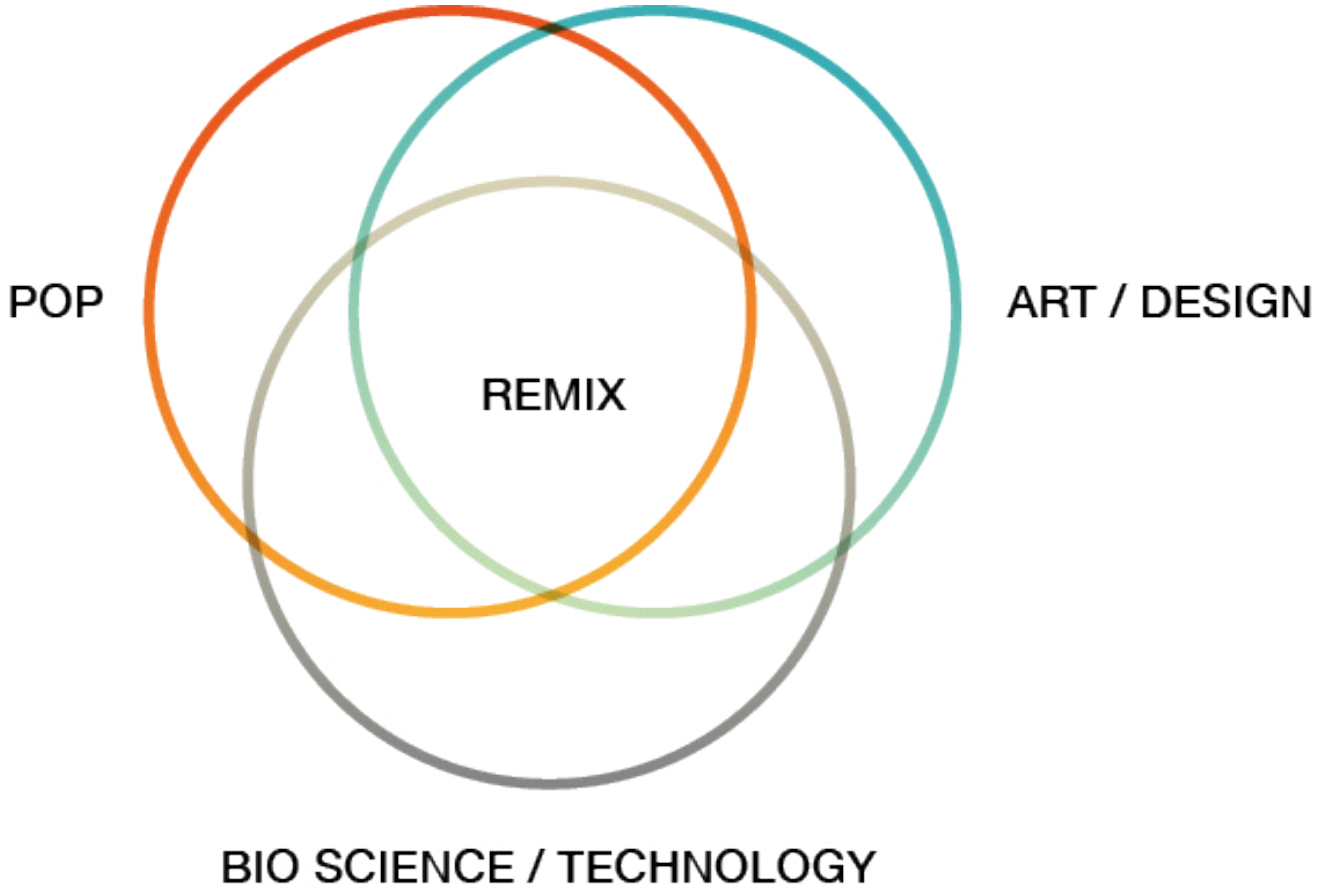
BLUEPRINT ARTSSCIENCES MINOR

Material Futures: Critical crafts at the intersection of art, design, and biotechnologies



FOREWORD

This document is a blueprint for a 30 ECTS-program on art at the intersection of science and technology, with a focus on biodesign and biofabrication. It serves as an example of how these topics might be offered to third- and fourth-year bachelor students in arts education and possibly also for future generalist, technology, and science teachers with an interest in critical making. This document describes the learning outcomes of the program, how the program is structured to arrive at these learning outcomes, and how these learning outcomes are assessed.

This is an adaptation of the minor Makers Lab: Making as Research, taught at the Amsterdam University of Applied Sciences (AUAS), combined with elements and objectives from courses and projects at the Breitner Academy, ArtechLab, Lectoraat Kunsteducatie (all AHK), and Platform OKTW.

This blueprint offers an example of how assignments and activities might be structured and executed. It is in essence a highly modular set up that can easily be adapted if a different emphasis or focus is desired. As the minor is geared towards third- and fourth-year students, it is assumed that participating students have already acquired foundational knowledge on arts or design, and educational practice. A number of activities require specific equipment or workspaces such as a makerspace or microbiology lab. If these are not available, substituting activities can be found in the Biomaterials Teaching Toolkit, a more expanded collection of educational activities on the topic: https://github.com/loesjebo/biomaterials_toolkit

