

Schedule for Tuesday 18.5. 2021

9.15 Sharing Material Wondering experience (in breakout rooms)

9.35 Programme for the Sustainable Design part III

9.50 Exercise

10 Discussing the results

Break

10.30 Lecture: (Bio)Material Futures

Short break

11.30 Forming groups and assignment info

12 Session ends

Programme for the Sustainable Design part III

Tuesday 18.5. Lecture and preparing for the group assignment

Thursday 20.5. Time for the group assignment – please organize yourself

Tuesday 25.5. Time for the group assignment and tutoring, 20 min/group

Thursday 27.5. Time for the group assignment

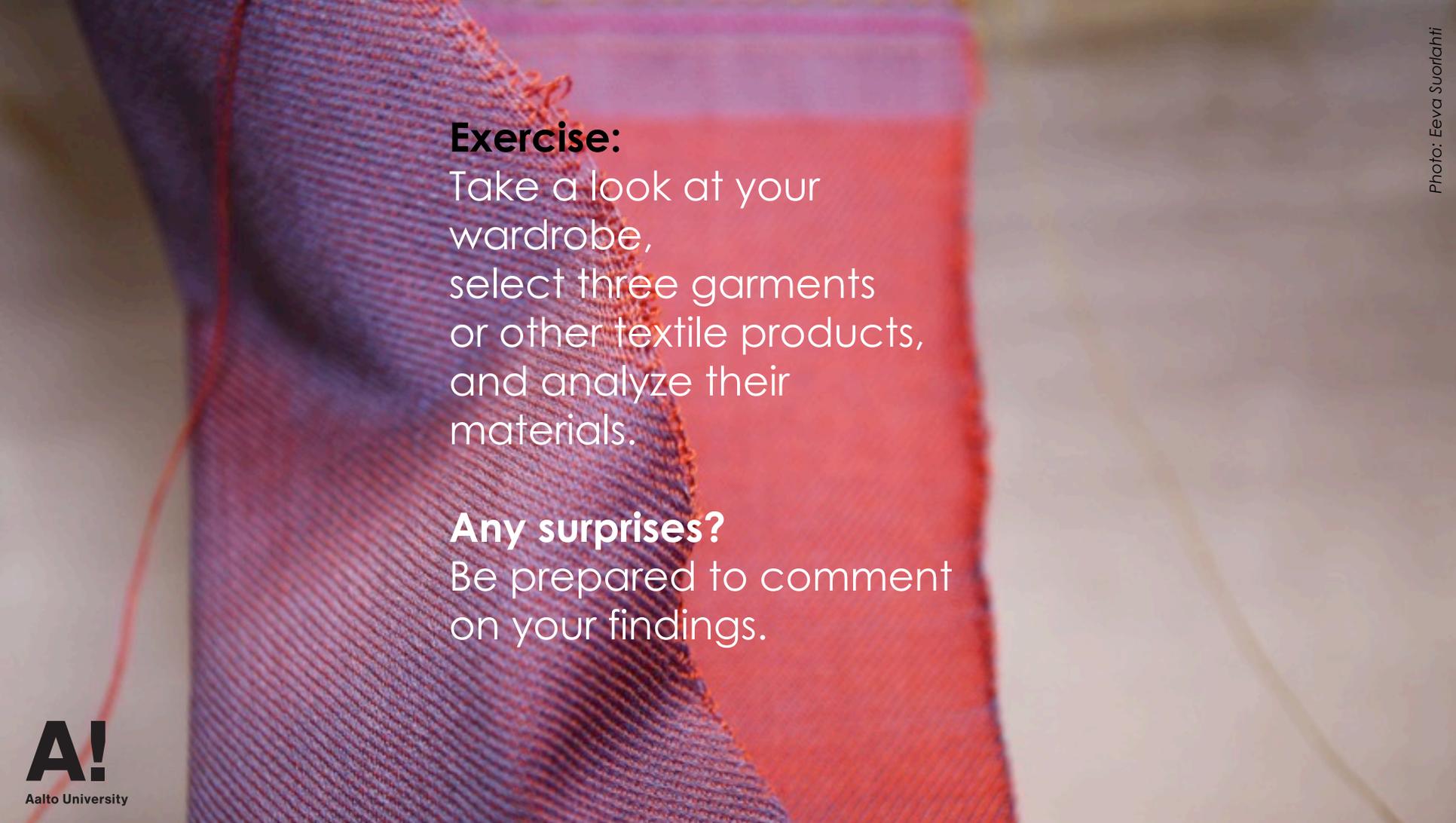
**Tuesday 1.6. Presenting the group assignment results (=poster) 10 min pres +
10 min comments/ group**

Thursday 3.6. No contact session, finalize your learning diary and fill in course feedback



Only one goal:

**You get curious of the materials
and how they are connected
to sustainability.**



Exercise:

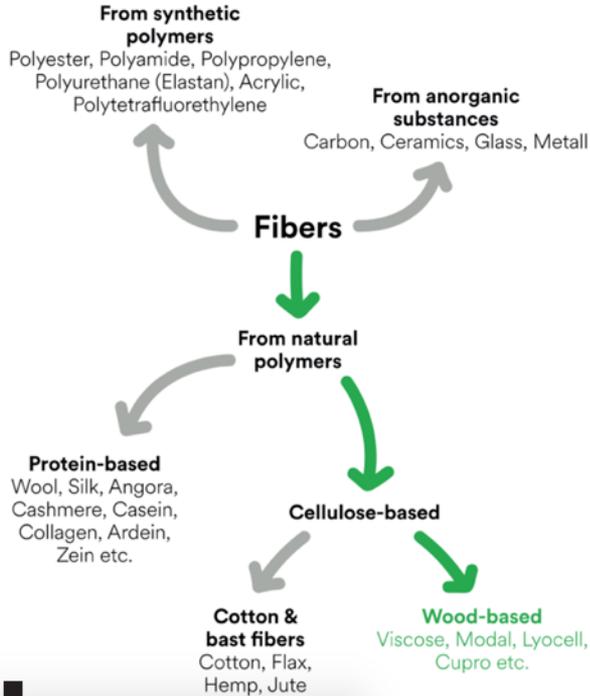
Take a look at your wardrobe, select three garments or other textile products, and analyze their materials.

Any surprises?

Be prepared to comment on your findings.

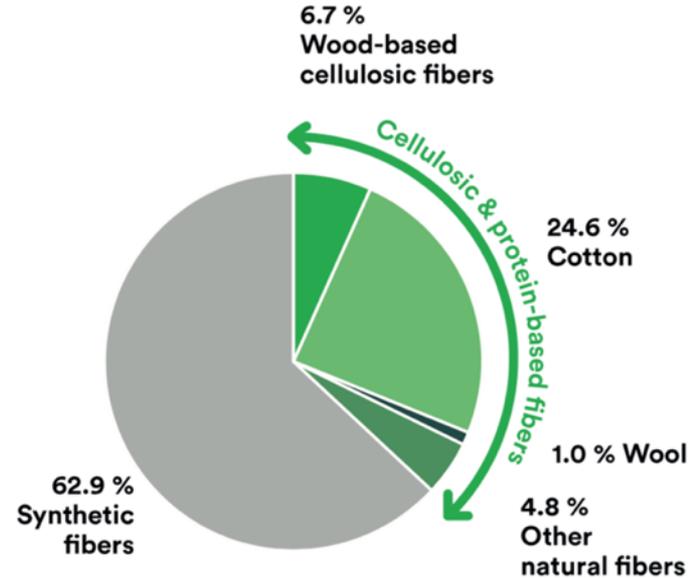
Did you know that 2/3 of textiles are fossil-based?

Fibers on the world market



Global fiber consumption in 2019¹

by type of fiber in percent (basis = 106.4 mn tons)



A collection of petri dishes containing various green and yellow microbial cultures. The foreground dish is in sharp focus, showing a dense array of small, spherical, green and yellow colonies. The background dishes are blurred, showing larger, more diffuse cultures in shades of green and yellow.

(Bio)Material Futures

18.5.2021

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@PirjoKaariainen

aalto.chemarts.fi

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Carbon Capturing Images by Aman Asif & Valentina Guccini CHEMARTS 2020

Photo Esa Naukkarinen

Overconsumption, limited raw material resources and environmental problems will change the world of materials in coming years.

Where might the materials come from in the future?

Which are the potential pathways towards new materials?

And how should they be produced and used to create a more sustainable material world?

No clear answers exist yet, but plenty of experiments and trials are going on.

Example: use of textile fibres 1970-2020

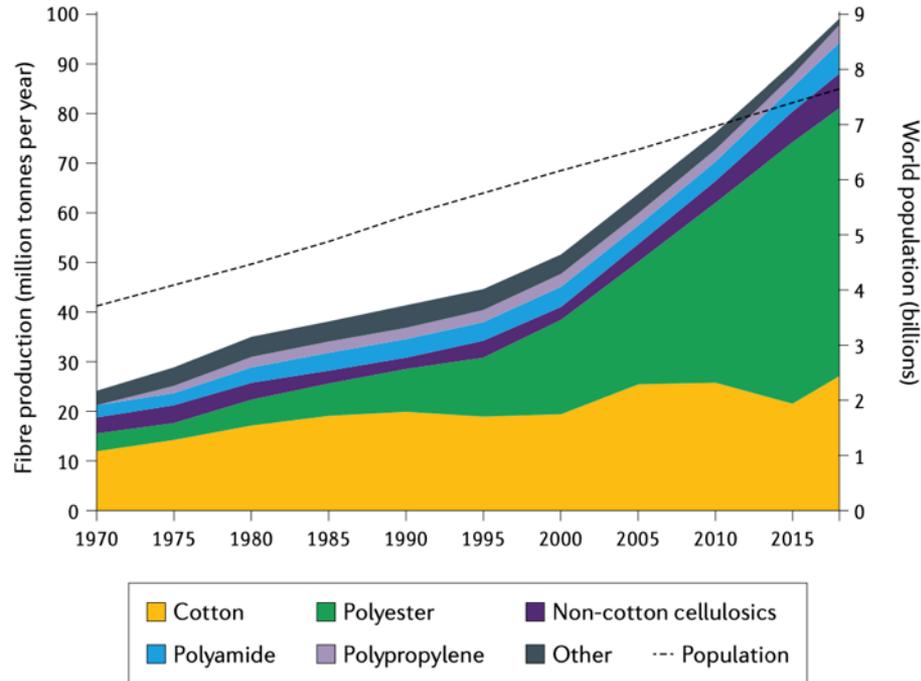


Fig. 1 | **Growth in global population and textile production by fibre type.** Fibre types include cotton, polyester, non-cotton cellulosics, polyamide and polypropylene, with silk and wool represented together as 'other'. Growth in world population is also depicted. By the 2010s, textile-production growth overtook world-population growth, largely driven by the rise of cheap manufacturing and fast fashion.

