education for FASHION-TECH

design and technology for future fashion creatives

Chiara Colombi, Livia Tenuta (eds)

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04. FUTURE SCENARIOS

Livia Tenuta, Susanna Testa

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L. Tenuta, S. Testa

The world of Fashion-Tech is not only growing but also evolving. This is confirmed by the state-of-the-art , from which emerges, on the one hand, the growing interest of the market for products, processes and services related to Fashion-Tech.

On the other hand, the need is clear for systems capable of training professionals with interdisciplinary skills, who are also able to have a global vision on the theme of Fashion and Technology. The world of Fashion-Tech is not only growing but also evolving. This is confirmed by the state-of-the-art, from which emerges on the one hand the growing interest of the market for products, processes and services related to Fashion-Tech, but on the other hand also for the creation of systems capable of training professionals with specific skills but at the same time able to have a global vision on the theme of Fashion and Technology. The experiences implemented during the whole E4FT project - the Hackathon in London and the three workshops in the three partner universities in particular - have explored exactly what are the fundamental aspects to create these professional figures. In particular, it emerged that: they need have basic knowledge in the areas involved in the Fashion-Tech world that we have seen to be multiple, complementary but heterogeneous; it is essential that they are able to work in teams in which all participants have a shared language but each of them, with their own specialisation, can develop and control the different phases of the design process; the need to have direct contact or a constant confrontation with business realities to get

out of the pure research field and face the limits of industrial production in terms of feasibility, saleability and timing. Starting from this awareness, a common structure or framework for the training of university students has been built and useful tools have been created to help teachers and students with different training to learn the practices useful to manage Fashion-Tech projects.
All this, as we will see in Chapter 5, has to be put in touch with the real world. A dynamic and fluid world that changes rapidly, not only because of the continuous innovative drives that renew technologies but also because of the continuous changes in behaviour and habits that involve not only the realities that operate in the sector - Companies, Higher Education Institutions and Research Centres - but more generally people, even consumers, who will then benefit from the products, processes and services offered by Fashion-Tech.
To be ready for these changes it is useful to draw guidelines on how the fashion world will evolve. Similar work was already developed within the Benchmarking Report combining desk research and the results of the interviews with Companies, Research Centres and Higher Education Institutes, to obtain an overview of current researches and emerging topics. In particular, 5 macro areas emerged that may represent a direction of future development for the Fashion-Tech sector:
- 1. Protection and body enhancement through an artificial second skin
- 2. Culture driven Wearable: art, technology and innovation
- 3. Hyper-body: connecting senses and materials
- 4. Fashion takes care
- 5. Real/Virtual mixed environments

To trace Fashion-Tech directions, recent case studies had been identified directly or transversely related to Wearable technologies, smart textiles or Digital manufacturing, along with analysing their area of origin. Most of the products, technologies, fabrics or techniques came from worlds apparently far from that of fashion design, and are only the result of the meeting of different disciplines and fields. Medicine, architecture, gaming, robotics and automotive were just some of the areas where most of the innovations we are seeing are being implemented.
The 5 macro areas were the applications of the 2017 research that foresaw a development time of 1-3 years and which automatically were concepts for the near future - so today already outdated.
Obviously, in recent years these future trends have changed and it was necessary to identify new scenarios characterizing the next decade. So big changes that involve society in general and that cross the fashion world. In particular, the research has been conducted according to the following steps:
1. Identify the great changes that characterize the contemporary world and that will have an impact on the future, not only in relation to the field of fashion
2. Identify how today fashion and technology are approaching these scenarios with more or less avanced products
3. Mapping existing products today in a more or less advanced state that characterize these scenarios according to two axes (function-interaction)
4. Identify possible opportunities for the world of Fashion-Tech.
In particular, the four scenarios that have been identified and that will be explored in-depth in the following pages are: **Apocalyptic Life; Extra-Humans; AI Feels; Phygital Self**.
This research confirms how the Fashion-Technology sector is in continuous evolution but is not intended to be an answer but rather a starting point to trigger a conversation with companies and to push companies to go beyond the technical problem of product feasibility to embrace innovative scenarios involving products, processes and services.
Fluidity - of the themes, professions and actors involved - is the key word.

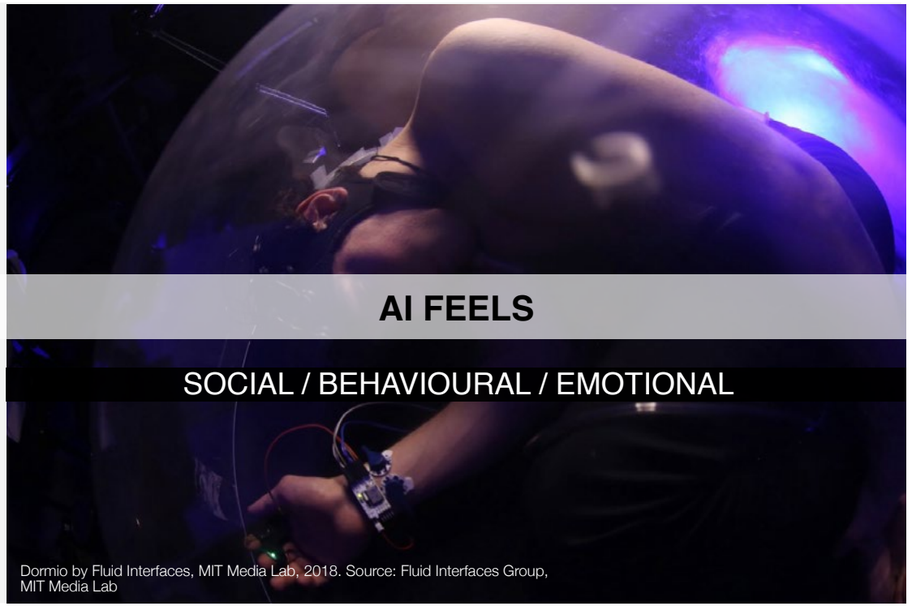
2030 // SCENARIOS

AUTONOMOUS INTERACTION

FUNCTIONALITY

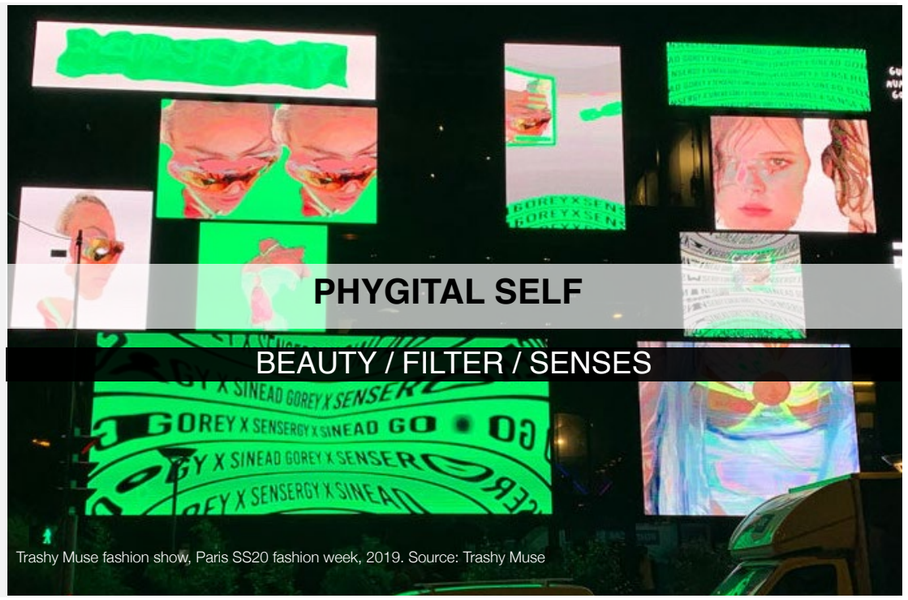
EXPRESSIVITY

Mars Garden: an Engineered Greenhouse for a Sustainable Residence on Mars, MIT media Lab, 2019. Source www.media.mit.edu



Dormio by Fluid Interfaces, MIT Media Lab, 2018. Source: Fluid Interfaces Group, MIT Media Lab

'I Want To Believe' photobook by David Vintiner and Gemma Fletcher, 2020. Ph: David Vintiner. Source: David Vintiner Photographer



