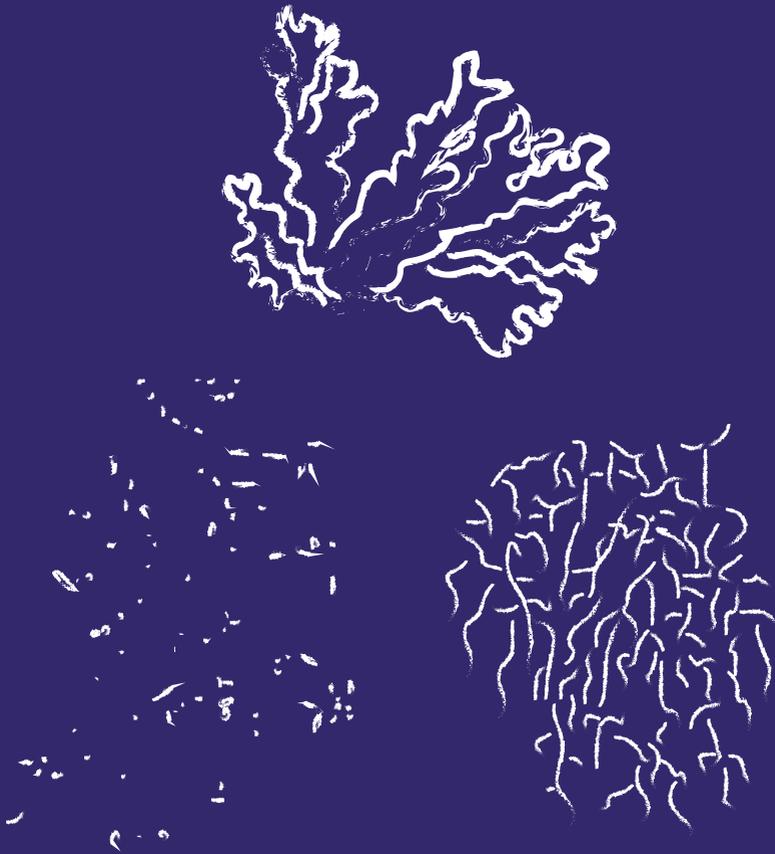


Bio Cards



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OF
DESIGN

Developed during the PhD project
Co-Cultivating Colours
by Monica Hartvigsen

Bio Cards

This tool comprises 21 cards, each providing a brief introduction to a specific aspect of the biomaterial world. It is designed to inspire designers by sparking curiosity about microorganisms and serves as an educational resource for sharing knowledge about biomaterials and biocolours.

The cards present selected algae, bacteria, and fungi, along with the biocolours or biomaterials they produce.

An overview of the cards is provided below.

Algae

Biomaterial

Spirulina
Alginate
Agar

Biocolour

Phycocyanin
Phycoerythrin
Luciferin

Bacteria

Biomaterial

Bacterial cellulose
Calcium carbonate
Polyhydroxy-
alkanoate (PHA)

