mycelium is one of the most fascinating examples of that.

Talk 4b

MycoHab: A Model for Regenerative Architecture

Christopher Maurer

Architect | MYCOHAB | Redhouse Architecture (USA)

In Windhoek, Namibia, a building stands that was grown rather than quarried, milled, or cast. MycoHab, the world's first self-supporting structural mycelium building, was made from an environmentally problem bush that has overtaken millions of hectares of Namibian rangeland causing desertification. Chipped and inoculated with oyster mushroom mycelium, the bush yielded a harvest of nutritious food and, once the fruiting was complete, a bound substrate that was pressed into structural blocks. Twelve tons of biomass became three tons of mushrooms that feed Namibians and nearly a thousand blocks as strong as concrete.

Hilma Nashandi, who worked on MycoHab from cultivation through construction, introduces the project as it was actually built: the process, the people, and the lessons learned on the ground in Windhoek. MycoHab Architect Christopher Maurer then considers what the model implies at scale. If land restoration, food production, and housing can be linked in a single biological cycle, the building industry shifts from extracting resources to regenerating them. He traces how the same logic is being extended to urban waste streams and even extraterrestrial architecture, and argues that MycoHab is less a finished building than a template for how architecture might work everywhere.

Short bio

Christopher Maurer is Principal Architect and Founder of redhouse studio, a Cleveland-based regenerative architecture and applied research practice working at the intersection of mycelium materials, regenerative design, and space research. He is a co-founder of MycoHab, the world's first self-supporting structural mycelium building, in Windhoek, Namibia, and a Co-Investigator on NASA's NIAC Phase III "Mycotecture Off Planet" program with Dr. Lynn Rothschild of NASA Ames. He also leads Biocycler, a venture turning waste streams into fungal building materials, and has published widely on mycotecture and its applications on Earth and beyond.

Talk 5

Alive Building Materials and Human Resourcefulness

Anupama Kundoo

Architect | Anupama Kundoo Architects | Technische Universität Berlin (IND & GER)

Anupama Kundoo advances the idea that architectural imagination can find practical ways to fulfill the universal human aspiration for refuge, purpose, and social engagement through extensive material research and experimentation. She will discuss 'Time as a Resource' in the quest for new materiality and critically examine how the time value of money has nudged us towards code-based design and over-standardization in industrialized production. She will discuss materiality and consumption of live natural materials and finite natural resources alongside their impact on human wellbeing and human resourcefulness. Her practice, the result of her quest for knowledge to build appropriately, considers projects as opportunities to build knowledge. Architecture is the result of building processes, and time needs to be invested despite the sense of urgency triggered by rapid urbanization.

Short bio

Anupama Kundoo graduated from the University of Mumbai in 1989 and received her PhD degree from TU Berlin in 2008. Her research-oriented practice started in 1990 in India has generated people centric architecture based on spatial and material research for low environmental impact while being socio-economically beneficial. She is currently Professor of Architecture at T.U. Berlin. She received the RIBA Charles Jencks award for her contribution to architectural theory, the 2021 Auguste Perret Prize for architectural technology, and the Global Award for Sustainable architecture under UNESCO patronage in 2022. Her studios are based in Berlin in Germany, and Pondicherry in India. Kundoo's rigorous research and experimentation in new materiality for architecture is the result of questioning basic assumptions, construction habits that humanity has adopted during the long process of industrialization. Rather than focussing on shortage, she sought abundance through investing in human resources and human resourcefulness, such as ingenuity, time, skills, care and sense of community. The most recent publication 'Abundance Not Capital. The Lively Architecture of Anupama Kundoo', edited by Angelika Fitz, Elke Krasny, and Architekturzentrum Wien, MIT Press, 2025 highlights her key strategies for human-centric development of the built environment and enrichment beyond capital drivers and large-supply chains.

Talk 6**The Power of Networks to Advance Fungal Biotechnology on Earth and Beyond**

Marc Violo

Global Networker & Fungal Advocate | Mycostories (UK)

NASA's Mycotecture Off Planet programme is already growing radiation-shielded mycelium habitats for the Moon and Mars, using dormant fungal biocomposites that activate on arrival. It is a striking demonstration that fungal biotechnology's frontier now extends beyond the planet it evolved on. Marc Violo, Founder of MycoStories, argues that reaching that frontier, and solving the industry's terrestrial challenges in soil, food, materials and health, depends less on any single scientific breakthrough than on the strength of the networks connecting researchers, founders, investors and corporates across borders and sectors.

Drawing on MycoStories' journey since 2022 building the intelligence layer for the global fungal bioeconomy, now tracking 1,000+ organisations across 20+ countries, Marc traces how shared cross-sector knowledge accelerates innovation: from mycelium material science to the startups and research programmes moving fungal biotechnology from lab toward infrastructure, on Earth and beyond.

Short bio

Marc is the founder of MycoStories, the leading intelligence platform and launchpad for fungi biotechnology, working with founders, investors, industry leaders, and research institutions. For the last 15 years, he has worked across 4 continents as a director of startups and business units in technology and sustainability. Beginning his career at Tencent, China's largest internet company, Marc later joined the leading communication agency Ogilvy & Mather, as Managing Partner of their Singapore innovation agency. He has also worked as a London-based circular economy consultant with clients such as the Royal Bank of Scotland, and was Vice-President at Terracycle, an award-winning recycling company. Marc advocates for the transformative potential of fungi, exploring their applications in various fields ranging from food, materials, agriculture and carbon storage to physical and mental health.

Wednesday, 14 October**Talk 1****Building within Planetary Boundaries**

Eike Roswag-Klinge

Architect | Natural Building Lab | Technische Universität Berlin (GER)

Construction generates immense greenhouse gas emissions, destroys landscapes, and consumes vast amounts of resources extracted from the planet Earth, making it one of the most environmentally damaging economic sectors in Germany and Europe. What are the framework conditions under which construction can succeed within planetary boundaries, and how do renewable raw materials, circular construction, and appropriate consumption contribute to this? In addition to the long-discussed issue of CO₂ emissions, there is the question of raw material use: 92% of the minerals extracted in Germany—particularly sand, gravel, and ores for steel, etc.—are used for the construction of buildings and infrastructure. At the same time, the European population is reaching its peak, and even in major cities like Berlin, this peak will be reached in just a few years. In recent decades, the consumption of living space in Germany has been the driving factor behind the demand for residential space. Building with natural materials will make a significant contribution to the transformation of the construction industry, particularly in the field of buildings. Real-world laboratories in the construction sector explore innovations in construction practice and in collaboration with society and can serve as a driving force for transformation. Specific projects demonstrate how TU Berlin is embarking on the path of transformation in both research and construction practice.

Short bio

Eike Roswag-Klinge is a trained carpenter and architect specializing in ecological construction, timber construction, and renewable raw materials - In 2003, he founded the firm ZRS Architekten Ingenieuren—one of the leading firms in low-tech construction and building with natural materials—together with Uwe Seiler and Christof Ziegert - Since 2017, he has been teaching and conducting research at the Natural Building Lab (NBL) at the Technical University of Berlin, which he established together with Dr. Nina Pawlicki - The NBL is a design studio within the Institute of Architecture that conducts research and teaches/learns about future-oriented issues in real-world laboratories in collaboration with partners from public administration and civil society. - Since mid-2025, he has served as president of the Berlin Chamber of Architects, where he advocates for consistent, integrated sustainability in urban development and construction - Since April 2026, he has served as vice president for sustainability and campus development at TU Berlin, focusing on how to maintain and further develop a complex building stock in critical condition.

Talk 2**MyxArch: Prototyping Stressed Skin Structures with Mycelium based composites**

Jan Wurm

Designer & Advisor | Arup | Katholieke Universiteit Leuven (BE)

Mycelium-based composites (MBCs) offer opportunities to rethink the material, component and structural logic of lightweight architecture. This talk presents MyxArch, first exhibited at the New European Bauhaus Festival Fair in 2024, as a case study in prototyping polyhedral stressed-skin structures using surface substrates and gravity forming. The design and fabrication process is examined across three interconnected scales: material development, component formation and structural assembly. Particular attention is given to the transition from loose substrates to textile-based surface substrates, from rigid moulds to soft moulding and gravity-forming processes, and from mass-stabilised compression systems towards lightweight stressed-skin structures. The talk situates MyxArch within broader developmental trajectories documented by earlier prototypes to identify its specific contribution to the field. The talk concludes by outlining the next steps required to advance MBC stressed-skin systems: systematic material characterisation, design methods that respond to biological growth and variability, and fabrication environments that enable architects and students to work directly with living materials. It also argues for stronger collaboration between researchers, educators, designers and industry partners to translate knowledge gained through prototyping into scalable architectural applications.

Short bio

Jan Wurm is Professor of Regenerative Design and Biofabrication in Architecture at the Department of Architecture of the KU Leuven and has established the BioDigital ConstructionLab. He is recognized as a leading expert for applied research and innovation in the field of sustainable construction. Based on his background as a carpenter, a researcher and lecturer at RWTH Aachen and a Director at Arup in Europe, Jan is passionate about bridging the gap between academic research and practice in the field of regenerative design. The current research focus is on mycelium-based composites with enhanced aesthetic, functional and environmental qualities integrating surface substrates and digital fabrication technologies.

Talk 3

The Role of the Humanities and Design in Interdisciplinary Materials Research

Claudia Mareis

Designer & Cultural Historian | Humboldt-Universität zu Berlin (GER)

This lecture examines the role of the humanities and design in interdisciplinary materials research, drawing on the Berlin-based Cluster of Excellence Matters of Activity. Image Space Material (Humboldt-Universität zu Berlin). It develops a critical diagnosis of modern Western material passivation—the historically entrenched tendency to treat matter as passive, formable raw substance—and proposes an alternative, non-dualist understanding of materiality. Central to this approach is the concept of active matter: matter as a dynamic network of relationships with inherent affordances and adaptive capacities. Particular emphasis is placed on the equal integration of design into basic research, which contributes to knowledge generation and methodological development beyond merely illustrative functions.

Short bio

Claudia Mareis is Professor of Design and the History of Knowledge in the Department of Cultural History and Theory at Humboldt-Universität zu Berlin. She is also the co-director of the Cluster of Excellence, “Matters of Activity. Image Space Material.” Her areas of research expertise include the history and theory of design, interdisciplinary design studies, the cultural history of creativity, and material humanities.

Talk 4

Aquafung: The Mushroom Boats and the Case for Artistic Material Research

Sam Shoemaker

Artist & Citizen Scientist | MYCO MYCO (USA)

In August 2025, artist Sam Shoemaker crossed the Catalina Channel in a 47-kilogram mycelium composite boat, traveling 26.5 miles from Santa Catalina Island to the coast of Los Angeles. Constructed from a wild *Ganoderma polychromum* propagated on natural fiber textiles and supplemented hemp fibers, without synthetic coatings or additional reinforcement, the vessel is the result of years of experimentation with the structural and hydrophobic capacity of mycelium composites. The successful twelve-hour maiden voyage served as a full scale material test, subjecting the composite to prolonged seawater immersion, mechanical stress, and open ocean conditions.

Shoemaker’s presentation examines Aquafung, the utilization of mycelium composites in aquatic environments. Following years of laboratory and open water testing, the artist published an open source compendium outlining the methodologies developed through his longstanding collaboration with fungi.

The presentation considers how artists working outside conventional scientific institutions can contribute to nascent material sciences. The freedom to pursue unconventional questions, work across disciplinary boundaries, and conduct experiments without predetermined applications creates a distinct space for research. Shoemaker proposes the artistic practice not as a metaphorical engagement with the natural world, but as an open ended collaborative creative process capable of generating and openly distributing material knowledge.

Short bio

Sam Shoemaker is an interdisciplinary artist working in collaboration with living fungi. His projects include large-scale structures grown from mycelium composites, including a boat made from a single wild mushroom that he used to paddle 26.5 miles across the Catalina Channel. His work has been shown at Craft Contemporary, Fulcrum Arts, the California African American Museum, Vielmetter, Armory Center for the Arts, and OCHI, and has been featured in The Guardian, W Magazine, and the Los Angeles Times. He currently works as a mycologist at the Centre for Applied Ecological Remediation (CAER) and leads mushroom cultivation workshops throughout Southern California. He lives and works in Los Angeles.