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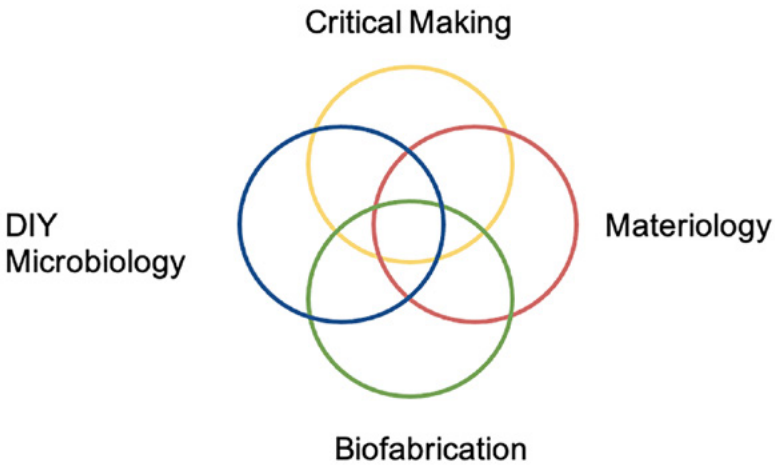
MATERIAL FUTURES: CRITICAL CRAFTS AT THE INTER-SECTION OF ART, DESIGN, AND BIOTECHNOLOGIES



In the throw-away culture that dominates contemporary society, we are losing foundational knowledge of all the things involved in making something from scratch, what materials can do, and how we might connect, discon-nect, and (re)shape things, as high-tech innovation and standardization transforms fabrication processes into increasingly complex global systems. More importantly, the material—even molecular and chemical—origins of human-made things, and their place in ecological life cycles has moved into the background. As a result, we have stopped seeing human-made objects as part of nature, with disastrous consequences for our climate and ecosystems.

To address these consequences, an interdisciplinary approach is needed. This blueprint comprises several activities that merge biofabrication, materiology, DIY mi-crobiology, and critical making to get students acquainted with tools and techniques to envision, create, and critique technical and cultural transformations in biodesign.

In the minor Material Futures students acquire knowledge about this interdisciplinary domain by a series of hands-on workshops and activities. A range of digital crafts and techniques is introduced and discussed, allowing stu-dents to fully and independently engage with high-tech equipment—like 3D printers and laser cutters—which is available at the faculty. Students learn foundational ma-terial knowledge by cooking, curing, growing, modifying, and connecting materials like bioplastics, natural pig-ments, fibers, and on some occasions “programmable” or responsive materials (such as biomimicry exercises around inflatables and soft robots). By experimenting and researching independently and collaboratively, students are challenged to discover techniques and combinations and make meaningful contributions to a shared material archive.

Intensive, sprint-like weekly assignments in week 1-10 introduce students to the fields of biofabrication and biodesign, and as such prepare students for the project of the second half of the minor. Assignments combine elements that prepare them for formulating research questions and project proposals, initiating and executing material research, documenting, and processing findings, developing concepts, prototyping, understanding users’ experience, and/or working on presentation and storytell-ing skills.]

ArtsSciences Database

The weekly assignments are matched with a REO (Re-sponsive Environment Organizer) predominantly deriving from the Nature section of the ArtsSciences Database. The database, developed by the Platform Onderwijs op het snijvlak van Kunst, Wetenschap en Technologie (OKTW), is a resource bank for teachers and students that covers several art and design projects from the intersection of art, science, and technology. The proposed

weekly assignments are often thematic and encapsulate multiple perspectives. A REO is an artwork or project that embodies the theme of the week and offers an interesting and thought-provoking starting point.

Biomaterials Teaching Toolkit
The Biomaterials Teaching Toolkit comes out of a two-year project at the Amsterdam University of Applied Sciences where ways of inviting students to make practices that center on ecosystems rather than human systems, were investigated. The toolkit consists of 62 cards describing activities that were tried and tested during the minor Makers Lab: Making as Research. The activities described in these cards invite learners to draw insights from material science, industrial manufacturing, microbiology, material culture, design, and arts, as well as ancient crafts practices, together.

The proposed assignments are accompanied by several cards, fitting the theme of the assignment. Some cards are more advanced and require specific facilities, such as a microbiology lab, others are more generic.

Critical questions
An important aspect of each assignment are the so-called “critical questions” related to the topic. These questions address ethical dilemmas embedded in the topics and are explored and discussed by the students during the work process. The critical questions challenge students to explore different viewpoints related to the central topic and to form an underpinned viewpoint with regard to their design.

PROGRAM SUMMARY

The program centers on exploring the fundamentals of materials and how things are made, tracing practices of use, and critically questioning contemporary production and consumption constellations. We rethink and reactivate the wealth of traditional material knowledge and craftsmanship in order to meet the demands of the 21st century. We re-envision them in the context of contemporary high-tech practices such as digital fabrication, biofabrication, and biotechnology to rediscover the potential of local materials and traditions. We aim to envision material futures that redefine the position of the maker and her role in relation to the commons (the cultural and natural resources accessible to all members of society), by taking a hands-on, critical, and transdisciplinary approach.

In week 1-10 of the program, students are introduced to topics and techniques related to biodesign and bio art, DIY microbiology and mycology, digital fabrication, and materiology. Students deliver a reflection document showing their conceptual engagement with class materials and readings and make contributions to a class material archive.

In week 11-20, students build on the acquired insights and skills, and work on their own project at the intersection of art, science, and technology, where they also develop an educational product geared at students in primary education, secondary education, or pedagogical spaces in the cultural sector.

