



INSTITUTE FOR LIVING MATERIALS

Living Architecture for Planet and People

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With research by Chat GPT-5 Plus

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Living Architecture for Planet and People

Employing “Biomaterial” & “Living Architecture” (BIOMATTERS.ORG?) (FUNGALMATTERS.ORG?)

IDEA: Mushroom production + mycelium construction + plastic & waste recycling + shelters.

Find sources of biodegradable waste products from related industries to use as the ‘food’ for mushroom (maybe *P cubensis*) production, to be produced WITHIN recycled plastic meshed ‘blocks.’ Harvest and donate the shrooms then use the blocks for construction, potentially for impermanent homeless shelters. Find related government grants and progressive cities willing to host and finance such production, including potentially finding architects specializing in ‘living architecture’ and using publicly-owned real property as site(s) for related experimentation.

For CHAT GPT: I know someone who's received a government grant for recycling discarded plastic into usable products. My idea is to combine what he's doing with mycelium construction techniques I've read about in the past. The organization (a non-profit) would combine the following environmentally, medicinally and socially conscious considerations:

- *P cubensis* et other shroom production (to be donated to research and licensed therapists)
- Mycelium ‘bricks’
- Recycled plastic ‘casing’ for said bricks, likely slightly ‘meshed’ for breathability
- Recycled biomaterials (like coffee grounds and spent brewery grain) from industrial waste for the ‘food’ for the mycelium – tons of breweries and coffee houses in Bend, OR area
- Completed bricks used in ‘living architecture’ homeless and emergency shelters etc.

CHAT SAYS (portion of a chat string; the above was mentioned towards the end):

You’re probably thinking of **mycelium-based construction materials**.

What it is

- **Mycelium** is the root network of fungi (the part that usually grows underground). It acts like a natural glue, binding together agricultural waste such as sawdust, straw, or corn husks.

- When grown in molds, the mycelium colonizes the waste and forms lightweight, durable, and biodegradable composite materials.

Applications in construction

1. **Insulation panels** – Mycelium composites have excellent thermal and acoustic insulation properties, comparable to conventional foams but without being petroleum-based.
2. **Bricks & blocks** – “Mycelium bricks” are lightweight yet strong enough for certain non-load-bearing structures. They’ve been tested in experimental pavilions and art installations.
3. **Packaging & alternatives to styrofoam** – While not strictly “construction,” this was the first large-scale commercial application.
4. **Architectural projects** – The “Hy-Fi Tower” (2014, New York, by The Living and Ecovative Design) was a temporary structure made entirely from mycelium bricks.
5. **Furniture & interiors** – Designers use mycelium to create lampshades, tiles, and wall panels.

Advantages

- **Sustainable:** Fully biodegradable, renewable, and low-energy to produce.
- **Lightweight** but still relatively strong.
- **Fire-resistant** and good at dampening sound.
- **Self-growing:** Instead of manufacturing, you “grow” the material in molds.

Challenges

- Not yet strong enough to replace concrete or steel in structural applications.
- Susceptible to moisture if not properly treated.
- Scaling up production for consistent quality is still being developed.

Related concepts

- **Bio-concrete** (concrete infused with bacteria that can heal its own cracks).
- **Hempcrete** (a mixture of hemp fibers and lime).
- **Living architecture:** experimental designs where biological organisms (like algae or fungi) are integrated into building systems.

🍄 ✨ Mycelium construction is part of a broader trend toward **biomaterials** — using living systems to replace industrial, resource-heavy materials.

From Google's AI:

Mycelium construction uses the root structure of fungi to create sustainable, biodegradable building materials like insulation, panels, and bricks that can grow on agricultural waste. These bio-fabricated materials offer low-carbon manufacturing, reduce waste, and can provide excellent thermal and acoustic insulation. While still an emerging field with limitations in structural strength and water resistance, mycelium holds promise for replacing unsustainable materials and significantly lowering the environmental impact of the construction industry.

How Mycelium is Used in Construction

1. **Bio-fabrication:**

Mycelium (fungal roots) is mixed with organic substrates like sawdust or agricultural waste.

2. **Growth in Molds:**

The mixture is placed into molds and allowed to grow, with the mycelium fibers acting as a natural binder, fastening onto the substrate to create a dense network.

3. **Drying:**

The material is then dried to stop the growth and stabilize its properties.

4. **Forming Products:**

The resulting composite can be formed into various building components, including:

- **Insulation Panels:** For walls, roofs, and floors to improve energy efficiency.
- **Acoustic Panels:** For noise control in recording studios and theaters.
- **Bricks and Blocks:** Lightweight, custom-shaped components for non-load-bearing structures.
- **Structural Components:** Experimental uses include arches, pavilions, and towers.
- **Interior and Furniture:** For decorative elements, cabinetry, and other furnishings.

Benefits of Mycelium Construction

- **Sustainability:**

Utilizes waste materials as a feedstock, resulting in a low-carbon manufacturing process.

- **Biodegradability:**

Products are 100% biodegradable, returning to the earth at the end of their life.

- **Environmental Impact:**

Aims to replace materials like plastic and high-CO2 emitting cement.

- **Insulation Properties:**

Offers excellent thermal and acoustic insulation, improving building energy efficiency.

Limitations and Future Development

- **Mechanical Strength:**

Mycelium-based materials typically have lower compressive strength and are not yet ideal for primary structural loads.

- **Water Resistance:**

High water absorption and susceptibility to breakdown in poor conditions are ongoing challenges.

- **Standardization:**

Lack of standardized development methods contributes to varying material properties.

Despite these limitations, mycelium-based materials are seen as a significant component of future green construction due to their versatility, low environmental footprint, and potential for scalable, on-site material production.

Grow Mushrooms In Coffee Grounds - A Piece Of Rainbow

To grow mushrooms on coffee grounds, mix cooled, spent coffee grounds with mushroom spawn in a container, then incubate it in a warm, dark place to allow the mycelium (the white, thread-like growth) to colonize the grounds. Once fully colonized, move the container to a humid environment with indirect light and fresh air to induce fruiting. You can add other materials like straw to the coffee grounds to improve aeration.

1. Gather Supplies

Spent Coffee Grounds: Collect fresh, cooled coffee grounds from a café or your own brewing.

Mushroom Spawn: Obtain oyster mushroom spawn or other suitable types.

Container: Use filter patch bags, large jars, or buckets with small holes for air exchange.

Optional Additive: Add pasteurized straw or cardboard to prevent the coffee grounds from compacting.

2. Prepare the Substrate

Clean Everything: Sanitize your hands, work surface, and container with isopropyl alcohol or boiling water to prevent contamination.

Mix Ingredients: Combine the coffee grounds and any additives in a clean bowl. A common ratio is 70% coffee grounds, 20% straw, and 10% spawn by weight.

Moisture Level: The coffee grounds should be moist but not wet.

3. Inoculate and Incubate

Add Spawn: Mix the mushroom spawn thoroughly into the prepared coffee grounds.

Fill Container: Spoon the inoculated mixture into your chosen container.

Incubate: Place the sealed container in a warm, dark place (18-25°C or 64-77°F). The white mycelium will grow and colonize the grounds over several weeks.

4. Initiate Fruiting

Induce Fruiting: Once fully colonized, expose the container to "autumn-like conditions" – humid, with fresh air and indirect light.