Talk 5

Soft Skills – Textile strategies for Material Design

Christiane Sauer

Architect & Designer | Kunsthochschule Weißensee (GER)

Fibers are an elementary and versatile building component both in natural and in textile structures. Their geometry and layout facilitate specific performance. To design with fiber therefore allows to design performance – with nature as a source of inspiration. The talk will highlight experimental design research based on transdisciplinary collaboration between textile design and biomaterial science.

In comparison to solid binder-based systems, the textile operations like weaving or knotting join fibers by geometric operation only. They can be unraveled and worked into new configurations over and over again, thus circularity is to the core of textile binding. By upscaling such operations from a micro to a macro scale, we are able to "build" with soft structures that are reconfigurable. They are based on the principles of flexibility and adaptivity and question the paradigm of rigidity and permanence in construction. With an increasing need for adaptivity in architecture today, textile thinking and fiber based design can become a key for a more sustainable way of building and living.

Short bio

Christiane Sauer is an architect and professor for Material Design at Weissensee School of Art and Design Berlin. In her work she bridges material experimentation and design implementation focussing on textile structures and active materials. She is a member of the Cluster of Excellence "Matters of Activity. Image Space Material" at Humboldt Universität zu Berlin and heads the research facility "DXM - Design Experiment Material" at Weissensee School of Art and Design. She lectures internationally (e.g. Kyoto University of the Arts JP, Cornell University USA) and worked as a practicing architect for international firms such as OMA Rotterdam and her own studio in Berlin. Her recent book publication "Architectures of Weaving. From Fibers and Yarns to Scaffolds and Skins" (2022) bridges architecture and textile experimentation.

Thursday, 15 October

Talk 1

Hybridisation: Beyond Mycelium-Based Composites

Martin Ostermann

Architect & Designer | magma architecture | Universität Stuttgart (GER)

Mycelium-based composites have been widely explored for their material and environmental properties. While they offer clear advantages over conventional building materials in terms of renewability, low-energy production, and biodegradability, they also present limitations in performance, durability, and scalability.

This keynote explores hybridisation as a strategy for moving beyond mycelium as a singular biomaterial. By combining fungal growth with complementary biological and manufactured components, hybrid material ecologies can emerge in which different species and materials contribute distinct capacities. The lecture examines how such systems may reposition mycelium-based materials as adaptable construction systems.

Short bio

Martin Ostermann leads the Institute for Building Construction, Building Technologies and Design at the University of Stuttgart, having served as a professor since 2018. He established the Future Material Laboratory (FuMaLab) in 2022, a 1,000 m² research facility dedicated to scaling mycelium-based biomaterials, following the institute's exploration of these materials since 2018. His research extends to circular building technologies and renewable energy integration, complemented by numerous publications in the field. Ostermann holds a background in architecture from RWTH Aachen, the Bartlett School of Architecture and the Architectural Association, and previously co-founded the award-winning firm magma architecture. His academic and professional career bridges rigorous research in sustainable material ecologies with high-level architectural practice.

Talk 2

Creating Impactful Fungal Materials

Mitchell P. Jones

Engineer & Chemist | Technische Universität Wien (AUS)

Fungal materials have captured imaginations because they turn biological growth into a manufacturing tool. But the reality is less simple. For many applications, their strength, durability and thermal performance remain below conventional materials, while production is often slow, space-intensive, difficult to automate and dependent on complicated batch processes. Feedstocks may already have higher-value uses, costs rise quickly with scale, and the sustainability benefit is not always clear. My research starts from that reality.

Rather than asking what fungi can make, I ask what a fungal material would need to do to have real impact: solve a meaningful waste problem, achieve useful performance, fit within circular material systems, and be manufacturable rapidly and at scale.

That focus points toward the fungal materials with the strongest practical potential. Engineered fungal sheets and nanomaterials can deliver genuinely high-performance, tunable materials, but their impact depends on making them at industrial scale by coupling fungal by-products with existing papermaking infrastructure. Mycelium composites remain more mechanically limited, but textile waste offers a way forward: its existing woven architecture can provide reinforcement while simultaneously valorising a difficult waste stream. The aim is simple: make fungal materials not just interesting, but useful, scalable and genuinely competitive.

Short bio

Mitchell P. Jones is an academic, professional engineer and chartered chemist working at the intersection of materials science, biotechnology and circular economy. He holds doctorates from the University of Vienna and RMIT University. For more than a decade, his research has focused on fungal materials, including mycelium composites, engineered fungal sheets and nanomaterials, and waste valorisation. He has authored 40 journal articles, including first-author papers in *Nature Chemistry* and *Nature Sustainability*, with around 4,000 citations. His work has received international media coverage including *The New York Times*, *CNN*, *CBC*, *Der Standard* and *Der Spiegel*. He is Outreach Editor for *Resources, Conservation and Recycling* and serves on the Publications Committee of the Royal Australian Chemical Institute.

Talk 3

From Decay to Design: What Does the Fungus Actually Do in Engineered Materials?

Wenjing Sun

Material Scientist | Cranfield University (UK)

Fungi are powerful agents of material transformation. In wood and other lignocellulosic materials, this activity is usually associated with deterioration. In fungal-based materials, however, similar biological capabilities can be redirected towards material formation and function. This talk will explore a simple question: what does the fungus actually do in an engineered material? Depending on the system, fungal growth can modify substrates, create networks, connect components and contribute to material structure and performance. These contributions are shaped by interactions between the organism, substrate, processing and material design. A better understanding of these interactions can support more deliberate material design and help us consider how fungal-based materials perform and change over time.

Short bio

Dr Wenjing Sun is a Lecturer in Fungal Biomaterials at Cranfield University, UK. Her background is in materials science and bioproduct engineering, and her research spans fungal biomaterials and other bio-based materials. She is particularly interested in how biological growth, material structure, interfaces and processing interact to determine material formation and performance, and in translating these relationships into new functional material systems.

Talk 4

Towards biology-informed design of pure mycelium materials

Eveline Peeters

Synthetic Biologist | Vrije Universiteit (BE)

This talk presents recent research in the Research Group of Microbiology at Vrije Universiteit Brussel on biology-informed production of pure mycelium materials using basidiomycete fungi. We investigate how inoculum preparation and cultivation parameters influence mycelium mat formation during liquid-state surface fermentation. Combining time-resolved imaging with mechanistic modelling, we examined how hyphal growth towards the air–liquid interface determines when and where a continuous sheet forms. Experiments varying liquid depth and inoculum proximity to the surface helped explain differences in formation time and spatial uniformity, informing faster cultivation processes that yield more homogeneous mats. Hyphal architecture and cell wall composition vary widely across fungal lineages, both in fruiting bodies and in vegetative mycelium. We hypothesize that this phylogenetically structured diversity is directly linked to material properties and performance. A large-scale screening effort is ongoing, with the aim of mapping hyphal types, cell wall composition and material properties within a phylogenetic framework to guide species selection for specific applications. Finally, I will reflect on the interplay between design and biological research through our experience of establishing an interdisciplinary laboratory and developing material prototypes, highlighting how this exchange shapes research questions and translates biological insights into tangible applications.

Short bio

Eveline Peeters is a professor in the Department of Bioengineering Sciences at Vrije Universiteit Brussel, Belgium, where she leads a team in molecular and synthetic microbiology within the Microbiology Research Group (MICR). Her research combines fundamental understanding of microbial biology with application-driven approaches. Her team connects microbiology, bioprocess development and interdisciplinary collaboration to explore the production of chemicals and materials for a bio-based industry.

Talk 5

How growth conditions shape mycelium materials

Tiffany Abitbol

Material Scientist & Chemist | École polytechnique fédérale de Lausanne (CH)

My introduction to mycelium materials came through an interdisciplinary collaboration that led to a publication in 2020. My contribution to the biofabrication was limited, but the materials made a lasting impression: they were among the most cohesive and visually appealing mycelium composites I had encountered. The paper described wrapping during growth, although I did not then understand how this practice influenced the resulting material.

At EPFL, we have since returned to these processing practices, including wrapping and flipping, to investigate their effects on material structure and performance. This talk will focus on recent experiments with *Ganoderma lucidum*, in which wrapping during growth increased stiffness under compression by up to 100%, while density increased by less than 10%. Wrapping also changed surface development, despite comparable indicators of fungal biomass. Together, these observations suggest that differences in fungal network organization may contribute to the improved mechanical performance.

The motivation for this work was a practical observation, followed by a scientific question: what made these materials work so well, and what could we learn by examining how they were grown? Alongside the findings, I will reflect on how collaboration across materials science, biotechnology, and design has shaped my approach to fungal materials. Understanding the effects of familiar production practices offers a way to connect that exchange of knowledge with more consistent materials and better-informed choices about their use.

Short bio

Tiffany Abitbol is an Assistant Professor at EPFL, where she leads the Sustainable Materials Laboratory in the Institute of Materials, School of Engineering. Her group develops materials from renewable resources, including plants, fungi, and proteins, exploring how natural building blocks assemble and how living organisms can help shape material structure and function. Before joining EPFL in 2022, she worked as a Research Scientist at RISE Research Institutes of Sweden. She holds a PhD in Chemistry from McGill University, where she worked with Professor Derek Gray. Her Chair in Sustainable Materials is co-funded by BASF SE, Logitech, Nestlé, and SIG Services AG.

Talk 6

Genome editing for future mushroom materials

Yoichi Honda

Fungal Biologist | Kyoto University (JP)

I am a molecular geneticist and good at modifying fungi with genome/gene engineering. Our research group is interested in the cell wall structure of the oyster mushroom, since this fungus is fast-growing and easy to handle. Cell wall structure is a major factor to determine features of mycelial materials. In this talk, I would like to share our recent progress on characterization/modification of the fungal cell wall structure, and it can be used to change mushroom leather and composite. I hope that, with working together, we may find a better future of mushroom materials with dream features impossible to be made from natural fungi.

Short bio

After graduated, he has got the master and PhD degree on 'Molecular mechanism for DNA replication' from Kyoto University, Japan. As an assistant and associate professor, he worked on a white-rot fungus, *Pleurotus ostreatus* (oyster mushroom) to make it a biocatalyst in wood biomass conversion process to make biofuels. His team has successfully developed practical and effective genetic engineering and genome editing systems in this fungus for the first time. In these days, as a professor at Kyoto University, he is working with his group to use these genetic technologies to get better mushroom materials.

Talk 7

Designing Fungal Materials: From Waste Streams to Performance and Application

Meng Zhang

Biotechnologist | Hub for Biotechnology in the Built Environment | Northumbria University (UK)

Fungal materials are increasingly explored as alternatives to conventional synthetic materials, particularly because of their capacity to transform low-value biological resources into functional composites. However, the challenge is no longer simply whether fungal materials can be produced, but how they should be designed, evaluated and translated towards practical applications. This presentation examines two complementary approaches to fungal material development.

The first investigates the use of locally available agricultural and biogas-site biomass streams as feedstocks for mycelium composites. Five fibre streams were screened against seven fungal strains, followed by the development of an in-house grain-spawn process and the fabrication of composites for mechanical, thermal and moisture-performance testing. The study demonstrates the potential for a localised farm-to-material production system while also revealing important trade-offs between strength, consistency, density, insulation performance and the incorporation of more challenging residual fibres.

The second study takes a different route, combining processed mushroom biomass with cotton fibres to produce wet-laid composite sheets. Here, the aim is to tune the material towards more leather-like behaviour through formulation and post-processing. Qualities including flexibility, drape, shape recovery, viscoelasticity, strength and surface character are considered alongside treatments including plasticisation, citric acid, heat pressing and chitosan layering. The results show that improvements in one property can significantly compromise others, demonstrating that material development is better understood as navigation through a performance landscape than as optimisation of a single metric.

Together, we argue that performance in emerging biomaterials is application-dependent rather than intrinsic. Established material standards remain essential for comparison and validation, but they may not fully capture the functional, sensory and experiential qualities of new biological materials. Closer collaboration between material researchers, designers, manufacturers and end users is therefore needed to define meaningful performance criteria.