Trashy Muse fashion show, Paris SS20 fashion week, 2019. Source: Trashy Muse

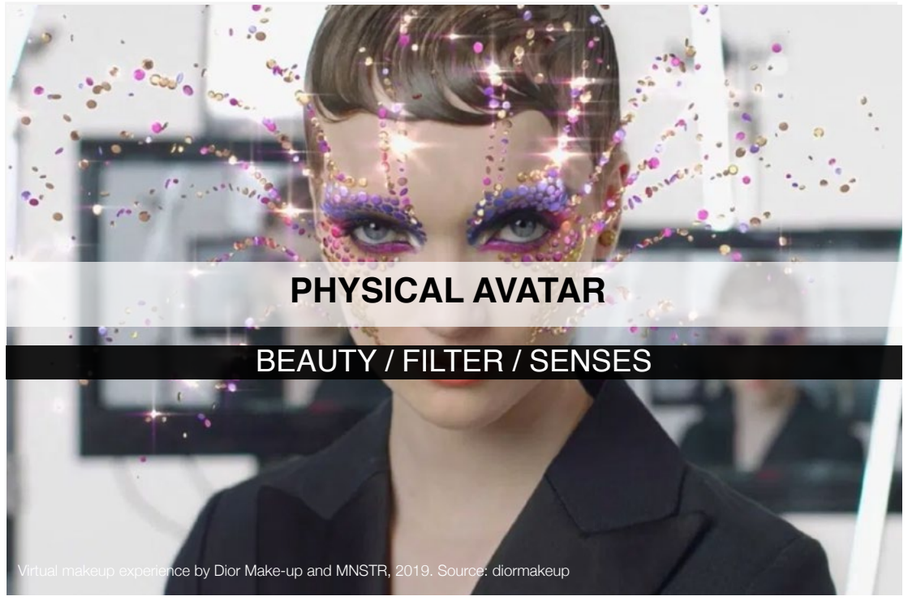
CONTROLLED INTERACTION

FASHION-TECH SOLUTIONS

Air's Atmos by Ao Air, 2020. Source: Ao Air

Flowing Water, Standing Time by Ying Gao, 2019. Source: Ying Gao

Black Squid Jacket by Volleback (2019). Source: Volleback



Virtual makeup experience by Dior Make-up and MNSTR, 2019. Source: diormakeup

SCENARIO

APO CALY PTIC LIFE

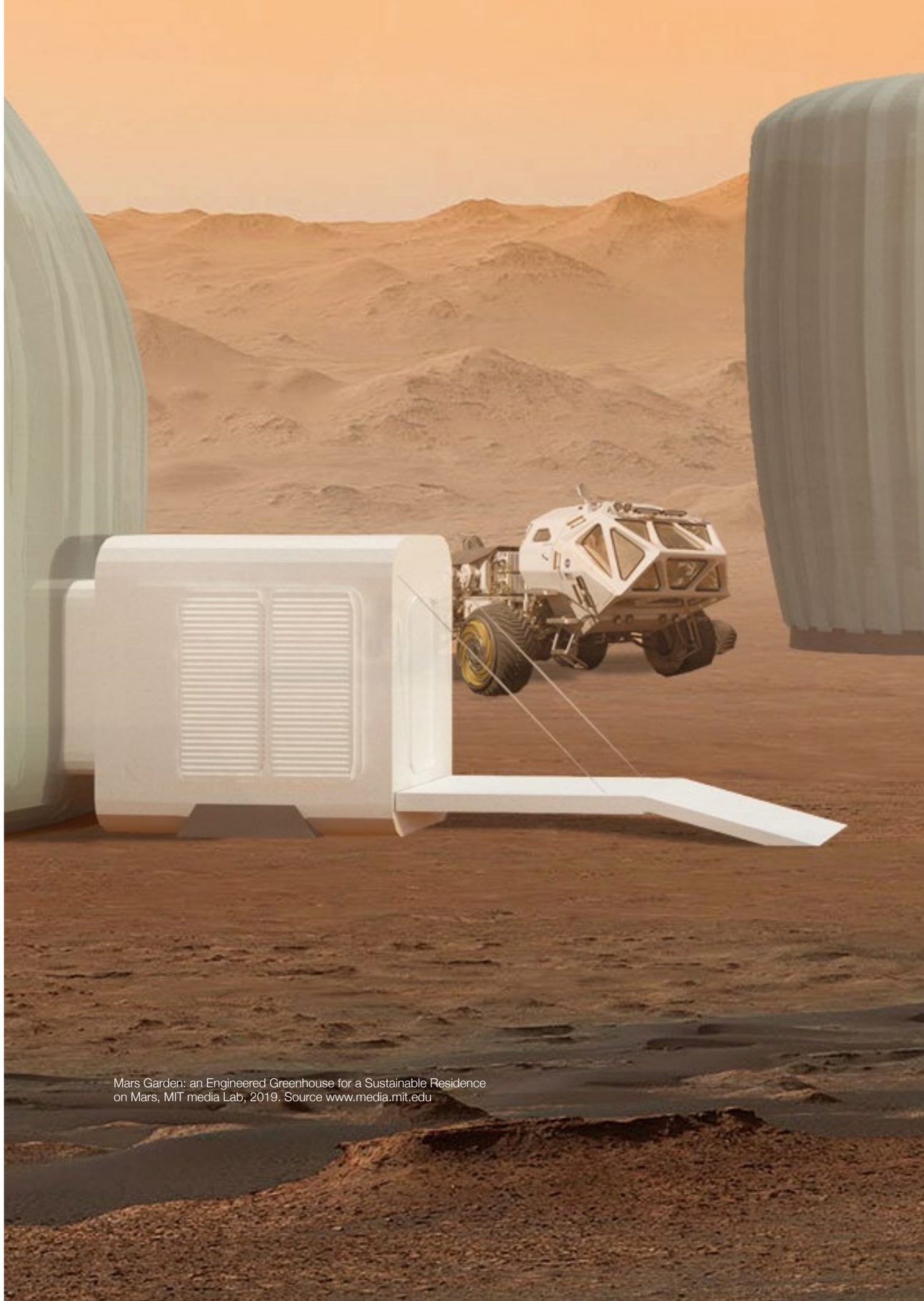
Mars Garden: an Engineered Greenhouse for a Sustainable Residence on Mars, MIT media Lab, 2019. Source www.media.mit.edu

APOCALYPTIC LIFE

SURVIVAL / SHIELD / CARE

A dystopian dimension where pollution, viruses, nuclear wars, exodus to new unexplored spaces will question the survival of human beings.

Surviving in polluted environments, the dynamism of a nomadic lifestyle, the need to adapt to extreme climates, space exploration. The spaces will have to be reorganized according to the new limits imposed by the change or even will have to pass through new contingent planet, the behaviour in domestic and private life but also in public life and the interactions between people will be modified to cope with emergency and crisis situations.
On April 12, 1959 John Fitzgerald Kennedy gave a speech at the Convocation of the United Negro College Fund in which he said "When written in Chinese, the word 'crisis' is composed of two characters. One represents danger and the other represents opportunity."
This double reading well summarizes the impact of the two emergencies on the contemporary landscape - pandemic and environmental crisis -: on the one hand the whole world is overwhelmed by a dramatic emergency, on the other hand creative visions are taking shape in response to the crisis.
The world of art, science and culture has perceived these changes and has given different interpretations. These have been grouped into five micro-trends.



Mars Garden: an Engineered Greenhouse for a Sustainable Residence on Mars, MIT media Lab, 2019. Source www.media.mit.edu

MICRO SCENARIO

SYNTHETIC BIOLOGY

SYNTHETIC BIOLOGY is a call for investigating and crafting, through art and science collaboration, stories to "stay with the trouble" of living in an environment of global warming, pollution, and species extinction. Dark Ecology, synthetic biology, genetically-engineered creatures to cope with environmental crisis. It is based on the scientific certainty that changes in our climate will require us all to adapt, focusing on human-scale acts of innovation and contemplation.

They reveal how artists, designers and scientists explore new imaginaries and visions of a future in the making: the natural world will never be the same again and what is taken for granted could be lost forever; nature needs care to give something in return; spontaneous natural processes become artificial.

Resurrecting the Sublime by Alexandra Daisy Ginsberg. Source: www.daisyginsberg.com

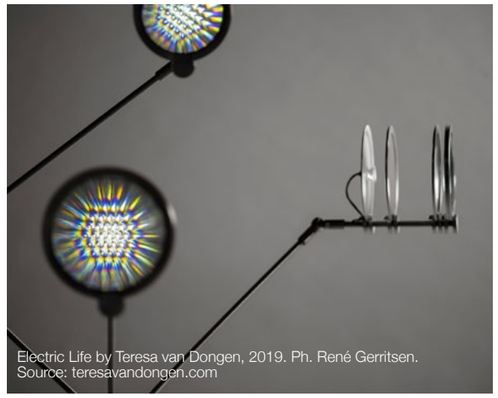
CURRENT FORWARD LOOKING PROJECTS

Mud Well by Teresa van Dongen, 2019. Ph. Alex Hamstra Photography, Source teresavandongen.com

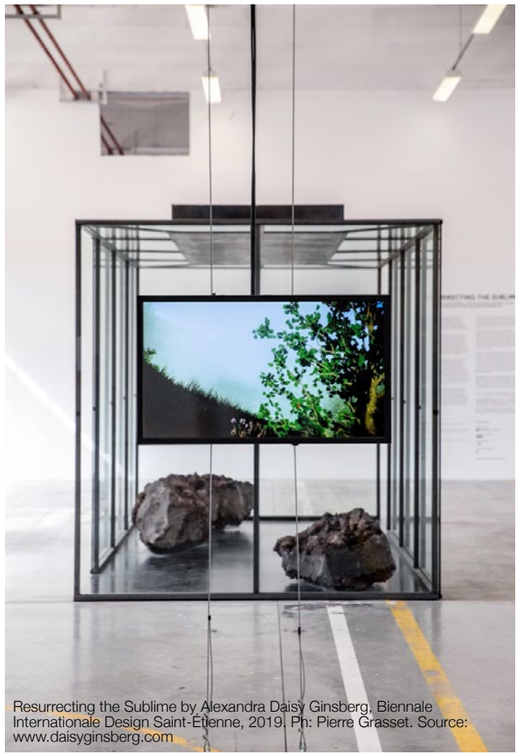
Hybrid living materials (HLMs) by The Mediated Matter Group MIT Media Lab, 2019. Source www.media.mit.edu.