RECURRING ACTIVITIES

Each week has a similar structure but as the topic varies, the activities may change accordingly. The weeks are structured along the following sessions:

Assignment briefing
The week starts with the introduction to the topic of the week, a responsive environment organizer, critical questions, and the assignment the students will work on, as well as practical information about the supporting activities planned that week.
Duration: 1 hour

Discussion of the readings
A collective discussion of the selected readings of that week. The readings are a mix of academic, scientific, or critical literature from a variety of perspectives (anthropo-logy, biology, material culture studies, engineering, philosophy, design) and are selected based on the assignments: the intent is that the readings allow students to develop new ideas about the assignment they are working on. The readings are accompanied by reading prompts to help students get acquainted with academic/scientific literature.
Duration: 2 hours

Workshops
Depending on the topic of the week and the assignment, students have extra workshops or labtime in a makers lab facility (digital fabrication techniques), a biomaterials studio (DIY microbiology and biofabrication) or a classroom/design studio (material research and archiving). There may be, depending on the experience of the students, extra design support to help with understanding new software or tools.
Duration: varies from 1–3 hours depending on the topic, sometimes done in smaller groups

Meet the makers
A lecture series with weekly guests whose practice is related to the topic of the week.
Duration: 1 hour

Review
At the end of each week, the students all show their work and collectively review the results and the learnings of the past week based on the assignment, the readings, and the guests.
Duration: 1–2 hours

LEARNING OUTCOMES

At the end of the program students have developed as material storytellers and critical makers. They can work with conceptual frameworks to initiate question-driven design processes for exploring sustainable material development with an awareness of the politics, cultures, and histories of made objects. Students are able to develop an ethical contemporary maker practice situated at the intersection of art, science, and (open source) technology, which they can draw from to further develop their pedagogical practice.

The learning outcomes of the minor are captured in three themes: 1) material craftsmanship, 2) research & documentation and 3) storytelling & activation. These themes are formulated holistically, and each encompasses activities that allow students to engage with biodesign and bio art from a multilevel perspective: Understanding how to recognize and act upon challenges in their immediate environment, deconstructing said challenge from several perspectives, and being able to connect a challenge to larger developments, societal issues, and/or global trends.

Material Craftsmanship
The student uses and repurposes lab equipment and tools safely and creatively, in order to design and fabricate 2D and 3D objects and textures, to make functional molds, following recipes to recreate and modify biopolymers, bio-composites, and natural pigments. The student explores possibilities of biofabrication practically, which includes formulating protocols and conducting empirical microbiology experiments in a supervised lab setting.

Storytelling & Activation
The student develops stimulating scenarios and uses effective (material) storytelling techniques to build an argument for the future relevance, urgency, and creative potential of their materials research. The student translates such scenarios and stories into activating prompts—e.g., workshop scripts—that appeal to different audiences, such as peers but also students in primary and higher education.

Research & Documentation
The student analyzes the properties of materials and their relationship to tools and production processes used, in order to identify areas for further question-led material exploration. Knowing how, when, and what to reference and document to give others insight into their creative process and the methodologies used, and for others to reproduce, replicate, and continue building on their work.

CRITERIA AND GRADING POLICY

During the twenty weeks the students have two assessments (after block 1 and block 2). The first assessment will take place at midterm in week 10, and the second assessment will be conducted in week 20/21. Each of the three learning outcomes is worth 10 ECTS. For the midterm assessment, students hand in a portfolio of their weekly assignments, a reflection zine, and the physical samples of the materials they have made. For the final assessment of their project, the exposition and their research zine are assessed.

Material Craftsmanship – 10 ECTS
Block 1: Each week students are given an assignment to build their skills and competences in digital design and fabrication. The weekly assignments make up the portfolio of their first assessment. During block 2 students develop a team project with peers.

- Digital design & fabrication skills (portfolio assessment block 1) 25%
- Active participation in class (block 1) 25%
- Team project: design and execution (block 2) 50%

Storytelling & Activation – 10 ECTS
Block 1: The student engages with academic and popular texts on biodesign, and actively reflects on and processes the concepts and ideas discussed in class by developing weekly reflections in the form of a short text (e.g., a micro essay) and a visual component. The student develops an aesthetic way of compiling her/his reflections and hands in a reflection document at the end of block 1 (this can be a deck of cards, RISO printed zine, AR enriched publication, etc.).
Block 2: The storytelling around the team project makes a clear and compelling argument and is translated into an educational format geared to a target audience of choice.

- Engagement with readings & class participation (block 1) 25%
- Reflection document (block 1) 25%
- Project communication & educational format (block 2) 50%

Research & Documentation – 10 ECTS
Block 1: The students deliver material samples with corresponding sample labels (recipe and references). A minimum of five samples is required for a pass (5.5). The grade is determined based on the quality and originality of the samples contributed to the class material archive. These can be variations on tried-and-tested recipes. Samples are accepted if they: 1) are well-crafted and carefully finished, 2) describe the process in a reproducible way, 3) clearly state sources and the contribution made by the student.
Block 2: The students present their work at the class expo, and each team describes its original contribution(s) to the field in the form of a research document with a maximum of ten pages that includes: research question(s), scientific underpinnings, positioning as cultural artifact, process documentation, technical documentation of designs/art works, tools, and procedures developed.

- Documenting and archiving of material samples (block 1) 50%
- Material research and experimentation (block 2) 25%
- Research documentation (block 2) 25%

Grading policy
Students' performances with regards to the learning goals described above are evaluated using the following criteria:

- substantial new work prepared for each class or team meeting
- thoughtful responses and follow-ups to criticism
- ability to develop a clear, workable idea and move forward in a coherent, inspired way
- collaboration/constructive teamwork and class participation
- engagement in dialogue and the ability to give constructive criticism
- attendance and promptness, ability to fulfill requirements and meet deadlines
- thoughtful and safe conduct in relation to people, workspace, materials, and tools

8,6–10,0
The student has demonstrated mastery of the learning outcomes outlined in the course syllabus. The student demonstrates excellent understanding of subject material and will be able to develop/present new and innovative concepts on the subject without additional help. S/he completes all course requirements on time, with precision and insight, as well as contributes to a stimulating classroom environment by attending all class sessions, by actively engaging in class discussions, and by interacting with other students.

6,6–8,5
Student has demonstrated some aptitude, but not necessarily mastery, of the learning outcomes. Student displays

excellent to above-average grasp of the subject and completed all assignments on time with precision and insight, attended class regularly and engaged in discussions. Some students may have work that is equivalent to an "A" student but may not have taken the initiative to go beyond specifically assigned materials.