Maintain Humidity: Mist the area around the container daily to keep the mushrooms from drying out.

Harvest: Mushrooms should begin to form after a couple of weeks. Harvest them when they are ready.

5. After Harvesting

The mycelium may fruit again after a short rest.

Once the substrate is exhausted, you can use the spent grounds to fertilize acid-loving plants or add them to your compost.

My thoughts, based upon my experience with mushroom production:

Using a combination of recycled plastic remade into suitable molds for encasing the growth of mycelium, the strengths of both the plastic and the mycelium can combine for greater structural stability and durability while also assisting in the environmental sustainability of recycling suitable industrial, biodegradable waste products fed to the mycelium. At the same time mushrooms (including, potentially, *P cubensis* for its therapeutic health benefits) can be grown and harvested, the 'spent mycelium blocks' then used for the aforementioned construction.

A type of specialty recycled plastic block will need to be designed and fabricated for the purpose of providing the casing for the growth of mycelium. It will likely need to be slightly meshed, or have sporadic small holes punched into it, for the air flow conducive to spore inoculation and mycelium growth. These blocks will, at least initially, need to have open tops for the purpose of harvesting the mushrooms once the mycelium fully develops. There will be at least five stages to the production and utilization of the mycelium blocks:

- (1) Mushroom spore inoculation, producing the mycelium
 1. This will require fully sanitized (mold-eliminated) food for the mycelium, including used, recycled coffee grounds and a 'wood product' to prevent the compacting of the grounds and permit breathability for the inoculation and later mycelium growth
 1. Partnership with one or more major coffee brands
 2. Partnership with one or more wood product producers
- (2) Mycelium growth in a dark, relatively high-humidity environment
- (3) Harvesting of the mushrooms ('fruiting bodies') through the top
- (4) Transfer of the 'spent blocks' to a low-humidity area for drying
- (5) Transfer of the dried blocks to construction site(s)

To permit the successful movement through these stages of its development, the mycelium blocks will need to possess certain structural features, including open tops (for filling and later harvesting of the 'fruiting bodies' or 'caps' of the mycelium; i.e. the mushrooms, or 'shrooms'), meshed sides for air passage (oxygenation/breathability) and either built-in tabs or ports on the sides and/or tops of the blocks for later interconnection during stage 5, construction.

Question to CHAT: Are there grants available for studying mycelium construction?

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CHAT: Yes — there *are* grants and funding programs that have supported mycelium- and fungal biomaterials research, including construction and insulation uses. Here are some examples and paths worth checking out, especially from a U.S. perspective:

 **Examples of fungus / mycelium funding**

Year / Source	Project or Research Focus	Notes
Montana State University (~2020)	Fungus-based building material	Received a \$500,000 NSF grant to explore fungus-based building materials. Montana State University
Penn State (Form & Matter Lab)	Mycelium for acoustic panels / building parts	Funded by an AIA Upjohn Research Initiative Grant and other seed grants to study fungal biomaterials for architectural and acoustic uses. Pennsylvania State University+2 Pennsylvania State University+2
University of Alaska Anchorage / NREL	Fungus-based, bio-insulation for Arctic and off-grid construction	Awarded \$2.5M from ARPA-E (Advanced Research Projects Agency – Energy) to develop carbon-negative, fungus-derived insulation. University of Alaska Anchorage
NASA (NIAC program)	“Mycotecture Off Planet” — growing habitats from fungi	NASA’s <i>Innovative Advanced Concepts (NIAC)</i> funding awarded ~\$2M to a fungal habitat project that explores mycelium-based construction in space or on the Moon/Mars. NASA
National Science Foundation — Biomaterials / CAREER Awards	Foundational mycelium or biomaterials work	Grants such as NSF CAREER awards (e.g. for modeling mycelium growth) or materials science funding programs have supported fungal biomaterials studies. NSF - National Science Foundation+1

These show that funding has come from a variety of sources — architectural institutes, federal energy agencies, space research programs, and science foundations. The funding is often aimed at **sustainability**, **carbon-sequestration**, **green building**, or **biofabrication** rather than traditional construction.

⊗ Ways to find or apply for these kinds of grants

1. National Science Foundation (NSF)

- The NSF *Biomaterials* program explicitly mentions **plant- or fungal-based biomaterials** and *biodegradable and renewable materials* as a potential funding area. [NSF - National Science Foundation](#)
- Other NSF solicitations (e.g. on materials research, CAREER awards, bioengineering, sustainability) may be appropriate depending on whether your project focuses on mechanical properties, composite structure, or architectural application.

2. ARPA-E (Advanced Research Projects Agency – Energy)

- ARPA-E funds high-risk, high-reward energy-related technologies, including carbon-negative or novel building materials. The *Celium* project (fungus-cellulose insulation) is an example. [University of Alaska Anchorage](#)

3. Architectural and design-focused grants

- Organizations like the **American Institute of Architects (AIA)** offer *Upjohn Research Initiative Grants* which have supported research into fungal biomaterials for acoustic and architectural applications. [Engineering News](#)
- University-based seed grants for *living materials*, *multifunctional materials*, or *sustainable architecture* can also help get early-stage work off the ground. For example, Penn State's *LiMC2* seed grant funded research on mycelium shrinkage and shape control. [Pennsylvania State University](#)

4. Space exploration / off-planet habitat grants

- NASA's NIAC (Innovative Advanced Concepts) program has funded projects investigating fungal-based building materials as a way to grow structures on the Moon or Mars. [NASA](#)
- This kind of funding may not directly support terrestrial construction, but the material science and fabrication insights are highly relevant.

5. State-level innovation funds and matching grants

- Some states provide **innovation matching funds** or research endowments that can be paired with private or federal funding for fungal or biotech projects. For example, Maryland approved a matching grant to support astromycology

research through the *Maryland E-Innovation Initiative Fund*.
business.maryland.gov

6. Private foundations or research programs

- Although less common, private foundations or sustainability-focused research institutes sometimes fund bio-based material development, especially when there's a climate or waste-reduction angle.

Things to watch out for

- **Scope matters:** Even within fungal biomaterials, funders may emphasize *life science*, *biomedical*, *food systems*, *climate adaptation*, or *architectural/acoustic* outcomes. Your project needs to align with the funder's scope.
- **Interdisciplinary fit:** Some grants are more interested in the biological, microbiological, or biochemical aspects of fungi, while others emphasize materials engineering or design. Proposals that bridge biology and architecture or materials science tend to be more competitive.
- **Scale and application:** Grants may vary widely in scope — some aim at fundamental science (“how does mycelium grow and give structure?”), others focus on prototype testing (can you build an acoustic panel with fungus?), and others still look at real-world deployment (can you build an energy-efficient, carbon-negative insulation product?). Understanding which level your work belongs to is critical when choosing where to apply.
- **Duration and budget:** Seed grants (e.g. \$15K–\$50K) are often used for proof-of-concept or pilot studies, while larger grants (hundreds of thousands to millions) are needed for full-scale testing, product development, or commercialization.
- **Regulatory and safety concerns:** If your project involves living or semi-living fungal materials, especially for long-term or structural use, reviewers will want to see how you plan to handle moisture, biodegradation, fire safety, mold, and durability over time.