CURRENT TEXTILE PRODUCTION AND CONSUMPTION COME WITH MAJOR ENVIRONMENTAL AND SOCIETAL BURDEN.



CONSUMES

4%

OF GLOBAL FRESHWATER
ANNUALLY

PRODUCES

10%

GLOBAL INDUSTRIAL CO₂
EMISSIONS

IS RESPONSIBLE FOR

16%

GLOBAL PESTICIDE USE

ACCOUNTS FOR

20%

GLOBAL INDUSTRIAL
WASTEWATER EMISSIONS

IS TO BLAME FOR

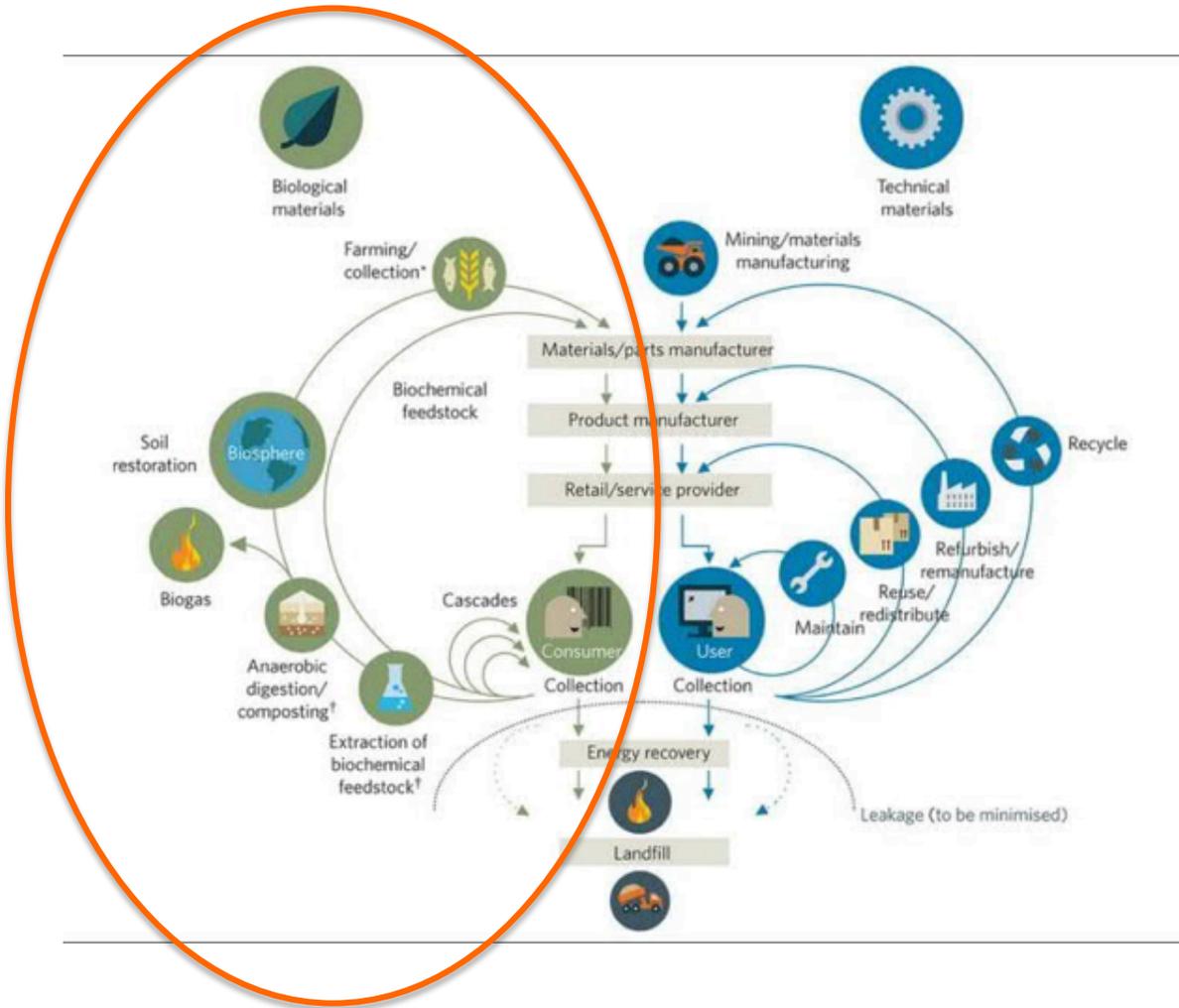
35%

OF OCEAN-BOUND
MICROPLASTICS



Materials are part of United Nations Sustainable Development Goals





Five phenomenas changing the world of materials

Transforming new and old (renewable) raw materials

Reuse, recycling

Digitalisation and new production technologies

Biology -biofabrication

Synthetic biology

Transforming new and old (renewable) raw materials



Photos Eeva Suorahiti

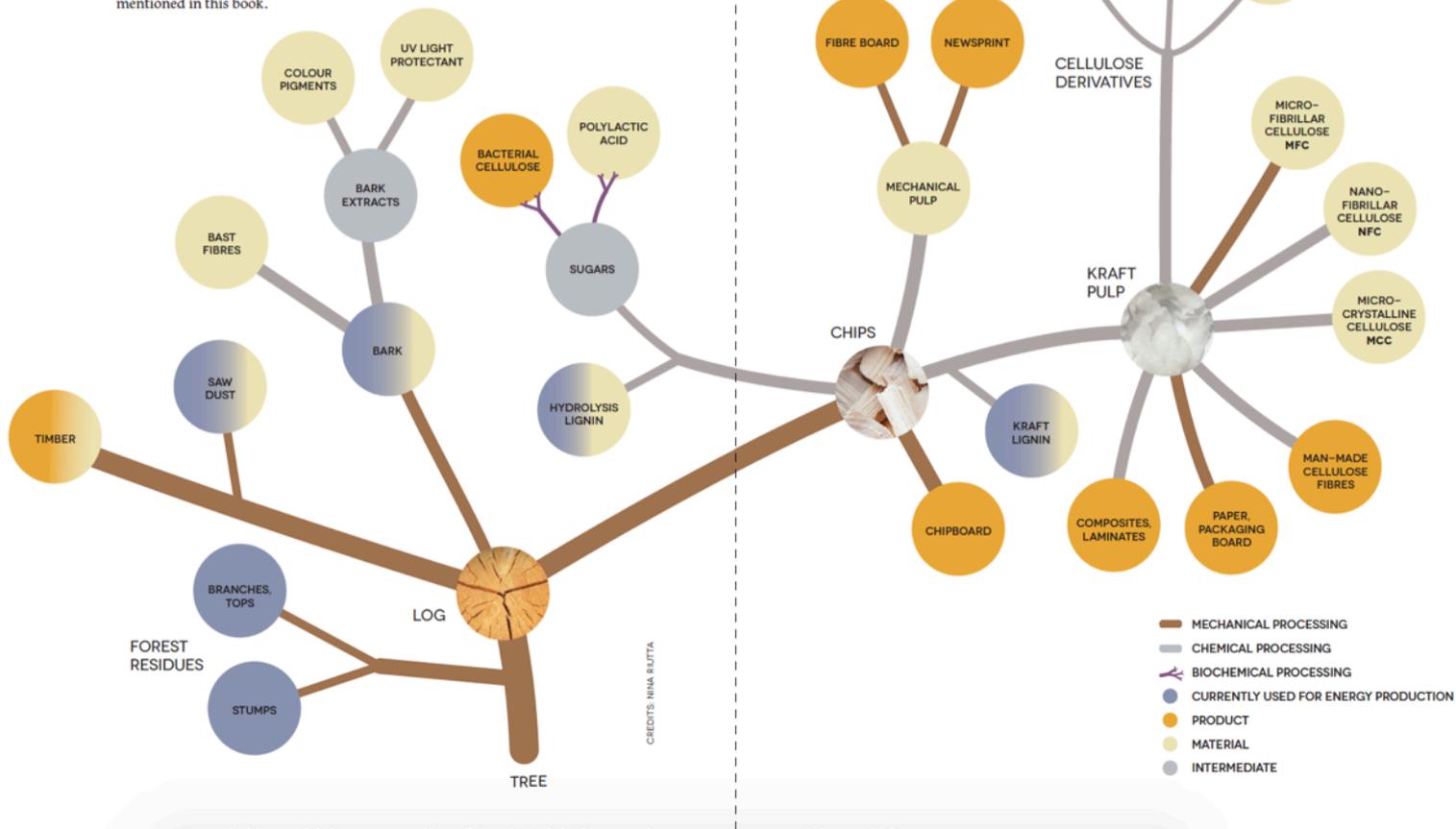
The CHEMARTS Cookbook:

Wood-based materials