Microsilk and cellulose blend fiber Tennis Dress by Bolt Threads, Stella McCartney, Adidas, 2019. Source: boltthreads.com

Transversal by Faber Futures, Cooper Hewitt Museum, 2019. Source: faberfutures.com



Electric Life by Teresa van Dongen, 2019. Ph. René Gerritsen. Source: teresavandongen.com



Resurrecting the Sublime by Alexandra Daisy Ginsberg, Biennale Internationale Design Saint-Etienne, 2019. Ph: Pierre Grasset. Source: www.daisyginsberg.com

AlgaeFabrics by Studio Tjeerd Veenhoven, 2016. Source: Studio Tjeerd Veenhoven

Algae biomass Ultra Blooms by Vivobarefoot, 2017. Source: Vivobarefoot

CURRENT FORWARD LOOKING PROJECTS

Loose to understand what you miss. The **"Resurrecting the Sublime" exhibition by Alexandra Daisy Ginsberg**, gives voice to one main question: could we ever again smell flowers driven to extinction by humans? could we ever again smell flowers driven to extinction by humans? "Resurrecting the Sublime" is an immersive exhibition resurrecting the smell of extinct flowers so that humans may again experience something they destroyed. Awesome and perhaps terrifying, it evokes the "sublime". Biotechnology, smell, and digitally reconstructed landscapes reveal the complex interplay of species and places that no longer exist. "Resurrecting the Sublime," asks us to contemplate our actions, and potentially change them for the future.

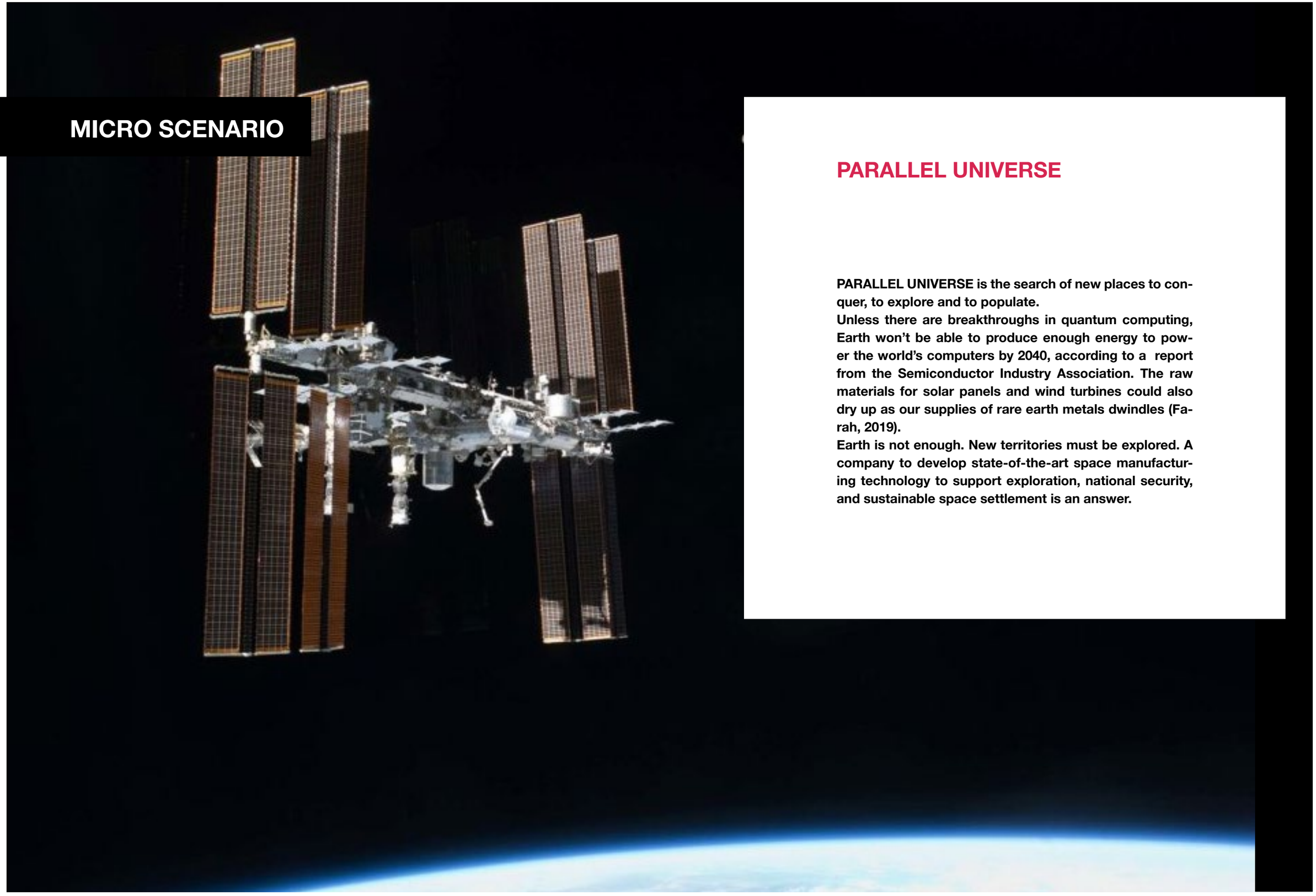
Alternative ecosystems to generate energy. Under our feet lies a world full of micro-organisms, most of which perform important tasks in our environment. The Geobacter is a bacteria that can purify water while continuously excreting electrons to its surrounding. **Teresa van Dongen** has been exploring these specific organisms since 2016 together with the Ghent University as a means to generate electricity for human use. For the 2019 Oerol Festival she investigated multiple places at the island Terschelling to see if she could find a new, strong ecosystem containing these energy providing microbes. Based on her findings she created **Mud Well**, a light installation that gets its energy from the bacteria in the muddy soil of an old Second World War bomb-crater. The ecosystem that she found in the so called "Bommengat" is one of the strongest she has ever encountered. The crater has turned out to be the perfect place for these microbes. One of the reasons is, that there is always an abundance of organic material and that it is quite closed off from various other influences like the sea or rivers. The water-filled crater thus functions almost like a closed cycle. Similarly, **Electric Life** (2019) is a home lighting system powered by the presence of bacteria to be nourished by tap water and a tablespoon of vinegar. Light, becoming living matter, needs care and establishes a deep human interaction. Natural processes go to artificial. Bacteria are also the main characters of the **Hybrid Living Materials** (HLMs): a method of interfacing a 3D digital design and printing platform with engineered bacteria, in such a way that we achieve programmable, replicable control of gene expression across the surface of 3D printed objects.

As for fashion, synthetic biology can be an alternative to traditional methods of producing fabrics, often highly polluting.

Some kinds of innovative and eco-friendly materials rely on the processing of waste of animal origin. Spider Silk, despite its apparent fragility and flimsiness, is in fact extremely resistant, a characteristic which has been developed by researchers with quite different backgrounds. After having developed its line of ties in 2017, **Bolt Threads** in 2019 partnered with **Stella McCartney** and **Adidas** to develop Tennis Dress, a piece made with a Microsilk and cellulose blend fiber and designed to be fully biodegradable.

Some other companies process plant-based materials. Indeed, a concrete threat to our planet is currently posed by the exponential proliferation of algae, which is largely due to the phosphorus and nitrates released into the sea by chemical waste; however, these organisms are in fact extremely versatile, and may be transformed into bioplastic material. **Ultra by Vivobarefoot** is a footwear collection made from algae-based foam, a valid vegetal alternative to the synthetic and oil-based ones; **Tjeerd Veenhoven** produces a similar fabric which is also made of the same aquatic organisms. The dyeing industry makes a huge environmental impact in terms of water use and water pollution. Faber Futures is developing an alternative dyeing method through fermentation, using bacteria such as Streptomyces coelicolor. **Transversal by Faber Futures**, commissioned by the Cooper Hewitt Museum, is a silk sculpture we designed and created in synergy with the parameters of their bacteria dye protocols. The piece explores how scale-up of biofabrication processes can be achieved both using the pigment produced per milligram through the fermentation process, as well as by emphasising the assembly of biofabricated components. They cut silk organza on a bias and then applyed the bacteria dye protocols to the material. The outcome is a malleable, breathable structure, pigmented with painterly forms of S.coelicolor.

MICRO SCENARIO



PARALLEL UNIVERSE

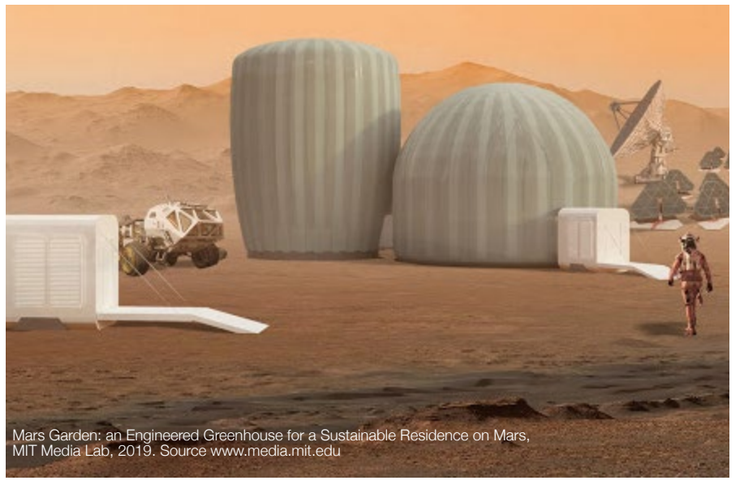
PARALLEL UNIVERSE is the search of new places to conquer, to explore and to populate.
Unless there are breakthroughs in quantum computing, Earth won't be able to produce enough energy to power the world's computers by 2040, according to a report from the Semiconductor Industry Association. The raw materials for solar panels and wind turbines could also dry up as our supplies of rare earth metals dwindles (Farah, 2019).
Earth is not enough. New territories must be explored. A company to develop state-of-the-art space manufacturing technology to support exploration, national security, and sustainable space settlement is an answer.

