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barbican

Creative Learning:
Teacher Notes
Future Fashion



Plan Your Visit

Our Time on Earth runs from 5 May – 28 August at the Barbican Centre. The exhibition takes place in the Curve, Pit Theatre and foyer. School groups can book to come any time, and we have limited slots for tours and workshops on Tuesdays at 2pm and Thursdays at 10am from 10 May – 28 July.

Please also find our digital [Exhibition Guide](#) to support your teaching.

Using this resource

This resource is for the classroom, and complements the exhibition *Our Time on Earth*, but you might use it even if you have not attended with your students.

Aimed at Key Stage 2, 3 and 4.

In here you will find...

- An introduction to the artwork *A Biological Future for Fashion* by Biofabricate and its premise to be used as a provocation to begin a discussion
- Teacher notes on **global justice, colonialism and traditional ecological knowledge**
- Discussion points and questions
- New vocabulary
- Activities for imaginatively exploring solutions to problems through sci-fi and design
- Further links to resources, notes and activities to develop the session



"Life Forces" by Tim&Ed, 2021

Curriculum Links

Our Time on Earth brings together indigenous thinkers, artists, scientists, activists, architects and more. Our resources reflect the interdisciplinary, collaborative ambition of the project, as we acknowledge the climate emergency affects every realm of life and every subject on the curriculum. We aim to provide opportunities for teachers to engage students with climate action in a holistic way. Below is some guidance for where the subject matter links to the curriculum.

Key Stage 3 Design and Technology –

- use research and exploration, such as the study of different cultures, to identify and understand user needs
- identify and solve their own design problems and understand how to reformulate problems given to them
- develop specifications to inform the design of innovative, functional, appealing products that respond to needs in a variety of situations
- use a variety of approaches [for example, biomimicry and user-centred design], to generate creative ideas and avoid stereotypical responses
- develop and communicate design ideas using annotated sketches, detailed plans, 3-D and mathematical modelling, oral and digital presentations and computer-based tools
- investigate new and emerging technologies
- understand developments in design and technology, its impact on individuals, society and the environment, and the responsibilities of designers, engineers and technologists

Key Stage 2 and 3 English –

- Reading Comprehension

Key Stage 2 – 4 Science –

- Living things and their habitats: recognise that environments can change and that this can sometimes pose dangers to living things
- Relationships in an ecosystem: how organisms affect, and are affected by, their environment, including the accumulation of toxic materials
- The chemicals in ecosystems are continually cycling through the natural world
- The role of microorganisms (decomposers) in the cycling of materials through an ecosystem
- Positive and negative human interactions with ecosystems

Key Stage 2 Citizenship –

- to talk and write about their opinions, and explain their views, on issues that affect themselves and society
- preparing to play an active role as citizens
- to research, discuss and debate topical issues, problems and events
- that there are different kinds of responsibilities, rights and duties at home, at school and in the community, and that these can sometimes conflict with each other
- that resources can be allocated in different ways and that these economic choices affect individuals, communities and the sustainability of the environment