PROCESSING OF WOOD BIOMASS

Tapani Vuorinen & Nina Riutta

The processing of wood biomass into the various materials and products mentioned in this book.



<https://shop.aalto.fi/p/1193-the-chemarts-cookbook/>



Wood-based solutions for global challenges

All Agriculture Construction & furnishing Cooking Cosmetics & Hygiene F&B packaging Pharmaceutical packaging Textiles Transport packaging



Recyclable SKIN base tray



Fibrous soil amendments



Wood-based biocomposites



Lidless paperboard cup



Renewable egg box



Plastic-free, heat-sealable material

Innovative wood-based material with structural colour

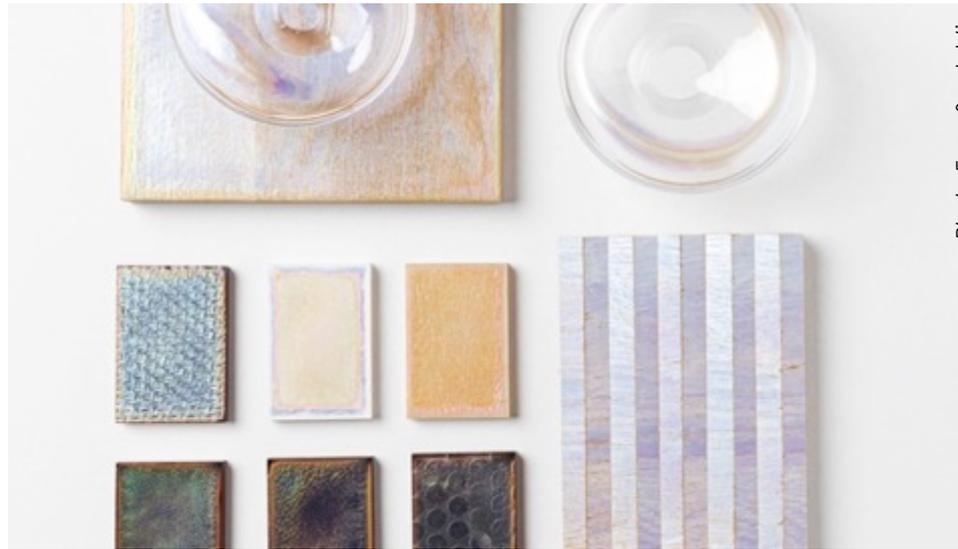


Photo Eeva Suorlahhti

Shimmering Wood – Structural colour from nanocellulose by Noora Yau & Konrad Klockars and Prof. Orlando Rojas's team at Aalto CHEM