Vulcan by Made in Space. Source: madeinspace.us

CURRENT FORWARD LOOKING PROJECTS

Vulcan by Made in Space. Source: madeinspace.us

Spacesuits by Virgin Galactic and Under Armor, 2019. Source: virgingalactic.com



Mars Garden: an Engineered Greenhouse for a Sustainable Residence on Mars, MIT Media Lab, 2019. Source www.media.mit.edu

SpaceHuman: A Soft Robotic Prosthetic for Space Exploration, MIT Media Lab, 2020. Source: Valentina Sumini, www.media.mit.edu

The Deep Sleep Cocoon by Vollebak, 2019. Source: www.vollebak.com

Skyscrape. Yarn expansion respect to the temperature, 2019. Source: skyscrape.us

CURRENT FORWARD LOOKING PROJECTS

As interest in space exploration increases, it is necessary to seek new housing solutions to achieve a safer stay in space. Reducing dependence on terrestrial resources and energy used, while improving conditions for astronauts.

In 2019, **Made In Space** won a NASA contract to build a robotic space manufacturing system called **Vulcan** that will build "precisely-machined metal parts" using over 30 different materials including stainless steel, titanium, aluminium and thermoplastic composites. The company hopes their system will be able to make anything crewed missions may need — for example, housings for life support systems on a lunar-orbit space station.

To respond to this same requirement, **Responsive Environments Group at MIT Media LAB**, proposes **Marsboreal Greenhouse**, a new design for a greenhouse module that can provide 100% of the food necessary for a crew of four astronauts on an extended mission to Mars. Maximizing the exploitation of space, thanks to a spiral system inside an inflatable cylindrical shell designed to protect astronauts from harmful radiation. The plants grow in modular hydroponic trays that descend from the top floor of the module along six spiral tracks. The lighting, temperature, nutrient supply, track length and vertical separation of each spiral are adapted to the models and growth needs of the plants, thus maximizing the volume for growth, optimizing growth conditions and providing isolation in case of illness.

Protection has traditionally been one of clothing's primary material functions. While in the past items of clothing were essentially devoted to protecting humans from the cold, the complexity of modern life has given rise to a plethora of new variables. Scientists and designers have consequently developed over the years innovative solutions and materials aimed at improving clothing's performative characteristics depending on the area and range of use.

Experimental projects concern themselves with the study of high-performance materials and technologies which may protect the human body from extreme temperatures.

SkyScrape produces responsive clothing that can naturally adapt to the temperature of the wearer and the surrounding environment. The active yarns with which the fabrics of the garments are made change their shape, expand and contract, becoming thicker and more insulating when temperatures drop. The temperature-responsive apparel is thought to preserve the human body from hostile climates: the fabric itself acts as a thermometer, with the thickness and insulation increasing in the cold.

From hostile earthly environments to space exploration. Nowadays, space travel has evolved from an inspiring utopia into a veritable creative opportunity also for the fashion industry. As we enter the second space age, we are being introduced to space garments and accessories which are created for the space exploration of the future. Sleeping in orbit can be difficult. Just think of astronauts on board the International Space Station who live 16 sunrises every day and in order to rest they need various aids. Vollebak designed a sweatshirt that can help astronauts sleep while moving around the cosmos in a cramped spacecraft. The project is based on the basic concept of creating an autonomous microhabitat around the wearer's head through a space helmet hood. **Deep Sleep Cocoon by Vollebak** is designed to help space travellers cope not only with lack of sleep but also with high pressure situations. Five segments inspired by insects' shells completely enclose the wearer's head, preventing light from filtering through.

Virgin Galactic in collaboration with Under Armor designed a space clothing system for private astronauts. Unlike NASA suits, born around the concept of utilitarian functionality to allow astronauts to carry out their work and keep them alive, new suits primarily concern the experience. In fact, the astronauts to whom Virgin Galactic is targeting are consumers looking for a unique experience, dedicated to adventure and leisure. A pioneering human space flight for individuals and researchers, the collaboratively designed space clothing system designed by Virgin Galactic and Under Armor combines comfort and attention to the customer experience, and could be what tourists will

CURRENT FORWARD LOOKING PROJECTS

wear in space.
Also **SpaceHuman**, a project developed by the **MIT Media Lab**, aims to support the human body during space exploration. The project consists of a soft robotic prosthesis to support space operations. In particular, the prosthesis is aimed at improving and enhancing the floating experience, while allowing man to adapt in microgravity environments. The underwater world, and in particular the structure of the seahorse's tail, inspired the design of an extension of the body capable of integrating the interiors of zero gravity habitats. In fact, the structure of the tail allows for movement, grip and protection while floating. SpaceHuman is therefore an additive prosthesis that can move around the body to grab objects, protecting the wearer from injuries that could occur while floating in a cramped habitat, while providing a cinematically stable base.

MICRO SCENARIO

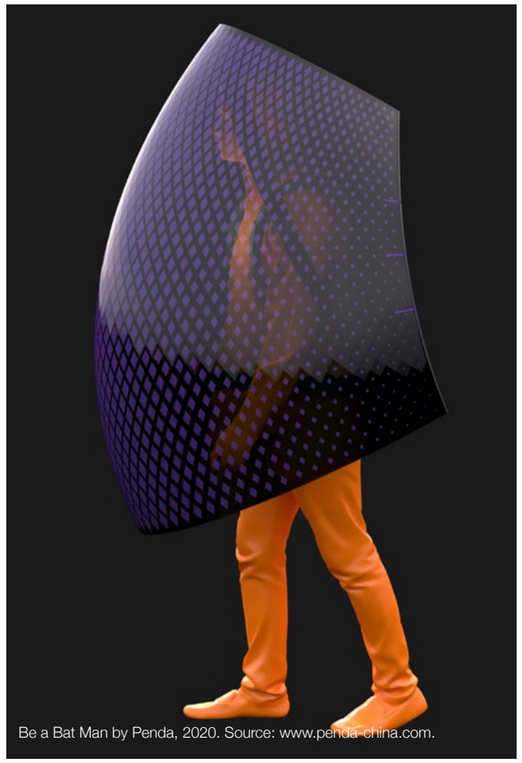
SOCIAL DISTANCING

An airborne virus has extended across the globe creating a pandemic, changing the way people perform their everyday tasks across the world. Social distancing measures have been introduced by the authorities as a way of slowing down the spread of the disease. However – beyond the obvious benefits of this action – there are certain drawbacks that make it only viable for a limited period of time, like its toll on mental health or its impact on the economy.
The theme of social distancing is explored in very different ways.

Here Comes the Sun Picnic blanket, open-source design by Paul Cocksedge, Source: www.dezeen.com

CURRENT FORWARD LOOKING PROJECTS

Don't forget to breathe installation by Doug Aitken, 2019, Ph. Stefan Altenburger Photography Zürich. Source: Hasselblad H5D



Be a Bat Man by Penda, 2020. Source: www.penda-china.com.

Proxxy by Halo, 2020. Source: www.proxxi.co

Do-it-yourself social-distance crown by Burger King Germany, 2020. Source: www.businessinsider.com

Here Comes the Sun Picnic blanket, open-source design by Paul Cocksedge, Source: www.dezeen.com

Proximity Dress 2.0 by Anouk Wipprecht, 2020. Ph Jeff Cacossa. Source: www.anoukwipprecht.nl

CURRENT FORWARD LOOKING PROJECTS

On one hand, a poetic and contemporary reflection comes from **Doug Aitken**. Doug Aitken explores the juxtaposition of the physical landscape with our ever-changing technological world, capturing intimate interpretations of the installation, '**don't forget to breathe**'. as light and colour synchronize through the sculptural bodies sited within an abandoned storefront in Los Angeles, they create a continuously changing contradiction between isolation and connectivity.

On the other hand **Burger King and Paul Cocksedge** with **Here Comes The Sun** work on products to facilitate the organization of spaces with social distancing. The fast food giant adopted the social distance crowns concept for a test run. On May 22, Burger King Germany posted on socials that some restaurants are handing out the crowns (folded and users have to make them themselves). 'We wanted to re-enforce the rules of high safety and hygiene standards that the BK restaurants are following,' a Burger King representative told. 'The do-it-yourself social distance crown was a fun and playful way to remind our guests to practice social distancing while they are enjoying food in the restaurants.' Here Comes The Sun can help people to socialize safely and confidently once restrictions have been eased. The typical English blanket, a symbol of convivial pleasures during Sunday brunches or picnics in the park, has been reinterpreted and redesigned to help people keep the right distance. Inspired by the sun and consistent with Cocksedge's style, based on simplicity, joy and wonder in everyday life, Here Comes The Sun is an open-source project available for download, to encourage people to make, craft and pattern-cut during lockdown.

Fashion builds shelters for the human body whose structures are no longer distinguished by the solidity and heaviness of the masonry, but rather take on the dynamism, fluidity and lightness typical of textiles (Testa, 2019).

Dayong Sun, founder of **Penda**, developed **Be a Batman**, a project based on a wearable shield concept, which could potentially be distributed during pandemics. Be a Batman is a light system, similar to the wings that allow bats to fly. Users wear a carbon fibre skeleton frame backpack. They hold a PVC film, which wraps around them like a jet cockpit, or personal bubble, creating a physical barrier with the virus. For added protection, UV lights also sterilize the plastic surface.

Proxxi, designed by **Halo**, is a bracelet with integrated technology that vibrates to alert wearers that another equal device is 2 meters away, reminding them of the need to keep social distance. The device could be widely distributed to ensure that an adequate and safe physical distance is maintained.

Also **Anouk Wipprecht**'s project starts from the concept of proximity and alertness. Her creation, the **Proximity Dress** was born as a response to the Covid-19 pandemic that has imposed new rules in terms of social distancing. The Dress generate a physical barrier when another person is detected in the surroundings of the wearer. It responds based on proximity and thermal sensors and identifies strangers within the intimate, personal, social and public space around the wearer. Each dress extends itself using an embedded robotic 3D printed mechanism.