5,5–6,5
The student has demonstrated minimal aptitude for the learning outcomes covered in the class. The student is unable to demonstrate understanding of the subject material. S/he may not have completed all course requirements on time, or attended class sessions, or participated in class discussions. In addition, a "C" student's work may not demonstrate competence in the subject material and/or may not be presentable outside of class.

Less than < 5.5
The student has demonstrated no aptitude for the learning outcomes to the instructor's satisfaction (fail).

N/A =
The student is unable to receive a grade and has arranged to demonstrate aptitude at a later date. N/A will only be given to clear and unambiguous cases of hardship. Having several concurrent deadlines are not cases of hardship. It is up to the instructor to provide a date when late work will be due.

WEEKLY ASSIGNMENTS

This section entails several weekly assignments that each encompass a REO, supporting sources, critical questions, and a suggested assignment. Depending on the aim of the course, critical questions and learning outcomes can be formulated. The assignments can be accompanied with workshops, readings, and guest speakers (see recurring activities).

Week 1: Kick-off week: Bio-based materials as sustainable alternatives for leather or plastics

An assignment to start thinking about biodesign on a very tangible level. Starting with a waste walk through the neighborhood gives students the opportunity to look at the environment with different eyes and to rediscover waste streams as resources. The bioplastics recipes allow for a reappropriation of everyday items found in kitchen cupboards and understanding the making of materials on a tacit level.

1. REO

• Suzanne Lee, Biocouture
http://artsciencedatabase.com/2021/09/16/suzanne-lee/

• Neri Oxman Aguahoja
https://oxman.com/projects/aguahoja

2. Sources

• Suzanne Lee, Why "Biofabrication" is the Next Industrial Revolution
(TED TALK, 2020)
https://www.youtube.com/watch?v=7pMhqyteR5g&t=3s

• Neri Oxman, Bio-inspired Design (WEF, 2016)
https://www.youtube.com/watch?v=nAA0DfAdilU

• AEG, The Next Black: A Film about the Future of Clothing (2014) https://www.youtube.com/watch?v=XCsGL-WrfE4Y&t=838s

• Myers, Bill, "Beyond Biomimicry" in: Bio Design: Nature, Science, Creativity. London: Thames & Hudson, 2012: pp.10-17 or, a 2019 revised version: https://nextnature.net/story/2019/beyond-biomimicry

3. Assignment

• Create at least two large sheets (at least A4) of a bio-based material of choice. Prepare a first batch of kombucha to start growing microbial cellulose pellicles. Read the article by Bill Myers in preparation for the class discussion.

4. Critical questions

• Why is it important that we investigate alternative materials for our
products?

5. Teacher's materials from the Biomaterials Teaching Toolkit

Waste walk | Agar bioplastic | Gelatine bioplastic | Alginate bioplastic | Chitosan bioplastic | Fruit leather | Fish leather | Carrageenan bioplastic | Starch bioplastic | Microbial leather

Biocouture, Suzanne Lee

WEEKLY ASSIGNMENTS

Week 2: Auto-connecting materials

This assignment revolves around the composition of materials in products. Mono-materials are more easily recyclable than combined materials and composites. To aid this, connective elements such as glue, stitches, screws, and other connective hardware can be taken out of the equation, so the students can explore how materials might connect to itself.

1. REO

• Open Desk,
https://www.opendesk.cc/

• Thomas Thwaites, The Toaster Project
http://artsciencedatabase.com/2019/10/03/thomas-thwaites/

2. Sources

• Flusser, Vilem, "The Factory" in: The Shape of Things: A Philosophy of Design. London: Reaktion Books, 2017 (1999): pp. 43-50.

• Franklin, Kate, and Caroline Till (eds), "Introduction" and "Co-Creation" in: Radical Matter: Rethinking Materials for a Sustainable Future. London: Thames & Hudson, 2018: pp. 8-11 and 142-165.

• I, Pencil: the Movie (2014), A film from the Competitive Enterprise Institute, adapted from the 1958 essay by Leonard E. Read.
https://www.youtube.com/watch?v=IYO3tOqDISE

• VPRO Tegenlicht, 'De eerlijke onderneming' (2016)
https://www.vpro.nl/programmas/tegenlicht/kijk/afleveringen/2016-2017/de-eerlijke-onderneming.html

3. Assignment

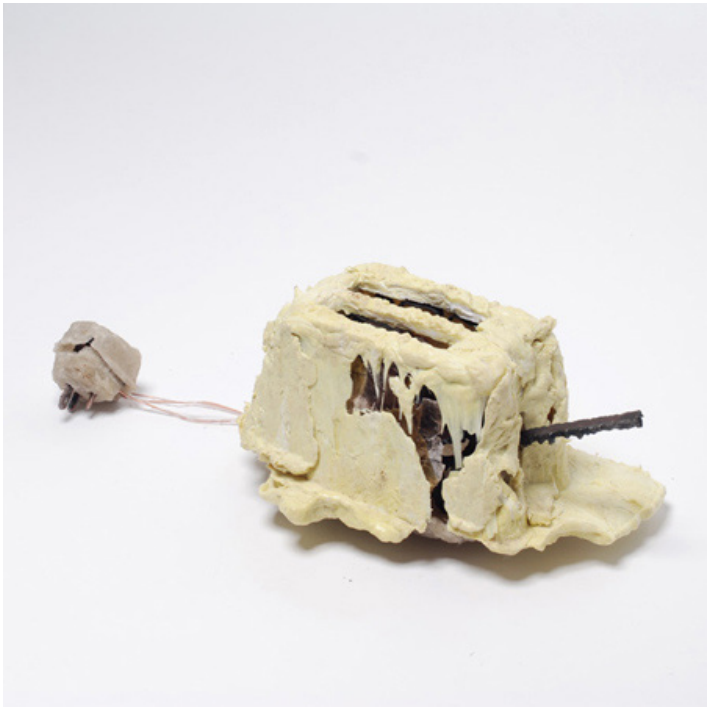
• Design an interlocking connection that allows you to turn a flat bio-based material into a 3D object without adding any additional materials. The object can be anything (a garment, a lamp shade, a box, a plant holder) but consider that the connection you design and the function of the object should match your material's qualities, limitations, and size (e.g., don't use a kerf bending pattern to bend a material that is already flexible). Use a vector drawing software to create a cut file for your design and cut it on the laser cutter.