*Disposable dish from willow bark
by Eveliina Juuri, Sanna-Liisa Järvelä and
Jinze Dou, CHEMARTS 2017*



*Natural dyes by Aleksandra Hellberg
and Jenny Hytönen, CHEMARTS 2019*

Rediscovering traditional materials



Hemp, flax (linen), nettle and other traditional textile fibers



Research by Julie-Anne Gandier 2020, Department of Bioproducts and Biosystems, Aalto University. Photo Valeria Azovskaya



Natural indigo for textile dyeing, Crops4luxury project 2019
Photo Eeva Suorlahti



*Birch polypore experiments Sonja Dallyn & Linh Tong
Aalto CHEMARTS 2020*



Algae-based materials Laura Rusanen CHEMARTS Aalto 2020

Recycling materials (e.g. mechanically, chemically -or with enzymes)



*Recycling material and colour with Ioncell technology
by Eugenia Smirnova & Ioncell team CHEMARTS 2015*

A photograph of a pair of white Adidas Futurecraft shoes, which are designed to be made from 100% recycled plastic. The shoes are shown from a side-on perspective, with their laces and soles visible. The background is a plain, light-colored surface.

'In circular economy materials are not only reused or recycled; they are merely stored in products, and used again and again' - Prof. Mark Hughes Aalto CHEM

Adidas Futurecraft shoes

Reuse – new luxury?



Collector Square

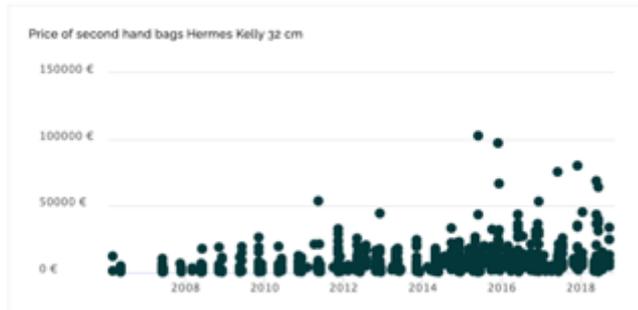


Advanced Previews

Watches

Jewellery

Bags



*LuxPrice-Index is the valuation index for luxury watches and bags with nearly 300.000 auction sales results from the major auction houses in the world.



Adidas Vintage Women's Booty Sho...
GodDinVintageGiznos
★★★★★ (174)
€24.15



vintage 70s 80s Adidas trunks shor...
CarnivalOfTheManiac
★★★★★ (1,938)
€38.90
Only 1 available and it's in 4 people's carts



vintage ADIDAS shorts cotton Size ...
widDushy
★★★★★ (483)
€35.40



vintage ADIDAS ORIGINALS track s...
widDushy
★★★★★ (483)
€43.20
Only 1 available and it's in 1 person's cart



vintage ADIDAS ORIGINALS track s...
widDushy
★★★★★ (483)
€39.70
Only 1 available and it's in 1 person's cart



vintage ADIDAS ORIGINALS track s...
widDushy
★★★★★ (483)
€64.99
Only 1 available and it's in 4 people's carts



Authentic Shorts Adidas 1980's Vint...
VintageMailons
★★★★★ (99)
€59.99



Vintage 1980's or 1990's Adidas SwL...
VintageFindsMichael
★★★★★ (313)
€34.49
Only 1 available and it's in 1 person's cart



1980s Adidas Shorts - Vintage 80s ...
mijumaju
★★★★★ (332)
€69.00



vintage ADIDAS ORIGINALS track s...
widDushy
★★★★★ (483)
€40.60
Only 1 available and it's in 2 people's carts