Short bio

Professor Meng Zhang is Professor of Microbial Biotechnology at Northumbria University, UK, where she co-leads the Living Construction research group. Her interdisciplinary research explores how biological growth can be harnessed as a form of fabrication, bringing together microbiology, biotechnology, materials science and design. Her work spans mycelium-based materials, microbial cellulose, biocementation and engineered living materials, with a particular focus on developing sustainable alternatives to conventional construction and textile materials. She was a founding member of the £8 million Hub for Biotechnology in the Built Environment and has led and contributed to a range of interdisciplinary research programmes exploring new relationships between living systems, materials and manufacturing

Poster Abstracts

Poster Topic: The Substrate

Poster 1 Flash Talk

Variations in properties of hemp shives depending on growth and post-harvest procedures. A substrate analysis

Luc Guder, Hans-Jörg Gusovius

Leibniz Institute for Agricultural Engineering and Bioeconomy (ATB)

The aim of ATB's sub-project A05 of MYCO BUILD is the pretreatment and stabilization of lignocellulosic biomasses as substrates for fungal composites. Field experiments will examine the growth of different hemp varieties sown at two dates following specific post-harvest and storage procedures, alongside chemical analyses and microbiome analysis of the shives via metabarcoding sequencing and plating. The objective of this project is to predict the properties of hemp shives by considering hemp variety, growth conditions and the makeup of the microbiome. The impact of physical treatments established in the food industry for increasing shelf life will be analysed. We aim to assess how chemical composition, surface structure, microbial load and community composition of shives change after exposure to (i) cold atmospheric plasma, (ii) high isostatic pressure treatment, (iii) high intensity electric pulses, or (iv) ultrasonic treatment. Preliminary experiments dealt with shives samples of optimal field- and non-retted hemp and shives from wet preserved whole-crop. For determining the microbial load plating experiments with a newly developed hemp shive medium was compared to established yeast & fungal media.

Poster 2 Flash Talk

Discrete element method (DEM) based modeling of biomass comminution for the production of fungal-based building materials

D. Helfmeier, H. Kruggel-Emden

Technische Universität Berlin

Fungal composites have considerable potential as building materials because of their favorable technical properties, low carbon footprint, and reliance on renewable resources. However, the environmental impact associated with scaling up their production requires systematic assessment and optimization. A major contributor to the energy demand of fungal-composite production is the comminution of harvested or residual biomass into particle-size distributions suitable for fungal growth. Predictive models describing the energy required for this process remain limited, partly because the material microstructure governing the complex comminution behavior is often neglected.

Further insight can be obtained using the discrete element method (DEM) in combination with the bonded-particle method (BPM), which enables the time-resolved representation of the microstructure. In this study, an initial DEM simulation of biomass comminution in a cutting mill was performed using a simplified representation of the material microstructure. The specific comminution energy was determined and analyzed. The simulation results show physically plausible trends, demonstrating the general suitability of the DEM-BPM approach for investigating biomass comminution. However, further experimental calibration and validation are required before quantitative relationships can be established. The presented model provides a basis for developing predictive tools for the energy-efficient production of fungal-composite building materials.

Poster 3

From Atmospheric Blocking to Biomass Resource Availability for Fungal Composites

Mahan Azizi, Pedro Alencar, Annette Rudolph

Technische Universität Berlin

A sustainable fungal-composite production chain requires knowledge of where suitable plant substrates can be produced and how reliably they remain available under variable climatic conditions. MY-CO BUILD project A09 addresses this challenge by developing an AI-based resource availability assessment for raw materials such as hemp, spruce and beech in Berlin-Brandenburg. As a first step, we investigate atmospheric blocking, a major large-scale weather pattern and driver of persistent weather extremes such as droughts and precipitation extremes that can affect plant growth and biomass production. Using ERA5 500 hPa fields, atmospheric blocks were detected and classified across the Euro-Atlantic sector for 1970–2026. The analysis identified 1,230 blocking events, averaging approximately 22 events per complete year. Omega configurations accounted for about 59% of classified blocked days, while blocking showed a pronounced spring maximum and no statistically significant long-term trend in event frequency. In parallel, environmental datasets describing relevant atmospheric and soil conditions are being assembled. Next, blocking information will be linked with local environmental variables and land-use information to assess growing conditions and ultimately identify climate resilient regions suitable for sustainable raw-material production for fungal composites.

Poster 4

Evaluating the potential of waste wood as a feedstock for mycelium-bound composites

Tim K. Felle, Johann Heinbuch, Lukas Emmerich, Christian Brischke, J. Philipp Benz

Technical University of Munich

Waste wood is generated in large quantities and is currently utilized predominantly for energy recovery despite its considerable potential as a lignocellulosic feedstock within a circular bioeconomy. One possible valorization pathway is its use as a substrate for mycelium-bound composites. However, due to the heterogeneity of waste wood and the potential presence of inorganic contaminants, it remains unclear whether fungal colonization is sufficiently robust for such applications. To address this question, waste wood from the German waste wood classes AI, AII+AIII, and AIV was evaluated using *Ganoderma resinaceum*. In addition, chemically defined metal(loid)-treated beech wood substrates and copper-ethanolamine-treated beech wood were included to investigate the effects of specific contaminants. Substrates were characterized by measuring pH, water-holding capacity, and elemental composition, while fungal growth was assessed using a growth-tube assay.

Growth was observed on all investigated substrates, demonstrating a considerable tolerance of *G. resinaceum* towards inorganic contamination. Nevertheless, fungal colonization generally decreased with increasing contamination levels, with the slowest growth observed on AIV waste wood. Arsenic and preservative-derived copper substantially delayed fungal colonization; however, complete substrate colonization was ultimately achieved in all substrates.

Overall, the results demonstrate that waste wood, including preservative-treated fractions, represents a promising feedstock for mycelium-bound composites and may enable the valorization of underutilized waste streams within a circular bioeconomy.

Poster 5 Flash Talk

Building with scraps: bread waste valorization as supplement for fungal biofabrication

Ana Goidea, Manuel Cárdenas

University of Kassel

It is estimated that around 10% of bread production is wasted annually as a result of standardization, overproduction, and a short shelf life (Melikoglu, 2013). Rich in readily available carbohydrates, proteins and micronutrients, bread waste (BW) has been previously investigated as a substrate for fungal fermentation (Gmoser et al., 2020).

Wheat flour, wheat bran and oat have been used to supplement lignocellulosic substrates in mycelium-based composite (MBC) production, promoting fungal growth and substrate colonization (Attias et al., 2019; Sisti et al. 2021). However, the potential of bread waste to replace these conventional supplements remains largely unexplored.

This study investigates waste bread as an alternative supplement for MBC grown in wood. Growth speed, fungal colonization, mycelium density and rate of contamination are evaluated to determine whether waste bread can be a viable substitute for conventional supplementation. Growth progression is monitored through time-lapse photography under controlled conditions in a growth chamber, allowing colonization rate to be quantified over time. These characteristics are compared between unsupplemented wood, conventional wheat supplements, and different amounts of bread waste supplementation.

The study explores a pathway for coupling urban food waste valorization with fungal biofabrication, contributing towards more resource efficient production strategies for mycelium-based building materials.

Poster 6 Flash Talk

MycoWool - Future-Oriented Development of Mycelium-Based Thermal Insulation Materials Using Raw Wool

Natalija Miodragovic¹⁻⁴, Tobias Pörschke², Vivien Ohlmer², Henrik-Alexander Christ³, Steffen Sydow³, Elisabeth Endres², Folke Köbberling¹

¹TU Braunschweig – Institut für Architekturbezogene Kunst (IAK), ²TU Braunschweig – Institut für Bauklimatik und Energie der Architektur (IBEA), ³Fraunhofer Institute for Wood Research Wilhelm-Klauditz-Institut WKI, Braunschweig, ⁴Humboldt University in Berlin,

The MycoWool Project develops mycelium-bound building materials from lignocellulosic residual materials, rape straw, European raw wool, and earth-based plaster, and tests them in real-world application environments. The aim is to create ecologically advantageous and economically scalable thermal insulation for interior applications that can replace conventional insulation materials.

A central task is the integration of previously unused local residual materials - raw wool and excavated earth from construction sites - into mycelium-based insulation materials to develop more sustainable building materials with higher performance. The project reduces the environmental impact of the construction industry and contributes to the transition towards regenerative construction.

First, the properties of the individual materials are investigated and synergistic combinations identified, harnessing their hydrophobic, hygroscopic, and ecological advantages. Promising combinations are incubated with fungal mycelium to produce testable prototypes. Mechanical and hygrothermal tests ensure that prototypes meet practical requirements.

Simulations and real-world monitoring in two climate rooms investigate thermal conductivity, moisture buffering capacity, and VOC emissions under dynamic conditions. Challenges such as microbial contamination of raw wool and insect protection are addressed. A life-cycle and cost analysis evaluates ecological and economic impacts. The results will support industrial production and transfer empirical findings to a digital twin, enabling scalability for further applications.

Poster 7 Talk at Workshop Scientific Perspective

Mechanical Characterization of Lignocellulosic Substrates for Mycelium-Based Materials

Christos Lolos, Daniel Helfmeier, Harald Kruggel-Emden, Claudia Fleck
 Technische Universität Berlin

Mycelium-based materials offer a renewable route for converting lignocellulosic resources, including wood residues and agricultural by-products, into lightweight alternatives for applications such as packaging, insulation, and interior construction. The properties of these materials depend in part on the characteristics of the lignocellulosic feedstocks used during cultivation. However, researchers often do not systematically characterize the mechanical behavior of potential substrates.

This study investigates representative lignocellulosic materials, including spruce, beech, and hemp shives, that may be used as substrates for mycelium-based materials. We conduct mechanical characterization across different length scales. We use instrumented nanoindentation to determine local mechanical properties, while compression testing assesses the macroscopic stiffness, strength, and deformation behavior of the substrates. Structural observations complement the mechanical measurements.

The work is expected to provide a comparative mechanical dataset for lignocellulosic feedstocks. It will improve understanding of their mechanical variability and provide a basis for their future use in mycelium-based material systems.

Poster Topic: The Fungus

Poster 8 Talk at Workshop Scientific Perspective

From identification keys to material design: repurposing fungal taxonomic data for mycelium materials

Annah-Ololade Sangosanya, Juliana Masis Solano, Piet Dimitriadis, Jara Salueña Martin, Joost Brancaert, Cony Decock, Mario Amalfi, Eveline Peeters
Vrije Universiteit Brussel

Pure mycelium materials are emerging as promising alternatives to petrochemical-based leather-like materials. Among the fungal strains currently used for material production, poroid fungi are particularly common. However, the biological and morphological traits that make certain strains more suitable for producing mycelium-based materials are still poorly understood.

Before the widespread use of molecular biology, fungal taxonomy relied on morphological characteristics, including cell types, spore production, tissue organization...As a result, extensive knowledge is available on the macro- and microscopic features of many fungal strains. In particular, J. A. Stalpers' 1978 identification key for wood-inhabiting polyporales in pure culture provides a valuable dataset derived from a cultivation setup closely resembling those used for producing mycelium mats.

In this study, we converted the 98 microscopic and colony-level characteristics described by Stalpers for more than 500 strains into a structured database. This resource was used to investigate whether specific morphological profiles are associated with the ability of fungal strains to form mycelium materials. Based on these attributes, strains were grouped into four clusters using complementary clustering approaches: Latent Class Analysis and k-means clustering. The analysis revealed that these morphological profiles do not always follow phylogenetic relationships, suggesting that material-relevant traits may be distributed across taxonomic groups.

From the identified clusters, 30 representative strains were selected for experimental validation. The next ongoing step is to produce pure mycelium mats from each strain and mechanically characterize them to assess the relationship between microscopic morphology, phylogeny, and material performance.

Overall, this work provides a new route to linking fungal morphology to the functional properties of pure mycelium materials. By integrating historical taxonomic knowledge with data-driven clustering and material characterization, this study contributes to a better understanding of strain selection for sustainable mycelium-based materials.

Poster 9 Flash Talk

Cell wall modification of *Fomes fomentarius* to develop biobased filter materials for antibiotic removal from wastewater

Stephan Starke, Carsten Freidank-Pohl, Wala Alkhatib, Vera Meyer
Technische Universität Berlin

Fomes fomentarius efficiently converts lignocellulosic biomass into valuable mycelium composite materials that can be applied in packaging and insulation. While progress has been made in tailoring their properties through substrate composition, cultivation and post-processing, direct molecular engineering of the fungal component remains largely unexplored.