Key Stage 2 and 3 Art –

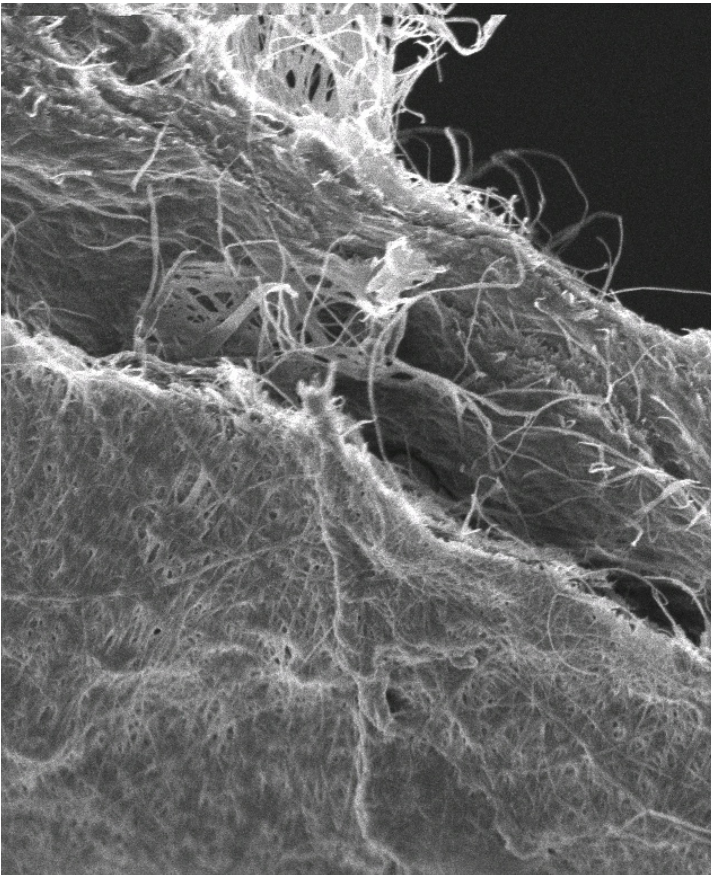
- to improve their mastery of art and design techniques

Key Stage 2 and 3 Geography –

- types of settlement and land use, economic activity including trade links, and the distribution of natural resources including energy, food, minerals and water
- population and urbanisation; international development and the use of natural resources

Key Stage 3 History –

- ideas, political power, industry and empire: Britain, 1745-1901



A Biological Future for Fashion

The exhibit by *Biofabricate* as part of *Our Time on Earth* is a multimedia walk through the process of 'biodesign', and 'biomanufacture' through to the catwalk. Each section introduces key concepts of how you can go from organism through to biomaterial and ultimately product. It explores what a biofabricated future for the fashion industry looks like with examples of materials grown by living organisms.

Biofabricate

Biofabricate is a pioneering team of material innovators who work with startups, consumer brands and investors to grow a sustainable future that is built with biology. Their exhibit showcases how biology is replacing materials derived from animals or petrochemicals.





Ask

What is slow fashion?

Slow fashion is a positive antidote to fast fashion. It advocates for buying better-quality garments that will last longer, and values fair treatment of people, animals and the planet along the way.

Do

Create a circuit around the class and choose some of the following questions and statements for them to discuss. Ask the class to move round in pairs, adding thoughts and points to each question.

Tip: Have samples of different materials currently available to show students so they are better able to identify clothes made with petrochemicals

Fast and Slow Fashion

Ask

What is fast fashion?

Come back to this question after the lesson.

Prompts:

**Can you name some fast fashion brands?
What makes it fast?**

Fast fashion is inexpensive clothing produced rapidly by mass-market retailers in response to the latest trends.

As a result of this, fashion, one of the most polluting industries in the world, has a huge social and environmental impact. It:

- Uses vast amounts of water and pesticides to grow cotton
- Deforests the Amazon to provide leather
- Uses huge volumes of petroleum to make polyester
- Exploits workers around the world
- Produces poor quality garments designed and advertised to be thrown away
- Produces enormous quantities of waste as more and more clothes are bought.

Since the mid-2000s, the number of garments purchased by the average consumer has more than doubled, according to the Global Fashion Agenda's Pulse Report.

In countries like the UK in the Global North, where fast fashion brands make their money selling clothes to customers, the picture is extremely different compared to countries in the Global South where huge textile factories with unsafe working practices employ mainly women, for very little pay. The UK and other Western countries also export much of our landfill waste to countries in the Global South to sort, leading to further pollution far away from those who bought the products in the first place.

You can use [this map](#) to explore the web of links in the supply chain to deforestation.

"The most sustainable clothes are the ones you already own"

How might the Slow Fashion approach change fashion culture? List the pros and cons.

What are some other ways we can reduce the harm to the planet when making fashion choices?

"What does it really mean to say 'throw it away'? What would happen if we redefined what the word 'away' means?"

