

Hayes Pavilion

2023

6°

An investigation into the potential of mycelium as an alternative material for the creative industries.



Supported using public funding by
**ARTS COUNCIL
ENGLAND**



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Hayes Pavilion
2023
6°

The project is led by Silver Hayes's area organisers, Team Love, and designed by Simon Carroll from Temple Design Studio in association with Big Team CIC, Glastonbury Festival and manufacturer, Biohm & Grown Bio. It is also supported using public funding by the National Lottery through Arts Council England.



Introduction

In 2019, Simon Carroll from Temple Design Studio¹ approached Team Love² to discuss a potential new material to be used in festival builds, Mycelium Panels, a new regenerative material made out of the root network of fungi. The panels were made by London-based company Biohm and were originally intended to be used for building insulation. Simon saw an opportunity to explore what similarities mycelium material could have with the materials used in creative set designs.

The idea was born out of a desire from Simon Carroll to completely challenge what we use, how we work and the status quo of a throw away society and the creative industry. Most set designs rely on the use of cheap plastic polymer based products or wood that require fossil fuel for extraction for production, depletion of natural resources and release of various CO2e emissions alongside the supply chain.

Like the rest of the world, in 2020, the pandemic put a halt to the discussions & project, but the idea grew. Finally at the end of 2022, Team Love & Temple Design Studio started the application funding process with the Arts Council of England to create a space at Silver Hayes, (Glastonbury Festival) showcasing the creative use of Mycelium panels in a festival setting. As mycelium feeds on agricultural waste, the utopian idea behind the project was to open up the possibility of using the waste from the farm to make mycelium panels used for the festival.

The aims of the projects were:

- Use festivals as testing labs for new technologies and future-led innovations.
- Challenge our use & perceptions of building materials.
- Discuss the changes required for a green transition in creative roles e.g. innovation, sustainable qualification & a greener skill set.
- Understand some of the environmental impact of using mycelium in festival settings.
- Share knowledge & resources with a large network in the festival & creative industries.
- Showcase a regenerative led future to wider audiences.

We identified three stages of the full project which will be developed during this report:

- 1) Mycelium Panels production.
- 2) The Making of the pavilion and 6 Degrees.
- 3) The Hayes Pavilion at Silver Hayes, Glastonbury.

The goal of this report is not only to understand some of the environmental impacts of working with mycelium but to discuss the way we work with materials and our relation to productivity. How do we incorporate nature-led new practices and materials into our fast-paced industry? We were also curious to gather the public's opinion & knowledge of these new materials and technologies. What further thoughts could be sparked for the public by showing them this project? Finally it was important for us to publicly share our findings, challenges & recommendations in order to help de-risk the use of mycelium panels for other companies and help Biohm & Grown with further research and a different use of their product.

¹Temple Design Studio provides large-scale set design, project management, fabrication and installation for clients such as Glastonbury, BoomTown, Love saves the Day, Wilderness, LoveBox and Secret Garden Party.

²Team Love is a Bristol based company specialising in festival and event production. Producing renowned festivals such as Love Saves the Day, Love International, FORWARDS and Waterworks. Since 2022, they are the Silver Hayes area organisers at Glastonbury Festival.



'We are entering a crucial time in how we meet creative design challenges in an informed sustainable approach and to provide the creative industry with an innovative tool kit of materials is such a privilege. I hope the work we have done within the project will go on to inspire others to make positive disruptive choices.'

Simon Carroll
Temple Design Studio

'The Silver Hayes celebrated 10 years in 2023, as part of this we were thrilled to have presented the first outing of 6°. Presenting thought provoking work at a festival on the international stage like Glastonbury has allowed for brilliant exposure to this new biomaterial and we hope helped for future adoption. We are now excited to take 6° on the road and raise more awareness of the potential of mycelium for the creative industries.'

Ben Price
Arts Producer of Silver Hayes at Glastonbury

'We're very thankful to the ACE & Julie's Bicycle for introducing an environmental pillar in the funding values. Opening funding access to innovative, sustainable and/or regenerative projects in the arts is a fundamental part of how we create a fairer and greener future for our industries.'

Pauline Bourdon
Sustainability Lead, Team Love

'At the Arts Council, we value environmental responsibility as a core investment principle, that's why we are excited to contribute to the innovative new chapter at Glastonbury's Silver Hayes area this year. Thanks to the support of the National Lottery, we're proud to be playing our part in sustainable design in the live events and music industry, while also creating opportunities for artists to showcase their work and enabling young people to learn about potential careers in the industry.'

Phil Gibby
Arts Council England, South West Director

Methodology

We were not able to gather enough data to do an accurate calculation for Life Cycle Analysis (LCA) of the structure. This was in part due to patent & intellectual property alongside the difficulty for suppliers & contractors to provide full details of supply chain. We found a Life Cycle Analysis for the use of mycelium packaging that presents similarly to the material we use, it can be consulted [here](#).

To mitigate this we redesigned our aim & focus on the environmental impact of transport, usage phase & waste disposal. We have also used some publicly available data to help us form assumptions & averages throughout the report. We used the government conversion factors for any calculation of CO2e which can be found [here](#). All crew and public data was gathered through online and in person surveys and interviews. This document was made for the Arts Council as a report of our activity and full project scope. We decided to publish it but it presents differences from scientific reporting.

Glossary

Some words and concepts used during this report might be new to some people or need clarification. We decided to focus on 10 of them which will hopefully help to make your reading as smooth as possible.

Bio-material is a material derived from, or produced by, biological organisms like plants, animals, bacteria, fungi and other life forms.³

Biosonification means using technology to turn the bio-rhythms of living organisms into sound (Sam Cusumano).

Circularity means a product, service, or resource is renewed or regenerated, rather than wasted.⁴

Hemp Shiv is the woody core extracted from the hemp stem as a co-product of the process of hemp fibre extraction.⁵

Life Cycle Analysis is a method used to evaluate the environmental impact of a product through its life cycle encompassing extraction and processing of the raw materials, manufacturing, distribution, use, recycling, and final disposal.⁶

Mould is a shaped cavity used to give a definite form to fluid or plastic material.⁷

Mold a superficial often woolly growth produced especially on damp or decaying organic matter or on living organisms by a fungus.⁸

Mycelium is the root of what we know as mushrooms, the fruiting body of fungi. Mycelium are small branching fibres that create an underground network of connections with other organisms in the soil.

Regenerative (adj) is marked by renewal or restoration through natural processes.⁹

³[Biomaterial Definition](#)

⁴[Circularity Definition](#)

⁵[Hemp Shiv Definition](#)

⁶[Life Cycle Analysis Definition](#)

⁷[Mould Definition](#)

⁸[Mold Definition](#)

⁹[Regenerative Definition](#)

An insight into the environmental impact of festivals and creative industries

Waste is a design flaw, a product of a system which does not incentivise a reduction in material consumption or maximise the life-cycle of material use. UK music festivals produce 25,800 tonnes of waste annually, which equates to 2 kg of waste per person per day.¹⁰ Waste can also represent up to 24% of the total carbon footprint of camping festivals according to the Show Must Go On report.

*'We need to shift our view from seeing waste as waste, to seeing it as materials and resources to be used efficiently, ideally reused, and otherwise recycled or recovered.'*¹¹

Two thirds of festival goers rank waste reduction as a priority for festivals¹², and although waste reporting focuses on audience consumption, the use of construction materials within set design should also focus upon reducing resources consumed and waste produced. As UK festivals continue to raise the stakes year on year with breathtakingly ambitious set designs, there is an increase in demand for wood, metal, and plastic based construction materials as well as electronics for lighting and sound to support the creative vision. The first step in addressing festival waste impact is to understand and map waste stream sources, volumes, and final destinations as well as creating space for alternative materials and innovation.¹³

Material procurement and design for deconstruction are outlined within the Screen New Deal report¹⁴ as important opportunities for change. For example, we found that In other creative industries, set design accounts for 2% of the total production carbon footprint¹⁵ in theatre and less than 10% for film. The principles of circular economy can be applied to the design community through a dramatic reduction of virgin material use, this can be achieved by sourcing materials from reuse networks and adopting a design for deconstruction design approach (meaning that materials can be returned to reuse networks in the same quality as they were received).

We believe the next step is for festivals to experiment with new technologies including sustainable building materials. With this project, we wanted to explore using regenerative materials and also the possibility of a more circular ecosystem within the sector's production supply chains. We view festivals as incredible testing labs for new ideas & behaviour change in relation to sustainability & regenerative practices. They can provide a fertile ground for businesses to showcase new technologies and practices to a wide & varied audience with a prime example of this being The Circular Lab for entrepreneurs at [Roskilde](#).

¹⁰The Show Must Go On 2020 — p42

¹¹The Show Must Go On 2020 — p42

¹²Ticketmaster State of Play: *Festivals UK, 2019*

¹³Metabolic 2019

¹⁴Albert — Screen New Deal 2020

¹⁵Julie's Bicycle 2010

The Hayes Pavilion and 6 Degrees

6° at The Hayes Pavilion harnesses the interconnected power of mushroom roots - the underground network known as mycelium - and investigates the potential adoption of this biomaterial in the creative industries.