This study therefore aims to functionalize the cell wall of *F. fomentarius* by introducing tailored surface characteristics that extend its functionality. As a proof of concept, β -lactamase enzymes were fused to a glucan-binding domain, expressed and purified from *E. coli*, and subsequently immobilized on the outer β -1,3-glucan layer of the *F. fomentarius* cell wall.

Specific and stable cell wall binding of the fusion proteins was confirmed by confocal fluorescence microscopy, SDS-PAGE, and spectroscopic fluorescence quantification. Furthermore, the hydrolysis of Penicillin G by coated *F. fomentarius* cells was verified by HPLC analysis. This study demonstrates how the surface properties of fungal-based biomaterials can be engineered to introduce new functionalities, expanding their potential use to filter materials or catalytic surfaces for wastewater treatment and beyond.

Poster 10 Flash Talk

Profiling Carbohydrate-Active Enzymes in the Basidiomycete *Fomes fomentarius* for Improved Lignocellulose Utilisation

Anna Sofia Birke¹, Carsten Freidank-Pohl¹, Cezary Smaczniak², Kerstin Kaufmann², Timothy Charlie Cairns¹, Sascha Jung¹, Vera Meyer¹

¹Technische Universität Berlin, ²Humboldt-Universität zu Berlin

Fomes fomentarius, an up-and-coming biomaterials cell factory, utilises lignocellulose (LCL) by secreting Carbohydrate-Active enZymes (CAZymes). This makes it a promising candidate for valorising industrial LCL and non-LCL by-products. However, substrate dependent CAZyme deployment and regulatory mechanisms are not well enough understood in this species to enable industrial application. Thus, we analysed the profile of secreted CAZymes in water exudates, i.e. droplets. By dissected the droplets when *F. fomentarius* was cultivated on different industrial by-products, it was found that LCL induced diversification of the droplet derived CAZyme profile compared, thereby widening its catalytic breadth. To understand if any CAZyme-encoding genes are the subject of carbon catabolite repression (CCR), differential gene expression analysis of CAZyme-encoding genes was carried out. Comparing the expression of CAZyme-encoding genes on LCL versus glucose-based media revealed that around 47 CAZyme genes were expressed more highly on LCL. One of the enriched motifs detected in the 27 -1000 bp upstream DNA regions of these genes, matches the transcription factor binding site of the CCR master regulator Mig1 from yeast. These data suggest that some of the CAZyme-encoding genes are subjected to glucose mediated CCR, rendering the Mig1 homologue from *F. fomentarius* a gene target for strain engineering.

Poster 11 Flash Talk

Fungal diversity for Mycelium Materials

Ilse Rovers, Han Wösten

Utrecht University

Pure mycelium materials (PMMs) and mycelium-bound composites (MBCs), collectively referred to as mycelium-based materials (MBMs), are being developed as alternatives to conventional materials used in, among others, packaging, construction and textiles. However, fungal selection in MBM research has so far been concentrated on a limited part of fungal diversity. This contribution combines evidence from a systematic review with results from an experimental screening to examine how broadening fungal selection can contribute to the development of MBMs with improved or distinct material properties.

The review identified 92 fungal species used in research articles, patents and patent applications concerning MBMs. Most belonged to the Agaricomycetes within the Basidiomycota, with *Ganoderma* spp., *Fomes fomentarius*, *Pleurotus* spp. and *Schizophyllum commune* among the most frequently used taxa. Although production variables such as substrate composition, cultivation conditions and post-processing strongly affect material performance, the review also showed that fungal species and strain are important sources of variation. The limited taxonomic range currently explored may therefore restrict the material properties obtained.

To investigate the potential of broader fungal selection, 59 strains representing Basidiomycota, Ascomycota and Mucoromycota were screened under a common cultivation approach. Of these, 52 could be cultivated reproducibly on agar, 40 formed coherent pure-mycelium sheets, and 24 colonised the cultivation area within ten days and were selected for physical and mechanical characterisation. Mechanical performance varied substantially among strains. High-performing strains were not restricted to the Basidiomycota: several Ascomycota strains produced sheets with comparable tensile properties. Density was the strongest measured predictor of ultimate tensile strength, while strains differed in their combinations of strength, stiffness, elongation, density, thickness, biomass and cultivation duration.

Together, the review and experimental screening demonstrate that strain-level selection across a wider taxonomic range is more informative than restricting candidate selection to traditionally used species or fungal phyla. Expanding fungal screening can reveal distinct material profiles suited to different applications and support the more deliberate development of mycelium-based materials.

Poster 12

Mating and fruiting body formation of *Fomes fomentarius* under laboratory conditions

Swantje Mohr¹, Stephan Starke², Cezary Smaczniak³, Andrew Gennet², Anna Parakenings², Kerstin Kaufmann³, Vera Meyer², Adam Lange¹, Carsten Freidank-Pohl²

¹Leibniz-Forschungsinstitut für Molekulare Pharmakologie, ²Technische Universität Berlin, ³Humboldt-Universität zu Berlin

Fomes fomentarius has recently been utilized for production of fungal composite materials. Yet, the laboratory methods for this organism are still limited. Being a basidiomycete, the life cycle is dominated by the dikaryotic state. Interestingly, the requirements for mating of monokaryotic strains have not been investigated yet.

We developed a method to mate monokaryotic strains of *F. fomentarius* on solid media and compared the growth speed of mono- and dikaryotic strains. We then investigated the cell wall composition of the ¹³C/¹⁵N-fed mono- and dikaryotic strain using solid-state NMR experiments, finding subtle differences in lipid and protein composition while the cell wall matrix remained largely unchanged. Further, we established a method to obtain fruiting bodies of *F. fomentarius* using birch logs and observed fruiting body formation under cold stress for both *F. fomentarius* PaPF11, a dikaryotic isolate as well as for Pdm1/Pdm2, a newly mated strain. Using a set of SNPs exclusively present in either parental strain, we confirmed the fruiting body indeed originate from the mated strain.

These methods are prerequisite for successful establishment of *Fomes fomentarius* as a polypore model species and a valuable milestone that might enable studies on plant-fungal interactions of genetically altered strains in the laboratory.

Poster 13 Flash Talk

Chemical origin, biological triggers and biotechnological use cases of fluorescent mycelium bound materials

Henrik-Alexander Christ

Fraunhofer Institute for Wood Research, Wilhelm-Klauditz-Institut (WKI)

Mycelium-bound materials (MBC) are used as biobased material alternatives for packaging, construction, insulation, and others. They are made from lignocellulosic plant residues (e.g. hemp shives, rapeseed straw, or wood chips) colonized by wood-rotting fungi such as *Trametes* sp., *Fomes* sp. or *Ganoderma* sp.. Research on MBCs at Fraunhofer WKI has revealed a multicolored fluorescence of the mycelium and respecting fruiting bodies of several species from the genus *Ganoderma*.

The spatial and temporal change of the fluorescence on the surface of mycelium in solid-state culture depends on specific cultivation conditions and fungal strains used. The intensive fluorescent colors are visible by eye or camera under UV light with a peak wavelength of 365 nm and point to underlying reactions of the fungus to multiple stressors. Using UV-induced visible fluorescence photography (UVIVF) adds a new layer of information in assessing mycelium for production of MBCs, edible or medicinal mushrooms and solid-state cultivation in general. The presentation discusses the chemical origin, biological triggers, and possible technical applications of fluorescent mycelium.

Additionally, an overview of the ongoing artistic work of visual artist Malte Taffner in collaboration with Fraunhofer WKI project LuminousNetworks, utilizing UVIVF timelapse of statures made from fluorescent MBCs, will also be provided.

Poster 14 Flash Talk

Molecular adaptation of *Pycnoporus sanguineus* during mycelium-bound composite formation

Tian Cheng, Tim K. Felle, Moritz Kruse, J. Philipp Benz

Technical University of Munich

Mycelium-bound composites (MBCs) are emerging bio-based materials with potential applications in packaging, insulation, and lightweight construction. Their performance is strongly influenced by fungal growth, substrate structure, and the local microenvironment. However, the molecular mechanisms underlying fungal adaptation during growth within intact three-dimensional composites remain poorly understood.

To investigate this adaptation, we used the white-rot fungus *Pycnoporus sanguineus* as a model organism. We combined material characterization with hybrid Nanopore-Illumina genome sequencing, RNA sequencing under defined-media and intact-composite conditions, and direct protein extraction from MBCs for proteomic analysis. This integrated approach was designed to link fungal molecular responses with substrate-dependent composite formation and material properties.

Poster 15

Diversifying material properties of fungal composites by harnessing intra-species heterogeneity of *Fomes fomentarius* on different forestry substrates

Simon Oliver Füßl, Tian Cheng, Johan Philipp Benz
Technical University of Munich

Fomes fomentarius is a white-rot basidiomycete widely distributed across Europe, colonizing predominantly beech and birch along broad climatic and altitudinal gradients. Its dense, resilient mycelium has attracted interest as a basis for mycelium-bound composites (MBC), but work to date has relied on a small number of isolates. To what degree intraspecific variation affects MBC production, and which molecular mechanisms underlie it, remain unknown.

Project A02 within CRC 1743 "MY-CO BUILD" addresses this with a collection of 70 *F. fomentarius* strains from 23 regions in Germany, Austria, Belgium, and Switzerland, spanning six host tree species and altitudes from 12 to 1405 m. A long-read reference assembly provides the genomic backbone, and all strains are being resequenced (Illumina, ~50x) to resolve genetic variation. Strains will be grown on wood-based substrates (beech and spruce), and the resulting composites will be characterized mechanically. Transcriptomic and proteomic profiling will link gene expression and protein abundance to composite performance, particularly structural stability.

The project aims to identify strains with favorable properties for MBC production, resolve the molecular basis of these traits, and define targets for strain improvement. This poster presents the collection, its geographic, host, and climatic structure, and the planned workflow.

Poster 16 Talk at Workshop Scientific Perspective

Three-dimensional hyphal network morphology in *Fomes fomentarius* composites as a basis for multiscale transport modelling

Xinyu Pan, Fangxing Zhang, Minghao Li, Heiko Briesen
Technical University of Munich

Fungal-based materials are renewable composites derived from residual agricultural and forestry resources. Since fungal growth is strongly influenced by environmental conditions, the resulting three-dimensional structure varies, and with it the properties of the composite. We therefore aim to investigate the relationship between the three-dimensional structure of fungal composites, consisting of plant-based substrates interconnected by fungal mycelium, and their resulting end-use properties.

Using μ CT and granulometry-based image analysis, we conduct morphometric characterisation of the fungal network. Segmentation separates the hyphal network from the substrate phase and distinguishes hyphae inside substrate vessels from those in the inter-particle void space. The morphological analysis includes branch length, branching density and branching orientation of the hyphal network, as well as the pore-size distribution of the substrate.

Based on these data, we will develop multiscale models of hyphal growth that explicitly distinguish between two structural levels: microscale growth within substrate vessels and particle-scale network formation between substrate particles. The models enable the in-silico generation of representative structures beyond the imaged volume, which serve as computational domains for pore-scale simulations of effective thermal conductivity and water-vapour transport. The approach thereby links quantitative structural characterisation to the end-use properties of fungal composites.

Poster 17 Flash Talk

Genetic transformation of *Fomes fomentarius*

Carmen Regner*, Justus Zillesen*, Friederike Hoberg, Svenja Elsner, Timothy C. Cairns, Carsten Freidank-Pohl, Vera Meyer

Technische Universität Berlin, *These authors contributed equally (co-first authors).

The white-rot fungus *Fomes fomentarius* can be used to produce lightweight, durable, and flexible materials from agricultural side streams. These materials offer sustainable alternatives from renewable feedstocks in various fossil-based sectors. To leverage the potential of fungal-based materials, a deeper understanding of fundamental *F. fomentarius* biology remains an important objective. Therefore, the establishment of genetic engineering techniques for *F. fomentarius* is an important aspect that can also benefit the material properties made with this fungus.