Biocolour

Violacein
Indigoidine
Prodiogiosin
Carotenoid
Structural colour

Fungi

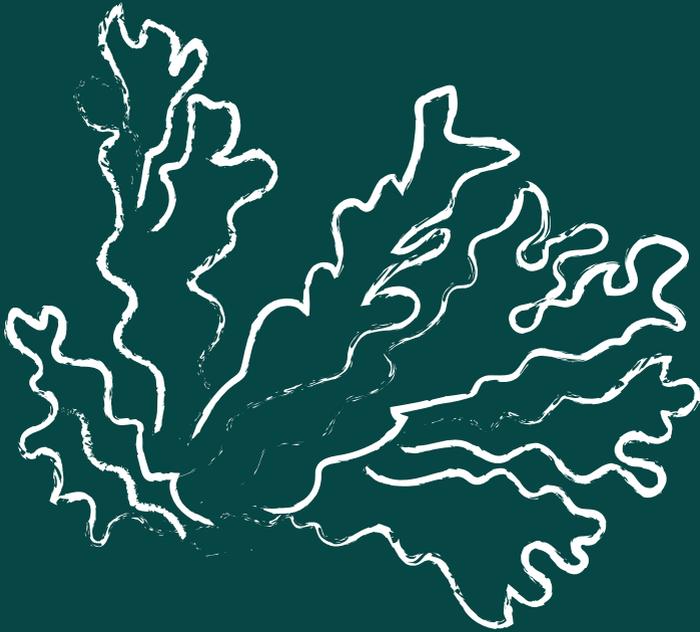
Biomaterial

Chitin
Chitosan
Mycelium
Mycelium leather

Biocolour

Xylindein
Bisorbicillinol
Azaphilone

Algae



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Spirulina



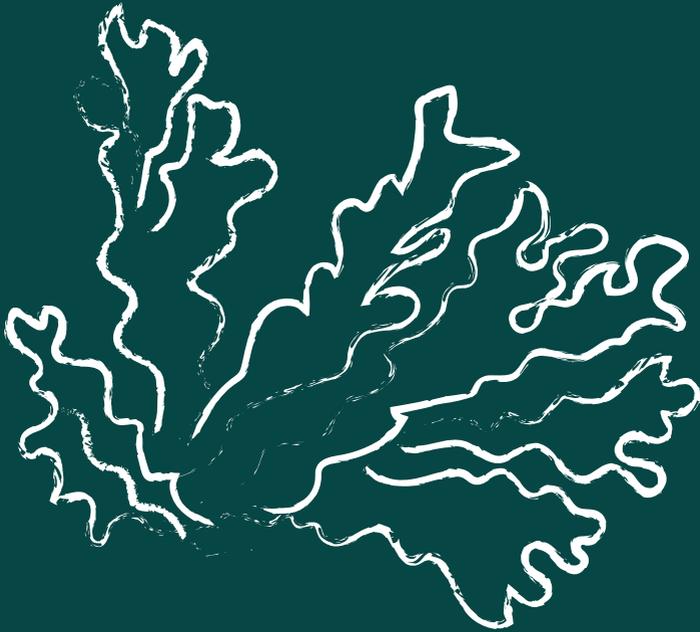
Source: Bloomberg Creative/Getty Images / BBC News Brasil

Who grew this?

Spirulina, a type of blue-green algae, is one of the oldest known species on Earth. It is rich in various nutrients, including fat-soluble vitamins (A, E, and K), essential fatty acids (DHA and EPA), beta carotene, and a range of minerals.

Biomaterial

Algae



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Phycocyanin

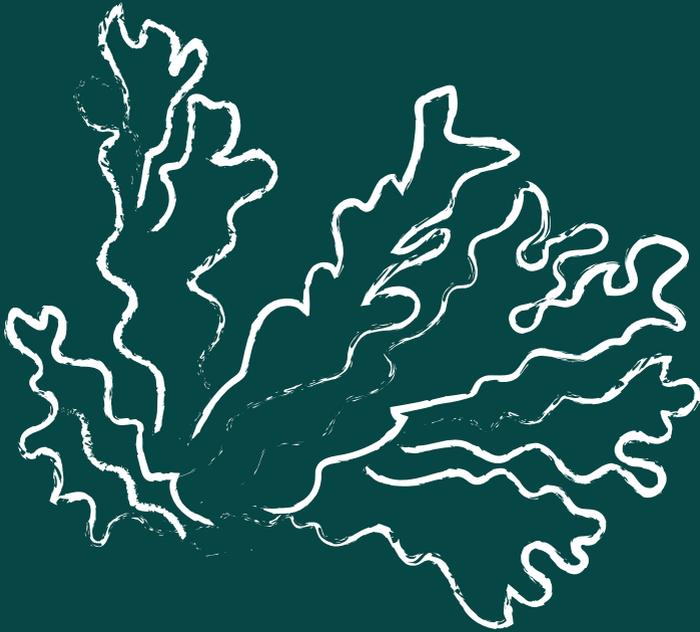


Source: Underfungus.com

Who grew this?

Phycocyanin, a phycobiliprotein, is found in cyanobacteria, a type of blue-green algae that obtains its energy through photosynthesis. It plays an important ecological role as an indicator of cyanobacteria blooms.

Algae



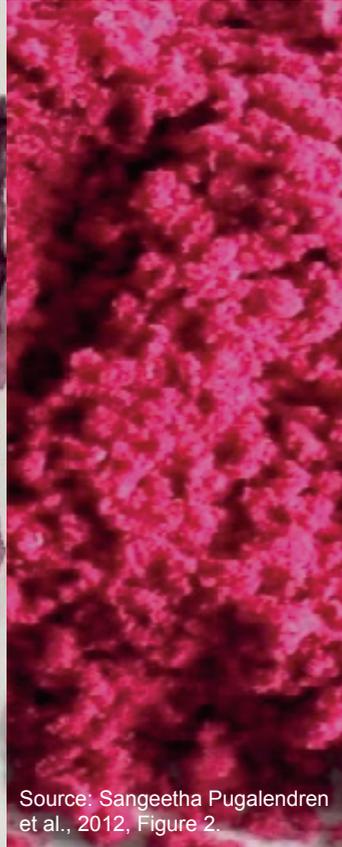
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Phycoerythrin



Source: Josie Iselin

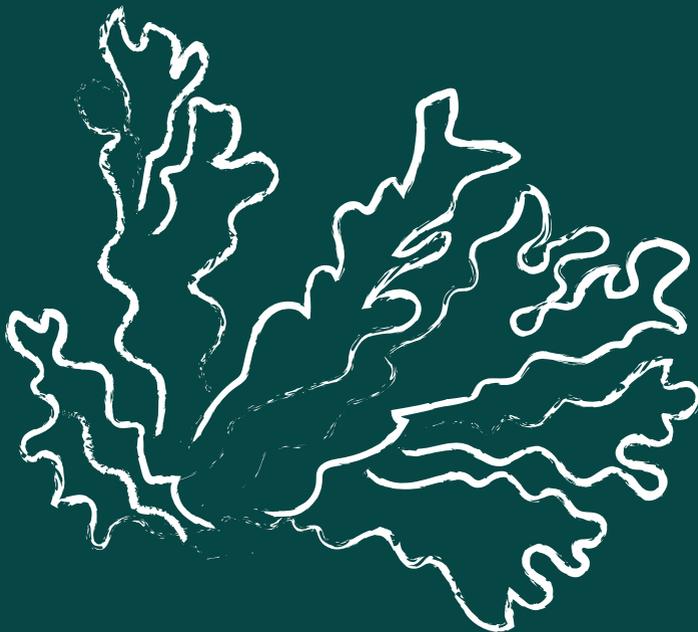


Source: Sangeetha Pugalendren et al., 2012, Figure 2.