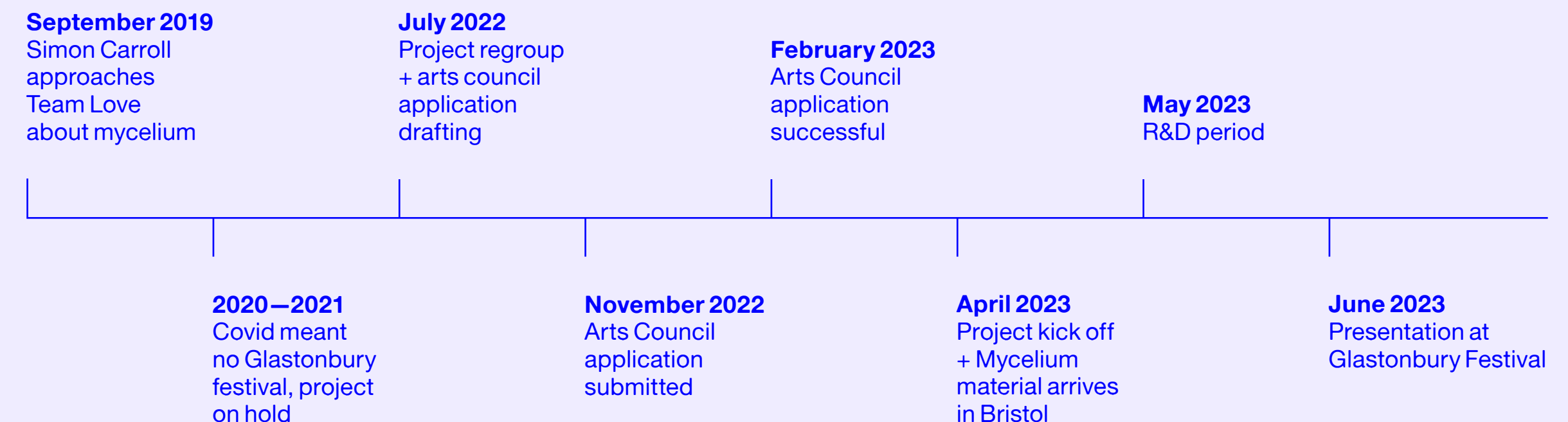
Inspired by its potential as a new industrial material, a selection of multi-disciplinary practitioners, from film, TV, set design and educational institutes explored artistic expression, creative possibilities and investigated the potential of mycelium panels.

6 Degrees aimed to demonstrate the opportunity to move away from environmentally impacting materials to a more sustainable fungi future. When mycelium is fed with agricultural waste, it forms a construction material, with properties potentially

similar to polystyrene, foam and plastics, but is entirely organic and biodegradable. In the 6 week period leading up to the installation at Glastonbury festival, the creative collective of practitioners tested, manipulated and challenged what is possible with mycelium as a practical material.

On site at Glastonbury, The Hayes Pavilion showcased these findings in an exhibition that journeys through simple 2-dimensional forms to innovative 3-dimensional approaches, pushing the creative limits of the mycelium material.

The Hayes Pavilion also played host to specially commissioned immersive sound art compositions by academic and musician Brian d'Souza (Auntie Flo) and rising star Or:la, in collaboration with harpist Roisín Berkeley. The music highlighted the ties between people and communities that emulate the connectivity of mushrooms.



September 2019
Simon Carroll approaches Team Love about mycelium

July 2022
Project regroup + arts council application drafting

February 2023
Arts Council application successful

May 2023
R&D period

2020–2021
Covid meant no Glastonbury festival, project on hold

November 2022
Arts Council application submitted

April 2023
Project kick off + Mycelium material arrives in Bristol

June 2023
Presentation at Glastonbury Festival

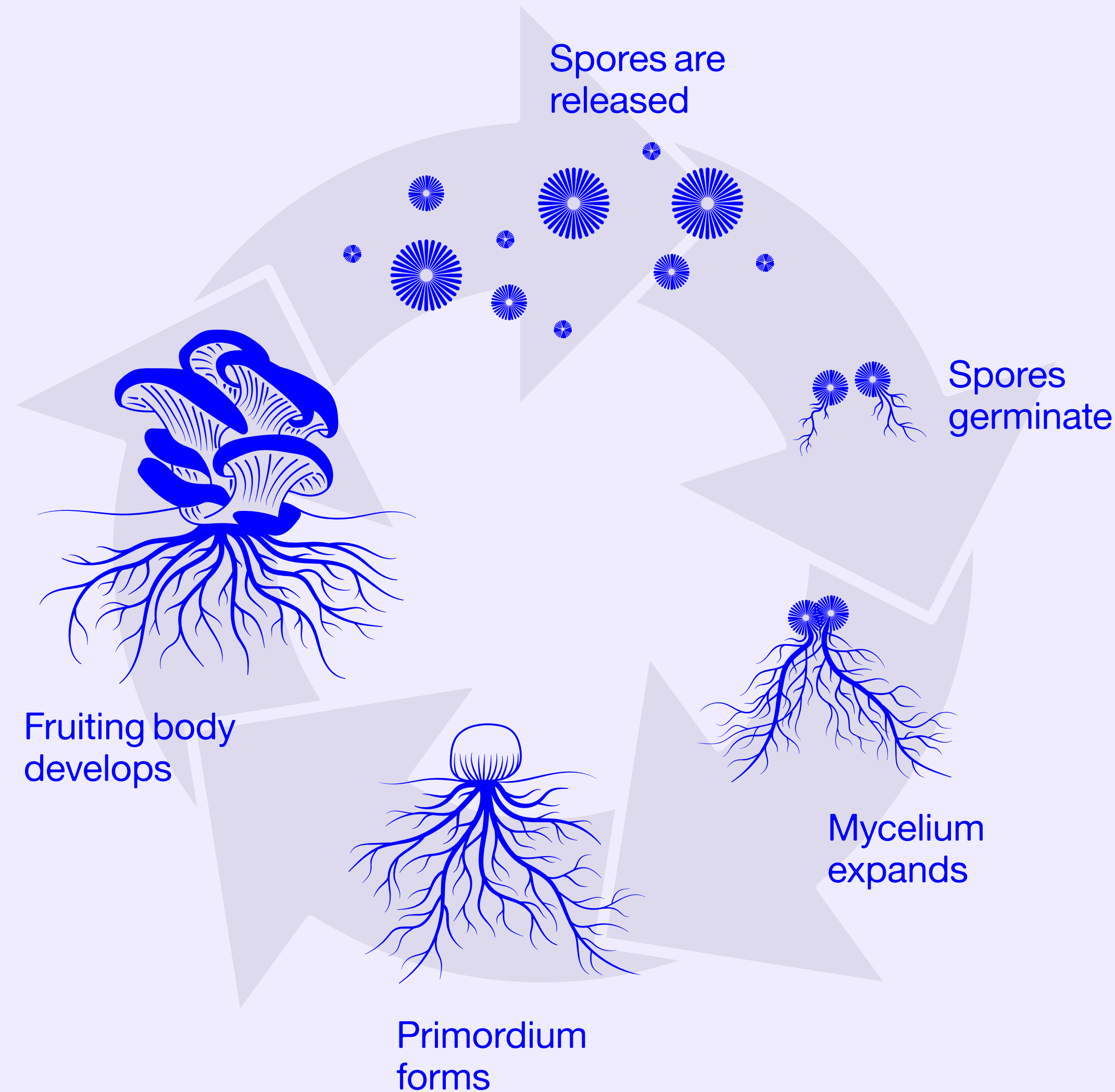
Working with mycelium

What is mycelium?

Mycelium is the root of what we know as mushrooms, the fruiting body of fungi. Mycelium are small branching fibres that create an underground network of connections with other organisms in the soil. The use of mycelium based material started to be researched by Western Academics in the late 2000s and was popularised by the company Ecovative and their work on mycelium based packaging.

Did you know that Mycelium:

- Decompose organic matter absorbed by the soil.
- Help to connect trees & plants while distributing water and nutrients.
- Can break down hydrocarbons, plastics, unrefined oil & nuclear waste.
- There are more species of mycelium than plants.



Our Biotechnology Partners



Biohm was founded by Ehab Sayed, a designer, engineer, researcher and entrepreneur to bring the principles of biomimetic into the construction industry by adapting and applying the ingenuity that is found in nature to our built environment. They aim to revolutionise our built environment and the way we do business through the development of bio-based materials, circular construction systems and innovative business models.

'It was an absolute privilege to have our biotechnologies exhibited in the world's biggest Greenfield music and performing arts festival, pioneering one of the first mycelium festival pavilion. It is critical that we shed light on nature's genius with the world, and there was no better place to discuss the future of nature-inspired regenerative biotechnologies.'