In the present study, we demonstrate that transformation of *F. fomentarius* with the nourseothricin-based selection marker (natR) is feasible and replicable. Southern blotting and diagnostic PCR confirmed stable, multicopy integration of the donor cassette. Furthermore, we demonstrate that expression of eGFP and mCherry fused to H2B using the heterologous *Schizophyllum commune* H2B promoter is possible. This will enable future protein localization studies. Lastly, we observe high extracellular DNase activity in *F. fomentarius* which might complicate genetic transformation and downstream processing.

In summary, *F. fomentarius* can be genetically transformed using a natR selection system and promoters developed in this study. We have established the framework for overexpression studies and pinpointed several key obstacles that must be addressed to enable precise, targeted genetic editing in this fungus.

Poster 18 Flash Talk

Built to last: What can black fungi teach us about durable biomaterials?

Julia Schumacher, Anna A. Gorbushina

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Current approaches for fungal-based materials primarily rely on fast-growing filamentous fungi that prioritize substrate colonization and biomass production. Rock-inhabiting black fungi use a different growth strategy: instead of maximizing biomass, they invest biological resources into persistence, protection, and stability. Their cells have exceptionally thick cell walls with DHN (1,8-dihydroxynaphthalene) melanin and form compact microcolonies that survive intense solar radiation, desiccation, and temperature fluctuations. This lifestyle is often accompanied by a reduced secondary metabolism, with fewer biosynthetic gene clusters and an apparent lack of toxic or strongly volatile compounds. Among black fungi, *Knufia petricola* provides a genetically tractable model to investigate the biological basis of fungal robustness. We have dissected the DHN melanin biosynthetic pathway and use the resulting strains to investigate biofilm growth, cell-wall architecture, and stress resistance. Efficient genome-editing tools further enable replacement of DHN melanin with alternative pigments, creating opportunities to explore how pigmentation influences structural and functional properties. Black fungi offer traits complementary to those of established fungal material producers and may contribute tailored color, durability, protection, and functionality to future fungal biomaterials. We invite discussion on how principles underlying black fungal persistence may inspire next-generation materials, coatings, and composite designs.

Poster 19 Talk at Workshop Scientific Perspective

Uncovering the transcriptional landscape of *Fomes fomentarius* during fungal-based material production through gene co-expression network analysis

Timothy Cairns, Carsten Freidank-Pohl, Anna Sofia Birke, Carmen Regner, Sascha Jung, Vera Meyer

Technische Universität Berlin

The basidiomycete *Fomes fomentarius* is one leading species for biomaterial production, yet little is known about the transcriptional basis of fungal growth during composite formation. Co-expression network analysis based on RNA-Seq profiling has enabled accurate predictions of gene function in a range of fungi. We aimed to develop such resources for *F. fomentarius*. We profiled gene expression from a numerous of lab culture (n = 9) or biomaterial formation (n = 18) to identify genes important for guiding mycelium formation through hyphal growth and cell wall biosynthesis. Probing co-expression networks revealed a fungal-specific transcription factor named CacA strongly co-expressed with multiple chitin and glucan biosynthetic genes or Rho GTPase encoding genes, suggesting this protein is a high-priority target for engineering adhesion and branching during biomaterials growth. We identified several types of co-expressed contiguous clusters not previously described in fungi, including genes predicted to encode hydrophobins, kinases, lipases, F-box domains, chitin synthases, amongst others. The co-expression data generated in this study will enable us to understand the transcriptional basis of *F. fomentarius* biomaterial formation in unprecedented detail. We confirm accurate network-derived predictions of gene function in *F. fomentarius* and generate the necessary data and scripts for analysis by any end user.

Poster Topic: Fungal Cultivation and Modification

Poster 20 Flash Talk

Optimizing *Trametes versicolor* Mycelial Skin Production by Liquid-State Surface Fermentation in Chemically Defined Media

Rafael Rodrigues Philippini, Piet Dimitriadis, Jara Saluena Martin, Simon Vandelook, Razieh Shafiei-Alavijeh, Annah-Ololade Sangosanya, Lars Dittrich, Anouk Verstuyft, Eveline Peeters
 Vrije Universiteit Brussel

Mycelium-based leather-like materials offer a renewable alternative to animal-derived and petroleum-based leathers. This study used response surface methodology to evaluate the effects of carbon-to-nitrogen ratio (C:N) and culture volume on mycelial skin formation by *Trametes versicolor* SV1 during liquid-state surface fermentation (LSSF). A two-factor central composite rotatable design consisting of 13 experimental runs was conducted with a chemically defined medium over 21 days. Total harvested biomass concentration (X_t) represented the complete recovered mat, whereas net biomass production (P_x) excluded the initial inoculum biomass. Across the design, X_t ranged from 0.701 to 4.356 g L⁻¹, and P_x ranged from 0.205 to 3.860 g L⁻¹. The quadratic model for P_x was highly significant (F-value 24.71; p-value 0.0001), explained 89% of the adjusted response variability, and showed no significant lack of fit. Culture volume was the dominant process variable, followed by C:N ratio. Triplicate validation yielded an X_t of 4.44 g L⁻¹ and a P_x of 4.08 g L⁻¹ at a C:N ratio of 16.65 and culture volume of 46.97 mL, confirming the model. Surface-to-volume ratio correlated positively with P_x and emerged as the principal engineering determinant of LSSF performance. These findings establish a validated operating window and identify surface-to-volume ratio as critical for scale-up.

Poster 21 Flash Talk

PRIMEAnalysis - A Module for Multi-Criteria Assessment of Bioprocess Models

Robert Knorre, Daniel Stors, Terrance Wilms, Steffi Knorn
 Technische Universität Berlin

Process modeling is a key contribution to sustainable process design, monitoring, and control. Therefore, developing and selecting the most suitable model for a given modeling task is of utmost importance. Although recent developments suggest different selection criteria combined with analytical algorithms to determine model suitability, no unified framework exists within the domain of bioprocess modeling. This research formulates an inclusive investigation which determines the best fitting model out of an ensemble of candidate bioprocess models. The goal is to analyse models describing the cultivation of *Fomes fomentarius* within the MyCoBuild research project. Therefore, a Python framework is developed, integrating numerical methods across several stages of model assessment. In this research, model optimality is defined as the model being structurally and practically identifiable, having the highest fit to measurement data and exhibiting the lowest prediction uncertainty relative to measurement uncertainty. First, structural identifiability is assessed in combination with data quality for the subsequent parameter identification (PI). After PI, practical identifiability and numerical conditioning are checked. Finally, parameter and model prediction uncertainties are quantified together with goodness-of-fit measures. The combination of all analytical stages concludes and ranks the most suitable model for the intended application.

Poster 22

Challenges of Submerged Stirred Tank Reactor Cultivations of *Fomes fomentarius*

Daniel Stors, Terrance Wilms, Steffi Knorn
 Technische Universität Berlin

The cultivation of *F. fomentarius* in stirred tank reactors (STR) is a promising process for further research on the growth dynamics of the fungus on one hand, and for biomass production for further process steps in the production chain of mycelium-based materials on the other hand. Controlling the morphology and physiology of the fungus during STR-cultivations enables an increase in the efficiency of the following process steps. STR-cultivations of *F. fomentarius*, however, are challenging due to strong growth on the walls of the vessel and a tendency for the mycelium to aggregate and fall out of suspension. In first preliminary experiments, we found that *F. fomentarius* grows faster at lower stirrer speeds at the beginning of the cultivation, but it tends to form larger pellets and aggregate stronger. As this aggregation of biomass leads to inhomogeneities in the reactor and conflicts with the assumption that the reactor is ideally mixed, which is at the heart of all unstructured modelling efforts, it is vital that a solution to this problem is found. Understanding the mechanisms of the changes in morphology with respect to reactor conditions enables controlling of the fungal morphology during cultivation.

Poster 23 Flash Talk

Color is Alive: Coloration of Fungal Engineered Living Materials across Different Stages of Aliveness

Anouk Verstuyft, Eveline Peeters, Elise Elsacker, Niko Van den Brande
 Vrije Universiteit Brussel

Fungal materials are commonly colored using approaches inherited from textile, leather, and polymer processing. These methods assume a stable, uniform, and biologically inactive substrate. Fungal materials are none of these: their composition, architecture, and metabolic activity change throughout growth, maturation, and inactivation. 'Color is Alive' investigates how fungal species, physiological state, and colorant chemistry determine coloration outcomes. Mycelial mats of *G. resinaceum*, *G. sessile*, and *T. versicolor* are colored with Brilliant Blue FCF, Reactive Black 5, or logwood extract. Colorants are introduced at 3 processing stages: during active growth, after culture maturation while the material remains metabolically active, and following material inactivation. The resulting materials are evaluated for color uptake and distribution, growth and decolorization, hyphal morphology, and color release. Macroscopic color is quantified using CIELAB coordinates and CIEDE2000 color differences across independently grown mats, while light microscopy and scanning electron microscopy examine color localization and changes in hyphal architecture. A standardized aqueous exposure followed by spectrophotometric analysis of the wash liquor assesses colorant release. Comparing three fungi, three colorants, and three physiological states identifies when conventional coloration methods remain applicable and when fungal activity and structure require different processing strategies. The resulting framework supports selection of species, colorants, and processing stages for reproducible fungal-material manufacturing.

Poster 24

Light-Guided Design of Fungal Materials: Programming Color and Pattern through Optogenetics

Létitia Leydet, Štěpánka Nedvědová, Asim Mohamed, Wilfried Weber
 INM - Leibniz Institute for New Materials

Interest in fungal biofabrication is expanding boundaries between biology, materials and design. This project investigates the valorization of decayed and recycled wood as a substrate for fungal biofabrication, with a particular focus on generating colour, pattern, and surface characteristics directly through biological growth processes. Rather than treating aesthetics as a post-processing step, we are exploring how fungal or microbial colonization can be harnessed as a direct design tool. This project focuses primarily on strategies for controlling the development of pigmentation and patterns, which allow the material's properties and appearance to be shaped simultaneously during growth.

By combining principles from the fields of materials science, synthetic biology, optogenetics, and bio-fabrication using fungi, we are exploring ways to create programmable fungus-based materials in which both the structure and the aesthetic appearance are generated biologically. This approach supports the circular use of degraded wood resources while expanding the design possibilities of mycelium-based materials beyond purely structural properties. Preliminary prototypes and experimental results will be presented, highlighting opportunities for customized surfaces, interior elements, and future applications in fungal-based design and construction.

Poster 25

Particle-assisted cultivation of the white-rot fungus *Fomes fomentarius* in shaken cultures across scales

Julie Mathiesen¹, Tölue Khierkhah², Peter Neubauer², Stefan Junne¹
¹Aalborg University Esbjerg, ²Technische Universität Berlin

The white-rot basidiomycete *Fomes fomentarius* is a promising candidate for fungal composites based on lignocellulosic substrates [1]. Fungal morphology significantly influences both growth and metabolic activity; however, modulating these characteristics in shaken cultures without increasing energy input remains challenging. At the same time, a random morphology leads to different flow regimes, substrate uptake, and gas mass transfer characteristics, which have a great impact on the process performance. Particle-supported cultivation could be a suitable approach for achieving reproducibly specific morphological structures. Here we demonstrate how particles of varying composition (inert and lignocellulosic), size, and concentration lead to specific morphologies and growth in both well-plate and shake flask cultures. We demonstrate that fungal morphology can be shifted from large, dense pellets to loose clumps and fully dispersed growth. This makes it possible to achieve specific surface colonization properties for biomaterial production as early as the screening phase. The investigations are combined with computer-aided image recognition, which enables the correlation of specific structures with adhesion and growth properties. The applicability of this approach to two-dimensional oscillating bioreactors with pH and oxygen control and a working volume in the liter range [2] is currently being investigated to create a platform suitable for seed cultivation.