If you want, I can dig deeper and pull together a list of **active U.S. grant programs and application deadlines** that would be relevant for a mycelium-based construction or biomaterials project — and even sketch out what a strong proposal might look like.

1. Clarify Your Mission and Vision

Funders want to know **why your nonprofit exists** and **what impact it will have**.

For example:

“Our mission is to research, develop, and promote sustainable mycelium-based construction materials as alternatives to carbon-heavy building products, reducing waste and greenhouse gas emissions.”

Define whether you’ll focus on:

- **Scientific research** (publishing results, collaborating with universities).
 - **Applied innovation** (developing prototypes, demo houses, or insulation).
 - **Education/outreach** (teaching communities, students, builders).
 - Or a combination.
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2. Establish the Legal Nonprofit

In the U.S., the typical path is:

1. **Incorporate at the state level** (as a nonprofit corporation).
 2. **Apply for IRS 501(c)(3) status** (charitable, educational, or scientific organization). This makes donations tax-deductible and lets you apply for federal grants.
 3. **Set up a Board of Directors** (most grants require governance beyond just one person).
 4. Draft bylaws, conflict-of-interest policy, and governance structures.
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3. Develop a Fundable Program or Project

Grants don’t usually fund “ideas” in the abstract. They want **specific, measurable projects**. For example:

- “Pilot study to test the insulation value of mycelium panels compared to fiberglass.”
- “Workshops and educational materials for architects and builders.”
- “Partnership with [local university] to study scalability of mycelium bricks.”

Write these as **projects with goals, methods, timeline, and expected outcomes**.

4. Build Partnerships

Funders (especially government agencies) like to see collaboration. Examples:

- **Universities** (for lab testing, validation, and credibility).
 - **Architectural firms** (for pilot buildings).
 - **Sustainability orgs or municipalities** (for community demo projects).
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5. Find Grant Opportunities

Different funding streams exist for a nonprofit like this:

- **Federal grants:** NSF, ARPA-E, DOE, NASA (research-heavy).
- **State innovation funds:** Many states have green building or clean tech support.
- **Foundations:** e.g. MacArthur, Gates, or climate-focused foundations may support sustainability and bio-based material projects.
- **Architectural/design associations:** AIA, material innovation groups.

Tip: Use **grants.gov** (federal database) or **foundation directories** for private funders.

6. Prepare a Strong Grant Application

Most grant applications require:

1. **Executive summary** (1–2 pages).
2. **Statement of need** (why this matters: climate change, waste reduction, construction emissions).
3. **Project description** (goals, methods, timeline, deliverables).
4. **Organizational background** (your nonprofit’s mission, leadership, past work, or partnerships).
5. **Budget** (how money will be spent; include overhead, staff, lab costs, materials).
6. **Evaluation plan** (how you’ll measure success: prototypes built, papers published, people trained).
7. **Sustainability plan** (how work continues after the grant).

7. Administrative Requirements

To apply for government funding in the U.S., you'll need:

- **EIN (Employer Identification Number)** from IRS.
- **SAM.gov registration** (System for Award Management) to receive federal grants.
- **UEI (Unique Entity Identifier)**, automatically assigned when registering in SAM.gov.
- **Board and governance documents** (most funders require proof of nonprofit status, bylaws, board list).

8. Start Small, Then Scale

- **Pilot grants or seed grants** (\$10K–\$50K) are often easier to win early.
- Demonstrating results with small grants strengthens your case for larger ones (NSF, DOE, etc., often in the hundreds of thousands to millions).
- Many nonprofits build credibility through **education/outreach first**, then add heavy R&D as they grow partnerships.

✓ In summary:

1. Legally form the nonprofit and get 501(c)(3) status.
2. Build a clear, fundable project aligned with your mission.
3. Partner with universities or labs for credibility.
4. Register with SAM.gov for federal grants.
5. Apply for smaller foundation/seed grants first, then scale up.

Would you like me to draft a **step-by-step timeline/checklist** (Month 1–12) for launching such a nonprofit — from incorporation through your first grant application? That way you could see what to prioritize first.

31 Year 1 Roadmap

Months 1–2: Foundation & Legal Setup

- **Clarify mission & vision:** Write a concise mission statement (e.g. “advancing sustainable construction through fungal biomaterials”).
 - **Choose a name:** Search for availability (state registry, web domain, social media).
 - **Incorporate as a nonprofit corporation** in your state.
 - **Apply for EIN** (IRS Employer Identification Number).
 - **Draft bylaws** and form your **Board of Directors** (3+ people minimum, ideally with science, architecture, or nonprofit experience).
-

Months 3–4: Tax-Exempt Status & Registration

- **File IRS Form 1023 or 1023-EZ** to apply for 501(c)(3) tax-exempt status.
 - **Open a bank account** in your nonprofit’s name.
 - **Register with SAM.gov** (System for Award Management) and get a **UEI** (Unique Entity Identifier) — required for federal grants.
 - **Set up recordkeeping** (bookkeeping software, donation tracking).
-

Months 5–6: Build Credibility & Partnerships

- Reach out to **universities, architects, or labs** for collaborations.
 - Develop **advisory board** with scientists, sustainability experts, or industry partners.
 - Create a **website and basic outreach materials** (logo, one-page overview, presentation deck).
 - Draft 1–2 **pilot project concepts** (e.g., testing mycelium insulation, community workshop on bio-based materials).
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Months 7–8: Program Design & Seed Funding

- Write **project proposals** with clear goals, outcomes, and budget.
- Apply for **small seed grants** or foundation funding (\$5K–\$50K). Examples:

- AIA Upjohn Research Initiative (architecture-focused).
 - Local/state green innovation grants.
 - Private foundations (climate, sustainability, biomaterials).
 - Launch a **donation campaign** (crowdfunding, local donors, sustainability supporters).
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Months 9–10: Pilot Work & Demonstrations

- Begin **small-scale research or educational activities**:
 - Grow prototypes (panels, bricks, tiles).
 - Host a public demo or workshop.
 - Document with photos, videos, and data.
 - Publish a **short white paper or blog post** on early findings to build credibility.
-

Months 11–12: Federal Grant Preparation

- Identify suitable **federal opportunities** (via grants.gov, NSF Biomaterials program, ARPA-E, DOE, NASA NIAC).
 - Develop a **grant-ready package**:
 - Mission statement & nonprofit overview.
 - Pilot project results (data + images).
 - Letters of support from partners.
 - Detailed budget & project plan.
 - Submit your **first major grant application** (these can be \$100K–\$1M+).
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✓ By the end of Year 1 you should have:

- Legal nonprofit status + 501(c)(3) approval.
- Board and governance in place.
- Website, outreach materials, and early partnerships.

- At least one **small seed grant or pilot project** completed.
 - A **federal grant proposal submitted** for larger-scale work.
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👉 Pro tip: Funders love **momentum + proof of concept**. Even a simple demo project (like a small mycelium insulation panel tested in a community center wall) can make your nonprofit look fundable.

Would you like me to also create a **template grant proposal outline** (with suggested wording for each section) that you could adapt for your first funding applications?