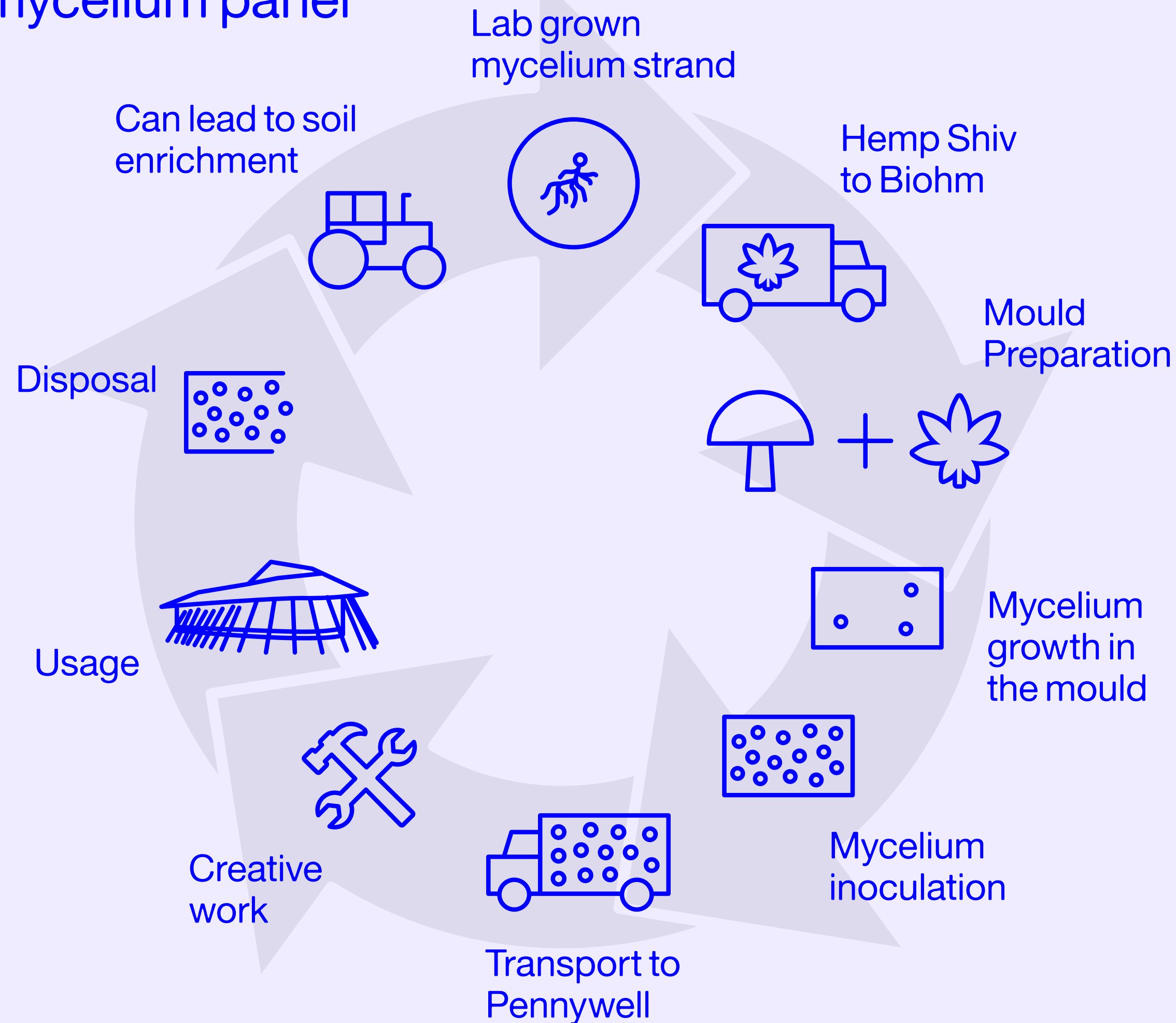
Ehab Sayed
Biohm



A biotechnology company based in Holland, harnessing nature's intelligence to grow 100% sustainable and 100% compostable protective packaging, building material and interior design items. They use natural, regenerative and waste materials and have been exploring the use of mycelium creatively.

Working with mycelium

Life cycle of a mycelium panel



Why work with Mycelium Panels?

'Mycelium is the vegetative filament root structure of mushrooms. Its existence and impact within nature is only just becoming fully understood, but the by-product of its controlled cultivated growth can be used as a binder when combined with organic and synthetic substrates such as agricultural waste streams to produce a solid and lightweight material similar to polystyrene. I believe that we are only beginning to scratch the surface of bio based materials and our ability to work with nature. We are currently seeing disruption in both the textiles and packaging markets from fungal based products, with pioneering work being done globally to further the technology and surrounding product markets. It won't be long before we see a wider adoption across manufacturing and construction.'

We need to completely challenge what we do within the creative industries and the status quo of using materials and objects designed to be thrown away. By working with a regenerative material like mycelium, not only do we raise awareness of possibilities for the future but we start to envision and redesign our way of working in this industry. Everything needs to change if we want to use bio-materials; from more informed design choices, to longer project delivery timelines and especially the diversity of experiences and skills within the crew. It's also very important to develop and invest in these new climate positive material technologies alongside integrating Life Cycle Analysis (LCA) choices in what we do and our decision making.'

'6 degrees is both an exploration of the space between separation and the freedom to move in that space. Communities develop to all shapes and sizes and have many different facets supporting the growth of the individual and the community connection as a whole. This can be seen both in the natural world and human behaviours. The mycelium network is a transformational space where each facet helps to nourish nurture and communicate with the world it inhabits'

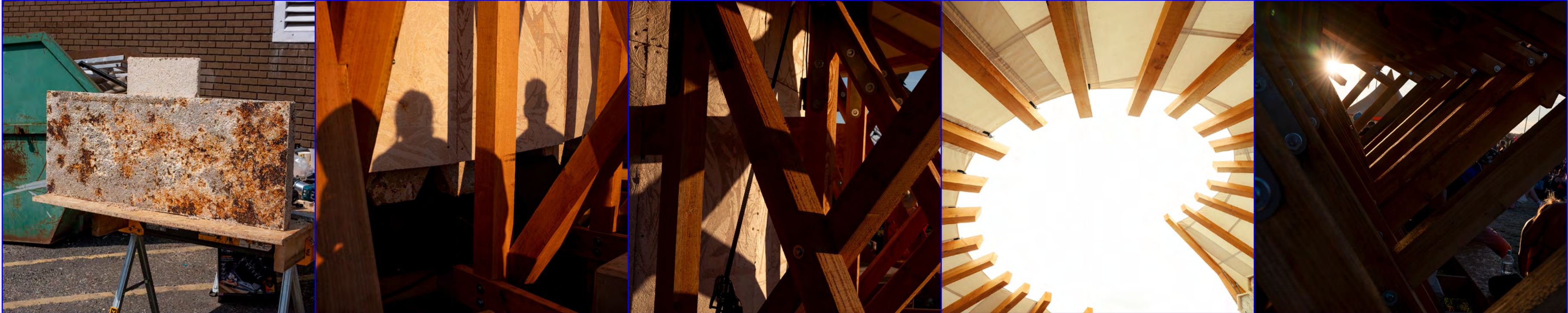
Name: Simon Carroll

Role during the project: Design, Innovation, Maker, Concept, Project Manager, On-site Delivery, Carpentry & Cutting, Day to Day Workshop



A material overview

In this section, you will find the breakdown of the materials used to build the structure of the Hayes Pavilion and 6 Degrees. Each materials were chosen carefully, preferably second hand or salvaged. The end of life of the materials were also considered and when the waste couldn't be managed in the warehouse, it was taken directly by Simon Carroll to be disposed of properly (e.g. home disposal). Some of the leftover materials were also redistributed to the crew for personal and/or professional use.



Material	Mycelium Panels	Douglas Fir Timber UK sourced wind fallen timber salvaged from bio mass. RSP3 Green.	Structural Timber Materials specified by engineer to provide compliant flooring structure.	Tent Canvas Reclaimed tent canvas from Danco Tents.	Structural Steel 3mm Laser cut mild steel plates, specified by engineer to reinforce joints.
Amount Delivered	100 panels from Grown 120 from Biohm	3 tonnes	6x2 FSC Treated Softwood 18 mm OSB ZERO 3x1 PAR Soft wood	135 m2 — 110 kg	125kg
Amount used	187 Panels	3.6 Cubic metres	95%	40m2 = 35 kg	100%
Waste	Four 1000L bags of offcuts (Biodegradable)	Two third of one 1000L Bag (Wood skip) One 1000L Bag off cuts (Reused)	5% – 40kg (Reused)	80% waste repurposed 20% domestic waste	0%
What tools were used?	Table saw, Rail saw, Chop saw, Hand tools	Petrol milling machine, Cross cut saw, Router, Battery saw	Skill saw, Rip saw 240v	Industrial sewing machine	N/A
Any other products used?	Bio-adhesives, e.g. Agar Agar Gelatine, Sugar, Milk	Screws, bolts	Screws	Nylon thread, Polypropylene webbing	N/A

A material overview

Environmental footprint

Transport

90 journeys in total from transportation to crew journeys to workshop & Glastonbury. Represents **1.1 Tonnes of CO2e**.