[1] Pohl, C., Schmidt, B., Nunez Guitar, et. al. (2022). Fungal Biology and Biotechnology, DOI:10.1186/s40694-022-00133-y

[2] Khierkhah, T., Neubauer, P., Junne, S. (2023). Biochemical Engineering Journal, DOI:10.1016/j.bej.2023.108905

Poster 26 Flash Talk

FungAI: AI-assisted digital monitoring and predictive characterization of fungal materials

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Mycelium bio-composites (MBCs) are promising sustainable alternatives for packaging, insulation, and construction, but industrial adoption is hindered by variability in material properties and the lack of standardized, non-destructive quality control methods. FungAI investigates the use of computer vision and artificial intelligence to support automated assessment of MBC growth and, ultimately, predict material performance from image data. MBC samples produced under laboratory and industrial conditions using *Ganoderma* spp. were photographed during incubation and drying and characterized for thermal conductivity, compressive response, shrinkage, mass loss, and surface hydrophobicity. Visual and material datasets were integrated to classify samples as undergrown, optimally grown, or overgrown. The AI model achieved 84% classification reliability, demonstrating the potential for automated growth-stage assessment. Distinct differences in surface coverage, fibre exposure, texture, pigmentation, and material performance were observed across growth stages. Preliminary trends indicated that optimally grown samples combined low thermal conductivity, high hydrophobicity, and improved mechanical response. These findings support the development of AI-assisted, non-destructive quality control tools and future predictive models linking visual growth characteristics to final MBC properties.

Poster 27

Photophysiological Strategies for Living Mycelium Materials

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Most envisioned uses of mycelium-based materials relegate the fungal biomass to a passive structural role, relying on mycelium deactivation after fabrication. Nevertheless, as a whole-cell material, the native responses of mycelium can be harnessed in fine-tuned environments to produce programmable behaviours such as sporulation or morphogenesis. To reliably trigger these responses, we investigate light as an external control input, leveraging its role as a critical parameter in fungal physiology and its high degree of engineerability.

To study the effect of light on mycelium materials, *Trametes versicolor* was grown using liquid static surface fermentation under different light conditions. UV light (365 nm) imposed a high spatial fidelity photomasking phenomenon and led to an increase of ~60% in ultimate tensile strength. UV as well as blue light (465 nm) induced reproductive behaviours such as asexual sporulation (up to $\sim 3 \times 10^4$ spores/cm²) and hyphal aggregation. Discontinuous green light (536 nm) raised biomass in localized regions, yet this gain did not translate into better mechanical performance.

Thus, light becomes a programmable handle on fungal physiology, turning mycelium from a passive scaffold into a material whose structure and function can be steered from manufacturing to application.

Poster Topic: Manufacturing and Material Prototypes

Poster 28 Flash Talk

Fungal Mycelium as a Bio-Based Interfacial Modifier for Flax Fibre-Reinforced Epoxy Composites

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This study investigates fungal mycelium as a bio-based surface modifier for natural fibre reinforced polymer composites. Flax fibre laminates with 11-ply of flax fabric were manufactured by vacuum infusion using an epoxy resin system. The fungus *Trametes versicolor* was utilized to modify the fibre surface. Five fibre conditions were investigated: untreated fibres, fibres sterilised in an autoclave process (121 °C) and fibres colonised by mycelium with incubation times of 1, 2 and 4 weeks. The composite materials properties were assessed through flexural tests (longitudinal and transverse), water absorption and swelling behaviour. Additionally, microstructural changes resulting from the fibre treatments were analysed using polished cross-sections and microscopy to investigate the interaction between the mycelium and fibre surface. Initial results show that the highest transverse flexural modulus was achieved after two weeks of mycelium growth, indicating improved interfacial adhesion in this configuration. For both, the autoclaved fibres and the samples with one week of mycelium growth, reduced stiffness values were observed in both orientations, suggesting microstructural changes affecting the load transfer. These results highlight the potential and further optimization possibilities for mycelium-based interface modification as a sustainable strategy for modifying composite interfaces.

Poster 29 Talk at Workshop Scientific Perspective

Circular Biobased Mycomaterial

Jitka Effenberger, Martin Kaltenbrunner, Robert Koeppe, Cornelia Rieder-Gardinger, Oliver Vay, Florian Lauberger, Christoph Preimesberger, Axel Solt-Rindler, Christian Hansmann
 Johannes Kepler Universität Linz

This presentation introduces an exhibition of prototypes exploring the potential of fungal mycelium as a regenerative building material and illustrating its practical application in architecture. Through material studies and wall modules, the work showcases construction details developed within an experimental, low-tech approach for the building sector.

This practical exploration is grounded in the investigation into mycelium-based insulation panels on a straw basis, conducted within the research project "Mycos-Insulation" (2022-2025). The research resulted in the scientific publication, "Properties of a mycelium-bonded wheat straw insulation panel" (Vay et al. 2026).

The work bridges the gap from fundamental material science to applied architectural solutions, demonstrating an experimental approach on the constructional application of mycelium-based composites and investigates the potentials and limitations of mycelium-bonded wheat straw insulation panels using the fungi *G. lucidum*.

Poster 30 Talk at Workshop Scientific Perspective

My.Le - Additive Manufacturing of Insulating Brick Components Made from Mycelium and Clay

Philipp Eversmann, Markus Schein, Eva Bullermann, Omar Abdelhady, Kea Stockbrügger
 Universität Kassel, Detmolder Schule für Gestaltung

Alongside concrete, bricks and brick-based insulation systems are among the most widely used building materials. Their production involves substantial material flows and high energy consumption. The My.Le project addresses this issue by developing thermally insulating and sound-reducing building components from unfired clay, organic substrates, and fungal mycelium. The project investigates clay-based composites with lignocellulosic substrates colonized by mycelium, aiming to tailor their thermal, acoustic, and structural properties. Additive manufacturing tests examine material printability and optimize component geometries for a durable, material-efficient connection between clay and mycelium substrate. Building-physical and structural tests characterize the resulting composites, while prototypes demonstrate potential applications.

The project has now been running for 10 months and we look forward to sharing insights into our work on the project so far, as well as our initial approaches and findings, during the conference.

Poster 31 Flash Talk

MEX-AM Meets Mycelium: From Separate Materials to Hybrid Structures

Narges Panjalipoursangari, Christina Völlmecke
 Technische Universität Berlin

Fungal mycelium and polymer-based additive manufacturing represent two very different approaches to creating materials and structures. Bringing them together opens a broad design space in which biological materials can be combined with the geometric freedom and reproducibility of material extrusion additive manufacturing (MEX-AM).

This work explores different ways of combining MEX-AM polymers with mycelium and other bio-based materials following the group's established Make--Break--Simulate approach. Examples range from post-printing colonization of polymer and lignocellulosic specimens with *Fomes fomentarius*, to direct printing of biodegradable reinforcement patterns onto cellulose- and mycelium-based membranes, and finally to additively manufactured lattice structures combined with mycelium-based infill. Experimental mechanical characterization, digital image correlation, mechanics-based modelling, and environmental assessment complement the fabrication process and help to understand the resulting material and structural interactions.

Rather than considering additive manufacturing and fungal materials separately, these examples demonstrate how their combination can be explored across different scales and configurations. In particular, direct MEX-AM reinforcement of compliant bio-based membranes illustrates how digital fabrication can introduce targeted mechanical function while maintaining the biological material as an integral part of the hybrid structure.

Poster 32

Automated Mycelium: Fabrication Strategies for Integrated Formwork and Modular Reinforcement in Architectural Applications

Moritz Plöns, Sven Pfeiffer

Bochum University of Applied Sciences

The building industry is one of the most resource-intensive sectors. To address this issue, researchers from multiple disciplines have identified Mycelium-Based Composites (MBC) as a promising alternative to conventionally used building materials.

Whilst several projects show how mycelium-based materials can be applied in architectural spaces, widespread architectural adoption remains constrained by low structural capacity and a reliance on manual fabrication processes. This research investigates automated fabrication strategies for permanent integrated formwork and modular reinforcement in MBCs to enhance structural performance without compromising biodegradability.

Through a research-through-design methodology and iterative physical prototyping, a full-scale (1:1) modular wall-and-door assembly is fabricated and evaluated. This demonstrator will enable the evaluation of the fabrication method as well as the resulting architectural, material, and spatial qualities — assessing how automated fabrication expands design possibilities beyond what manual production allows.

The proposed research contributes automated fabrication strategies and design guidelines for structurally reinforced MBCs, supporting future scale-up strategies and the integration of ecological building materials into the sector of architecture.

Poster 33 Flash Talk

From craft to building systems: investigation of upscaling solidified textiles from MBC-textile-hybrid filaments

Anne-Kathrin Kühner, Eliza Biala, Martin Ostermann

University of Stuttgart

Textile techniques have always been part of architectural practice, from woven walls to tensile membranes. Textile systems do not merely produce surfaces. They define spatial logic. The project presents an innovative method for producing MBC (mycelium-bound composite) structures, in which MBC biomaterials are used as a filling within a textile mesh sleeve, functionalised as filaments and processed using textile construction techniques.

MBC filaments' are produced by stuffing textile sleeves with a substrate that has been inoculated with mycelium in paste form, manually or semi-automatically.

Due to the composition of the sleeve and the filling, the minimum filament diameter is already significantly larger than that of a conventional textile, and can be upscaled further. Parameters such as the material combination, amount of material and textile construction influence the resulting upscaled solidified textiles.

Textiles are made of yarns or filaments that are processed by textile construction techniques into surfaces. The focus is particularly on the techniques of knitting and weaving. The MBC filament can be used in warp and weft, alone or in combination with other materials such as natural fibres/warp threads.

This practice-based research explores textile craft within an architectural context through testing. A distinctive characteristic of textiles, their limpness, flexibility and adaptability, which is determined by their material and construction, makes it challenging to predict their behaviour in advance, as is also the case in this project, prior to solidification.

Poster 34 Flash Talk

Bio-welding of mycelium-bound composites increases their mycelium content

Marcello Nussbaumer, J. Philipp Benz

Technical University of Munich

Mycelium-bound composites (MBCs) are usually covered by a continuous layer of mycelium due to good heat and oxygen exchange on the material surface. Growth conditions are typically less optimal towards the core, especially for larger composites, which can result in weaker cohesion. One approach to tackle this issue is the bio-welding of stacked layers. So far, it is unknown to what extent the mycelium content can be increased with this technique. Using quantitative PCR, we estimated the mycelium content of different MBCs based on beech wood sawdust: Monoliths with heights of around 50 mm and 12.5 mm, as well as bio-welded composites consisting of four 12.5 mm layers. Additionally, we determined the density profile and internal bond strength of (bio-welded) MBCs. We found that the mycelium content was higher in thinner and bio-welded composites. Despite a drop in density, failure did not necessarily occur at the bio-welding interface. When removing the surface mycelium from the sides, it was mostly the individual layers that fractured rather than the interface. Our results showed that bio-welding successfully counteracted growth limitations and suggest it is not a weak point in composites with large cross-sections, where the contribution of surface mycelium is negligible.

Poster 35 Flash Talk

Mechanical properties of composite materials produced with the tinder fungus *Fomes fomentarius*: Benefits of modular design based on topological interlocking

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⁴Weissensee School of Art and Design Berlin, ⁵Monash University, ⁶The University of Western Australia

Fungal mycelium-based composites are emerging as sustainable alternatives to conventional fossil-based building materials. *Fomes fomentarius* has been successfully used to produce such composites from renewable plant biomass, although existing studies highlight limitations for certain architectural applications. Transitioning from monolithic to modular structures based on topological interlocking (TI) may help address these issues. Such concepts have been explored previously, but the mechanical behaviour of assemblies of interlocked fungal mycelium-based blocks has not yet been characterised.

This study presents the first mechanical assessment of a topological interlocking assembly (TIA) of osteomorphic fungal mycelium-based composites under in-plane and normal loading. Whereas monolithic plates failed catastrophically, TIAs preserved structural integrity, with cracks confined to individual blocks. TIAs also accommodated substantial structural and compositional variability while maintaining load-bearing capacity—an important advantage given the inherent heterogeneity of biological materials. These findings indicate that TI structures offer promising benefits for architectural applications of fungal mycelium-based composites.

Poster 36 Flash Talk

Investigation of adhesion of mycelium-based composites with conventional building materials

Adrian Keilhauer, Tim Doeringer, Raya Allataifei, Konrad Byron, Eliza Biala, Martin Ostermann
 University of Stuttgart

Mycelium-based composites possess the capacity to bond with each other (biowelding) as well as with other materials (textiles, veneer, etc.). However, quantitative research on this characteristic remains limited.

This study investigates the adhesion performance of *Ganoderma lucidum* mycelium-based composites with both biodegradable and non-biodegradable building materials. Following a pilot study, systematic shear and tensile strength tests were conducted.