"New sustainable materials created without chemicals or polluting fabrics are the way forward"

"Biofabrics aren't as beautiful as real fur, nylon mesh or leather"

"Our responsibility to change the fashion industry is the same no matter who you are across the world"



Bio-Custom Materials

Scientists are working on a new way to make clothes that doesn't pollute the planet. Instead of being manufactured from plant, animal or petroleum-based resources, imagine that fabrics are grown in laboratories from living microbes. This is the biotechnology revolution, inspired by the living systems of the natural world. Polyester is the most commonly used fibre in the fashion world. The chemicals used to make it come from petrochemicals, requiring us to burn and extract fossil fuels, and produce products that pollute.

Microbes are all around us. They play a critical role in our health and that of the planet. Humans have been using biology to make things for thousands of years. Can you think of examples?

For example: to make yogurt, beer, or wine we feed sugar to bacteria or yeast cells, in a process called fermentation. These microorganisms transform that sugar into delicious products that we can consume.

Now, using the latest tools of biotechnology, we're able to design these living organisms so that instead of making food and drink, they can instead produce sustainable fibres and fabrics for the fashion industry, as well as eco-friendly pigments and dyes for fashion. We've always prized pigments and dyes from the natural world. But in the industrial age we switched to petrochemicals to colour our clothing because it was cheaper and easier to scale.

Biofabrication uses organisms such as yeast, bacteria, fungi, algae and mammalian cells which are fermented, cultured, and engineered to synthesize nature's materials and have specific desired properties.

By turning to biotechnology, we can now sustainably grow the colours you see in nature, using much less water, less energy, with lower CO₂ emissions and no toxic chemicals. Imagine a fashion future where all of nature's colour palette is at our fingertips without negatively impacting our environment. We are able to design the DNA of a microbe so that it will make the exact chemical or material we need. That means we can now make the chemicals that go into polyester using biology not petrochemicals. We can design a material to have the properties it needs.

Do

Ask the class what properties they would want in a bio-customisable fabric – think about movement, workability, texture, colour, durability, sustainability, source. Ask them to brainstorm properties and make a big class map.

You can design properties in the DNA like softness, elasticity, strength, durability. We can also design the conditions the material needs to biodegrade or be recycled. And we are not bound by nature's constraints. Whereas leather can only come in the shape of an animal, we can produce biological, leather-like alternatives that come on a roll!

Circular economy

Circular economies are all around us. A tree takes nutrients from the ground to grow, and when fruit and dead leaves fall and decompose in the soil, those nutrients go back in to the ground. Nature's materials are an inspiration for many new material innovators. Whether it's life on land or in the sea, biological life efficiently uses the resources all around in cycles of growth and decay. It's a regenerative, circular system.

Inspired by nature, scientists at *Biofabricate* are learning how we can create biomaterials that have similar renewable, regenerative benefits to the environment. They are working on how to mirror this with fashion: by engineering textile fibres to be soft and strong, but also degradable so they cause no harm to marine life. Their goal is for materials to safely biodegrade in the environment they came from. They can even design living cells to do this while feeding on harmful carbon emissions. So, with biology's help, we can turn pollution into recyclable fabrics.



Courtesy of Marshmallow Laser Feast

Closing the loop

Upcycling, reusing and fixing garments is a great way to reduce waste and pollution. However, it isn't always as simple as trying to buy second hand and donating clothes. When we recycle or donate second hand clothes in the UK, some people call this a "circular economy", however it is actually very one sided: most are exported to developing countries, ending up in dumping grounds or sold cheaply, which reduces possibilities for economic development, as local craftspeople can't compete.



Photo by Francois Le Nguyen on Unsplash

Do

Use the resources about second hand fashion at the end of this resource to read in groups and feed back, to discuss the true meaning of "circular economy".

Temporalities

This work provokes us to think about time. When we produce an object, it is important to think about the timeline of existence, or "temporality" of that object, as the "matter" of it will stay in the circulation of the planetary system forever, in its many forms.