Power

Main usage in terms of power was charging the batteries of all power tools used. We recorded the type of tools used throughout the project with an average usage per day. In total, our power consumption was **33.7 kWh**, emitting **6.9kg CO2e**.

Procurement

We broke down the extra materials, tools or items that were bought during the project, most of these were either online deliveries or collected in specialised shops. It was important for us to keep track of what happened to these items after usage.

Total Extra Purchased	35
Delivered	69%
Collected	31%
Re-use	89%
Bio-degradable	11%
Recyclable	71%
Repurposed	60%

Waste

WHAT	AMOUNT	ITEMS	DISPOSAL
1000L White Bag	4	Mycelium	Biohm, Gardners, Organic waste disposal
1000L White Bag	2/3	Wood waste	Wood waste skip
1000L White Bag	1	Offcuts	Reused
25L Bag	3	Inseparable dust	Skip of the workshop in general
25L Bucket	1	Food waste	Home disposal
30L Bucket	4	Mixed recycling	Home separation and disposal



Making 6 Degrees



The first week of build started at Pennywell Studios (Bristol) where we invited different creatives to come and test the mycelium material's opportunities and limitations for a week. The team was made up of a biomaterial specialist, a sculptor, a specialist technician, a set-designer and a researcher. All participants experimented with different tools, ways of cutting, edging, structuring smaller parts of the panels and designing structures as they went along.

'Through our many experiments with different cutting tools, we discovered that a jigsaw and soft material blades produced the cleanest cuts, although this method still left something to be desired. I would suggest heavier-duty safety equipment than what was recommended, particularly during sanding and angle-grinding. It seems to me a basic dust mask is not enough, considering the superfine quality of the dust.'

Leksi Kostur
Biomaterial Specialist

While the panels are perfectly viable options for insulation, the testing team found that the variable density of the panels impacted their work. They had to problem solve on the go & explore different techniques in order to work with the material successfully. This meant that a longer time was required for researching & testing than was originally scheduled. It would have been less of an issue if the team hadn't needed to cut all of the panels—some into very detailed shapes—to achieve the desired design. The most exciting part of this research stage was to discover that the panels could be glued and coated in a creative way, which was a property that had been unproven until then.



'The panels provided seemed like an exciting and viable alternative to replace insulation panels in wall and ceiling cavities. (...) The 'skin' or surface of the material was a challenge to not 'tear out' on cuts with more traditional woodwork edges, but we had greater success with more knife-blade like or very fine toothed saws. Due to the thickness varying across each panel, marking-out accurately was a further challenge, but as the material was so flexible it didn't seem to matter too greatly.'

Hannah Morris-Coole
Scenic Sculptor Consultant

Although the team who was brought in to test the material and/or make of 6 Degrees were highly skilled, it was apparent that in order to start using mycelium as a creative material, a period of research would be necessary alongside knowledge transmission. Crew would need to be trained on how to manipulate mycelium panels and longer project deadlines are needed to allow this time for exploration. The plurality of skills, knowledge and resources within our crew created a joyful atmosphere and high level of engagement & interest throughout the project.

Most of the crew¹⁶ worked with bio-material before such as Wood (67%). Few of them had a deep knowledge of what mycelium was but this knowledge increased by working on the testing days (67% knew more about mycelium by the end of their work). It was also important for us to understand what type of eco-practices people had in their workplace before the project. The survey found that they all tried their best at work, by reusing materials as much as they could while being mindful of waste/

energy consumption. Participants reported an increased motivation to improve personal best-practice after exchanging ideas during the test days, but 33% of the team felt like the responsibility for changing an industry lied with big companies, lawmakers & governments - not individuals.

'Creative people are connectors and communicators. We have the ability to inspire and motivate others. That's a lot of power! The complex environmental challenges we face demand that we work together in order to find truly sustainable solutions. Our team of multidisciplinary professionals coalesced over our shared commitment to sustainable practice. I feel that the entire project had an air of full-circle poeticism. The diverse skill sets and fields (creative, manual, scientific) of the people involved in the fabrication and documentation of the pavilion reflect the diversity of a forest ecosystem: each unique element in symbiosis with the next, and together comprising a cohesive whole. The fact that the piece was displayed at Glastonbury, a place for appreciation of creative energy and connectedness among people, adds to this effect. It is high time we broaden this sense of interconnection to include not just other people, but nature, recognising and honouring our potential for symbiosis with the planet.'

Leksi Kostur
Biomaterial Specialist

¹⁶Workshop Crew Demographic in Appendix

Decorating 6 Degrees

Name: Leksi Kostur

Role during the project: Biomaterial Specialist

Job outside of project: Interdisciplinary designer (freelance); Biomaterial Instructor at the Royal College of Art

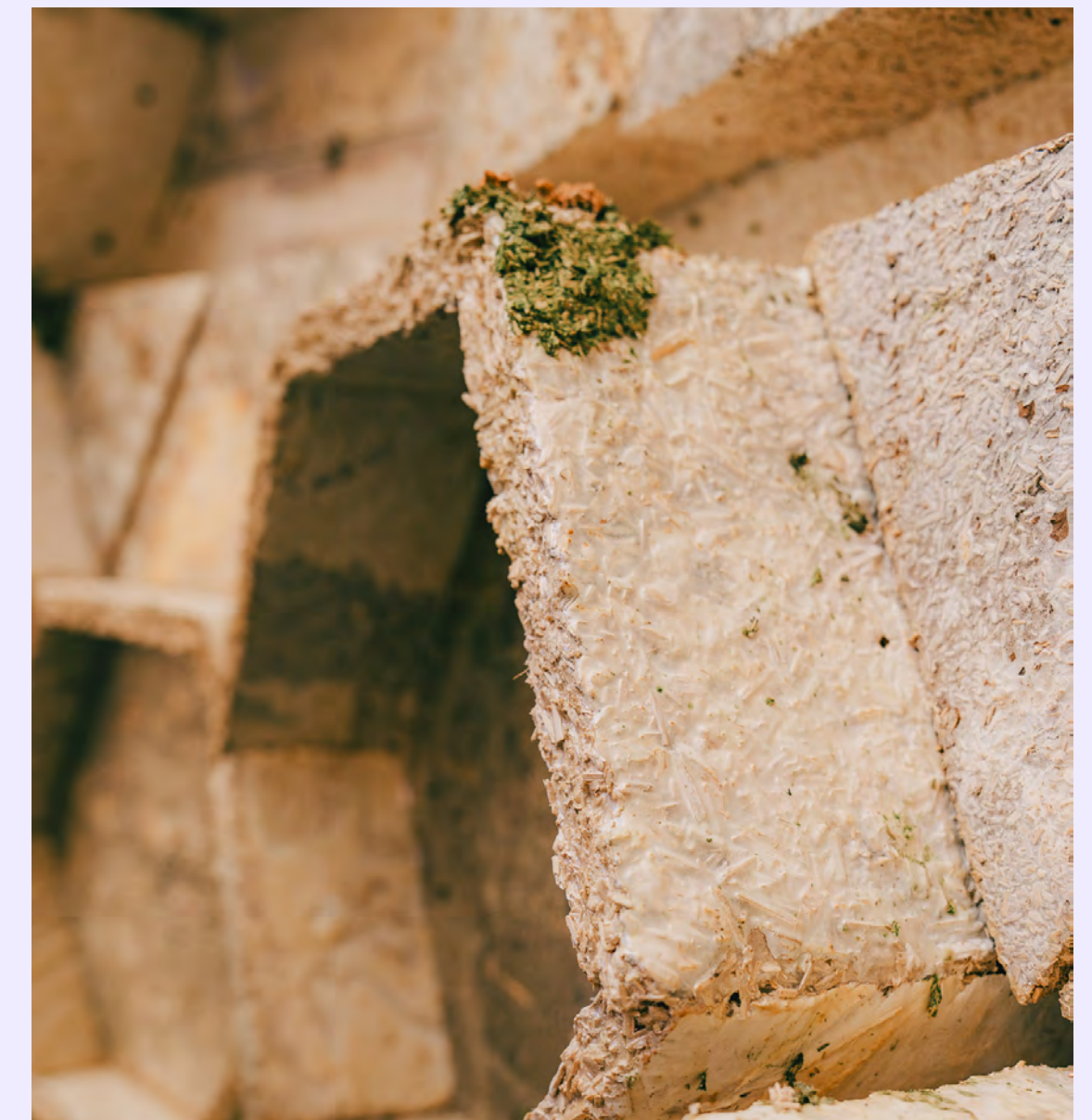
'I created and applied biomaterials to the mycelium sculpture, and consulted on material usage to ensure the biodegradability of the entire design. I made the materials on-site and used them not only to bond the mycelium, but also to embellish the panel surfaces with a multicolour, iridescent glow. Furthermore, I created new materials, including one out of seaweed and mycelium dust that closely resembled moss, to compliment mycelium's natural resemblance to stone. This was an exciting exercise in biomaterial applications in scenic painting and set decoration. Throughout the project, I also assisted with design elements, creative decisions, and fabrication of the pavilion.'