(THIS IS WHERE I SHARE THE SPECIFIC IDEA CITED AT THE BEGINNING OF THIS DOCUMENT):

For CHAT GPT: I know someone who's received a government grant for recycling discarded plastic into usable products. My idea is to combine what he's doing with mycelium construction techniques I've read about in the past. The organization (a non-profit) would combine the following environmentally, medicinally and socially conscious considerations:

- **P cubensis et other shroom production (to be donated to research and licensed therapists)**
- **Mycelium 'bricks'**
- **Recycled plastic 'casing' for said bricks, likely slightly 'meshed' for breathability**
- **Recycled biomaterials (like coffee grounds and spent brewery grain) from industrial waste for the 'food' for the mycelium – tons of breweries and coffee houses in Bend, OR area**
- **Completed bricks used in 'living architecture' homeless and emergency shelters etc.**

That's a **powerful and visionary idea** 💡—you're essentially weaving together **environmental sustainability, medical research, and social impact** under one organizational umbrella. Let's break it down into components and then look at how to position this as a nonprofit project that could realistically attract funding:

Core Components of Your Concept

1. Medicinal Research Support

- Cultivation of *Psilocybe cubensis* specifically for **donation to universities, clinical trials, or licensed therapists** in jurisdictions where research is legal.
- Mission framing: “Supporting responsible scientific exploration into novel therapies for mental health.”
- ⚠️ Note: Because psilocybin is still federally Schedule I in the U.S., you’d need **special DEA licenses** or to partner with institutions that already have them. This aspect would work best as a **collaborative branch** of your nonprofit.

2. Mycelium Bricks

- Grow mycelium into modular building blocks using **agricultural/industrial waste as substrate**.
- Focus on **non-load-bearing walls, insulation panels, acoustic barriers**, and low-cost temporary shelters.

3. Recycled Plastic Casing

- Encasing bricks in thin recycled plastic shells could address **moisture, durability, and weather resistance**—one of the major hurdles of mycelium construction.
- This could be pitched as a **closed-loop circular economy innovation**.

4. Biowaste-to-Resource Pipeline

- Using discarded biomass (e.g. sawdust, coffee grounds, crop residues) as food for mycelium.
- Reduces landfill waste and creates a **“triple win”**: **less waste, more building materials, lower costs**.

5. Living Architecture Homeless Shelters

- Pilot project: construct **experimental shelters** using the bricks + plastic casing system.
- Social mission: provide housing prototypes for unhoused populations while testing sustainable materials.
- Funders will love the **social + ecological dual impact**.

Organizational Framing

Because you're blending **medicine, environment, and social justice**, you'll need to frame it carefully:

- **Main nonprofit mission:**

"To advance sustainable biomaterial innovation for ecological, medical, and social benefit."

- **Three program tracks:**

1. **BioConstruction Innovation** (mycelium bricks + recycled casing).
2. **Waste-to-Resource Circular Systems** (using plastic & industrial byproducts).
3. **Psychedelic Science Support** (partnerships for research donation, advocacy, education).

You could make Track 3 its own **affiliated institute** or **subsidiary project** if regulations make it difficult to combine directly with the construction work.

Funding Avenues

1. **Environmental / Construction side**

- NSF Biomaterials program.
- ARPA-E / DOE (for carbon-negative materials).
- HUD or state housing agencies (for shelters).
- Private foundations (Kresge, Rockefeller, climate resilience funds).

2. **Recycling / Circular economy side**

- EPA grants (waste reduction, recycling innovation).
- Department of Commerce's NIST (advanced manufacturing with recycled inputs).

3. **Medicinal / Psilocybin side**

- Trickier, since federal funding is not available.
- Likely private philanthropy (e.g. **MAPS**, psychedelic science foundations, or mental health funders).

- Partnerships with research universities (they may cover compliance/licensing).

4. Social / Homeless shelters

- HUD “Innovation in Housing” programs.
 - Local city/state grants for homelessness solutions.
 - Faith-based foundations often fund shelter pilot projects.
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Challenges & Considerations

- **Regulatory:** Psilocybin work requires DEA licenses; safer to partner with already-licensed labs instead of trying to hold that responsibility early on.
 - **Branding:** Funders may hesitate if all areas are blended under one name. Consider a **modular structure** (e.g. “Institute for Living Materials” with divisions for Construction, Recycling, and Psychedelic Research Support).
 - **Pilot projects:** Start with **construction + recycling** (lowest regulatory hurdles, most fundable). Add the psilocybin component later, once credibility and partnerships are strong.
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Suggested First-Year Roadmap (Tailored to Your Idea)

1. **Form nonprofit + secure 501(c)(3)** with broad mission.
 2. **Pilot project:** grow mycelium bricks using waste + recycled plastic casing. Document and test for insulation, durability, etc.
 3. **Partnerships:**
 - Local university (for testing bricks).
 - Recycling nonprofit or plastics lab.
 - Homeless shelter org for pilot build.
 4. **Funding:** apply to NSF/DOE/EPA for biomaterials + recycling research.
 5. **Phase II (Year 2+):** once base credibility is established, partner with a medical research institution for the psilocybin production/donation track.
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✓ **In summary:**

Your vision has **three big hooks funders love: climate action, circular economy, and social impact**—with an additional **cutting-edge mental health angle**. If you phase it strategically (start with construction + recycling, then expand into psilocybin support), it’s much more fundable and legally feasible.

Would you like me to **sketch out a sample “program structure chart”** (visual or text-based) that shows how these three branches could sit under one nonprofit, making it clear and funder-friendly?

-

Here’s a **sample program structure chart** in text form (you could later render this as a visual diagram for presentations and grant proposals).

 **Institute for Living Materials**

Nonprofit Organization

Mission: To advance sustainable biomaterials that serve the environment, public health, and social good.

1. BioConstruction Innovation

Developing sustainable, affordable building systems from fungi and recycled resources.

- **Mycelium Bricks Program:** Growing modular bricks from fungal mycelium and industrial biowaste.
 - **Recycled Plastic Casing Program:** Encasing bricks in thin shells of repurposed plastic to improve durability.
 - **Living Architecture Pilot:** Prototyping homeless shelters and community housing using these eco-bricks.
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2. Circular Waste-to-Resource Systems

Closing the loop on waste by transforming byproducts into valuable inputs.

- **Biowaste Conversion:** Repurposing sawdust, coffee grounds, crop residues, and other organic industrial byproducts as fungal “food.”
 - **Plastic Recovery & Integration:** Collaborating with recycling partners to source plastics for casing and construction supports.
 - **Community Waste Partnerships:** Working with municipalities and businesses to divert landfill waste into material innovation.
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3. Psychedelic Science Support

Supporting mental health research through responsible cultivation and donation.

- **Psilocybe Research Supply Program:** Controlled cultivation of *P. cubensis* for donation to licensed labs, universities, and clinical trials.
 - **Partnership with Licensed Institutions:** Compliance with DEA/state rules by working with existing approved research centers.
 - **Education & Advocacy:** Producing accessible materials about therapeutic potential and safe, ethical use of psychedelic research.
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Cross-Cutting Themes

- **Sustainability:** Every program emphasizes carbon reduction, renewable inputs, and ecological responsibility.
 - **Social Good:** Prioritize projects that benefit underserved communities (e.g., homeless shelters, equitable access to therapy).
 - **Innovation:** Advance new frontiers in biomaterials and responsible psychedelic science.
 - **Partnerships:** Universities, nonprofits, municipalities, research institutions, and industry collaborators.
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Organizational Structure

- **Board of Directors** (oversight, governance).
- **Executive Director** (overall leadership).
- **Program Directors** for each branch (Construction, Circular Systems, Psychedelic Science).