If it will not transform or break down for years, it will remain as it is for much longer than we need it for.

Synthetics i.e. nylon and polyester are cheap and easy to produce but these are made from processed petrochemicals.

Nylon takes 30-40 years to decompose.

Polyester can take between 20 and 200 years!

Do

Look around the room, what different temporalities can you see?

Think about any fruit or food in your vicinity, the chair you are sitting on, what your building is made out of, what about your clothes?

Pick 3 different objects and draw a timeline to show how long each material will last before transforming and going back into the cycle of matter and energy. They will need to lead an investigation into the material and research its properties.

New Vocabulary

Matter – matter is any substance that has mass and takes up space by having volume

Circular Economy – a circular economy is “a model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products as long as possible”. CE aims to tackle global challenges like climate change, biodiversity loss, waste, and pollution by emphasising the design-based implementation of the three base principles of the model. The three principles required for the transformation to a circular economy are: eliminating waste and pollution, circulating products and materials, and the regeneration of nature. It is defined in contradistinction to the traditional linear economy

Biofabrics – new forms of sustainable textiles using customised (via DNA) microorganisms to grow materials that can be compostable

Decomposers – living creatures including insects, fungi and bacteria that can break down organic matter (e.g. dead plants) and turn it into soil

Compostable – organic matter that can be turned into soil by decomposers in a composting process

Temporality – an object’s relationship with time

Regenerative – characterised by regeneration

Petrochemicals – a chemical obtained from petroleum and natural gas

Nylon – a tough, lightweight synthetic material made from plastic

Polyester – a synthetic fabric, a group of polymers consisting of repeated units of an ester



Courtesy of Liam Young

"It's my flimsy for the evening – Jackrabbit designed it... A flimsy is a once-garment for festivals. Made out of algae, natural dyes. We throw them in the compost afterward. Not like costumes. Costumes circulate – like the robe Bee wore for naming? Costumes you sign out of the library for once a month, then they go back for someone else. But flimsies are fancies for once only. Part of the pleasure of festivals is designing flimsies – outrageous, silly, ones that disguise you, ones which you will be absolutely gorgeous and desired by everybody in the township!"

"That must be what yours is for."

Luciente threw up her hands. "At a festival, why not be looked at?"

"What about me? Can you dress me up?"

"I don't have a flimsy for you." Luciente looked grief stricken. Then she snapped her fingers. "All is running good. You put on Red Star's flimsy. Red Star ordered it but that person had an accident picking cherries and is healing at Cranberry. We'll get their flimsy from the presser for you."

Luciente scooped her along and they dodged through groups wandering the paths of the village, people in wild and bright, in delicate and fanciful flimsies, carrying wine bottles and passing cups and eating small cakes that left the scent of spice on the air, trailing flowers in leis and in hair and beards, playing on the flutes and recorders and guitars and stringed instruments strange and twangy, high and shimmering in their sound, beating on drums and sets of drums and carrying along objects that sputtered sound and light and scent."

Activity 1: Redefining "Away"

Read the extract below. *Woman on the Edge of Time* is a science fiction novel written by Marge Piercy in 1976, set in a future world in a community called Mattapoissett.

Respond

Complete the questions and prompts below.

- Write 5 words in response to the text.
- Why does Luciente like "flimsies" so much?
- Can you see any differences between the imagined world of Mattapoissett and our world? What about similarities?
- How can you distinguish between a flimsy and a costume? How would you choose which to wear? Would you design it or would you ask someone else? If so, who?
- What was the author's intention to write this, in 1976?
- Challenge: Science fiction is a genre of writing that imagines up futuristic ideas based on technological advancement. Often it is based on real science and technology. What, in your opinion, is the role of science fiction in society?