4. Critical questions

• Why do many consumer products exist of various materials?
• How can we develop alternative production systems for consumer products?

5. Teacher's materials from the Biomaterials Teaching Toolkit

Mono-material Connections | Extractive manufacturing | Assembling



The Toaster Project, Thomas Thwaites

WEEKLY ASSIGNMENTS

Week 3: Material alchemy and mold-making

Although science is commonly not understood as an everyday activity that is part of life, we do encounter biology and chemistry all the time. Not in a laboratory, but in the household. We cultivate plants in our own gardens, prepare them in our kitchens, and eat them. And after all is done, we will clean the area thoroughly to make sure we don't grow unwanted micro-organisms. By means of culinary, technical, chemical, and biological advances we have been able to understand ingredients and the chemical processes we engage in while cooking and cleaning. Behind the scenes of the food industry, a lot of wonderful by-products are thrown away instead of used as a potential resource. Contemporary material alchemists return to the kitchen to allow us to reconnect with locally abundant materials. The assignment this week is to engage with several recipes to create bio-based, renewable materials, and design and fabricate your own molds to create shapes and textures. Be careful, they are probably not safe for consumption!

1. REO

• Chloe Rutzerveld, Edible Growth
http://artsciencedatabase.com/2020/06/06/chloe-rutzerveld/

• Atelier Luma, Algae Lab
http://artsciencedatabase.com/2019/02/14/atelier-luma/

2. Sources

• Kelley, Lindsay, "Subject P: Embodying Home Economics" in: Bio Art Kitchen: Art, Feminism and Technoscience. London/New York: I.B. Tauris, 2016: pp. 14-22.

• Franklin, Kate, and Caroline Till (eds), "Shit, Hair, Dust" in: Radical Matter: Rethinking Materials for a Sustainable Future. London: Thames & Hudson, 2018: pp. 8-11 and 74-107.

3. Assignment

• Continue practicing and experimenting with the biomaterials recipes and make variations on the source recipes. Design and make at least one mold (3D printed or laser cut) for a textured sheet, 3D object, or a composite material. Think of a texture as an interesting repeating tactile pattern. Aim for a mold that has a printing time of less than three hours (you can use Curaslicer to get an estimate) or a mold that has a laser cut time of less than 1.5 hours. The mold should demonstrate that you understand how to design surfaces, not just geometric solids. Use the mold to cast/mold your material samples with the bio-based material recipe you explored previously.

4. Critical questions

• What kind of domestic "waste" streams can be used as raw material for new products, as a strategy to reduce our footprint?
• How do textures help to ease the acceptation of new materials and new foods?

5. Teacher's materials from the Biomaterials Teaching Toolkit

Mono-material Connections | Extractive Manufacturing | and (optional) (Un)making the Mold

Edible Growth, Chloe Rutzerveld

WEEKLY ASSIGNMENTS

Week 4: Radical collaborations with nature: Biofabricating with mycelium

Design materials are dead. Long live design materials! Designers and artists have come to appreciate predictability and malleability in materials, with cheap petrol-based plastics as its pinnacle. It is these materials we can bend to our will as designers, make them do whatever we want, in easy and scalable ways, but with devastating ecological results. What if, instead of telling materials what to do, we started listening and observing their cycles of life? This week centers on exploring radical mycology (the study of fungi, e.g., mushrooms, molds, yeasts, and lichens) as 1) a social philosophy that describes cultural phenomena through a framework inspired by the unique qualities of fungal biology and ecology, 2) a mycocentric analysis of ecological relationships, and 3) a grassroots movement that produces and distributes accessible mycological and fungal cultivation information to enhance the resilience of humans, their societies, and the environments they touch (McCoy 2016: vii).

1. REO

• Eric Klarenbeek, Mycelium Chairs
http://artsciencedatabase.com/2019/02/28/erik-klarenbeek/

• Tomas Gabzdil Libertiny, Honeycomb Vase
http://artsciencedatabase.com/2021/09/16/tomas-gabzdil-libertiny/

• Gavin Monru, Growing Furniture
http://artsciencedatabase.com/2019/10/03/gavin-munro/

2. Sources

• Haneef, Muhammad et al., "Advanced Materials from Fungal Mycelium: Fabrication and Tuning of Physical Properties" Scientific Reports, (7), 2017: pp. 1-11.

• McCoy, Peter, "Introduction: Toward a Radical Mycology" in: Radical Mycology: A Treatise on Seeing and Working with Fungi. Portland: Chthaeus Press, 2016 (1985): pp. xv-xx. Optional: also review pp. 201-287.