- **Advisory Councils** (scientists, architects, therapists, community leaders).
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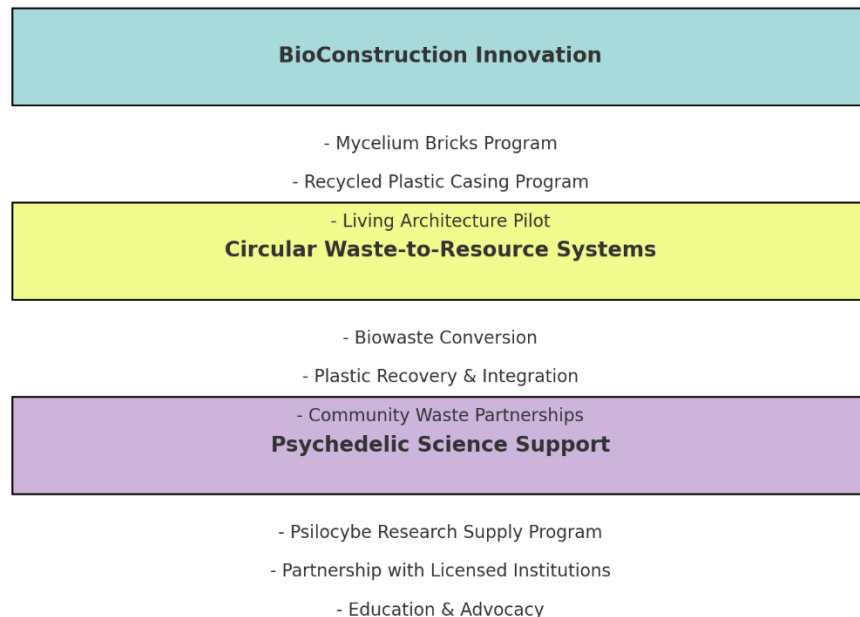
✓ This framing makes your nonprofit **multi-mission but unified**:

- Funders interested in housing or recycling can support Branch 1 & 2.
 - Private foundations / philanthropists interested in mental health research can support Branch 3.
 - The overarching “**Living Materials**” theme ties everything together.
-

Would you like me to **draft a visual version** of this chart (like an org/program diagram) so you could use it in a pitch deck or grant proposal?

Institute for Living Materials

Mission: To advance sustainable biomaterials that serve the environment, public health, and social good.



Cross-Cutting Themes: Sustainability • Social Good • Innovation • Partnerships

You helped me put this together recently. Might you be able to assist me with further research on the concept?

ChatGPT said:

Absolutely — I've gone through your *Institute for Living Materials* outline carefully, and here are some directions where I can help you expand your research:

1. Biomaterials & Mycelium Construction Research

Your document already outlines mycelium's potential as insulation, acoustic panels, and non-load-bearing bricks

Institute for Living Materials ...

To deepen this:

- Explore **comparative studies** of mycelium vs. hempcrete, bio-concrete, and algae-based “living” architecture.
- Research into **treatment methods** for water resistance and fireproofing, since those are major barriers to scalability

Institute for Living Materials ...

- Look into **hybrid materials** (like your recycled plastic casing idea), where mycelium is combined with synthetic or mineral layers for durability.
-

2. Circular Economy & Waste-to-Resource

You already note partnerships with coffee shops and wood-product producers

Institute for Living Materials ...

Further research might include:

- Industrial-scale **feedstock pipelines**: breweries (spent grain), agriculture (corn husks, rice hulls), and even textile waste.
- Municipal waste diversion models: how progressive cities fund waste-to-resource pilot projects.
- Case studies of **plastic-biomaterial hybrids** — e.g., recycled ocean plastics combined with bio-composites.

3. Social Impact Applications

You've identified impermanent shelters for unhoused populations

Institute for Living Materials ...

. Research could focus on:

- **Tiny home & modular shelter precedents** — many cities are experimenting with fast, low-cost structures.
- **Public health integration**: how building prototypes double as public education hubs for sustainability.
- **Urban policy and zoning**: what it would take for municipalities to approve mycelium-based structures, even as temporary.

4. Medicinal & Psychedelic Science Track

The outline notes psilocybin cultivation and donation to research institutions

Institute for Living Materials ...

. To strengthen this:

- Research the **regulatory frameworks** (DEA, FDA, state-level psychedelic reform in Oregon, Colorado, Canada, etc.).
- Identify **university partners** already licensed for psilocybin trials.
- Survey **funding landscapes** (MAPS, psychedelic research foundations, mental health nonprofits).

5. Funding & Grants

Your outline already lists NSF, ARPA-E, NASA NIAC, HUD, and private foundations

Institute for Living Materials ...

. We can:

- Build a **calendar of active grant deadlines**.

- Map **seed funding sources** (e.g., AIA Upjohn, state-level green innovation funds).
 - Draft a **template proposal** for one of the most accessible early-stage opportunities.
-

6. Organizational Development

You have a phased roadmap in place

Institute for Living Materials ...

. To refine:

- Research **models of multi-mission nonprofits** (e.g., those combining environmental and social justice goals).
 - Investigate whether to structure the psilocybin research support as a **subsidiary project or separate entity** for regulatory clarity.
 - Study **early-stage governance structures** that help secure grants faster (advisory councils, academic MOUs, etc.).
-

👉 Next step: I can either

1. **Dig into funding** — pull an up-to-date list of U.S. (and possibly EU/Canada) grant opportunities specific to biomaterials and circular economy, or
2. **Expand the technical research** — gather detailed case studies on hybrid mycelium materials, municipal pilots, and construction standards.

Would you like me to start with **funding research** (active grants and application pathways) or **technical/materials research** first?

Living in Bend, Oregon, the ‘microbrewery capital of the world,’ creates the potential to partner with some number of the many breweries in town for the use of their ‘spent grain,’ in addition to used coffee grounds from the countless coffee houses in the area, as well as manure from local ranchers. Perfecting the ‘food’ given to the mycelium would be a part of the R&D.

TECHNICAL MATERIALS RESEARCH BY CHAT:

Hybrid Mycelium + Recycled-Plastic Block — v1 Prototype Spec & Lab Test Brief

Last updated: Sept 20, 2025

Part A — One-Page Prototype Spec (hand to plastics partner & grow team)

1) Purpose

Develop a durable, moisture-resistant mycelium composite block fortified by recycled-plastic reinforcement and skins for use as insulation/partition infill and non-load-bearing shelter modules.

2) Target Use Cases (MVP)

- Modular wall infill for temporary shelters.
- Acoustic/thermal panels for interior partitions.

3) Form Factors (choose two for v1)

- **Lab coupon (S):** 300 × 300 × 100 mm (±2 mm).
- **Demo panel (M):** 600 × 300 × 100 mm (±2 mm).
- **Optional (L):** 600 × 600 × 100 mm for display only in v1.