Results demonstrate substrate- and material- dependent bonding behaviour. Wood exhibited consistently strong adhesion, with failures occurring within the mycelium body rather than at the interface, indicating reliable adhesion. Concrete exhibited variable, but occasionally exceedingly high, strength and adhesion, in some cases surpassing synthetic polyurethane mounting adhesives. In contrast, stoneware ceramic showed consistently poor bonding, with failures limited to the interface, reflecting its smooth, non-porous surface.

These findings establish that mycelium is not a universal adhesive but a material-specific bonding agent with promising applicability in both timber construction and renovation of existing concrete structures. The study underscores its potential to reduce reliance on petrochemicals and contribute to circular material economies. It also identifies the need for targeted surface engineering and further research to assess compatibility with various construction materials and to broaden understanding of the mycelium-driven adhesion mechanism at the microscopic level.

Poster 37

Additive Manufacturing of Living Fungal Mycelium for Lightweight Three-Dimensional Materials

Huaiyou Chen, Bertram Schmidt, Andrew Gennett, Aleksander Gurlo, Vera Meyer, Ulla Simon
 Technische Universität Berlin

Fungal mycelium-based materials provide an opportunity to transform renewable lignocellulosic resources into lightweight materials to substitute petroleum-derived products. However, conventional formwork fabrication limits design flexibility and likely to produce more plastic moulds for cultivation. Here, we demonstrate extrusion-based additive manufacturing of living *Fomes fomentarius* to fabricate lightweight three-dimensional mycelium composites with defined geometries. A water-based formulation containing living fungal biomass, rapeseed straw and sodium alginate was extruded and deposited through a 1.6 mm nozzle. During fungal growth, manual compression was applied to restrict excessive growth and preserve the intended geometry. Comparing different inactivation and drying strategies, freeze drying most effectively retained the structure of the printed objects. The resulting composites were super lightweight with a bulk density of approximately 0.06 g/cm³ and the surface is highly hydrophobic with a water contact angle of about 150°. Furthermore, the dehydrated three-dimensional printed composite allows for clean separation between the compressed aerial mycelium and the sacrificial printed scaffold, maintaining high fidelity to the complex geometry. These results demonstrate a new strategy for producing renewable, geometrically complex mycelium composites as well as three-dimensional pure-mycelium skins.

Poster 38 Flash Talk

Additive-free complex three-dimensional foams and papers from the basidiomycete *Fomes fomentarius*

Huaiyou Chen, Maged F. Bekheet, Bertram Schmidt, Cekdar Vakifahmetoglu, Carsten Freidank-Pohl, Vera Meyer, Aleksander Gurlo, Ulla Simon
 Technische Universität Berlin

Bio-based, biodegradable, and of renewable origin, fungal mycelium-based materials are a promising class of materials that could substitute unsustainable raw materials, such as non-biodegradable polymers in the future. When sourced from agricultural, forestry, and food side streams, lightweight fungal mycelium-based composites with zero or even negative carbon footprints can be manufactured. Pure fungal mycelium mats are produced by either separating the surface layer of fungal mycelium from growing composites or by harvesting fungal mycelium biomass in liquid culture, followed by post-processing. In this work, we introduce a post-growth material-processing strategy that separates fungal cultivation from product manufacturing. Thus, we are addressing an innovative manufacturing process that is independent of the as-grown geometry of the fungal mycelium.

Furthermore, this water-based process avoids the use of harsh chemical additives and does not require operation under low-germ conditions. With it, we can produce fungal mycelium-based papers and aerogel-like foams consisting of 100% fungal mycelium. Various properties, such as shape, porosity, and surface properties, can be controlled by varying processing conditions.

Poster 39 Flash Talk

MykoPlektonik Intertwining the biological and the built environment Mycelial Growth for Structural Textiles: Cultivating Material Practices across Architectural and Urban - Tectonic Scales

Natalija Miodragovic¹, Dimitra Almpanti-Lekka¹, Bertram Schmidt², Vera Meyer²

¹Humboldt-Universität zu Berlin,

²Technische Universität Berlin

Bio-driven design bridges knowledge of mycelial growth in filamentous fungi with architectural applications across urban - tectonic scales, employing filament- and fiber-based techniques from biology, basketry, and the textile industry, alongside local biomaterials such as fungi, willow, hemp, flax, and wool.*

How can we extend our bodies, systems, and architectures to meet our fiber–fibril–filament biological world halfway? The research explores mycelial biofilm as textile-making across multiple scales and configurations to envision new architectural systems. It conceptualizes the cell membrane as a semi-permeable harvester and filter; hyphae as investigative yarns engaged in weak interactions; and mycelium as an intelligent, filamentous, branching structure for redistribution in society.

Drawing from microbiology, biotechnology, and scavenging practices, the project investigates liquid-culture-based mycelial growth on woolly, fibrous substrates in synergy with the Structural Textiles system. Based on warp knitting - Wirken - and continuous wooden yarns, the system creates complex surfaces with programmable loop sizes and elastic properties. The resulting biofilm coats, binds, and stabilizes the structure while preserving softness and elasticity, enabling textile-making through biological growth.

The resulting models and experiments take the form of (post-)critical prototyping. Transdigital immersive prototypes enable embodied experiences, encouraging self-reflection and diffraction towards a new material culture rooted in awareness and care. Workshops and exhibitions extend the research into collective experiences.

Poster 40

Hybridisation of mycelium-based composites with elastic textiles lost formworks for novel complex geometries biofabrication in architecture

Eliza Biala, Piotr Baszynski, Martin Ostermann
 University of Stuttgart

As mycelium-based composites (MBCs) are the first biomaterials, in the context of architecture, which allow moulding, they can be used in the waste-free additive fabrication of complex geometries. For repeatable production, reusable moulds are a suitable solution. However, custom production, inherent to architectural design, is impossible with this approach, as the environmental cost of producing the single-use mould (usually polypropylene) exceeds the benefits of using biofabricated material.

Paring mycelium-based composites (MBC) with textiles has been explored in multiple studies over the past few years and has proven to offer several advantages for MBC, such as reinforcement and form-giving. A particular case of such a forming approach is the use of elastic knitted textiles as lost formwork. In contrast to earlier examples, which employed custom CNC knitting (Yogiama 2020), this approach utilises off-the-shelf textiles and their inherent capacity for deformation.

Mycelium-inoculated substrate, in the form of a paste, when applied to a tensioned textile, deforms it, creating doubly curved or bulged geometries. The target geometry is achieved by regulating attachment points or lines at the perimeter of the geometry and tension strength. During the growth phase, mycelium solidifies into tensile geometries and creates a continuous air-mycelium layer on top of the textile, encapsulating it and making it invisible.

The study presents exploratory geometric studies of this forming approach: from one-off small models to medium-sized (50 x 50 cm) concave and bulged units to forms fabricated serially for deployment in the art installation context (600 pieces, 50 x 50 cm units). Subsequently, it speculates on its architectural and product-design potential in the context of individualised production.

Poster 41

Fungilation: investigations in mycelium-natural fibres interoperability for mycelium-based composites reinforcement

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Hybridisation of mycelium-based composites with natural fibre textiles has been thematised in multiple research studies as a method that can contribute to multiple goals: improving predominantly tensile properties of the composite, enhancing composite surface durability, or driving new speculative fabrication processes. However, the fundamental knowledge of the interaction between different natural fibre yarns and mycelium is very scarce.

The project Fungilation aims to fill this gap by conducting research to test the interoperability and bioreceptivity of different natural fibres in a cross-scalar method. The research framework encompasses experiments ranging from single yarns and their mycelium-growth-induced influence to textile sheets and their assemblies with particulates and mycelium-inoculated substrates.

The presentation aims to provide insight into the ongoing study, elaborate on the variables influencing and challenging the investigation process, and demonstrate the new avenues of investigation arising in the process.

Poster 42 Flash Talk

Radiolarian Myco-Luminaires: A Computational Design and Composite Mycelium Fabrication Workflow

Christos Kourtidis Vlachogiannis^{1,2}, Xristina Sarli³

¹University of West Attica; ²Decode Fab Lab, Greece; ³TOP Lab Berlin

This research explores the design and make of complex, organic geometries through a novel composite mycelium fabrication methodology. Initially, the design was inspired by the intricate morphology of marine radiolaria and fungal organisms illustrated in Ernst Haeckel's "Kunstformen der Natur" (1904). A primary objective was to minimise fabrication waste by entirely eliminating temporary 3D printing supports. To achieve this, a workflow was developed which combines computational design, digital fabrication, and mycelium cultivation. The forms are parametrically generated, and 3D printed by 100% biodegradable wood PLA filament. This structure acts as a permanent and breathable outer scaffold. Inoculated mycelium substrate of straw and "*Ganoderma Lucidum*" is inserted into the intricate shell and shaped using a simplified, negative inner mould. This allows the wood PLA and mycelium to aggregate into a unified composite, as the mycelium grows and covers the scaffold. This process ensures minimal material usage while providing necessary aeration for fungal growth. As a proof of concept, a functional lampshade was successfully cultivated over a seven day period, including two days of unconstrained growth in an incubation box. Ultimately, this project demonstrates a sustainable, zero-waste fabrication paradigm that successfully bridges computational design and biological growth to create ecological design applications.

Poster 43 Flash Talk

ROBOHAB - Providing deadwood microhabitat substitutes for animals in cities using 3D-printed wood-mycelium structures

Elena Reitberger

Technical University of Munich

Due to its profound alterations in land use and cover, urbanization is widely recognized as a major driver of biodiversity loss. Despite this, recent research on biodiversity occurring in cities and urbanized areas highlighted that a considerable number of regionally occurring and endangered species are still present within the urban environment, demonstrating that cities hold promising, yet often unused, potential for biodiversity conservation. To harness this potential, promoting the presence of deadwood structures, which are typically scarce in cities for a variety of reasons, is essential.

The ROBOHAB project combines established methods and knowledge from urban ecology research with recent advances in 3D-printing technologies and fungal biotechnology by developing substitute structures of deadwood microhabitats consisting of wood-mycelium printing mixtures using liquid deposition modelling. Subsequent field testing will allow the assessment of material properties and evaluate whether such substitute structures are accepted by various animal groups. The results will be further implemented into the project and used for the refinement of manufacturing of wood-mycelium mixture structures and the upscaling of complexity of printed deadwood substitutes.

Poster Topic: Performance and Durability

Poster 44 Flash Talk

Protection of fungal-based materials from stored product insects

Christina Müller-Blenkle, David Gradl, Helge Schmitt, Cornel S. Adler

Julius Kühn-Institute; MycoLutions GmbH

Fungal-based materials will likely play an important role in future building and insulation as they offer a compostable alternative for conventional insulation material. While rapid composting at the end of the service life is desirable, insect infestation must be prevented during use. Stored product insects specialized on dry conditions and hard substrates could be attracted by the fungal material causing damage and leading to customer dissatisfaction. Samples of fungal-based materials with different surface properties (fungal skin or aerial mycelium layer) or with added repellents were exposed to four stored product insect species. The experiment ended with hatching of F1 adults. Samples were examined for damage and change in weight.

All species caused some damage of the samples, with different specific patterns; the Black Larder Beetle (*Dermestes haemorrhoidales*), however, caused severe damage resulting in a weight loss of up to 63%. Preliminary results with quassin, an extract from the bitterwood tree suggests that quassin may not have a repellent effect on all tested species. While the experiments showed that the species can damage the samples under favourable conditions when food substrate is present, future experiments will determine whether they can thrive exclusively on fungal-based materials and thus pose a threat.

Poster 45

When MycoBuild feeds insects – how to prevent destruction before time

Cornel Adler, Bertram Schmidt, Miriam Hesse, Annika Baudisch, Alva Kahra
 Julius Kühn-Institute

Stored product insects break down dry organic matter and thus facilitate microbial activity and humus formation. In suitable substrates they feed, hide, and propagate. Respiration allows insects to thrive in rather dry materials, additional water is produced by oxidizing carbohydrates. This presentation summarizes experiments on how to reduce insect attack on mycelia in insulating materials based on tinder fungus *Fomes fomentarius*. On trees, tinder fungi are protected by their hard outer surface. Thus, physical conditions at the end of mycelial growth to produce insulation materials may be crucial. Water is another deciding factor: While our test specimen survived outdoor conditions in a sun-exposed spot under a roof from spring to fall, exposure to rain caused total destruction of fungal materials in a few months. In the lab, some protection of test specimen was achieved by desiccants like diatomaceous earths and frass deterrents like Azadirachtin from seeds *Azadirachta indica*. If test specimens are impregnated with a protectant after production, even distribution and the thickness of the protective layer is important. Insulation materials that are cut to fit on a construction site may need protection throughout the body rather than a surface treatment. Here a desiccant may be the more stable choice.