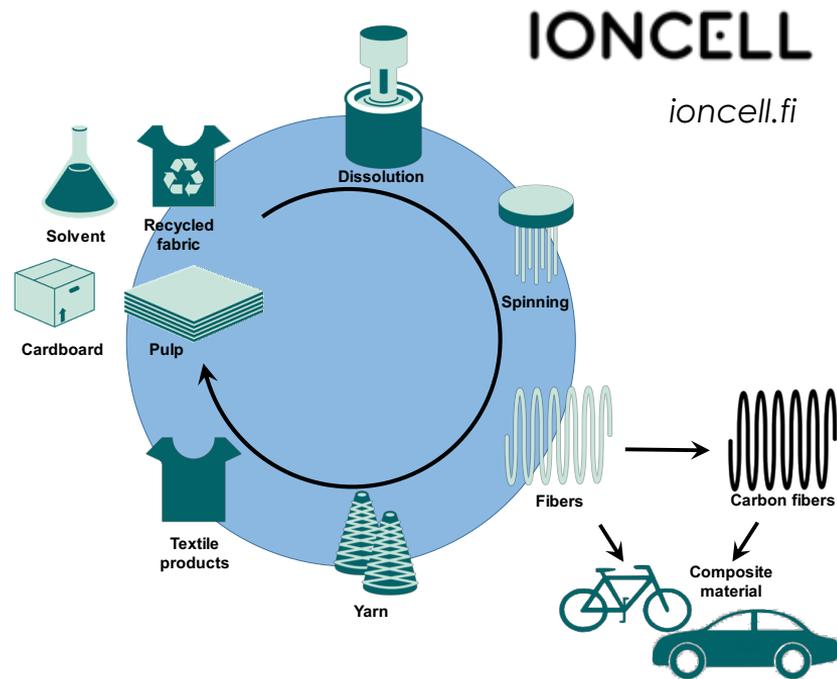




Ioncell, new sustainable technology to produce high quality textile fibres from wood or cellulosic waste (cotton, cardboard, paper waste) by Prof. Sixta's team, in collaboration with the University of Helsinki.



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Circular processes enabling circular economy

'It was a bedsheet, became my summer pants, and now the material is to be recycled'



TAUKO

Fashion from locally sourced industrial textiles
<https://taukodesign.com>



H&M

[NEWSROOM](#) [IMAGE GALLERY](#) [PRESS CONTACTS](#)

RECYCLING SYSTEM 'LOOP' HELPS H&M TRANSFORM UNWANTED GARMENTS INTO NEW FASHION FAVOURITES

We are thrilled to soon offer customers in Sweden the possibility to transform unwanted garments into new fashion favourites with the help from our new garment-to-garment recycling system 'Loop'. We are committed to closing the loop on fashion and this machine visualizes to customers that old textiles hold a value and should never go to waste.



From textile waste to paddings. Recycling experiments by fashion designer Elina Onkinen, Aalto University CHEMARTS 2020. Photo Esa Kapila.

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Digitalisation and new production technologies



*Hard and soft hybrid textiles dyed with dyer's Woad
by Anna-Mari Leppisaari & Anna van der Lei 2019
Prof. Tatiana Budtova's team at Aalto CHEM (Dissolution)
Prof. Kirsi Niinimäki's team at Aalto ARTS (Dyer's Woad)*



*PLA and nanocellulose by
Megan McGlynn CHEMARTS 2019*



WOOL KNOT WOMEN



MERINO WOOL
WOMEN

129,00€

FARBE



GRÖSSE



Passform

Normal

Bitte Farbe und

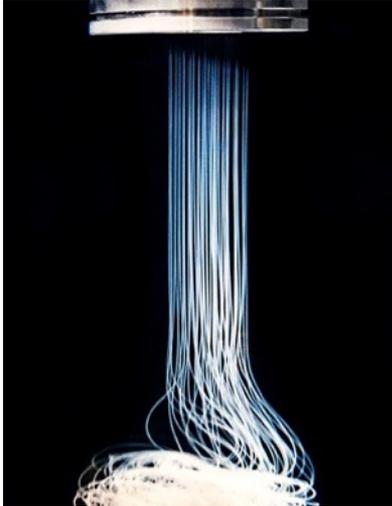
IN DEN W

Reinventing production technologies: Knitting is additive manufacturing

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'Let's brew for a pullover!'



*Microsilk by Bolt
Threads, U.S*



*Stella Mc
Cartney
x Bolt
Threads*

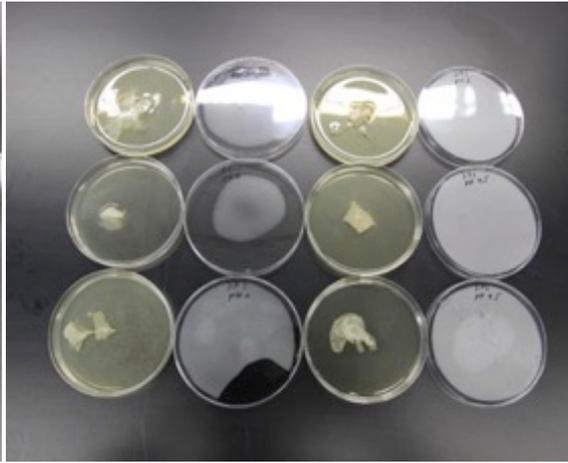
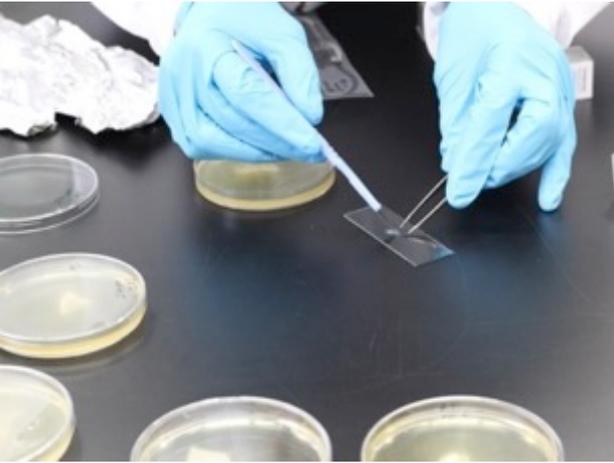