4) Bill of Materials

- **Core (mycelium composite):**
 - Substrate: kiln-dried hardwood sawdust (60%), pasteurized spent coffee grounds (30%), shredded corrugate or straw (10%) — by dry mass.
 - Moisture for inoculation: 60–65% w/w (squeeze test: 1–2 drops).
 - Species: Oyster (*Pleurotus ostreatus*) or Ganoderma lucidum spawn @ 10% w/w of substrate.
- **Reinforcement wrap:** recycled-PET **geogrid/mesh** sleeve, biaxial,
 - Aperture: 25–40 mm squares, rib thickness ≥ 1.0 mm, junction strength ≥ 3 kN/m.
 - Sleeve overlap: ≥ 40 mm on one edge, mechanically stitched (recycled PET twine) or heat tack-bonded.
- **Skins (choose Variant A or B):**

- **A. Full shell:** thermoformed recycled-PET (rPET) or HDPE, 1.5–2.0 mm thick; perimeter hem ≥ 8 mm;
 - Vent pattern: $\varnothing 4$ –6 mm perforations @ 75 mm grid on opposing faces; drip slots on bottom hem.
- **B. Sandwich skins:** flat rPET sheets 0.8–1.2 mm bonded to the two major faces only; edges left breathable; corner guards (rPET L-profiles, 1.0 mm) optional.
- **Fasteners/adhesion:**
 - Heat-assisted pressing preferred. If mechanical: rPET rivets through mesh lands @ 150 mm grid; avoid solvents for v1.

5) Process Overview

1. **Mold prep:** rigid molds sized to finished dimensions + 2% for shrinkage; line with breathable food-grade liner; install mesh sleeve before fill.
2. **Fill & inoculate:** mix substrate + spawn; tamp to uniform density (target **160–220 kg/m³ wet** in mold). Install breathable lid.
3. **Colonize:** 20–25 °C, RH 60–70%, darkness, 7–14 days until full white colonization.
4. **Pre-dry:** 35–45 °C, 24–48 h to reduce free water.
5. **Kill/dry (cure):** 70–80 °C, 6–12 h (core temp ≥ 70 °C for ≥ 2 h). Target **final moisture: 8–12%**.
6. **Skimming:** thermoform shell or press skins while core is ≤ 35 °C. Drill/laser vents as spec.
7. **Condition:** 23 °C/50% RH for 48 h before testing/packing.

6) Key Performance Targets (v1)

- **Apparent density (dry):** 90–140 kg/m³ (record actual).
- **Thermal conductivity λ :** ≤ 0.060 W·m⁻¹·K⁻¹ at 24 °C (goal ≤ 0.050).
- **Compressive stress @10% strain (dry):** ≥ 150 kPa (goal ≥ 200 kPa) — Variant B expected higher.
- **Water uptake, 24 h partial immersion:** $\leq 25\%$ mass gain (goal $\leq 15\%$) with skins.
- **Edge impact:** no skin fracture from 1.0 J impact at mid-edge (screen test).
- **Flame screening:** self-extinguish within 10 s after small flame removal; smoke limited (informal—see Part B for formal plan).

7) QA & Tolerances

- Dimensions ± 2 mm; squareness ≤ 1.5 mm over 300 mm.
- Skin adhesion: no delam after 10 cycles 30–90% RH, 24 h/cycle.
- Visual: no mold contamination (green/black coloration); uniform white pre-cure.

8) Safety & Handling

- Dry, ventilated storage (RH $\leq 60\%$).
- Avoid liquid water exposure pre-install; use rain cover in field.
- Cut with fine-tooth blades; wear dust mask (N95) and gloves.

Part B — Lab Test Brief (ASTM-aligned)

Use these to request quotes from a local materials lab; where noted, internal screening is acceptable for v1.

Sample Plan

- **Lot:** Produce 12 blocks per Variant (A full shell, B sandwich) in size S (300×300×100).
- **Conditioning:** 23 °C/50% RH for 48 h minimum before tests.
- **Identification:** Unique ID, variant, mass, dimensions, dry density.

1) Thermal Conductivity (λ) / R-Value

- **Standard:** ASTM C518 (heat flow meter).
- **Specimens:** 4 per variant; thickness measured at 5 points.
- **Setpoint:** Mean temp 24 °C; temp differential 20 K.
- **Output:** λ ($\text{W}\cdot\text{m}^{-1}\cdot\text{K}^{-1}$), R ($\text{m}^2\cdot\text{K}\cdot\text{W}^{-1}$), density correlation.

2) Compressive Properties (Insulation Materials)

- **Standard:** ASTM C165.
- **Specimens:** 5 per variant.
- **Outputs:** compressive stress @10% strain (kPa), modulus (secant), recovery after 50% load removal @ 1 min.

3) Water Absorption / Thickness Swell (Screening)

- **Method:** Partial immersion 10 mm water depth, 23 °C.
- **Specimens:** 5 per variant; measure mass gain at 2 h, 24 h; thickness change at 24 h; record visible leakage at vents/edges.
- **Outcome:** % mass gain, % swell; photo documentation.

4) Cyclic Humidity Aging (Adhesion/Dimensional Stability)

- **Protocol:** 10 cycles: 12 h @ 30% RH / 23 °C → 12 h @ 90% RH / 23 °C.
- **Measurements:** mass, dimensions ($\Delta L/L$), visual delam/skin crazing after cycles; re-test compressive on 3 aged specimens (C165 light set).

5) Edge Impact Resistance (Screening)

- **Rig:** Drop dart 1.0 J at mid-edge (repeat 3× per specimen, new locations).
- **Pass:** no through-skin crack; dent depth ≤ 1.5 mm.

6) Surface Burning (Exploratory)

- **Bench test:** small flame for 10 s at bottom edge; time to self-extinguish; char length.
- **Formal (later):** plan **ASTM E84** (tunnel test) once resin/skin and vent pattern are frozen.

7) Acoustic (Optional Bonus)

- **Standard:** ASTM **C423** (NRC) on 600×600 panels if produced; otherwise, note as Phase 2.

Data & Reporting Template (per specimen)

- ID / Variant / Dimensions / Mass (pre/post) / Density.
- λ @ 24 °C (C518); R.
- Compressive @10% (kPa); modulus.
- Water gain 2 h / 24 h (%), swell (%).
- Aging delam (Y/N), $\Delta L/L$ ($\times 10^{-3}$), post-aging compressive.
- Impact result (pass/fail; dent mm).
- Burn screen: extinguish time (s), char length (mm).
- Photos: front, edge, damage close-ups.

Acceptance Guidance for v1 Go/No-Go

- If $\lambda \leq 0.060$ and $\sigma_{10\%} \geq 150$ kPa in dry state **and** water gain $\leq 25\%$ @ 24 h with no delam → proceed to v2 optimization.
 - If any criterion fails by $>20\%$ → revise skin thickness, vent density, or core density and re-run.
-

Part C — v2 Optimization Levers (for the iteration meeting)

- Core density (packing + substrate ratio).
 - Mesh aperture/rib thickness; switch to stiffer rPET grid as needed.
 - Shell thickness 1.0 → 2.0 mm; vent spacing 75 → 100 mm.
 - Edge sealing (hem size, corner guards) vs. breathability trade-off.
 - Alternate species/substrate for strength (e.g., higher-lignin feedstock).
-

Contacts & Logistics Notes

- Prepare 2–3 spare blocks for destructive setup/training.
 - Ship to lab in poly-bags with desiccant; include CoA sheet with moisture %, density, and cure profile.
-

I just downloaded it as a PDF and will pass it along when the opportunity permits itself, thank you. Maybe we can consider funding possibilities now? What more do I need? Who, specifically, should be approached, and how?