Who grew this?

Phycoerythrin, a phycobiliprotein, is found in red algae (Cyanobacteria), Rhodophyta, Glaucocystophyta, and Cryptophyta. It plays a crucial role in photosynthesis.

Algae



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Alginate



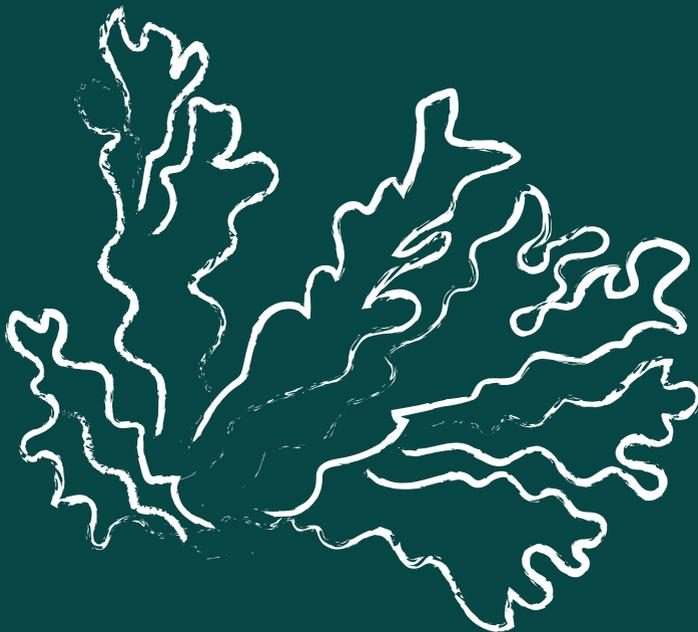
Source: IndiaMart.com

Who grew this?

Alginate, a polysaccharide derived from the cell walls of brown algae, has the ability to form a gel.

Biomaterial

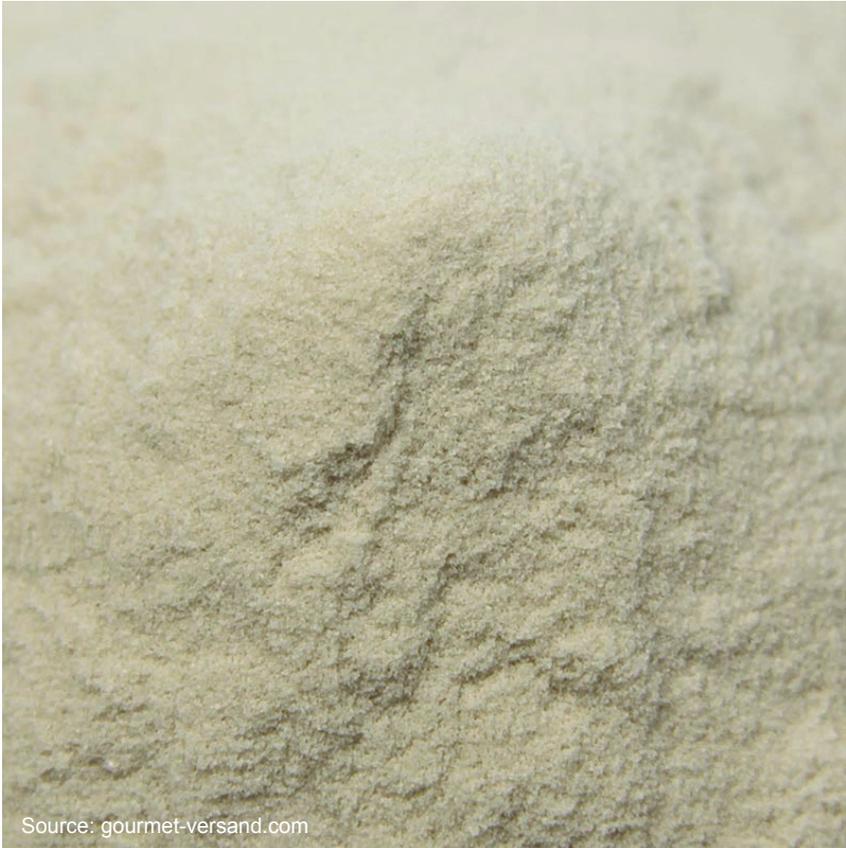
Algae



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Agar

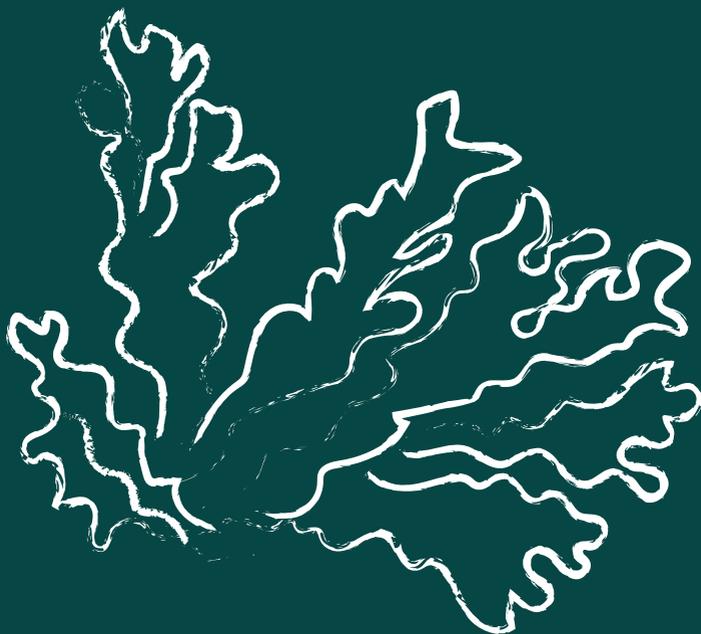


Who grew this?