Brewed Protein by Spiber



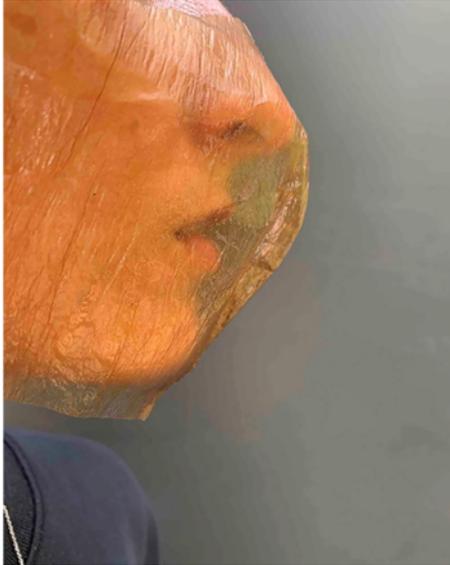
*New kind of textile factory:
Brewed Protein by Spiber*

Biofabricating materials with **biology** (with the help of microbe, yeast or fungi)



Complex structures of microbial cellulose grown by Prof. Orlando Rojas's team 2018, Aalto University

'Have you seen this recipe to grow your jacket?'



A bio-design studio has grown the material in their home kitchen for a protective mask made of xylinum. Photo: Elizabeth Bridges and Garrett Benisch, Sum Studio.



Textile-like materials from microbial cellulose and other bio-based materials by Julia Strandman, Aalto University CHEMARTS 2018. Photo Esa Eeva Suorlahti



Experimental mycelium jacket By Aniela Hoitnik
<https://neffa.nl/portfolio/>



Ingvill Fossheim, CHEMARTS 2018



Image by Oscar Vinck

Pavilion grown from mycelium acts as pop-up performance space at Dutch Design Week



Augusta Pownall | 29 October 2019 | Leave a comment

The Growing Pavilion is a temporary events space at Dutch Design Week constructed with panels grown from mushroom mycelium supported on a timber frame.

Designed by set designer and artist Pascal Leboucq in collaboration with Erik Klarenbeek's studio Krown Design, the temporary pavilion is made entirely from bio-based materials.



bioMASON®
building with nature

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Biocement™ Masonry, 2017– ongoing



Installation, Building with Nature, 2019;
Designed by Thomas Hill; bioLITH tiles;
Courtesy of bioMASON, Inc.

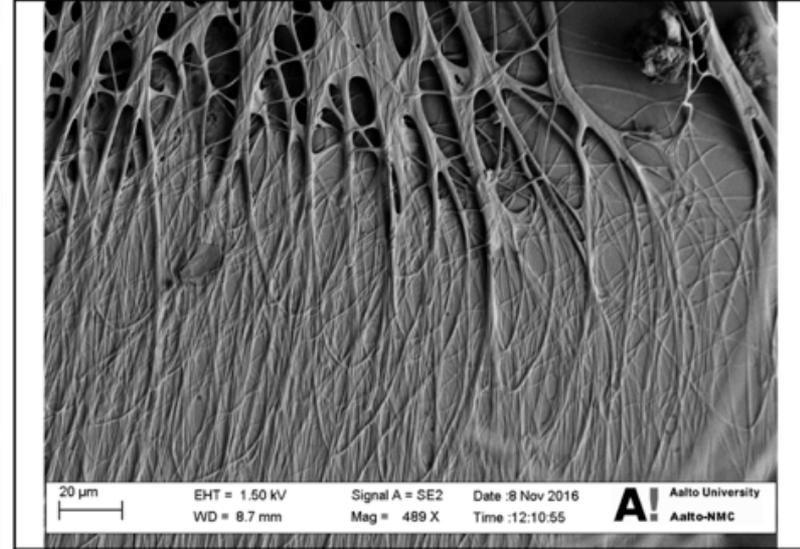
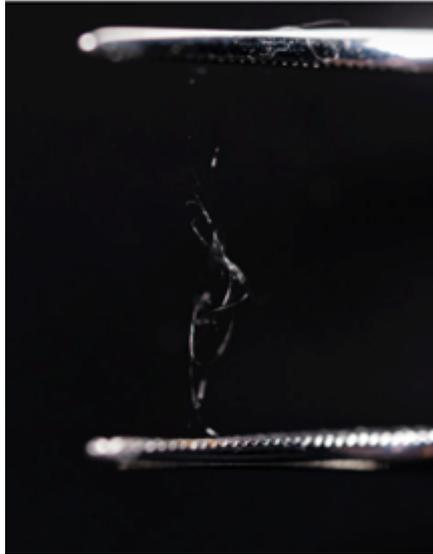
Ginger Krieg Dosier (American, born
1977), bioMASON (Durham, North
Carolina, USA, founded 2012)

Biocement bricks are made by mixing sand with nutrients and microorganisms. The bricks harden in a few days at room temperature, an ecologically sensitive solution to the intensive firing and carbon emissions released in traditional brick production. The biocement bricks are grown in molds in various shapes, textures, and colors, and perform like traditional bricks. bioMASON developed the process based on research into how seashells and coral grow underwater into hard, durable organisms.



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Designing totally new materials with **synthetic biology**



Prof Markus Linder's research group, Aalto CHEM + VTT

Real spider silk, microscopic photo by Pezhman Mohammadi

'Dyeing with microbi, colours by photosynthesis, glowing dresses – what's next ?'