The colours and patterns chosen were based on night-time spore release images. The moth, featured in the middle section of the sculpture, was particularly enjoyable to embellish with opalescent colours and gold geometric lines.

Both animal- and plant-based materials were used in the process. The two primary materials made were a gelatine-based casein glue and an algae-based bioplastic coating, coloured with mineral and plant dyes. Leksi experimented with cabbage, butterfly pea flower, spirulina, beetroot, and mineral powders to create different colours and finishes.

A coating made out of seaweed-based bioplastic provided some protection to the mycelium from the unpredictable weather at Glastonbury. We allowed at least 24 hours of dry time in a ventilated area for all the materials applied. Mould was a concern with any organic matter and mycelium is particularly prone to moulding in damp conditions.

Once the pavilion was erected and the flats were in place in Silver Hayes, Leksi made a moss material (algae and mycelium) and applied it to surfaces to "age in" the sculpture, enhancing its natural resemblance to stone.



On the way to Glastonbury

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'Taking the project to Glastonbury had various challenges. The first was to separate out the mycelium and the recycled wood into 2 separate deliveries. Also due to the delicate nature of the mycelium we had to carefully package the panels for couriering to the festival. This was done through 2 x flat bed 3.5tonne trucks over 2 trips. In addition we had a 20ft container delivered to site from a subcontractor, this would become the storage unit for the project after Glastonbury.'

Ben Price



Most of the install crew came to the workshop opening or were involved throughout the project. Due to this, they had a higher knowledge of mycelium by previously working with it at Pennywell. A positive outcome of this project was the increased knowledge from the team of environmentally friendly work practices by working on the Hayes Pavilion project (100%). Understanding of the climate crisis also increased for all of them. By the end of the project, all crew believed that music festivals present a good opportunity to promote environmental thinking and create a lasting positive impact.

'Displaying the project at Glastonbury gave the opportunity to talk to people and allow a wide variety of people to learn about the materials and processes. Most had a keen interest.'

'What I liked about the panels are the different textures; when you start to put them together the overall effect looks great. Also, the fact that they're biodegradable is really good.'

Anonymous

'The on-site install of a very complicated structure presented several challenges, As always time pressure played a part and as such my hope to assemble the frame without the need for a lifting plant had to change. Having lost time during this phase, slight errors were made in assembly which then required the use of unplanned additional materials. Finally the weather although perfect for an outdoor build was very hot and tiring and as such crew welfare became paramount. This required additional bottled water and hydration drinks which increased our use of single use plastics. The install of the mycelium sculpture went very smoothly but the thinner insulation material from Grown proved challenging to install to the rear of the sculpture flats as it was difficult to cut and handle in the small space between the frames.'

Simon Carroll



6 Degrees at Silver Hayes

13

Marking its 10th anniversary, the Silver Hayes area was transformed for the 2023 festival with the debut of a new artistic pavilion grown from mushrooms – THE HAYES PAVILION, a stage for urgent debate on music culture and beyond titled THE INFORMATION, and the creative re-imagining of three iconic Silver Hayes stages. The area was open throughout the day & night, and visitors could access the 6 Degrees exhibition between 12–6pm for three and a half days.

Outreach

Over **2500** visitors.
105.9 million MUU from media coverage.

Silver Hayes Instagram



Likes
2686



Comments
43



Accounts reached
19,653



Impressions
172,856



Engagements
2806



Audience Engagement

The feedback on the project was overwhelmingly positive. 82% of those asked said that they loved the mycelium material and found it inspiring, whilst a further 13.4% said that they liked the material but the aesthetic & density of it could be improved. 90% agreed or strongly agreed that they felt inspired and hopeful that mycelium could help improve sustainability in the future.

'Awesome, so imaginative. I feel like it could be revolutionary!'

'What an interesting development to eliminate plastic. It's great to see research like this in its early stages!'

The mycelium project introduced mushroom potential to a whole new audience. Although 69% recognised that innovation and creativity had an important role to play in combating the climate emergency, only 44% claimed to have an awareness of mycelium/mushroom commercial potential prior to Glastonbury festival 2023. Of those who walked by and found the pavilion, 66% said they had learnt things about mushrooms they didn't know before coming to Glastonbury festival.

'I was very surprised that the material was related to mushrooms!'

First impressions included 'beautiful' 'captivating' and "inspiring" whilst many people were surprised by the lightweight feel of the material and the cool calm atmosphere it created. Audience members were fascinated by the innovative nature of the project,

with many taking photographs and videos to show to friends and family, and showing enthusiasm that the installation should be taken elsewhere to showcase the possibilities to other demographics. Audience members enjoyed the tactile nature of the installation and were automatically drawn to touch textured walls and surfaces, with the majority commenting that festivals made good spaces for engaging with new ideas and creating a lasting impact.

'It has such interesting forms and patterns, it helps people cross the barrier. I would love to use it!'

'Beautiful sculpture, very unique. Amazing to see structure built using mycelium and the future potential!'

The Glastonbury audience displayed clear concern for environmental issues (77% strongly agreed that the climate crisis needs addressing urgently in order to prevent major consequences within their lifetime) but showed uncertainty when asked how well informed they were (only 19% strongly agreed they were well informed about the climate crisis). Women showed more concern for climate change (77% strongly agreed) compared to men (67%).

Note on Survey Methodology:

94 people surveyed on-site between Friday 23rd to Sunday 25th June. Number of visitors calculated by counting the number of people entering the structure for an hour each day and multiplying by the amount of hours opened. We had between 120-150 visitors per hour.

6 Degrees at Silver Hayes



Engaging the industry

Industry/European Network

Throughout the project we've engaged with the Glastonbury Sustainability Team headed by Luke Howell from Hope Solutions. Thanks to their support we've been able to communicate the project to other Area Organisers at Glastonbury. We organised two industry guided tours of the Hayes Pavilion with a deeper explanation of 6 degrees. Due to the size, huge programming and working patterns at the festival not all professionals and industry experts were able to join the tours. However, thanks to Glastonbury HQ we've been able to connect with a network of more than 100 sustainability experts online and promote the project.

'The Mycelium pavilion was a fascinating new feature at the Festival in the Silver Hayes area and really showcased the creative and innovative thinking that we try to support across each area at the Festival. The work undertaken by Simon Carroll, Team Love and all the creatives working on the project to show how natural, fossil fuel free materials could be used as the building materials of the future really helped enhance the wider work around climate and environmental storytelling at the event.'

Luke Howell
Strategic Sustainability Lead
Glastonbury Festival



100% of those interviewed said they were likely to recommend the project and its findings to their own professional network, commenting that: **'It gives options for more sustainable alternatives'**, and with more media coverage and research into financial viability **'It could be an industry leader!'** The multi-purpose nature nurture ethos of the mycelium build was seen as a good opportunity to inspire public interest and change the narrative around sustainable material use.

Other feedback included advice to push the project forward more on social media platforms and provide more information to students to increase academic engagement. Many felt that more development was necessary in order to produce impact data and to experiment with decarbonisation capabilities, however the scope of opportunities for circularity were noted as 'exciting' and 'nurturing curiosity'.

Talks at The Information Stage

Alongside the Hayes Pavilion, Team Love opened a new space at Silver Hayes - The Information - dedicated to providing a powerful platform for urgent debate, putting forward-thinking conversation side-by-side with contemporary electronic music programming.

We programmed two panels dedicated to further discuss the use of bio-design & bio-materials alongside a discussion on the power of music to accelerate climate action on the opening day. Both panels were well attended with an estimate of up to 200 people at each talk.



Friday 23rd June (12:00—12:45)
Bio-design, Building a regenerative planet

Ehab Sayed
[Biohm](#)

Leksi Kostur
[Biomaterial specialist](#)

Michael Pawlyn
[Bio Architect](#)

Nikolet Kostur
[Biology Applications at the Royal College of Art](#)

Hosted by Simon Carroll
[Temple Design Studio](#)

Friday 23rd June (13:15—14:00)
The Power of Music to accelerate Climate Action

Sophie Shnapp
[Earth Percent](#)

Domi Palmer
[Climate Live](#)

Fay Milton
[Music Declares Emergency](#)

Frances Fox
[Climate Live](#)

Jayda G
[Musician, Biologist](#)

Hosted by Pauline Bourdon
[Soliphilia](#)

Engaging the industry

16



Engaging the industry

Big Team Documentary

Alongside this report, we commissioned Phoebe Holman Films and Siddiqui Media to create a short film documenting the journey of the project, with the hope of expanding our outreach to a wider audience that might not have attended Glastonbury. The video team consisted of an all female crew including two placements hosted by Big Team CIC. Big Team actively works to diversify the people who create and contribute to festivals by supporting 18–30 year olds from groups that are currently under-represented to forge their paths in the sector and working with industry partners to develop more inclusive festival environments.