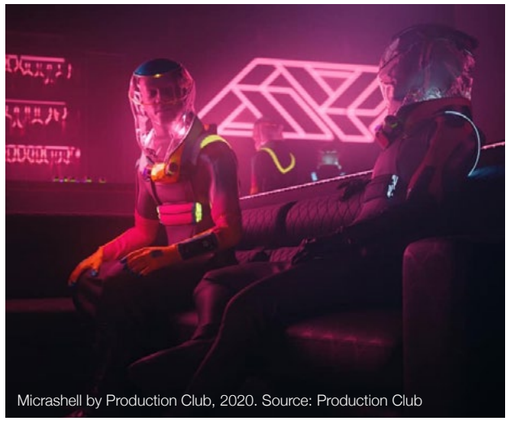
MICRO SCENARIO

PURIFICATION

PURIFICATION is defence against the invisible viruses that silently graft onto everything around us.
Another response to the virus - in addition to social distancing - is hygenisation. Everything is meticulously purified, from the parts of the body to the objects we use daily to the spaces.

The Fountain of Hygiene by Bompas & Parr, 2020. Source: Bompas & Parr.

CURRENT FORWARD LOOKING PROJECTS



Micrashell by Production Club, 2020. Source: Production Club

Notebook Sanitizing by Studio Shikai, 2020. Source: shikai.tw.

Pura-Case by CRA-Carlo Ratti Associati, 2020. Source: carloratti.com

The Fountain of Hygiene by Bompas & Parr, 2020. Source: Bompas & Parr

Atmosphère by Seymourpowell, 2019. Source: Seymourpowell

Air's Atmos by Ao Air, 2020. Source: Ao Air

Sterilising Lamp by Frank Chou, 2020. Source: frankchou.com

Time-Changing Hand Sanitizer by Pino Wang and Frank Chou, 2020. Source: frankchou.com

EarthTones by Hybridbody Lab, Cornell University, 2017. Source: Hybridbody Lab

CURRENT FORWARD LOOKING PROJECTS

The Fountain of Hygiene by London-based design **studio Bompas & Parr** initiative challenges designers to explore new forms and functions to improve behavioural norms when it comes to the simple act of handwashing through a new product.

While with the same aim the **Time-Changing Hand Sanitizer by Pino Wang and Frank Chou**—the liquid changes colour as the user rubs it into their hands, as a visual representation of the length of time spent on washing.

Not only hands but also objects.

February 2020 Frank Chou initiated the Create Cures project, inviting designers to "promote the development of public health in a designer's way." Concepts from Create Cures include the **Sterilizing Lamp by Frank Chou**, which uses ultraviolet light to disinfect objects such as the user's keys, mobile phone and wallet in 60 seconds.

Notebook Sanitizing: considering the current rate of remote work, **Studio Shikai** redesigns a notebook stand which integrates a 270-280nm UV light, allowing users to easily sanitize their laptop keyboard, away from diseases.

Also many projects are born around the purification of garments. Two of them are Micrashell and Pura-Case. **Micrashell** was born as a socially responsible solution to safely allow people to interact in close proximity. Specifically designed to satisfy the needs of nightlife, live events and entertainment industries, Micrashell is a virus-shielded, easy to control, fun to wear, disinfectable, fast to deploy personal protective equipment (PPE) that allows socializing without distancing. **Pura-Case**, a portable wardrobe purifier that uses ozone to remove most micro-organisms, bacteria, and viruses from clothes and fabric, is designed by **CRA-Carlo Ratti Associati**. Once a piece of garment is hung inside the case, an air purification system by ozone treatment cleans and deodorizes the fabrics.

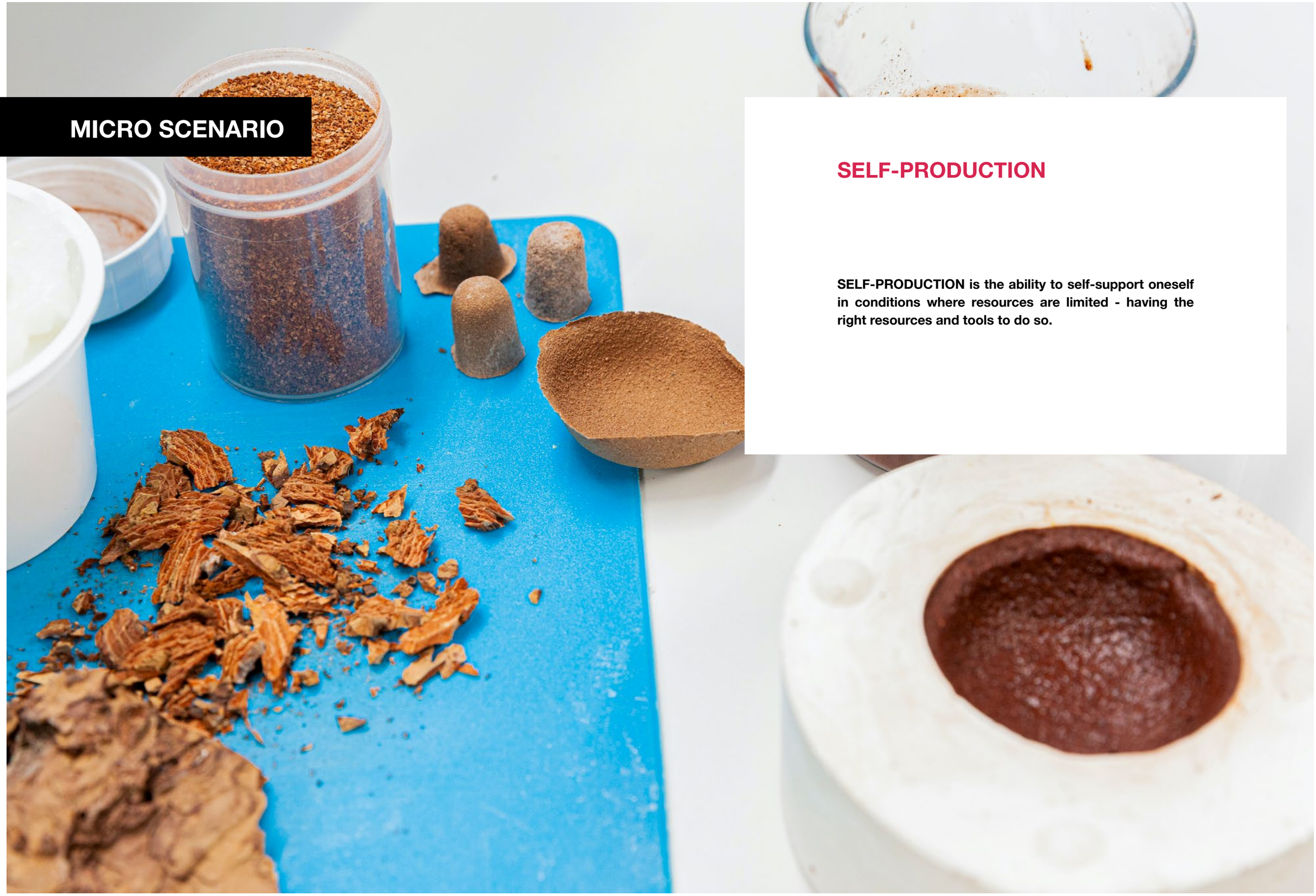
Research in the field of fashion is aimed at identifying ways to help protecting man from pollutants or virus and bacteria.

The most immediate solution is the one of masks, which act as filters and help prevent health issues such as asthma and other diseases. Air filtering masks have been already popular in specific areas of the world, where for example the air is particularly polluted, or in some places where the "courtesy masks" - masks worn to prevent their germs from infecting others - are consider a polite practice to wear if you are sick. The reasons of using masks are many and might unfortunately drastically increase in the future. The forest fires that occur in Australia and the growing concern about climate change could make the fire seasons longer and more frequent: the air full of pollutants caused by smoking is dangerous and can exacerbate asthma and other respiratory conditions that lead to stroke, heart disease and even cancer. Added to this is the COVID 19 pandemic.

Against bad air quality is also **AO air**, a wearable device presented at CES 2020. It is a transparent mask that crosses the face, covering the mouth and nose, inside which an incorporated system of fans adapts to the breath of the wearer and cleans the air that passes through the mask.

Atmosphère by Seymourpowell is a wearable device that combines protection against pollutants present in the environment with personalized beauty treatments on-the-go. The protective wearable device is equipped with artificial intelligence that maps the user's position and allows to respond in relation to the environment, also taking into account the user's personal data (from the type of skin to the needs of the body). It uses this information to obtain optimal environmental protection, while also trying to contribute to body homeostasis and to replace the skin care ritual by supplying beauty products in the form of steam.

EarthTones by Hybridbody Lab is a wearable chemical display that comes in the form of cosmetic powders. EarthTones is able to detect environmental pollution, generating colour shifts to display dangerous levels. Three different types of powder are able to detect respectively carbon monoxide, ultraviolet and ozone. For example, in the case of a ultraviolet sensitive powder, when exposed to UV rays a yellow to dark red colour transition occurs.



MICRO SCENARIO

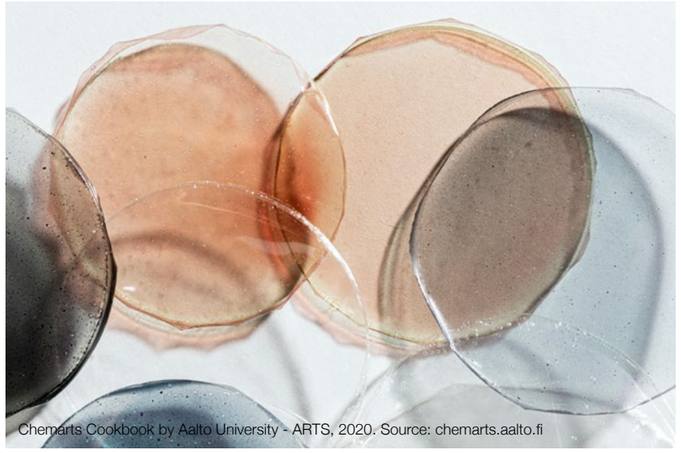
SELF-PRODUCTION

SELF-PRODUCTION is the ability to self-support oneself in conditions where resources are limited - having the right resources and tools to do so.