• Sustainable Human, How wolves change rivers, 2014.
https://www.youtube.com/watch?v=ysa5OBhXz-Q

3. Assignment

• Participate in one or more of the following biomaterials workshops (grow mycelium in a petri dish; learn how to create a grain jar; learn how to colonize bulk substrate; fill molds with a grown.bio kit) in order to understand how to work with living materials. After about five days you can return to see the result of your work.
In the meantime, analyze or envision how an ecosystem in which you work/live and the workshop you just followed may intersect or give rise to new hybrid systems in which living materials are central. For instance, you want to analyze how bioremediation may be used in an indoor water-filtering system. Or you set out to envision how living in a living and growing house may be a reality.
For this, draw a matrix with three columns and three rows. The vertical axis maps the level of engagement from an individual person (you) to a systems level and finally to a level that impacts culture. The horizontal axis maps the range of expertise involved: from an individual person (you) to interdisciplinary teams to cross-sector collaborations. What kind of disciplines or professions need to be involved to get your idea going? Start with you in the bottom left square and envision what is needed on each level (individual, system, culture) to facilitate such an idea and what kind of crossovers and collaborations (interdisciplinary teams or cross-sector collaborations) it demands.
The exercise is not so much about designing a solution, as it is about mapping what factors are central in ecosystems (note: these factors may wildly vary).

4. Critical questions

What kind of materials can be replaced with natural, biodegradable materials?
What kind of alternative ways to produce materials are you familiar with?

5. Teacher's materials from the Biomaterials Teaching Toolkit

Cross-disciplinary reading | Mycelium-hemp composite (no lab necessary) | DIY Applied Mycology | Biolab Rules | Aseptic Techniques | Micro-organisms to Get to Know | Set up a Community Biolab

Mycelium Chairs, Eric Klarenbeek

WEEKLY ASSIGNMENTS

Week 5: Color as a material

Color is fundamental to our experience of the world and an interesting interplay between the thing itself and what we perceive. A tomato for example absorbs short and medium wavelengths of the spectrum, and bounces back everything that isn't blue, violet, green, yellow, and orange. Which leaves red as the only color that reaches our eye. We see what the tomato is not (St Clair 2016: 13). Color is everywhere, color is life, and life is color. But it is also evasive: to capture color is to kill it. And even then, it may fade, change color, or disappear altogether. It is for this reason that synthetic inks, dyes, and paints have been developed, but often with devastating consequences for the environment. Synthetic textile dyes for example are a major cause of water pollution. With this assignment, natural inks are explored by extracting pigment from barks, plants, leaves, and insects, and (optional) by creating a bacteria textile dye that requires hardly any water. We don't suggest that natural dyes are the solution, but perhaps they can help us appreciate again how special it is to surround ourselves with colors that are out-of-season, and that we should not take this for granted.

1. REO

• Bioshades: textile dyeing with bacteria
https://bioshades.bio/

• Vantablack, Anish Kapoor
https://www.thecollector.com/vantablack-anish-kapoor-stuart-semple-controversy/

2. Sources

• Agapakis, Christina, "Biofabrication 101", Medium. 23 January 2015. Available at:
https://medium.com/re-form/biofabrication-101-1b1757ce5404

• St. Clair, Kassia, The Secret Lives of Colour. London: John Murray, 2016: pp. 10-35.

3. Assignment

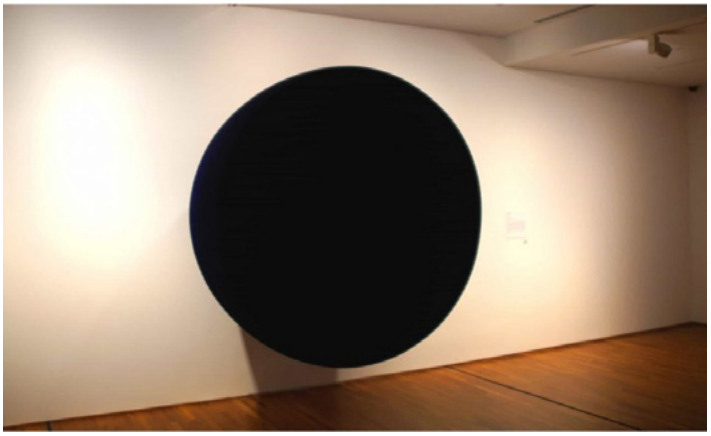
• Learn how to prepare protein (silk, wool) and cellulose (cotton, linen) fabrics for dyeing. Research natural dyes and pigments (see references under sources) and see what materials are locally abundant to dye with. Pick one natural pigment and use it to dye some protein and cellulose swatches, make sure you have two of each, measuring 10x10cm. Label everything so you can remember what's what. You can exchange one set of samples with a classmate and overdye their samples with your dyestuff to get new colors or use modifiers to change your colors.
• Optional (if infrastructure is available): learn to dye textile with bacteria.

4. Critical Questions

• How can we reduce the ecological impact of (synthetic) colors?
• How can the fading of color become a design feature?

5. Teacher's materials from the Biomaterials Teaching Toolkit

Designed to Disappear (no lab necessary) | Scouring and Mordanting | Madder pigment extraction | DIY PH paper | DIY Iron Acetate | Oak Gall Tannin Extraction | Onion Skin Pigment Extraction | Fungal Dye | Microbial Dye (lab needed)



Vantablack, Anish Kapoor

WEEKLY ASSIGNMENTS

Week 6: Materials research and archiving

This week the students dive into the topic of material archiving. The assignment centers on learning to observe, describe, and compare materials, and familiarizing yourself with a number of protocols for more in-depth collaborative archiving. Workshops will cover material testing and an introduction to the MDD method.

1. REO

• A+N (Alissa Asseldonk and Nienke Bongers)
https://www.alissanienke.nl/material-archive

• Maria Viftrup,
https://viftrup.com/work

2. Sources

• Karana, Elvin, Bahareh Barati, Valentina Rognoli and Anouk Zeeuw van der Laan, "Material Driven Design (MDD): A Method to Design Material Experiences" in: International Journal of Design, 9(2), 2015: pp. 35-54.