Agar, derived from the cell walls of certain species of red algae, is composed of a mixture of two polysaccharides: agarose and agaropectin, with agarose accounting for approximately 70% of the mixture. It possesses the ability to form a gel.

Biomaterial

Algae



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Luciferin



Source: carolina.com

Who grew this?

Bioluminescent algae, most commonly dinoflagellates, produce light through the interaction of the enzyme luciferase and the compound luciferin. Luciferin is a complex molecule that generates light, while luciferase is an enzyme that accelerates the chemical reaction, resulting in the emission of light.

Bacteria



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Violacein



Who grew this?

Violacein is a purple pigment produced by the bacterium *Janthinobacterium lividum*.

Bacteria



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Carotenoid



Who grew this?

The orange or yellow pigment known as carotenoid is produced by various bacteria, such as *Sphingomonas* sp. or *Micrococcus luteus*, the latter being a common bacterium found on human skin.

Bacteria



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Polyhydroxyalkanoat



Source: PHA Market

Who grew this?

Polyhydroxyalkanoate (PHA) is a bioplastic comparable to PLA. It is produced by various bacteria, such as *Cupriavidus necator*, *Aspergillus eutrophus*, and *Rhodobacter sphaeroides*.

Bacteria



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Calcium carbonate



Source: Thora H. Arnardottir

Who grew this?

Biom mineralization is the process by which ureolytic bacteria, utilizing urea, produce calcium carbonate biominerals.

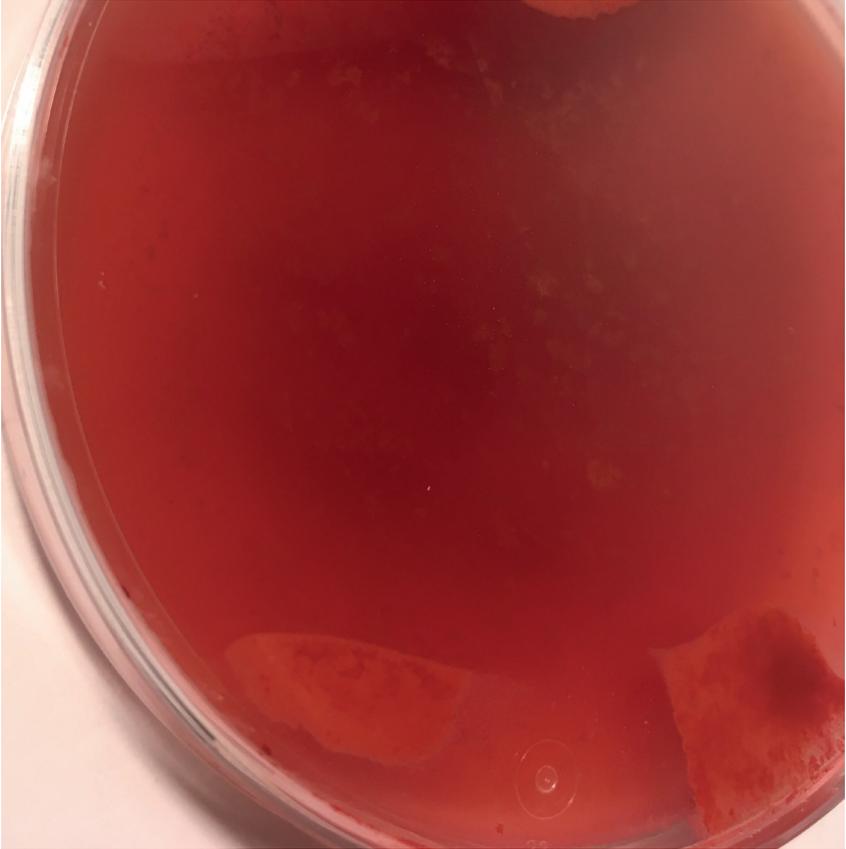
Bacteria



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Prodiogiosin



Who grew this?

The red pigment, prodigiosin, is produced by the bacterium *Serratia marcescens*.