Chemarts Cookbook by Aalto University - ARTS, 2020. Source: chemarts.aalto.fi.

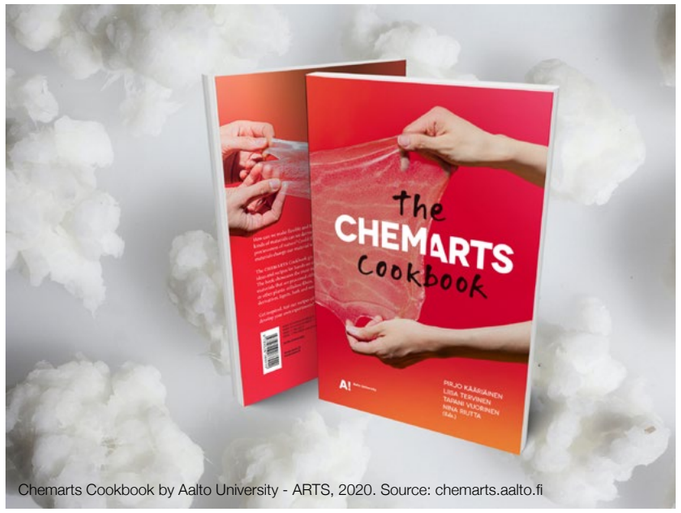
CURRENT FORWARD LOOKING PROJECTS

Chemarts Cookbook by Aalto University - ARTS, 2020. Source: chemarts.aalto.fi

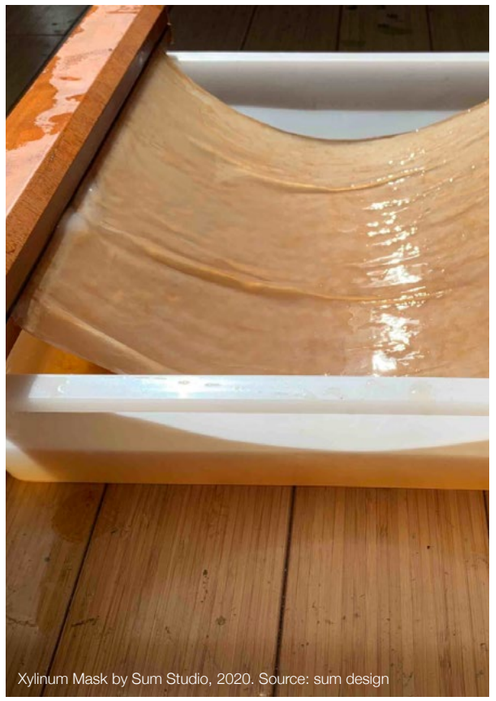


Chemarts Cookbook by Aalto University - ARTS, 2020. Source: chemarts.aalto.fi

Xylinum Mask by Sum Studio, 2020. Source: sum design



Chemarts Cookbook by Aalto University - ARTS, 2020. Source: chemarts.aalto.fi



Xylinum Mask by Sum Studio, 2020. Source: sum design

Xylinum Mask by Sum Studio, 2020. Source: sum design

CURRENT FORWARD LOOKING PROJECTS

The **Chemarts Cookbook** offers both simple and more advanced ideas and recipes for hands-on experiments with wood-based materials. The book showcases interesting results, focusing on raw materials that are processed either chemically or mechanically from trees or other plants: cellulose fibres, micro- or nano-structured fibrils, cellulose derivatives, lignin, bark, and wood extractives.

Xylinum Mask by Sum Studio starts from the need for the material with which the masks are made to fight Covid-19 and the possibility of growing the material could in local municipalities, in people's homes, or even within the very hospitals that need them. N95 masks are made from melt blown non-woven plastic fabric at the perfect precision in order to filter particles containing pathogens. These materials are paramount in our fight to stop the spread of COVID-19, yet our essential workers are lacking supply of them. This is due to the machining and precision required to make the fabric. The machines that create melt blown fabrics are expensive, complex, and take months to build. Despite ramped up production and factories prepared to transition their time toward PPE fabrication, the supply chain of N95 Masks has bottlenecked severely. Sum Studio declares "As bio-designers, we often look at moments where synthetic chemistry hits a wall and ask ourselves if this bottleneck would have occurred in a world more invested in bio manufacturing. To follow our question, we grew our own bacterial cellulose face mask in our home quarantine kitchen while ideating some possible ways that this prototype could be grown to function just like the melt-blown N95 fabric that is in short supply."

APO CALY PTIC FASH ION

The ability of fashion and design is to understand and investigate the changes of its own time, offering solutions as a result of exploring new areas, contexts, technologies or materials.
Fashion's quest for innovation will include radical projects focussed on a world which is constantly evolving. These experimentations will envisage the human body as immersed in environments and spaces which are complex, extreme, an ever-changing reality which may be continuously remodelled and reshaped (Sbordone, 2012). Fashion interacts with the body like a second skin layer and by adding new functions determines unusual behaviours and meanings.
Tackling successfully all the complex scenarios mentioned above will be made possible thanks to a new generation of high-performance clothing. These items will be devoted to a wide range of uses, from shielding to filtering, from curing to nourishing the body, and they may even act as a kind of second skin to ensure protection and preserve the existence of humankind.

SCENARIO

EXTRA HUMANS

'I Want To Believe' photobook by David Vintiner and Gemma Fletcher, 2020. Ph: David Vintiner. Source: David Vintiner Photographer

EXTRA-HUMANS

PROSTHESIS / MEDICAL / BODY ENABLER

The adventures of superheroes have populated comic books for children all over the world, and their supernatural powers have informed humanity's collective imagery for more than a century. What seemed only a fairy tale and a fantastic childhood dream is closer and closer to the real world.

Superhumanity becomes reality thanks to technology. The theme of technology as an extension of the body is not new and various thinkers have reflected on the relation between technology and the human body.

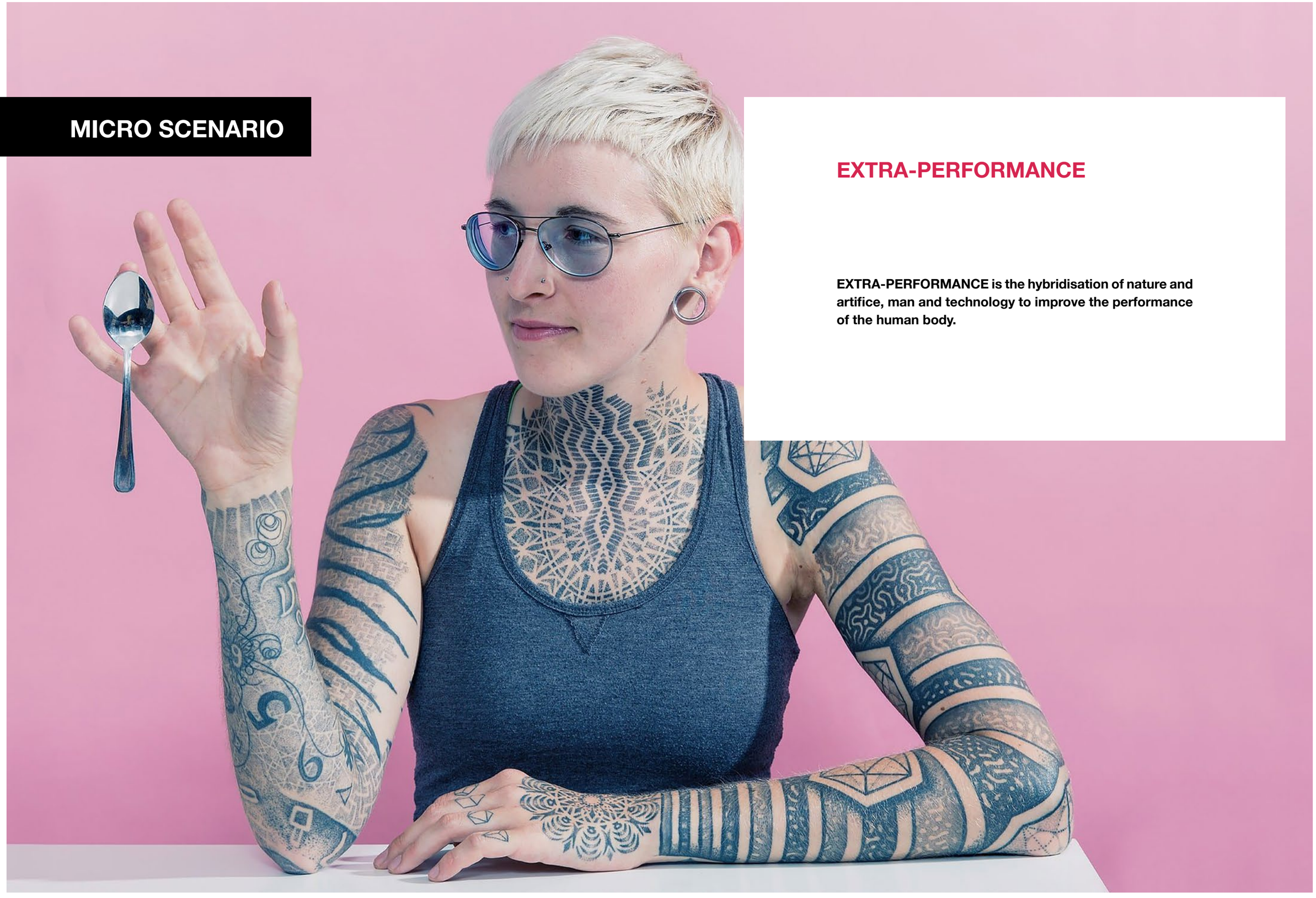
The first to approach this subject was Eric Kapp in 1877 with Grundlinien einer Philosophie der Technik, claiming that technological products are nothing but a "projection" of the physical and functional features of biological organs. To illustrate this concept he uses the example of the shape of the hook that recalls the drawing of a folded finger, the bowl that has a similar shape to that of the cupped hand to hold liquids, the rake that simulates the human arm and hand, the telegraph cables that take their inspiration from the nervous system and so on (Tenuta, L. 2020).