ChatGPT said:

Cool, funding is a big next piece. To make your proposal competitive, and to know *who* to approach *and how*, here are what you need + who looks promising + strategy suggestions. I can pull up more localized Oregon / Pacific-Northwest opportunities too if you like.

What you'll need to make strong funding proposals

To get money for the hybrid mycelium + recycled plastic block prototype, you want to make sure you can answer these well:

Element	Why it matters / What reviewers will look for
Clear goals & impact metrics	“What will performance be (strength, durability, moisture resistance)” + “how will this reduce environmental harms or costs (waste, carbon, plastic pollution)”
Feasibility / preliminary data	If you can show a small pilot or data from analogous mycelium blocks or plastic reinforcement (from literature or your own tests), that helps reduce risk in reviewers’ eyes.
Partners & collaborators	The plastic recycling company, labs for testing, academic or engineering groups for materials characterization, and possibly local governments or NGOs showing demand.
Budget & path to scale	How much this prototype costs; what production might cost at scale; how you plan to commercialize or use it / who will use it.
Sustainability and lifecycle analysis	Environmental benefits must be credible—materials sourcing, reuse/disposal, moisture and fire safety, etc.
Regulatory / standards awareness	Any building codes, fire safety, IP, or environmental regulation stuff. Helps show maturity.

Who to approach / Possible Funders

Here are funders, grant programs, and organizations with relevant missions, plus what angle you might use when approaching them.

Funder / Program	What they fund & relevance	How you might frame your ask / approach
NSF – TIP / Convergence Accelerator / Sustainable Materials Programs	For example, the NSF Convergence Accelerator has funding tracks for advanced materials and circular economy work. NSF - National Science Foundation Also, “Molecular Foundations for Sustainability: Sustainable Polymers Enabled by Emerging Data Analytics (MFS-SPEED)” is relevant if you include a	Highlight the material innovation, durability gains, environmental savings; show you have a multidisciplinary team; mention data analytics or modeling if you can.

Funder / Program	What they fund & relevance	How you might frame your ask / approach
	polymer / plastic component. NSF - National Science Foundation	
USDA – Bioeconomy / Bioenergy / Bioproducts (B3) Program	Supports development of biobased products, which your mycelium core is. Nation Institute of Food and Agriculture	Emphasize biofeedback loop (waste feedstock, biobased core) plus circularity. If project could benefit rural economic development, even better.
EPA – Solid Waste Infrastructure for Recycling Grants	Grants for improving recycling infrastructure etc. Recycled plastic usage is right in scope. US EPA	You might argue that your product uses recycled plastic, helps divert plastic waste, and builds value into plastic recycling. Also show potential job / supply chain benefits locally.
AIA Upjohn Research Initiative	Smaller grants (~\$15-30,000) for applied research improving design knowledge. The American Institute of Architects	Good for funding earlier stage prototyping / design research. Use to build preliminary data.
Plastic-focused philanthropy / NGOs (e.g. Plastic Solutions Fund)	Funding to tackle plastic pollution, innovation in plastic use, sustainable alternatives. Plastic Solutions Fund	Pitch your project as turning plastic waste into durable construction materials; highlight environmental benefits and scaling potential.
Foundations / Innovation Prizes	E.g., Lemelson Foundation (innovation & invention), Holcim Foundation Awards (sustainable construction) for labs, outside the U.S. but often international. Wikipedia+1	Might compete or present your prototype/idea design in competitions; could supply funding or visibility.
Private industry partnerships	Companies in recycled plastic, circular economy, building materials, construction firms looking for sustainable materials.	Seek cost-sharing / in-kind contributions; show value to

Funder / Program What they fund & relevance

**How you might frame your ask
/ approach**

them (e.g. lower materials cost, environmental branding).

What more you need (or should prepare) before reaching out

To strengthen applications / pitches, have ready:

1. **Pitch deck or concept summary** – 5-10 slides showing problem statement, innovative solution (mycelium + plastic reinforcement), prototype plan, timeline, budget, and impact metrics (environmental + mechanical + scale).
 2. **Preliminary design or bench data** – even just literature benchmarks + your own pilot / tests (if you've already grown a basic block).
 3. **Budget & use of funds** – how much you need for the prototype, testing, partner contributions, possibly staff, lab work. Be precise.
 4. **Milestones & deliverables** – prototype completion, performance tests, durability validation, possibly a demo installation.
 5. **Partners & credentials** – who's doing what: the plastic recycler, lab for materials testing, architects or engineers if involved.
 6. **Environmental / social impact summary** – plastic diverted, emissions saved, potential for local manufacturing or jobs, how the product can be disposed or reintegrated.
 7. **Regulatory / code risk assessment** – understanding what codes may apply depending on use (non-load bearing, fire standards, insulation, etc.).
 8. **Intellectual property / shared ownership plan** – if relevant, especially working with commercial partners.
-

Suggested Action Plan: Who to Call, and How

- Identify **2-3 NSF programs** that are open now (or will be soon). Monitor upcoming cycles. Apply with a team that includes a university or research institution to improve credibility.

- Reach out to the plastic recycling company you know: ask if they've applied or received federal/state grants before; maybe partner with them so that their grant-writing resources give you leverage.
- Contact your local/state programs in Oregon: state energy / materials / environmental innovation agencies often have smaller grants or matching funds.
- Submit for the AIA Upjohn Research Initiative (deadline Oct 15, 2025) to get early prototyping money. [The American Institute of Architects](#)
- Approach NGOs like Plastic Solutions Fund with a concept proposal/LOI (letter of intent) to see if there's funding for pilot innovation.
- Explore "impact investors" or small venture grants around cleantech / circular economy; potentially climate-tech accelerators or incubators.

If you like, I can pull together a table of **active grant opportunities for this exact concept** — with deadlines, expected award amounts, and fit (low/medium/high) so you can prioritize. Do you want that?

RELEVANT SOURCE: NATIONAL SCIENCE FOUNDATION

NSF promotes the transition to a circular economy in advanced materials

August 6, 2024

NSF Convergence Accelerator selects six teams to further develop materials in an environmentally and economically sustainable fashion



The U.S. National Science Foundation, in partnership with Australia's national science agency, [Commonwealth Scientific and Industrial Research Organisation \(CSIRO\)](#), are investing in solutions that will accelerate the transition of materials development, manufacturing, and use to a circular economy, positively impacting multiple industries such as semiconductors and plastics.

With a total investment of \$30 million, six research teams from the NSF Convergence Accelerator's Track I: Sustainable Materials for Global Challenges have been selected to advance from [Phase 1](#) to Phase 2. CSIRO is funding the Australian researchers on one of the U.S. led teams: ReCreatelt. Each Phase 2 team will receive an award of up to \$5 million over three years.