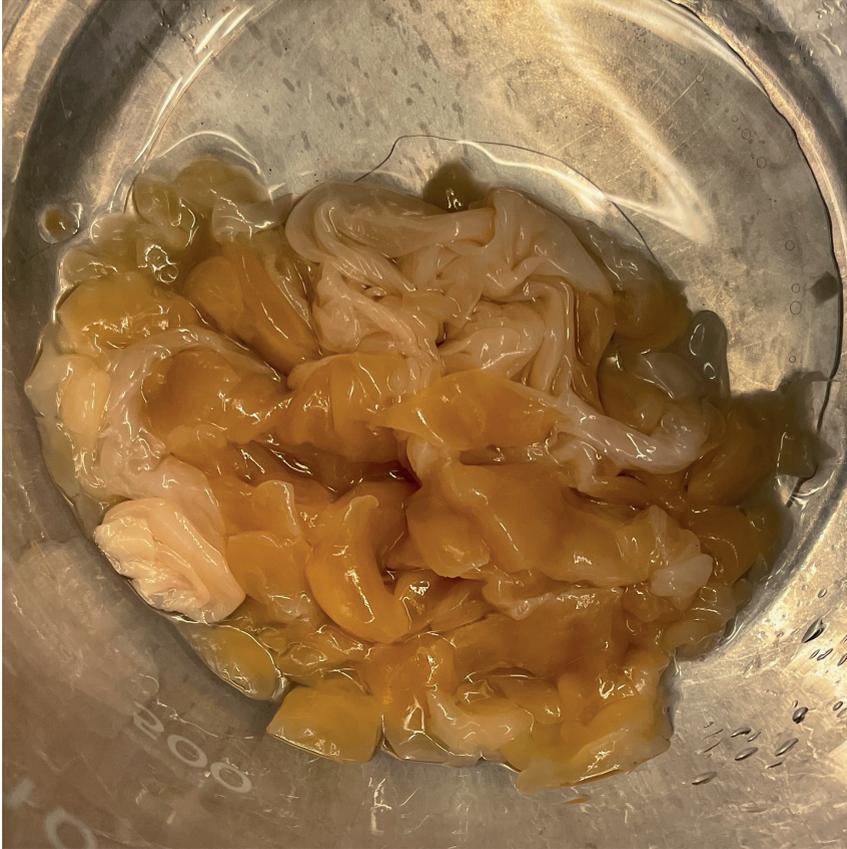
Bacteria



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Bacterial cellulose



Who grew this?

Bacterial cellulose is produced by various types of bacteria, such as *Komagataeibacter xylinus*, which utilize different forms of agricultural waste as nutrients for cultivation. It can also be generated by a symbiotic consortium of yeast and bacteria, known as SCOBY.

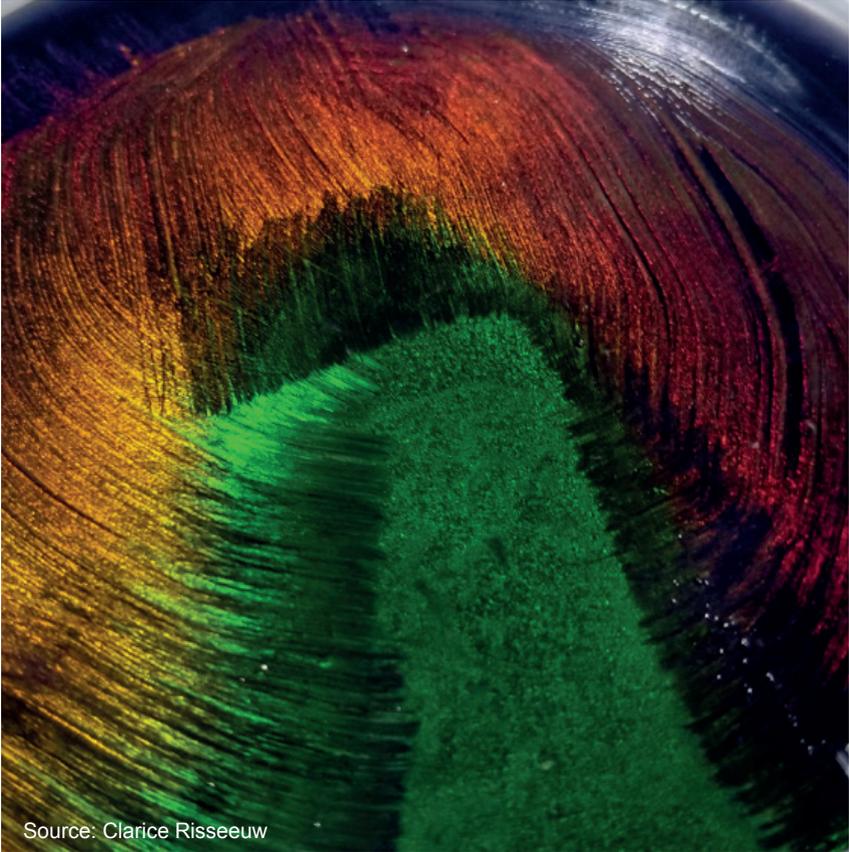
Bacteria



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Structural colour



Source: Clarice Risseuw

Who grew this?

Some bacteria, such as *Flavobacteria* sp., produce structural color by arranging themselves into nanostructures that reflect specific wavelengths of light, resulting in the creation of various colors.