• Bogers, Loes, "Archiving New Naturals". Fabricademy, 2019-2020. These pages in particular:
https://class.textile-academy.org/2020/loes.bogers/projects/archiving_new_naturals/
https://class.textile-academy.org/2020/loes.bogers/projects/outcomes/tools_and_templates/recipe_template/

3. Assignment

• Pick one material sample to study (can be one of your own).
• Document a heat test, water test, and strength test with these samples.
• Make a tactility video of your samples, see the tutorial here:
https://www.youtube.com/watch?v=ySV1o9vA8NQv8
• Use the MDD method to research the material experience:
• analyze, synthesize, and summarize the findings in a one-slide overview
• write a material vision, define the three main key words to describe it
• manifest material experience patterns, get input from others
• create a material or product concept with a team, by making sketches and/or renderings of the concept(s)
• prepare a three-minute presentation to share your findings in the review.

4. Critical Questions

• How does archiving allow for the sharing of material knowledge?

5. Teacher's materials from the Biomaterials Teaching Toolkit

What is a Material Property? | What is a Material Experience? | Collaborative Open-source Archiving | Tactility Video

Ingenmandsland, Maria Viftrup

WEEKLY ASSIGNMENTS

Week 7: Exploring biodesign

This week starts with studying projects from the exhibition catalogue from 2019's Milano Triennale with the topic of "broken nature". The reading of Louise St. Pierre's text "Design and Nature: A History", helps to understand how designers throughout history have searched for ways to design with "nature". St. Pierre's text will offer you a conceptual framework to rehearse, critique, and learn to work with nature, using key concepts such as mechanistic vs. organicist views of ecology. Understanding these will also help you position your own (future) work. This week we will start ideating project proposals to get warmed up for the project-phase.

1. REO

• Jacco Borggreve
http://artsciencedatabase.com/2020/10/22/jacco-borggreve/

2. Sources

• Louise St. Pierre (2019) "Design and Nature: a History" in: Kate Fletcher, Louise St. Pierre & Mathilda Tham (eds.) Design and Nature: A Partnership: p. 92-108.
• Antonelli, Paola, and Ala Tannir. Broken Nature: XXII Triennale di Milano, 2019.

3. Assignment

• Make a project proposal for a work you would like to create in the next part of the course. Use the following prompt as a starting point: Envision a (near-)future application of biotechnology. Be prepared to pitch your project in next week's review so you can get feedback from your peers. Your project pitch should show that you considered the following questions and have done the research to address the following questions. Read up on the issues so you can be precise about the problems you are addressing. What cultural issues are you responding to? Are you posing a solution or raising a question? Are you focused on a solution for today or speculative future applications and scenarios? Whatever the case, try to understand the scientific evidence of the possibilities, either by reading or by speaking to experts, to argue for the feasibility of the ideas.
• Cherish your sources of inspiration: pick one or two projects that inspire you and analyze the approach of the maker. Specify which aspects of their methodologies and thinking you will take forward to inform your own project.
• If your project is speculative or critical, formulate a diagnosis of the problems you identify. What are its problems? What underlying structures and systems keep it in place? How does your project address this? Does it pose a solution or call to action?
• Identify the communities your design will serve and include. Can you find ways to give voice to this target community and its unique aspects? Design with these people rather than for them.
• Ask others to help you identify biases, assumptions, and values (implicitly) at work in your project proposal. Assess in which ways you are speaking and thinking from a place of privilege that might disadvantage others or overshadow their needs.

4. Critical Questions

• Consider the questions posed in the assignment and think about what kind of perspective(s) of biodesign are embodied in these questions. Can you think of other conceptions of biodesign?

5. Teacher's materials from the Biomaterials Teaching Toolkit

A History of Design & Nature | Developing a Bio Art or Biodesign Project | Beyond Biomimicry | Demystifying Biotechnology

Ever it takes, Jacco Borggreve

WEEKLY ASSIGNMENTS

Week 8–10: Documenting, reflecting, and archiving

The first part of the program is rounded off with a synthesis of each student's reflections. Each week students have prepared plain text and images to reflect on each week's readings. For the mid-term exam, students synthesize these reflections into a printed portfolio.

Deliverables for the assessment
[DUE DATE IN WEEK 10 of the program]

1. Material craftsmanship: Compile an overview of all the work produced for the assignments from week 1–8. Include pictures, with a maximum of ten pages or slides.

2. Storytelling and activation deliverables: Review and rework your weekly reflection texts and images. Rewrite where necessary and provide an introduction text and colophon. Come up with a concept to present these reflections in the form of a publication. This may take any form (poster, card sets, booklets, combined techniques, an AR publication with AV media embedded, etc.). Realize your publication and hand in two copies.

3. Research and documentation deliverables: Review all the material experiments you have made so far. Select five or more that 1) are high-quality and 2) that you think make for an original contribution to the class archive. Create the documentation for your material samples and label them.

Teacher's materials from the Biomaterials Teaching Toolkit
Collaborative Open-source Archiving | Define your Eco-compatibility Principles, from the Biomaterials Teaching Toolkit.

WEEKLY ASSIGNMENTS

Class schedule week 11–20

In week 11 students will decide on an area of interest and develop a research project and subsequently develop their project from week 11 until week 17. It can take the form of exploring and expanding (the creative applications of) existing techniques or materials or developing a tool or machine to support making processes. These outcomes will be shown at the class expo and documented under a creative commons license in the material archive. Tutors, researchers, and designers and makers from the professional field offer support to students by critically reflecting on their experiments, contextualizing their creative practice, and understanding where and why their work could be or become relevant. Week 18–20 are dedicated to developing an educational format for a target audience of the student's choice. Assessments take place during the class expo in week 21. Although the projects each have a different topic, the pace and process is roughly the same. The weekly meetings can be accompanied with workshops, readings, and guest speakers (see recurring activities).

Week 11: Project kick-off

Each student revisits her/his topic or area of interest by researching the state of the art and inspiring projects, recently published research papers, and spending time with their material(s) of choice. We will discuss a number of ideation and decision-making methods and outline different approaches you can take to address the challenge.