The core team, Phoebe (Producer/Director & Big Team Lead) & Farhath (DOP), started by filming the Biohm team in their London offices and shooting the scientific process in the Biohm lab. Alongside regular interview sessions during the Research & Development construction phase at the Pennywell workshop. They were joined by two young photographers & videographers on-site to support the interviews, film the building phase of the project and cover the Hayes Pavilion live, in the Silver Hayes Field.

'Documenting this journey and pulling together a film for this project makes The Hayes Pavilion accessible to all. Something that is a core value to Big Team, Team Love and this project, is making the festival industry more accessible. This film allows a multitude of audiences to engage with this project, for the public, for partners, stakeholders, and those that created it to have a living visual representation of the process. I really hope the film shows what can happen when science, design, production, art, and nature all meet at Glastonbury festival.'

Phoebe Holman
Film Producer & Director

'Working on the documentary was fantastic, I didn't know anything about Mycelium before this project - it was a great learning experience. It also gave Siddiqui Media a great opportunity to shoot at one of the biggest festivals in the world & to work on a project that was focussing on sustainability. The two mentees from Big Team were very enthusiastic and fast learning, I enjoyed my time teaching while also learning from them & Phoebe. I always love seeing new people join Big Team & more so love seeing how fast people progress from the opportunities they have from Big Team with their own careers.'

Farhath Siddiqui
Film DOP, Siddiqui Media

You can find the documentary [here](#).



Music & mycelium

Music, Nature and Community

It was important for us to highlight the link between music, nature and community alongside presenting a new material. We decided to do some field recording in Pilton, Weston-Super-Mare and South Bristol to explore what community means in different areas e.g. a village, a town a city. We asked people in the street a simple question: *What does community mean to you?* This question was essential to us, referring to the connective nature of mycelium & ecosystems. The recordings were sent to the two artists who used them in the creation of experimental music pieces in accordance with the principles of the project.

Who are the music artists?



Auntie Flo is a DJ, producer and sound therapist. Over the last couple of years he has explored the relationship between music, sound, health, well-being and consciousness. Through his sound wellness business Swell, he's currently working with The Centre for Psychedelic Research at Imperial College London, curating playlists & exploring the relationship between psilocybin & music to treat chronic pains.



Or:la is a DJ, producer and label owner. Since her first EP in 2017, she launched a collaboration label Deep Sea Frequency alongside her current label venture, Céad. The label is centred around the music of lesser known artists and strives to shine a spotlight on up and coming talent. Her La Potion club night started in London in 2021, focusing on showcasing queer creatives. Her sound piece for 6 Degrees was made in collaboration with the brilliant harpist Roísín Berkeley.

'I loved being involved with this project. I used a process of biosonification to pick up the electrical activity in a variety of mushrooms that could then be turned into musical notes. I worked with a variety of fungi, including Lion's Mane, Reishi, Oyster and Shiitake, with each of them producing their own individual output that shaped the character of the music. Once I'd captured the output from the fungi, I processed them live in my studio using a variety of effects and modules that were sympathetic to each fungi, allowing me to produce the finished piece. I'd like to think this process highlights the connectedness that the mycelium network brings to the natural world, where every species has its own personality but manages to live in harmony with its neighbours and surrounding environment.'

Brian D'Souza (Auntie Flo)
Artist



Conclusion & recommendations

The mycelium panels were originally made for insulation and as per all certifications received by Biohm, its usage can be advised for the construction industry. We found that for usage in festival creative builds the material requires further research & development. For example, the inconsistency of the material's density made it difficult to shape the panels into intricate designs - for mycelium composite panels to be widely used by the creative build sector they will require more uniformity. However it is important to keep in mind that new materials, especially mycelium, should not have to meet capitalistic requirements (e.g. single-use, environmentally damaging, cheap workforce, short longevity). To implement effective change, it will also be necessary for our industry to rethink our approach to creative builds, from the design process, to scheduling, budgeting and skills development. If we continue to push new biomaterials to be exactly like plastic based existing ones we are at risk of making similar mistakes, damaging the planet further and promoting over consumption.

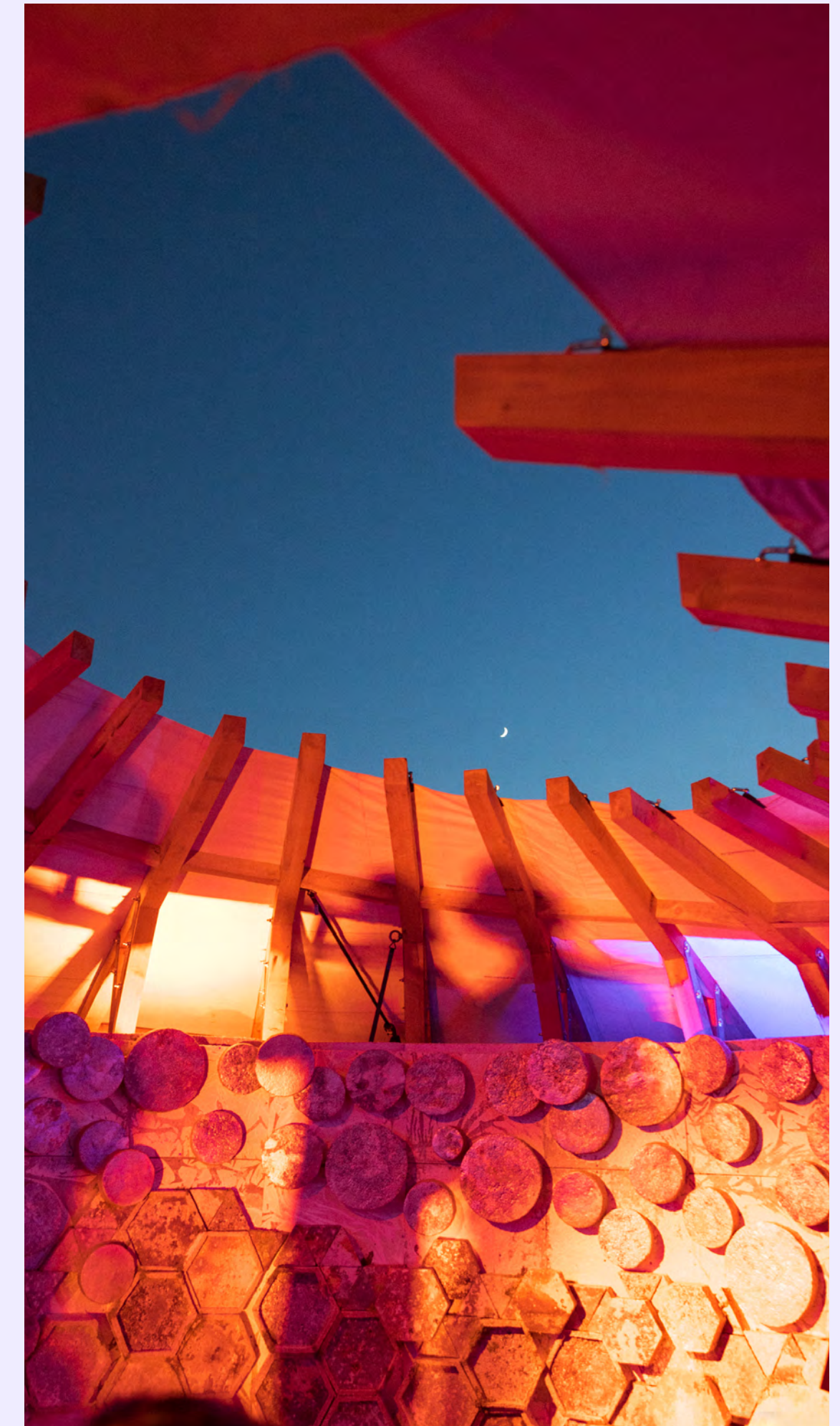
By adopting a more informed approach to practices alongside integrating Life Cycle Analysis choices into our material selections, not only will we be able to make environmentally conscious purchases, we will also be supporting improved working conditions for people throughout the entire life cycle of a product and its supply chain.