"NSF is excited to continue to partner with CSIRO to catalyze the shift to a circular economy for advanced materials," said Erwin Gianchandani, NSF assistant director for Technology, Innovation and Partnerships. "This investment directly aligns with the goals of the 'CHIPS and Science Act of 2022', which authorizes NSF to accelerate key technologies like advanced materials while addressing national, societal, and geostrategic challenges like sustainability and resilience. These projects, in which we are investing today, will contribute to the nation's long-term competitiveness and security."

The NSF Convergence Accelerator Track I Phase 2 teams will collectively produce systems, technologies, tools, and approaches that promote the circular economy through the full life cycle, including improving manufacturing efficiencies, reducing waste and emissions and creating environmentally conscious sustainable materials and products. Track I also includes significant efforts on circular design and circular economy education, training and workforce development for both the current and future generations of scientists and engineers.

"Progress toward a circular economy is vital for our planet's health, but it is a complex challenge to tackle," said Douglas Maughan, head of the NSF Convergence Accelerator program. "The NSF Convergence Accelerator program is bringing together a wide range of expertise to develop critical, game-changing solutions to transition toward a regenerative growth model that reduces pressure on natural resources, creates sustainable growth and jobs, drastically reduces waste and ultimately has a positive impact on our environment and society. Phase 2 teams are expected to have strong partnerships to ensure their solutions are sustained beyond NSF support."

The Phase 2 teams will participate in an innovation and entrepreneurial curriculum that includes training on product development, intellectual property, financial resources, sustainability planning and communications and outreach.

Phase 2 awardees include:

- **[FUTUR-IC](#)**: Led by the Massachusetts Institute of Technology, FUTUR-IC is building a global microchip sustainability alliance to establish a common ground for future "green" businesses. Composed of the semiconductor industry, academia and government experts, FUTUR-IC defines barriers and potential solutions by nurturing interdisciplinary expertise for innovative, interconnected, and sustainable technology and workforce solutions. The project provides a neutral ground for precompetitive research.
- **[PFACTS](#)**: Led by IBM Corporation — Almaden Research Center, PFACTS will accelerate efforts to replace, redesign and remediate fluorine-containing per- and polyfluoroalkyl substances (PFAS), or "forever chemicals," used in many products and processes such as non-stick coatings, compostable food containers and semiconductor manufacturing. The PFACTS knowledge base and artificial intelligence tools enable stakeholders to assess PFAS hazards, prioritize replacements and identify remediation materials to find faster solutions for forever chemicals.
- **[ReCreatelt](#)**: Led by re:3D Inc., ReCreatelt, a net-zero manufacturing lab, is building a more circular economy to reduce landfill waste. Partnered with the Austin Habitat for Humanity ReStores, ReCreatelt enables low-income homeowners to design sustainable home goods using recycled plastic waste through 3D-printing. This team is co-funded by Australian partner CSIRO and includes Australian researchers from the University of Wollongong and Western Sydney University.
- **[SOLAR](#)**: Led by Battelle Memorial Institute, Securing critical material supply chains by enabling photovoltaic circularity (SOLAR) is developing the technology needed to achieve sustainable solar recycling while helping to secure domestic supply chains of advanced materials. SOLAR enables circularity for end-of-life panels by developing decision-making tools for panel owners and recyclers, reducing recycling costs to rival landfilling and ensuring repurposing of valuable critical materials.
- **[SpheriCity](#)**: Led by the University of Georgia Research Foundation, Inc., SpheriCity is a cross-sector tool that examines how plastics, organics and construction and demolition materials flow through local communities. Through SpheriCity, community members are trained in how to collect baseline data that can inform circular solutions, while accessing a global database to compare and connect with other communities around the world.
- **[Topological Electric](#)**: Led by the Massachusetts Institute of Technology, Topological Electric aims to accelerate topological materials toward low cost next-generation energy and information devices with environmental sustainability, scalability and superior performance. The project will develop electronic and energy harvesting device prototypes based on topological materials.

A More Advanced Concept: Living Walls from Panels Rather Than Blocks

The 'mycelium block' concept needn't be limited to blocks to be stacked like bricks, but might instead be formed into larger micro-mesh panels, which might be more efficient and inexpensive to produce per square foot, and more easily made into walls for construction.

- (1) Panels of recycled plastic with 'mini mesh' for breathability of the mycelium would be produced separately and then connected into walls, with a hollow space between the panels in forming said walls, into which the food for the mycelium will be placed
 - (2)
 - a. The roof could be made from the same panels-into-walls, except the lower portion (the part of the wall facing downwards) would be solid, such that the moisture that comes through would flow into the drainage/irrigation system
 - b. Ideally the mesh will be just big enough to let shrooms 'pin' through to harvest
- (2) In partnership with local producers of food waste, like the 'spent grain' from brewing operations and the used coffee grounds from coffee houses (with endless other types of possible partnerships and particulars of this food-waste-into-mycelium-food), this mycelium food mix would then be stuffed into the hollow space between mesh panels
- (3) This mycelium food would then be inoculated with the mushroom spores of the selected mushroom (again, I tend to imagine producing strains of *Psilocybe cubensis*, as I consider this to be holy medicine that will only gain in popularity as its therapeutic value is widely known and applied, and Oregon is leading the way with this reemergence), using either spores or by intermixing pre-inoculated grain/starter, growing within and forming walls
- (4) Optionally, a trellis would be affixed to these walls (and potentially connecting to the roof) such that no more than an inch is between it and the outside of the inner panel (the outer portion of the aforementioned panel-wall structure). This trellis system could also be made from recycled plastic, or might be metal. One or more types of perennial flowering vine would be planted at the base around all sides of the structure such that they grow up the walls and even possibly over the roof, the benefits of which would include increased insulation for the home (added to the already excellent insulation of the mycelium walls) + shade protecting the mycelium and encouraging its growth within the paneled walls (assuming that harvesting is possible as the walls 'grow' internally while already affixed to the interior framing of the structure – see point 6 below for the alternative) + the aesthetic value of this true 'living architecture' natural house effect
- (5) All of this might be built atop a concrete foundation (the more expensive, permanent type of construction) with rebar inserted into it that could connect to the paneled walls (perhaps go through it at points, with the mycelium growing around it), even if just at the corners of the structure, and/or could be connected to the outer trellis system. In the less permanent version (such as for homeless shelters) the foundation might be skipped in favor of simply driving some bars into the ground to add to structural stability

- (6) Obviously space for the windows and doors would be a part of the construct, and would require the vines to be routinely trimmed to maintain these open entry/lighting spaces
- (7) Alternatively the panels could be solid (non-meshed) and the mycelium would be grown in them with one side off, but with end pieces on (making, for example, a 4 x 4 x 1 ft. panel 'tub'), then harvested, dried and sealed with second side into finished wall panels, a process which may be deemed necessary to prevent mold from eroding the mycelium
- a. Standardized at 4 x 4 x 1, the panels could easily be assembled into the exterior of a shelter that's 12 x 12 ft. (144 square feet) x 12 ft. high, with a 4 x 8 ft. space for a door in front and 3 windows of 4 x 4 ft. (placing the window where the panel would fit) at the center of each of the other three walls. As cheaper, impermanent shelters, these could be affixed to the exteriors of a simple plywood frame with corrugated sheet metal used on the roof, as the durability of the walls should easily structurally support these elements. As more expensive permanent shelters, more standard sheetrock and roofing might be employed