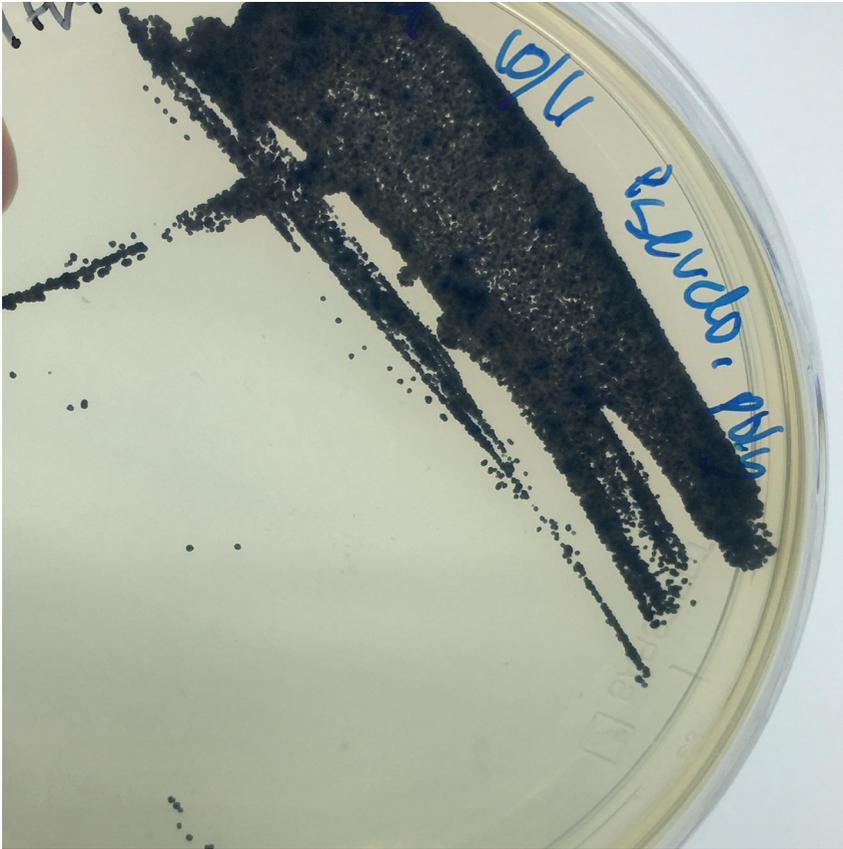
Bacteria



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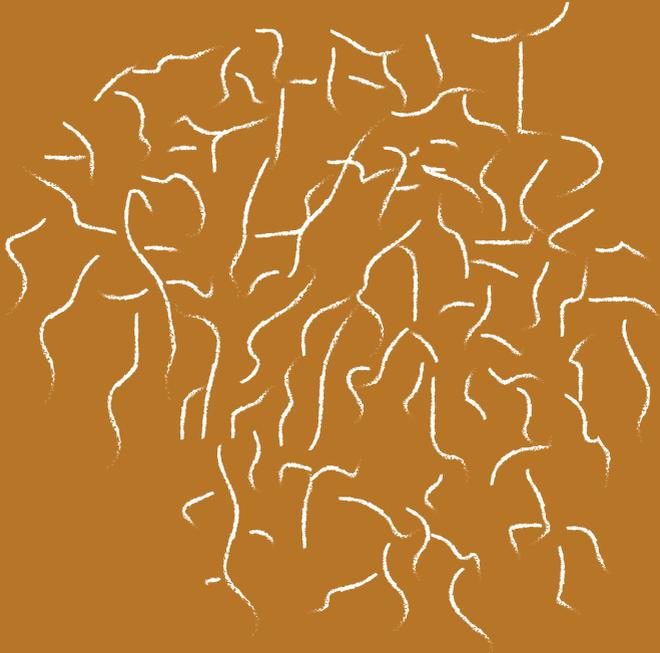
Indigoidine



Who grew this?

The blue pigment, indigoidine, can be produced by various bacterial strains, including *Vogesella indigofera* and *Pseudoanthrobacter polychromogenes*.

Fungi



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Mycelium leather



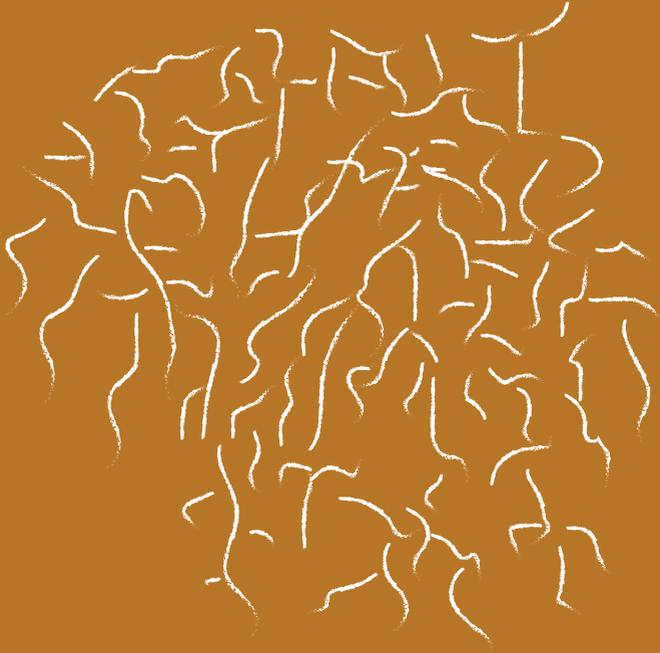
Source: Science Friday

Who grew this?

Mycelium leather is derived from the root-like network of fungi, known as mycelium. Various types of fungi can be utilized for this process, such as *Trametes versicolor*, which digests lignocellulose and forms a dense mycelium network suitable for producing mycelium leather.