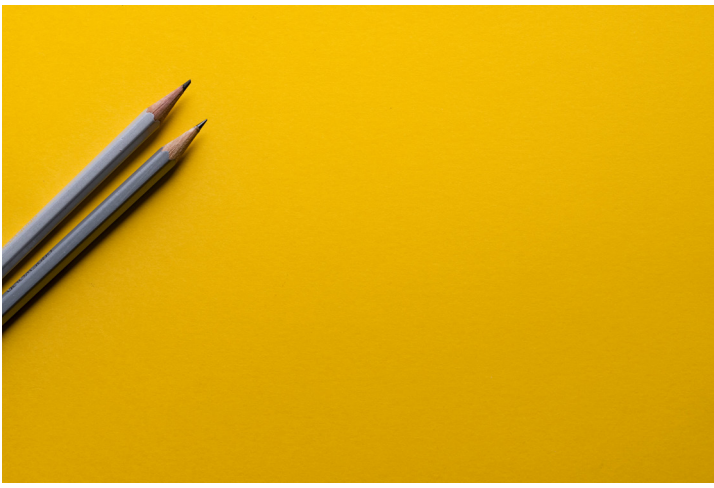


Photo by Joanna Kosinska on Unsplash

Activity 2 – Design Room

It's the year 2040 and clothes are being grown from crabs, algae and mushrooms. These materials are durable, long-lasting, grown to size and shape, and you can ethically grow the colours in the natural world. It's all at your finger tips. If you had to design a piece of clothing made from biofabrics, what would you design? Think about presenting your work, showing the process of decision making.

Things to consider:

- Research different types of biofabricated textiles to discover what is possible. You could start with myco-leather, spider silk or brewed protein. Find further resources at the end of this pack.
- Start with the bio-customised material, what would you first want to develop? How would you customise it?
- How can you think about "celebration" and "parade" through your bio-designs. Use the text by Marge Piercy and the costumes you may have seen in *Our Time on Earth's Planet City*, designed by Ane Crabtree.
- Decide whether you'd want your clothing to be a "flimsy" or a long-lasting item that will be used again and again, perhaps by different people over time. How did you make your decision? How would it affect your design?
- Natural dyes are a sustainable way to incorporate colour into clothing. What colours from the natural world would you want to display with your flimsy? i.e. think coral red, cherry blossom pink and poison frog green.



Mushroom Jacket, Biofabricate 2022



Courtesy of Julia Watson

Further resources:

[Slowfactory](#) – (Educational Group) Slow Factory is a nonprofit that transforms socially and environmentally harmful systems by designing models that are good for the Earth and good for people. We are People of the Global Majority advancing climate justice and social equity through regenerative design, education, and materials innovation. Education is central to the systemic change we need for a livable equitable climate future. We must dismantle the current paradigm of extraction, exploitation, and racial oppression and revive a pan-Indigenous paradigm to restore our relationships to each other and our planet.

[True Cost](#) (Documentary)

[Sustainability and Fashion](#) (Book)

[Fashionopolis: Why What We Wear Matters](#) (Book)

Fast Fashion

Gal-Dem – intersectional media organization – [Fast Fashion archive](#) (Articles)

[Shein: The unacceptable face of fast fashion](#) – (Article)

Second hand clothing

[The hidden trade in our second-hand clothes given to charity](#)

(Article)

[Second-hand fashion: Is it really good for Africa?](#) (Article)

Biofabrics

[30 Sustainable Fabrics For The Most Eco Friendly Fashion](#) (Article)

[What are Biofabrics and How Sustainable are They?](#) (Article)

Zero – waste

[Learning activities ages 7-11, zero waste](#)

Can I Live?

By Fehinti Balogun

Produced by Complicité

A new online performance about the climate emergency. With rap, theatre and animation, Fehinti links the climate crisis & social justice, finding hope, through activism, for the future.

Catch the Trailer of the film [here](#)

If you want to discover more about the ecological emergency, climate justice and the creatives behind this filmed performance download the digital resource pack [here](#).

To screen the film at your school contact creativeengagement@complicite.org

Credits

These Learning Resources were created by Hannah Calascione for Barbican Creative Learning, with ethical consultation from Angela Chan, Angela Camacho and Sarah Melia.



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