Our key takeaways from using mycelium panels for creative design:

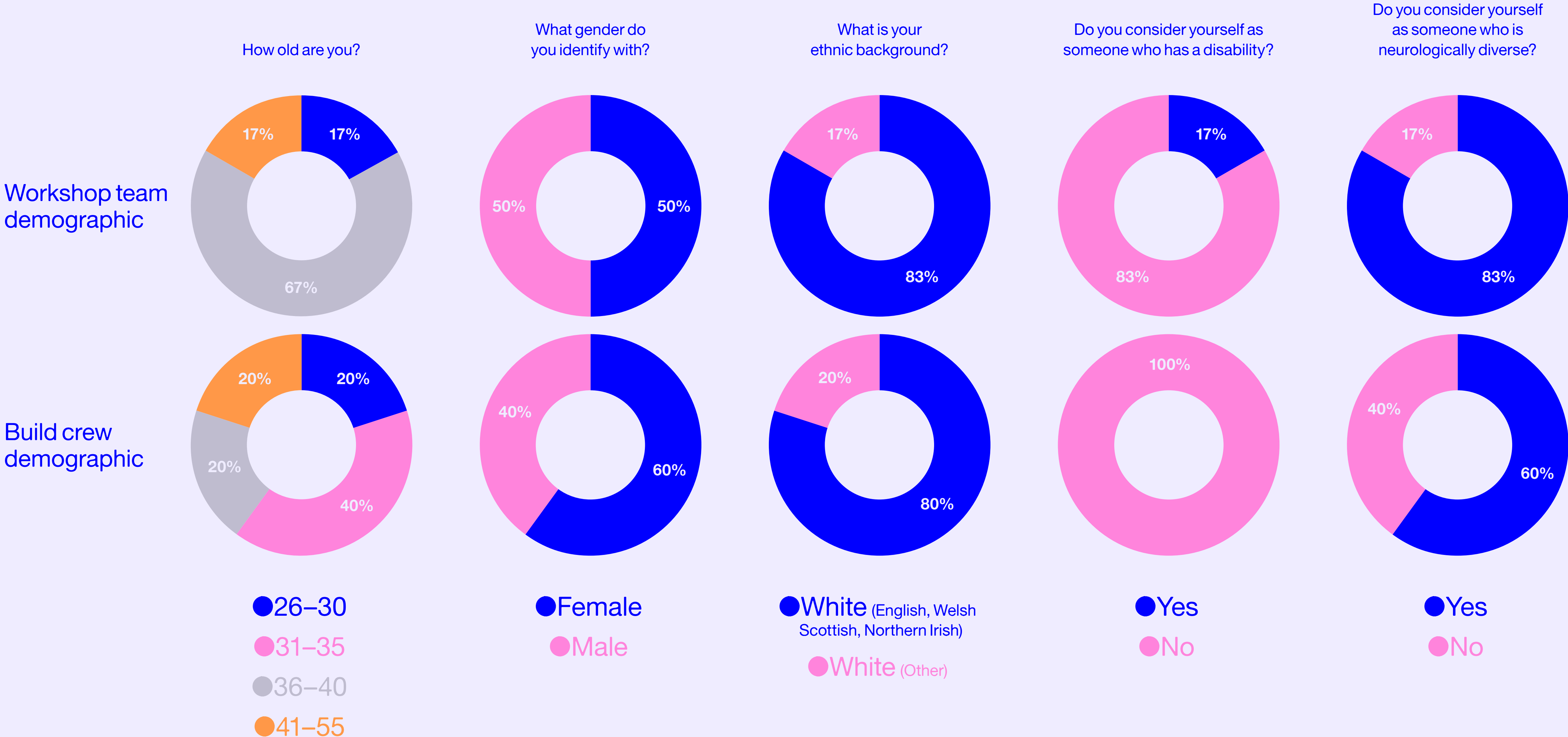
- Think about the relationship with the material from the design stage.
- Prefer the use of power tools compare to a CNC machine e.g. knife-blade like or very fine toothed saws.
- Heavier-duty safety equipment needed particularly during sanding and angle-grinding.
- Use bio-adhesives to not temper the biodegradability of the material.
- The most compatible glue was made out of a gelatine and milk mixture.
- Store in a dry and dark environment to avoid bio-decoration to mould.
- Material is fragile, especially if shaped creatively, be mindful when transporting.
- Plan longer creative & build timelines when working with mycelium material.
- If showcased in a public area, note that people will want to touch the material due to its unfamiliar nature/aspect.

Further explorations

- 1) We haven't tested the full biodegradability of the material ourselves, some questions still remain regarding the difference in how fast the material can break down when it is in its raw state and when it has been coated.
- 2) New organic waste being created could present a risk for biodiversity if over produced and consumed. What is the impact of a strand of mycelium waste in another environment where it isn't native?
- 3) It is possible that one of the futures for the mycelium industry is to develop mould making instead of using set panels. This could open an opportunity to develop a new body of work and we would need to work on the material the moulds are made of.
- 4) There is a potential issue with the increasing monopoly of patents e.g. 28 patents are from America and 14 patents from China with the US company Ecovative owning 45% of all existing patents today.¹⁷ Could this limit independent researchers & makers' use of mycelium based products?
- 5) More investment in this new technology is necessary for industries to be able to afford mycelium products. At this stage, the production of panels hasn't reached an industrial level and therefore the product is still more expensive than plastic based materials.