McLuhan is the first using the term "extension" and he writes that «all technologies are extensions of our physical and nervous system to increase power and speed. Again, unless there were such increases of power and speed, new extensions of ourselves would not occur or would be discarded» (M. McLuhan, Understanding Media, the extension of Men, McGraw–Hill, 1964, p. 91.). McLuhan has the merit of dividing technologies that are extensions of the body into physical and cognitive. The first mechanise a task usually performed by the human body, the second on the other hand help in the processing of data — the media for example. These are, as psychologist Donald Norman has called them, cognitive artefacts able to represent, keep, retrieve and manipulate information. Thirty years later, in Hand's End, David Rothenberg continues McLuhan's line of investigation and similarly divides technologies into two big categories: faculties of action and faculties of thought for perception, abstraction and memory. His main contribution to debate lies in his intuition that these intentions are already present in human beings and the technologies are simply their carriers, facilitators of the intentions innate in human beings. Today technologies are used to enhance the human body 360 degrees.

Tech pioneers like Elon Musk and Mark Zuckerberg are now pursuing brain implants that aren't purely for treatment but could let us do things like communicate telepathically or type with our minds. Others claim we'll soon have neuroprostheses to enhance our attention and memory or allow us to integrate our brains with the Internet and control our smart homes with our minds.

Cullen and graduate student Dayo Adewole setting up an experiment with light-sensitive living electrodes. Cullen uses tissue engineering to grow tiny, three-dimensional threads of brain cells that he calls "living electrodes." Grown from stem cells and then packed into biodegradable gel tubes, these natural electrodes could be gentler in the brain, merging and connecting with living tissue rather than injuring it. He hopes they could solve some of the problems with implants used in DBS and BCIs and potentially make these treatments available to more patients (Mullin, 2018).

The recent documentary I AM HUMAN sets the stage for jaw-dropping revelations to come: Bill, a wheel-chair bound tetraplegic, stares intently at a simulated arm on a computer screen. Two tentacle-like cables protrude from his skull and hook into a nearby computer, which sends messages to electrodes implanted in his arm and hand with his brain signals. Bill is one of many first-wave pioneers ushering in a biotechnological revolution–presently, more than 200,000 people in the world have digital chip technology implanted in their brains (Greczyn, 2020). Man and technology come together to enhance the body or personalize it.



MICRO SCENARIO

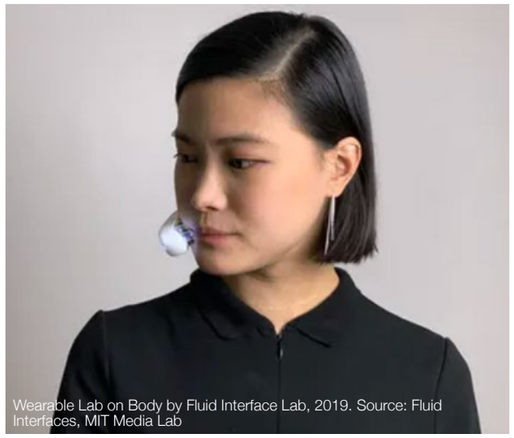
EXTRA-PERFORMANCE

EXTRA-PERFORMANCE is the hybridisation of nature and artifice, man and technology to improve the performance of the human body.

'I Want To Believe' photobook by David Vintiner and Gemma Fletcher, 2020. Ph: David Vintiner. Source: David Vintiner Photographer

CURRENT FORWARD LOOKING PROJECTS

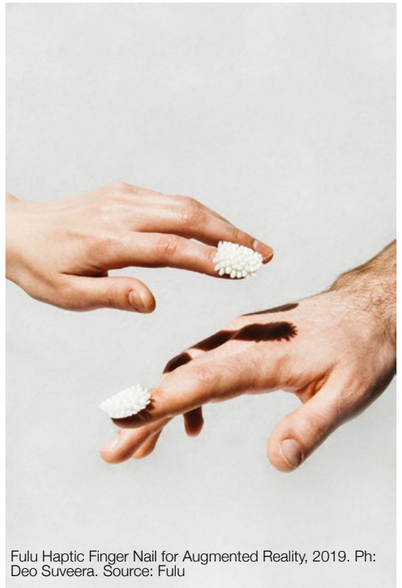
Human skin 'yarn', 2020. Source: New York Post



Wearable Lab on Body by Fluid Interface Lab, 2019. Source: Fluid Interfaces, MIT Media Lab

Black Squid Jacket by Volleback (2019). Source: Volleback

G-SERIES shoes by Inov-8 and University of Manchester, 2018. Source: www.manchester.ac.uk



Fulu Haptic Finger Nail for Augmented Reality, 2019. Ph: Deo Suveera. Source: Fulu

'I Want To Believe' photobook by David Vintiner and Gemma Fletcher, 2020. Ph: David Vintiner. Source: David Vintiner Photographer

G+ Graphene Aero Jersey by Oakley, Bioracer, Directa Plus (2018). Source: Bioracer

CashCuff by DressCode and DIGISEQ (2019). Ph: Keith Heppell. Source: www.cambridgeindependent.co.uk

Les Hybrides by Vanessa Lorenzo, 2020. Source: Utopiana

CURRENT FORWARD LOOKING PROJECTS

Vanessa Lorenzo investigated this theme with a residency in Utopiana on the understanding of hybrids, behaviour of bodies and affectivity between species through ornaments and prostheses. Vanessa Lorenzo's project focuses on hybrids, intra-species attachment and the ecology of new media in the era of ecological and digital change. Her project is inspired by a pre-Christian architectural ornament called «Green Man», a leafy head carved on many European churches, which recognizes the pagan worship of a nature valuing our vulnerability. The project is also influenced by an animistic approach to metamorphic and indefinite beings that proliferate in times of crisis. During this residency, Vanessa Lorenzo will question the desire, the fear and the vulnerable effects between the human, the human and the technologies that link them. The human body is also the tool to strengthen and 'repair' the human body itself.

Can you imagine a textile made of human skin cells? Sounds a bit science fiction, but a team of **researchers from France, Columbia and the U.S.** have made it happen (Magnan et al, 2020). They have developed a yarn that can be woven into human textiles- a material that can be used to heal skin and even replace parts of damaged organs. It is a known fact that some patients' immune system can reject foreign agents, so it is great news to read that the scientists have found a way to create textiles that the human body will most likely accept. They did this by producing a type of textiles out of human fibroblasts—cells that generally assist with the production of collagen and other fibres. The body will not reject them because they are natural human cells.

The human body then seems to overcome the limits of space thanks to the strengthening of objects that are able to replicate the sensations of the human body. **Fulu** is designed to introduce the sense of touch to audio-visual interactions such as video calls and online gaming, which the studio says "neglect" the human senses. The Wearable technology can connect to mobile devices via Bluetooth, and recreates sensations that range from stroking the fur of your dog, to touching the hand of a loved one from anywhere in the world.

Finally, external tools potentiate the body to control it. **Wearable Lab on Body** (Pataranutaporn at al, 2019)- a project is developed by the **Fluid Interface Lab** and supported by **NASA through Translational Research Institute for Space Health (TRISH) and MIT Media Lab Space Exploration Initiative** - is a platform for active continuous monitoring of human biomarkers from the biological fluid containing both digital sensors such as IMU for activity recognition, as well as an automated system for continuous sampling of biomarkers from saliva. The main advantage of such a bio-digital wearable platform is that it enables the continuous monitoring of behaviour and wellbeing of the individual in real-world settings. The information from both the biochemical and digital sensors can contextualize one another, and provide insights on the effects of an individual's behaviour, which in turn can be used to develop healthier lifestyles. With the closed-loop system, the platform could also provide real-time feedback to the individual when recognizing unhealthy behaviour. Hybridisation opens up interesting scenarios when pushing the boundaries between the human body and body equipment, questioning the relationship between prosthesis and ornament and the generation of new aesthetic canons.

The work of the photographer **David Vintiner** explores the concept of transhumanism, of how human experience can be redefined through technology. The book, entitled **"I Want to Believe - An Exploration of Transhumanism"**, created in collaboration with the artistic director and critic Gem Fletcher, tells about the theme of body modification, presenting a variety of people who identify themselves, to some extent, as "transhuman": man with bionic ears who perceives changes in atmospheric pressure, a woman who can "feel" earthquakes that occur all over the world and technicians who have developed laboratory organs. According to Vintiner, the impact of science on the human understanding of aesthetics is one of the most fascinating aspects of transhumanism, on the concept of beauty standards of posthuman perfection.