Biomaterial

Fungi



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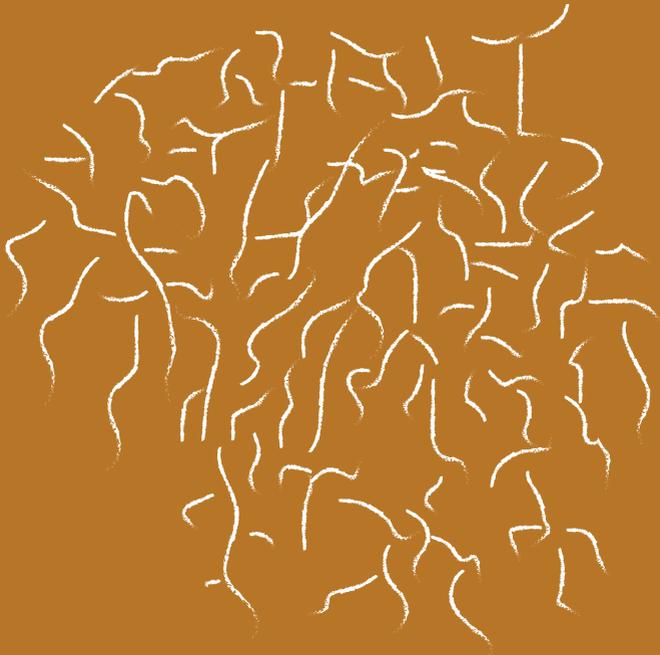
Chitosan



Who grew this?

Chitosan is a derivative of chitin. It is produced by partially removing acetyl groups from chitin through a process known as deacetylation, which makes it soluble in aqueous acetic acid. Chitin is commonly found in the cell walls of filamentous fungi.

Fungi



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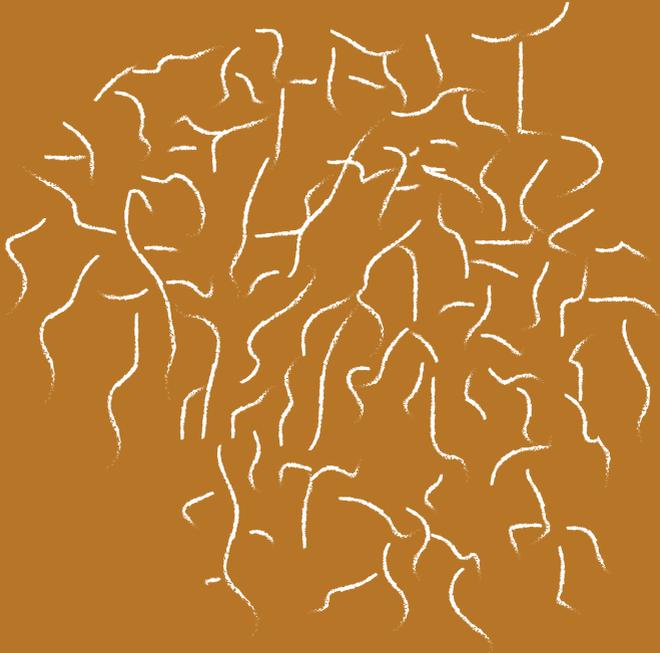
Chitin



Who grew this?

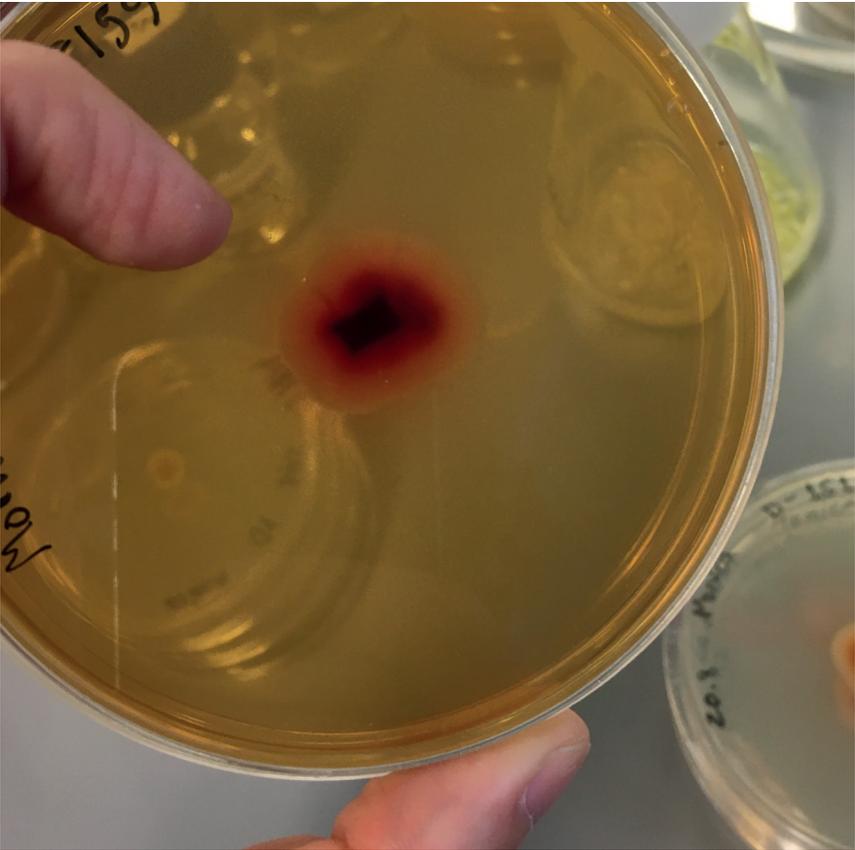
Chitin, the second most abundant polymer after cellulose, is present in the cell walls of filamentous fungi.