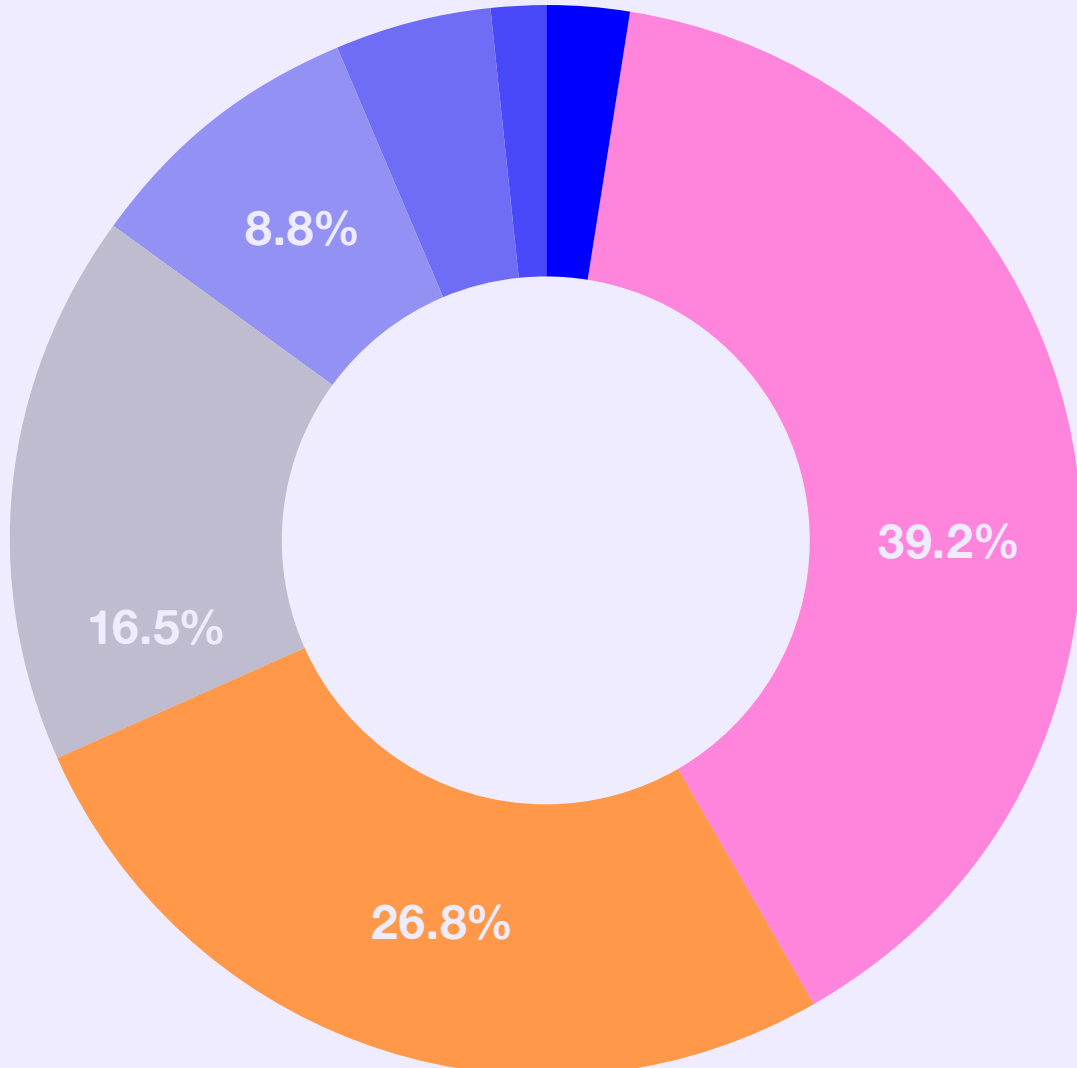


¹⁷Patent Review



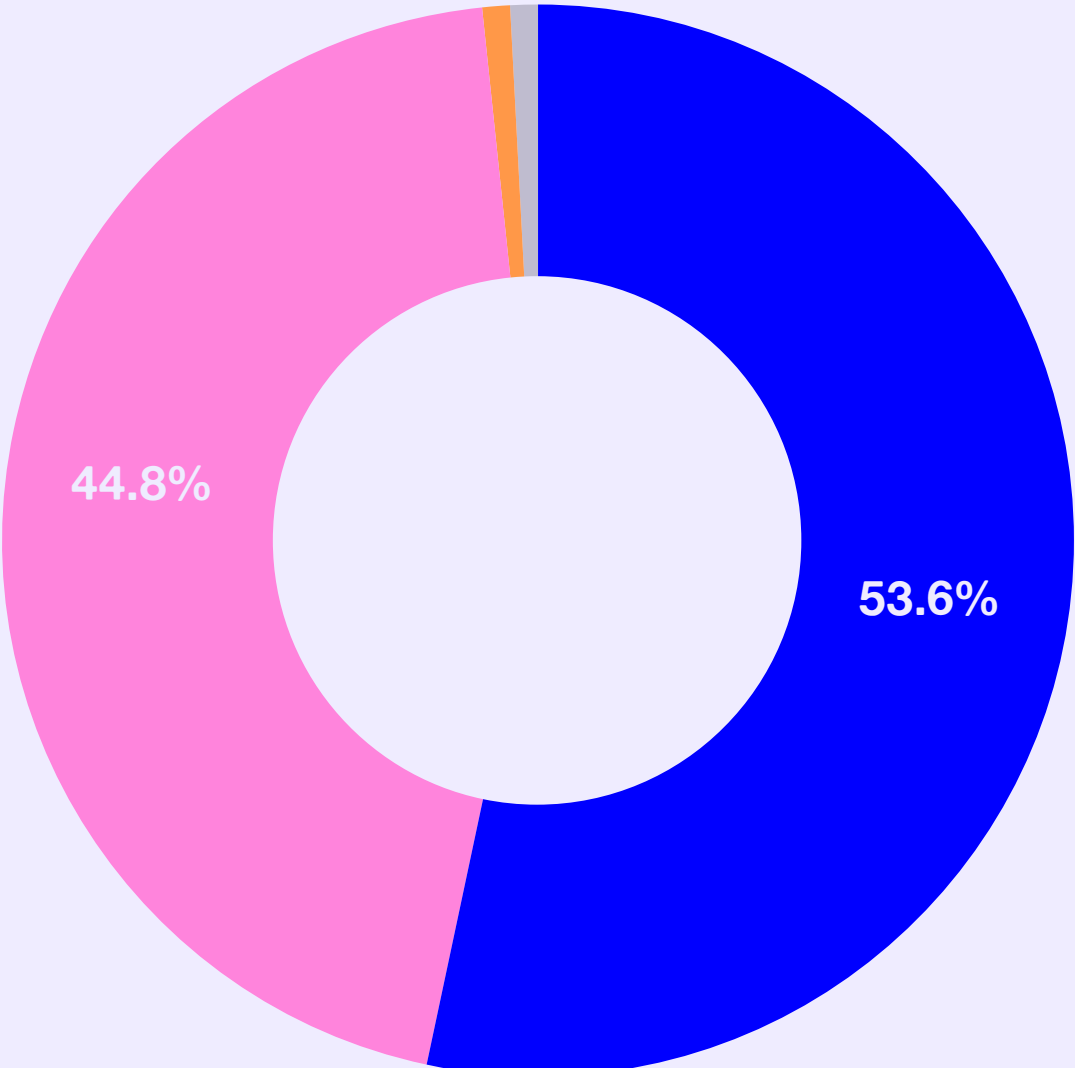
Audience demographic survey results

How old are you?



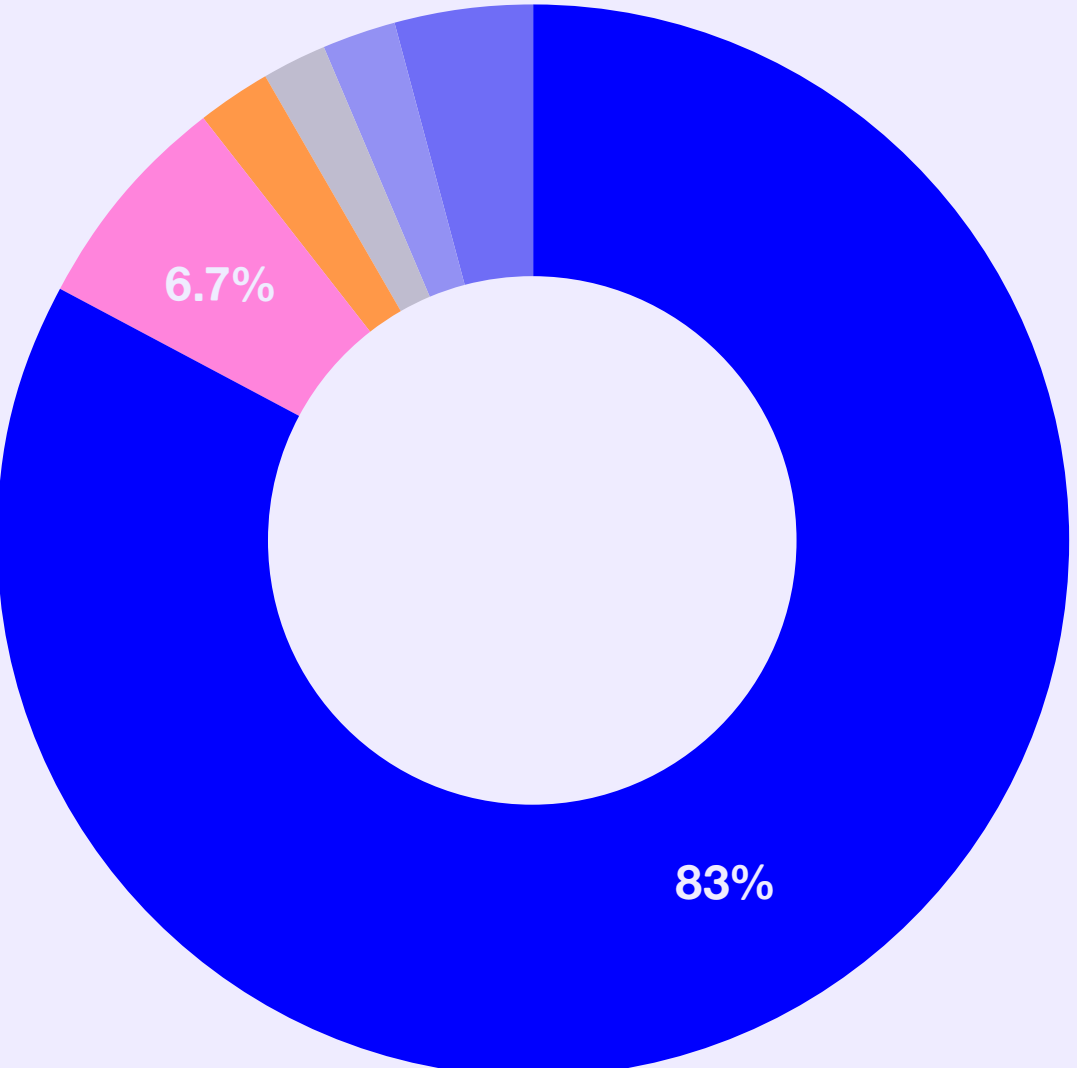
- 10-20
- 21-30
- 31-40
- 41-50
- 51-60
- 61-70
- 71+

What gender do you identify with?



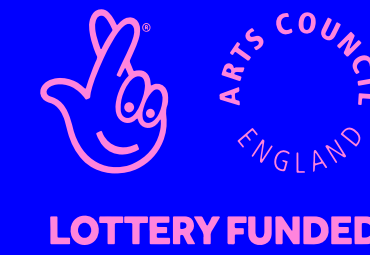
- Woman
- Man
- Prefer not to say
- Other

What is your ethnic background?



- English, Welsh, Scottish, Northern Irish
- Any other white background
- Indian
- White and black Caribbean
- Irish
- Any other

Credits, thank you & partners



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ENGLAND**

Design & build
Simon Carroll at
Temple Set Design

Production & delivery
Team Love Productions

Biotechnology
Biohm & Grown Bio

Project Lead
Benjamin Price

Sustainability & Report Lead
Pauline Bourdon

Biomaterials Specialist
Leksi Kostur

Scenic Sculptor Consultant
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Sustainability Team

Sustainability Assistant
Rowan Barnes

Volunteers
Charlotte Jackson
Frances Fox

**External Sustainability
Consultant**
Anna Johnson
Phoebe Currie

Musicians Commissions

Brian D'Souza
Or:la with Roisín Berkeley

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Phoebe Holman

Film DOP
Farhath Siddiqui at Siddiqui Media

Film Editor
Rob at Siddiqui Media

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Renders
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Photography
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Artist
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Materials Artist & Technician
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Lynford James
Chris Hoare
Pauline Bourdon
Megan Tsu Kip

Design for Report
Harry Richards

SILVERHAYES



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Hayes Pavilion
2023
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