1. Sources

- Bar-Shai, Nurit et al., Cut/Paste/Grow. Exhibition catalogue by Observatory/Genspace. New York: Observatory, 2013.
- Franklin, Kate, and Caroline Till (eds), "Living Materials" in: Radical Matter: Rethinking Materials for a Sustainable Future. London: Thames & Hudson, 2018: pp. 190-217.
- Antonelli, Paola, and Ala Tannir, Broken Nature: XXII Triennale di Milano, 2019.

2. Assignment

- Present a revised project proposal including a research question during the review at the end of the week.

3. Teacher's materials from the Biomaterials Teaching Toolkit

Developing a Bio art or Biodesign Project

WEEKLY ASSIGNMENTS

Week 12 – Studio sessions

Tutors will be available for feedback and discussion during studio hours [insert here]. Weekly plenary reviews and discussion of readings continue to take place at the usual day and time.

1. Sources

• Cogdell, Christina, "From BioArt to BioDesign". *American Art* 25(2) (Summer, 2011): pp. 25–29.

2. Assignment

• Present a revised project proposal including a research question during the review at the end of the week.

3. Teacher's materials from the Biomaterials Teaching Toolkit

Developing a Bio art or Biodesign Project

Week 13 – Studio sessions

Tutors will be available for feedback and discussion during studio hours [insert here]. Weekly plenary reviews and discussion of readings continue to take place at the usual day and time.

1. Sources

• Lee Sethi, Meera, and Adam Briggle, "Making Stories Visible: The Task for Bioethics Commissions" in: Issues in Science and Technology 27(2) (Winter 2011): pp. 29–44. Also available at: https://issues.org/sethi/

Week 14 – Studio sessions

Tutors will be available for feedback and discussion during studio hours [insert here]. Weekly plenary reviews and discussion of readings continue to take place at the usual day and time.

1. Sources

• Lee Sethi, Meera, and Adam Briggle, "Making Stories Visible: The Task for Bioethics Commissions" in: Issues in Science and Technology 27(2) (Winter 2011): pp. 29–44. Also available at: https://issues.org/sethi/

Week 15 – Studio visits by guests

Tutors and guests will visit the studio for feedback and discussion during studio hours [insert here]. Weekly plenary reviews continue to take place at the usual day and time. As the project is nearing the final stage, this is a good week to focus on storytelling and presentation. Invite a photographer to visit the studio to give a talk addressing how photography can help convey students' project message in the most compelling way.

Week 16 – Art/Science educational design

This week will be facilitated by educational design experts [INSERT NAMES]. They will introduce strategies and models for developing art/science education. Prepare for the session by reading the text and considering your target audience.

1. Sources

• Talitha Groenendijk & Emiel Heijnen (2018), Transdisciplinaire Ontwerplabs: Een ontwerponderzoek naar lesmateriaal op het snijvlak van kunst, wetenschap en technologie. Amsterdam: Lectoraat Kunsteducatie, Amsterdamse Hogeschool voor de Kunsten.
• Emiel Heijnen & Melissa Bremmer (eds), (2020) Wicked Arts Assignments. Practicing Creativity in Contemporary Arts Education. Valiz ism Amsterdamse Hogeschool voor de Kunsten.
• Melissa Bremmer, Emiel Heijnen & Sanne Kersten (2022), ArtsSciences Unlocked. Kunst, wetenschap en technologie voor jongeren met autisme. Amsterdam: Lectoraat Kunsteducatie, Amsterdamse Hogeschool voor de Kunsten.

2. Assignment

• Develop an educational product (assignment, intervention, project), based on your research process for a designated target group. As a point of reference, you can use:
– Wicked Arts Assignments. Practicing Creativity in Contemporary Arts Education.
– Designmodel Emiel Heijnen. In: Transdisciplinaire Ontwerplabs: een ontwerponderzoek naar lesmateriaal op het snijvlak van kunst, wetenschap en technologie.
• Prepare the blueprint of your educational product, present it in week 17.

Week 17 – Educational product – blueprint presentations

Present your blueprint to the class and acquire feedback from your peers and educational design experts so you can continue improving your educational product.

1. Assignment

• Develop the entire lesson plan as described in the literature provided in week 16.

WEEKLY ASSIGNMENTS

Week 18 – Test educational product & expo prep

1.Assignment
• Locate some willing test subjects to test out (parts of) your lesson plan. Document your insights and analyze the results. Define areas of improvement and iterate. Present your results in week 19.
• Develop a proposal for how you will present your project and educational product at the class expo in week 20. Provide sketches and mock-ups, make a list of the things you need (power, screens, natural light, darkness, etc.).

Week 19 – Expo prep

Present the results from your test session, and your expo proposal during the review session. Use the feedback to iterate further on your designs.

Week 20 – Class expo and assessments

Present your work at the class expo and hand in the required deliverables.

Deliverables for the assessment – due date: [DUE DATE IN WEEK 21 HERE]

- **Material Craftsmanship:**
  - Quality of the project outcomes will be assessed during the expo.
  - If first assessment was unsatisfactory: Compile an overview of all the work produced for the assignments from week 1–8. Include pictures, with a maximum of ten pages or slides.

- **Storytelling and activation deliverables:**
  - Artist's statement (maximum of 0.5 page)
  - Video (maximum of two minutes)
  - Ten high-resolution images of your project
  - Detailed lesson plan and educational materials

- **Research and documentation deliverables:**
  - Process documentation, document ten pages (maximum of ten pages). Should include:
  - research question(s)
  - scientific underpinnings
  - positioning of the work as a cultural artifact
  - process documentation (pivotal experiments, iterations, key insights)
  - technical documentation of designs/art works, tools, materials, and procedures developed