Fungi



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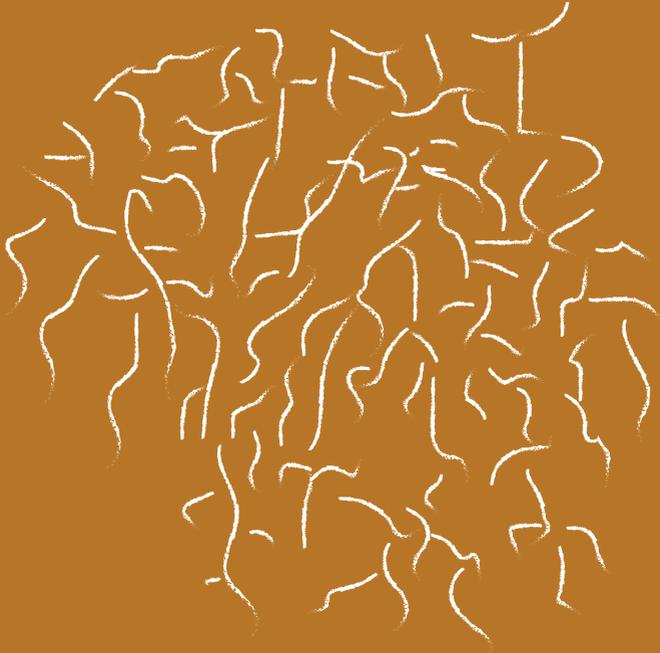
Azaphilone



Who grew this?

The fungus *Penicillium purpurogenum* produces a red pigment belonging to the azaphilone molecular structure.

Fungi



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Mycelium



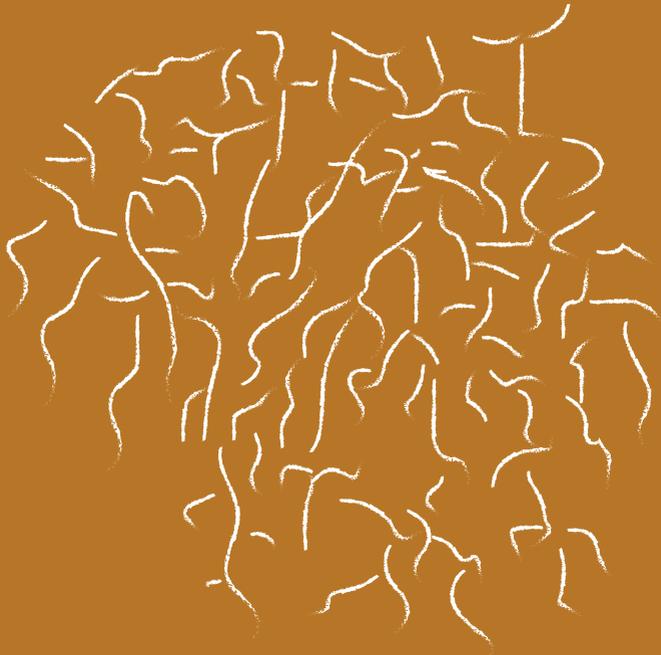
Source: AFJD

Who grew this?

Mycelium, derived from the root network of fungi, can act as a natural "glue," binding various sources of biomass together to form a biocomposite material. During this process, it digests part of the biomass as it develops its root-like structure.

Biomaterial

Fungi



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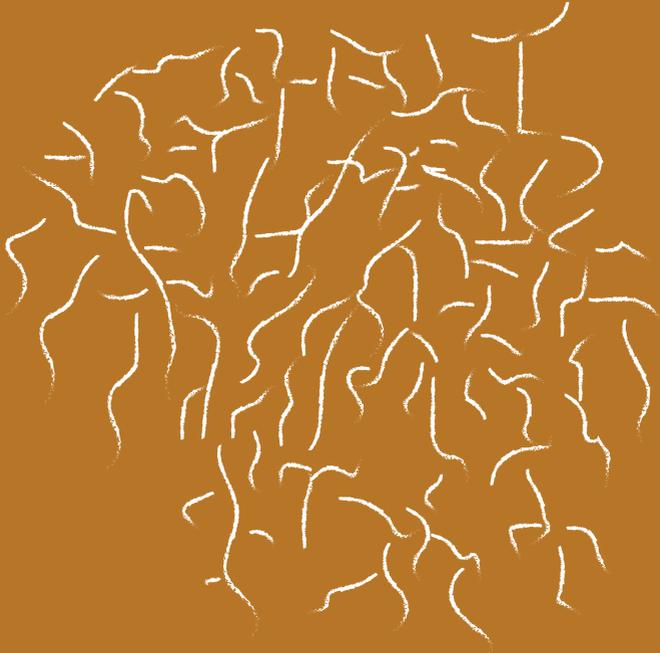
Xylindein



Who grew this?

The fungus Green Elf Cup (*Chlorociboria aeruginascens*) produces a green pigment known as xylindein. This fungus thrives on decaying wood, coloring it green as it grows.

Fungi



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Bisorbicillinol



Who grew this?

The fungus *Trichoderma reesei* produces a yellow pigment known as bisorbicillinol. It thrives on various carbon sources and has been utilized for large-scale industrial production.