Poster 46 Flash Talk

Research on the Interfacial Interaction between *Fomes fomentarius* and Classical Building Materials for Durable Hybrid Composites

Chen Hou, Christian Lehmann
 Technische Universität Berlin

Combining Mycelium-Based Composites (MBCs) with conventional building materials offers a promising strategy to overcome the mechanical limitations of standalone MBCs, potentially expanding their application in the construction sector. However, the interactions and bonding mechanisms between fungal mycelium and inorganic materials remain poorly understood. This research investigates the interfacial behaviour between *Fomes fomentarius*-based MBCs and a broad matrix of conventional building materials to establish a foundation for the development of durable hybrid composites.

The research is currently in the initial sample preparation stage and has successfully produced multi-layer sandwich samples by bonding shredded active MBCs to concrete, clay, steel mesh and heat-pressed MBCs through natural hyphal growth. The combined materials will expand to include foam glass, bricks, natural textile fibres, timber and some 3D printing materials. Interfacial properties will be systematically evaluated through tensile bonding strength, lap-shear, and 3-point bending tests, complemented by microstructural and chemical characterisation using SEM-EDX, micro-CT, XRF, and FTIR. Critical parameters influencing interfacial bonding will be analysed as well. Material combinations demonstrating promising interfacial performance will subsequently be selected for durability testing under controlled environmental conditions. Finally, the structural viability of selected hybrid formulations for 3D printing applications will be explored.

Poster 47 Flash Talk

Optimizing Fungal Composites for Sustainable Construction Through Advanced Processing and Functional Additives

Attila Ibuk, Frank Dehn
 Karlsruhe Institute of Technology

In line with SFB C01's objectives, this research explores challenges of bio-based insulation by advancing *Fomes fomentarius*-based fungal composites through a multidisciplinary approach. Key aspects include:

1. Lyophilisation, which preserves mycelial architecture and links structural integrity to thermal buffering performance—optimizing heat transport mechanisms;
2. Phase-change materials (PCMs), integrated not only as insulators but as functional additives that enhance specific heat capacity, transcending conventional thermal conductivity paradigms;
3. Bio-based flame-retardants (e.g., seaweed and corn steep water), suppressing flammability while eliminating petrochemical dependency;
4. Spheroid mycel formation, addressing processing bottlenecks to enable scalable pneumatic deposition.

Hypotheses are evaluated via standardized methods: fire resistance through small-scale burner tests, thermal properties via heat capacity/conductivity assays, and hygrothermal behavior per current norms, alongside processing issues addressed through pneumatic trials.

Preliminary insights reveal correlations between freeze-dried treatment and improved thermal buffering, while the pneumatic insulation technique bypasses processing challenges and improves processability. These findings advance the development of sustainable bio-based insulation, aligning with SFB C01's vision of resilient, eco-efficient building physics.

Poster Topic: Transdisciplinary Learning and Teaching

Poster 48 **Poster withdrawn, but Talk at Workshop Art/DIY Perspective**

Myco Art - a networkological approach in practice

Theresa Schubert
Independent artist

Fungi have become powerful figures for rethinking ecological relationships, distributed intelligence, and more-than-human collaboration. This presentation introduces "Myco Art" as an artistic methodology that not only represents fungal life but adopts mycelial principles as a model for artistic research and practice.

The presentation introduces Theresa Schubert's artworks and their development processes, offering insights into how artistic concepts evolve through experimentation with living fungal systems, laboratory research, and interdisciplinary collaboration. Combining bioart, media art, and biotechnology, her practice creates living installations, performances, and immersive environments in which fungi become active collaborators rather than passive subjects. Through cultivation, microscopy, environmental sensing, sound, and computational media, her works investigate fungal perception, communication, and agency, challenging conventional notions of authorship, intelligence, and control.

The talk also presents outcomes from Schubert's long-term collaborations with microbiologists, biotechnologists, and environmental researchers, demonstrating how art-science exchange can generate new modes of ecological inquiry. Her artworks including "Sound for Fungi" and "Hylē" explore how artistic research makes the hidden dynamics of fungal networks perceivable while fostering alternative ways of thinking about technology, ecology, and multispecies coexistence. www.theresaschubert.com

Poster 49 **Talk at Workshop Art/DIY Perspective**

Why I write about fungi

Corrado Nai
Independent scholar and science writer

I would like to present my journey from researching fungi to writing about them for magazines such as New Scientist and Fungi Magazine. I am particularly interested in the public perception of fungi and in how fungi influence the arts, in particular literature and cinema. Constantly baffled that fungi are essential but ignored by most people, I am inspired by fungal artists who surprise and intrigue their audience while educating about fungi. In this session, I hope to get inspired by fungal artists and explore possible collaborations. Artists who wish to connect and share their profile can join the Fungal Artist Open Directory at <https://docs.google.com/forms/d/1o9W4RFesyW8VSX-r2DXqWq5IfE0nUOvjOvJS7PWmIoA/> (please be aware that data can potentially be accessed by everyone). The long-term goal would be to map fungal artists worldwide and see how different fungal forms are affecting various artforms!

Poster 50 **Flash Talk**

Shaping Perception: Material Expression and Terminology in Fungal-Based Materials

Gudrun Rauwolf¹, Sven Pfeiffer², Nina Langen¹

¹Technische Universität Berlin, ²Bochum University of Applied Sciences

Background and study objective. Sustainable construction requires low-impact material systems. Fungal-based materials offer promising potential, but their unfamiliarity may influence acceptance. User feedback is therefore important for material-driven design processes. This study investigates a door as a use case and examines the effects of (1) senso-aesthetic material expression and (2) different descriptive name variants of the material on its evaluation and acceptance. **Material and methods.** In a randomized study, 120 visitors at the Long Night of Science were presented with digital door representations alongside physical samples. A 3 × 3 mixed-design varied material expression (high aerial-mycelium/soft, moderate aerial-mycelium/medium, no aerial-mycelium/hard) and naming (fungus/mycelium/bio-based). Participants evaluated visual, haptic, acoustic, and olfactory properties and the descriptive name of the material.

Results. Material expression significantly affected evaluation, with harder samples receiving more positive ratings. The strongest effect was found for haptic evaluation, followed by acoustic and visual evaluation; smell was unaffected. Neither naming nor its interaction with material expression significantly influenced evaluation. However, naming affected trust when explicitly assessed: bio-based received the highest trust ratings, followed by mycelium and fungus. Future research should examine use-case-specific material expressions and the robustness of communication strategies across explicit and implicit measures of trust and acceptance.

Poster 51 Flash Talk

Teaching Fungi

Bertram Schmidt, Christian Lehmann, Paul Bochow, Alex Gross, Ulla Simon, Lena Heber, Tamara Núñez-Guitar, Johanna Ficht, Maria Kobylenko, Nora Wilhelm, Inka Mai, Stephanie Bürkle, Erik Göngrich, Vera Meyer
 Technische Universität Berlin

The construction sector must undergo a radical shift toward sustainability. This requires people to be open to new things. **We need to talk.** Developing mycelium building materials includes obvious scientific goals; performance, durability, sustainability, scale, aesthetics, among many others. In this project we have additionally accepted the challenge of collaborating with artists and so-called citizen scientists. This has involved a range of activities- conducting research, engaging in artistic experimentation, and contributing to what might harmlessly be called “science communication.” We tried all this- not as an end in itself- but specifically to lift material developments to large scale practical applications.

Considering this, what could be more natural than trying out new formats in the education of biotechnology students? Perhaps they should learn - and work alongside - students in architecture and civil engineering. If we’re going that far, then this should also be open to urban planners, artists, designers - Craftspeople should be involved too - and kindergarten teachers of course. Here we present a few examples of such unconventional teaching events. Who could have guessed that this would pay off so well? We got extensive information and many ideas which originated outside our professional bubble. Moreover, we found great project partners and saw people doing awesome things together.

Poster 52 Talk at Workshop Art/DIY Perspective

HOPE HOME • Fungi Lab: Mycelium-Based Post-War Reconstruction and Bioremediation in Ukraine

Kateryna Krolenko, Maryna Shchhehelska, Sofi Halat, Anastasiia Zhuravel, Fee Dorina Dutombé, Adrienne Goehler
 HOPE HOME • Fungi Lab

Russia's invasion has left Ukraine with millions of tonnes of rubble contaminated with asbestos, heavy metals, and toxic dust, alongside over 80,000 square kilometers of mined territory — a scale of destruction with no direct precedent for existing reconstruction models. HOPE HOME • Fungi Lab, a women-led citizen science initiative based in Kyiv, Ukraine, explores fungi's capacity to encapsulate debris, neutralize hazardous chemicals, and remediate contaminated soil as a foundation for radically different rebuilding.

Since its founding, the project has run 15 workshops (both online and offline), as well as a dedicated fungi biodesign course, built a network of eco-material producers and researchers across Ukraine and Europe, partnered with the Kyiv National University of Construction and Architecture, and community initiatives in frontline-adjacent areas. Supported by the IMPETUS Accelerator, the Fungi Lab bridges art and science through open workshops, student practicums, and collaboration with the local makerspace community Ostriv Platform. We present the Fungi Lab's community building experience, early building-waste experiments, and findings in fungal bioremediation, and issue a call to collaborate.

Poster 53 Flash Talk

Mycelium in education: How education can respond to new materials

Mareike Aue, Martin Schlecht, Alessandro Volpato
 Technische Universität Berlin

New materials do not reach society through technical research alone. People need opportunities to understand, handle and question them. Research on mycelium composites is advancing, yet they remain largely absent from school curricula and teacher education. This study explores how education can contribute to their wider societal uptake. We introduced fabrication with mycelium composites in a tenth-grade class and in university projects with students and future teachers. Participants designed and fabricated their own objects, including modular building blocks, and explored circularity. We examine how learners accept and handle mycelium and how sensory experience, fabrication and biological processes shape learning. The study uses teacher surveys, expert interviews, ethnographic observations and video recordings; post-course surveys are ongoing.

Initial findings from the school study show that mycelium is not experienced like a familiar material. Its smell and fibrous texture caused irritation and sometimes disgust, but also curiosity. The pupils did not refuse to work with it. Instead, they developed hypotheses, asked questions about biological processes and showed creative initiative and peer learning. Sterility, waiting times and limited predictability created practical difficulties. The findings show how educational settings can help different groups test new materials and identify conditions for their wider use in society.

Poster 54 Talk at Workshop Art/DIY Perspective**Opening Open Fung: a non-profit advancing applied fungal biology through open science, community and the arts**

Rachel Linzer, Courtney Fink, Philip Ross

Open Fung

To humans, fungi offer an infinitely renewable resource, transforming agricultural and other waste at scale into mycelium materials for fashion, building, space exploration and beyond. Why, then, do affordable, high-performing mycelium materials remain largely out of reach, despite surging interest and innovation? A lack of accessible tools, shared infrastructure and common imagination impedes provisioning our future with fungi. To meet this challenge, we started Open Fung, a scientist- and artist-led 501(c)(3) non-profit (California, USA) advancing fungal technologies through open science, community-building and the arts. Currently focused on mycomaterials, we centralize existing information and generate new “as-open-as-possible” tools.

But tools alone don't change the world. We also bring fungal innovation communities together to foster collaboration and build and validate shared infrastructure. Our arts program creates experiences that invite people to the fungal future. Here, we present our approach and introduce three ongoing exemplar projects: 1) our Artist-in-Research program, 2) our values-forward “Ganofornia” project to develop local fungal cultigens adapted for mycomaterials, while co-developing an ethical fungal collection and use framework, and 3) our work to build a unique multi-modal dataset integrating fungal growth phenotypes and mycomaterial properties across characterized substrates and conditions, in support of predictive modeling.