*Pigments of Microorganisms, Master's thesis on microbial colours by Eveliina Juuri, Aalto University 2020.
Photo by Eveliina Juuri*



Carbon capturing images (colours by photosynthesis) by Aman Asif and researcher Valentina Guccini, Aalto CHEMARTS 2020. Photo by Esa Kapila



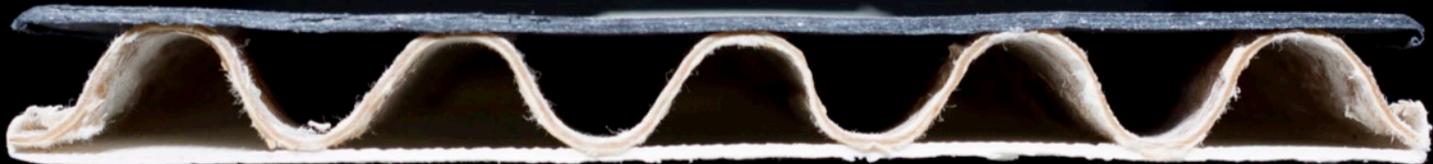
Transgenic glowing silk dress. Fantasma by Another Farm et al. Japan. Cooper-Hewitt museum 2019, New York



Design(ers) for a sustainable material future

'The challenges to our planet are so complex that they cannot be solved by one discipline. Design is a bridge. It translates scientific ideas and discoveries into real-world applications.'

- Matilda McQuaid, Curator at Cooper-Hewitt Smithsonian Design Museum, NYC
in the exhibition catalogue: 'Nature: Collaborations in Design', 2019



Design from Finland (?)

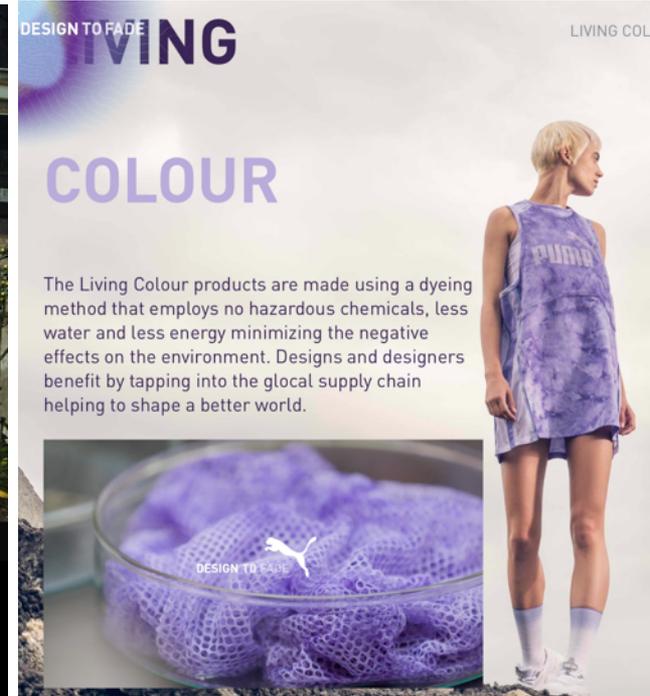


White tubes made of microfibrillar cellulose by Tiina Härkäsalmi & Kim Antin, DWoC project 2017 (not waterproof). Photo Eeva Suorlahti

Changing the perspective



***Design to Fade* - PUMA x Streamateria biodesign project explores sustainable ways of producing and dyeing textiles**



"The vision is to design a fully sustainable ecosystem for consumption of garments that works much in the same way that we consume food."

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Source: streamateria.com



Designerly approach:
Hands-on experiments for
understanding material
behaviour and properties.
(Practice-based design research)

Photos: Eeva Suorlahhti

Impact through speculative & critical design

Julia Lohmann: "Tiedämme liikaa ja teemme liian vähän"

Julkaistu: 21.1.2020

Maailman talousfoorumien vuosikokouksessa 2020 esillä ollut merilevypaviljonki on valittu ehdolle Dezeen Awards 2020 -kilpailussa kestävä suunnittelun kategoriassa.



Department of Seweed by Julia Lohmann

All these projects (and many more) have been inspired
by the idea of a sustainable material future

– but we don't know yet which ones will turn out to be truly
sustainable - or even realistic.

Assignment:

The final assignment of the course is conceptual design case around novel materials, focusing on the sustainability aspects.

In your group, select one interesting material as a starting point. Perform research on the selected material (for example, how it has been used previously, what kind of scientific research exists, what kind of properties it has, are there some problems from regarding sustainability etc.)

As a group, develop a speculative product/service idea based on your research, and design a concept. Analyse and argue how it would be sustainable.

Final presentations online with posters on Tuesday 1.6.

Team 1 Alexandra Artemenko, Fiona Keil, Kathleen Lindgren, Emma Prost

Team 2 Lu Chen, Radovan Lamac, Diana Lisitsa

Team 3 Solveiga Bucyte, Tuomas Laakkonen, Carlotta Pezzica, Vilhelmiina Skyttä

Team 4 Maria Klata, Jaakko Meyn, Erik Quick, Julia Vila Comas

Team 5 Nina Balashova, Daniel Giacomelli, Matteo Serre, Elina Ludborza

Team 6 Asala Ahmadli, Jihae Kim, Irina Valeeva, Kristin Gschwender

Team 7 Elde Siilbek, Iiro Törmä, Vilis Zuromskis, Kristen Barretto

Team 8 Sonja Norpila (works alone due to her graduation schedule)

Kamilla Grämer and Vilma Leinonen will join some of the teams or form a team of their own. (Kamilla, Vilma, please contact me by email)