Today research has made possible the creation of products for the body which favour and facilitate performances in direct proportion to the amount of

CURRENT FORWARD LOOKING PROJECTS

physical effort made. Hyper-performing garments have been especially welcome in those sectors of human activity which require specialised technical clothing; one of these is the field of sports, which demands continuous experimentation on materials and fabrics to enhance the future performance of the bodies wearing them. It is very important for athletic shoes to have a firm grip, as this feature does not only boost the athletes' performance, but also helps prevent accidents. In view of this consideration the **Inov-8 firm and the University of Manchester** developed a kind of rubber which is graphene-based. Graphene derives from graphite, and because of its very high level of strength and flexibility it makes shoe soles twice as robust, elastic and wear resistant, and indeed ensures a firmer grip. The same material has also been used by **Oakley and Bioracer** to develop their **G+Graphene Aero Jersey**, a high-tech, high-performance garment for cyclists: graphene's properties dissipate heat from the rider's body, and enable them to use less energy to adjust their body temperature (TechnicalTextile, 2018).

But, ever more often today, the athletic gestures comes out of the stadiums and inspires daily life.

Volleback's Black Squid Jacket is made up of a completely waterproof and windproof external coating that mimics the adaptive camouflage of squids. Volleback replicated elements of this biological survival mechanism using lasers, resin and over 2 billion microscopic glass spheres. The result is an amazing ski and snowboard jacket. In opaque light conditions it has a metal or petrol colour, but when exposed to bright lights it instantly reflects every colour in the visible spectrum, a particularly useful feature if you want to be seen on the ski slopes but also while commuting at night.

To simplify everyday activities, **DressCode**, the fashion-tech start-up from Cambridge, designed together with **DIGISEQ**, **CashCuff**, a tailored and smart shirt, which allows users to pay for the goods using the shirt cuff.

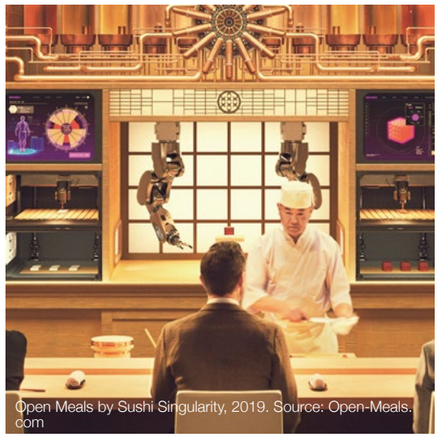
MICRO SCENARIO

BIODATA SERVICES AND HYPER-PERSONALIZATION

In 2020 consumers primed by constantly evolving digital services and smart physical spaces – and accustomed to the ultra-convenience of 'everything as a service' – will increasingly expect relevance as a service, too. That means services and experiences that constantly adapt around the changing needs of the user. Facial recognition, sensors and smart objects are turning the world into a landscape that shifts and changes around consumers. The result is ever-heightening expectations for responsive personalization. No wonder 39% of global businesses say they have started to deliver personalized experiences in real-time (Adobe and Econsultancy, February 2019). New technologies – think affordable DNA testing, blood testing and more – are making new innovations that shift and change around the changing human body possible for the first time. More than 26 million people have taken an at-home ancestry test. High-end services are turning to genetic analysis to take hyper-personalization to new heights. Over the past few years, at-home DNA testing kits have exploded in popularity. By February 2019, over 26 million consumers had added their DNA to four leading commercial ancestry and health databases, according to an MIT Technology Review report. As advances in speedy, sophisticated DNA analysis make genetic testing easier than ever, it's paving the way for lifestyle experiences that elevate the hyper-personalized offerings already saturating the luxury space. Daniel del Olmo, founding partner of The Passionality Group, has called this the next era of dining. "We believe hyper-personalization will become commonplace in the future." (Regaladoa, 2019).

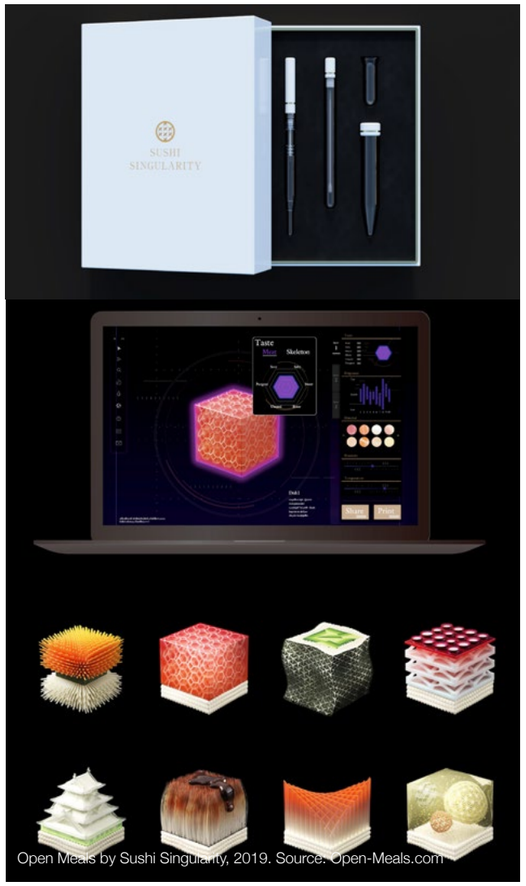
Open Meals by Sushi Singularity, 2019. Source: Open-Meals.com

CURRENT FORWARD LOOKING PROJECTS



Open Meals by Sushi Singularity, 2019. Source: Open-Meals.com

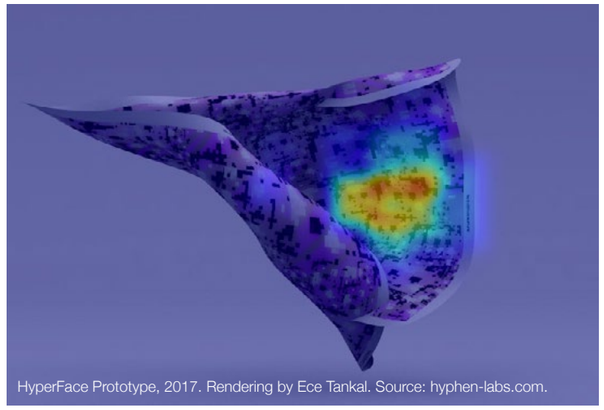
Yo! Dinner, Yo! Way by Yo! Sushi, 2019. Source: yosu



Open Meals by Sushi Singularity, 2019. Source: Open-Meals.com

Optune by Shiseido, 2019. Source: FashionNetwork.com.

HyperFace Prototype, 2017. Rendering by Ece Tankal. Source: hyphen-labs.com.



HyperFace Prototype, 2017. Rendering by Ece Tankal. Source: hyphen-labs.com.

Exclusion of Surveillance by Jip van Leeuwenstein, 2019. Source: HKU Design/Jip van Leeuwenstein

CURRENT FORWARD LOOKING PROJECTS

But how this customization is applied today?

Sushi Singularity will use genetic analysis to create bespoke meals for each individual. New restaurants and services are turning to biodata to redefine the fine dining experience. Set to open in Tokyo later this year, the restaurant will collect bio samples from diners a week before their reservation to create unique, 3D-printed sushi tailored to diners' nutritional needs.

Another sushi dining experience assesses a person's DNA information to curate a menu suited to their specific nutritional needs. **London's Yo! Sushi** partnered with at-home genetic testing company **DNAFit** in February 2019 for the **Yo! Dinner, Yo! Way** scheme and offered free personalized meals to a select number of customers who mailed in a saliva sample. Baze has developed a closed-loop personalised nutrition model that uses blood micronutrient analysis and app data to deliver tailored supplements to the doorstep of its consumers.

Also fashion and beauty re evolving into that direction, with products and services customised according to the single user.

Optune, Shiseido's first subscription service, to which users can sign up via website, is an IoT skin care system that offers 80,000 personalized skin care models that match the body conditions, user habits and environments they frequent. A dedicated application uses an algorithm to analyse data on skin conditions, environmental data - such as temperature and humidity - and sleep information to detect the interruption of the biological rhythm. The data is sent to a dedicated machine that provides optimal skin care by adapting the one's current conditions.

Hyper personalisation brings along tools such as facial recognition which are highily controversial because of privacy reasons. Facial recognition technology is widespread and is becoming increasingly pervasive. Against this dynamic, Wearable accessories and clothes have been designed to contrast facial recognition technology.

Already in 2004, the researcher and artist **Adam Harvey** invented a clutch decorated with L.E.D. lights: when a camera flash went off, the bag would respond with a counter-flash, washing out the photo and making it unreadable. More recently, he worked on a textile print, **HyperFace**, which can be used as clothing that interferes with recognition by adding visual noise around the face. It is the case of the **Exclusion of Surveillance** mask designed by **Jip van Leeuwenstein**. The facial recognition software takes place by means of artificial intelligence capable of detecting human faces in real time. Body equipment can mislead the software with forms that prevent artificial intelligence from detecting the object. Other designs confuse artificial intelligence with images of decoy faces, preventing it from making proper identification.

ORNAMENTAL NEEDS

Heightened senses, speed, and the ability to fly effortlessly: garments and accessories will become functional as well as ornamental prostheses capable not only of overcoming physical impairment but also of enhancing body performance by bestowing almost supernatural characteristics on it. Among the challenges posed by this dimension are those concerning the relationship with the body modification and the definition of a new concept of beauty.

Although the subject of body modification has long been discussed in fields such as anthropology, technology and science, it has only recently been approached by design. Design and fashion have started to pay more attention to the potential of the human body as a place of project intervention. Engineers and scientists have oriented their research mainly towards an improvement in terms of quantifiable performance, data and mathematical results, intending to constantly push humanity beyond its limits. Contemporary society is markedly based on performance, on breaking records, on crossing borders, in the incessant pursuit of the superhuman myth. The fantasy that feeds the common imagination is that technologies applied to the body and clothing can become functional prostheses capable of improving human performance and therefore, as a direct consequence, it's quality of life. But is it really so?

Designers now have a new area to work on: the body. In this territory, the definition of the prosthesis is questioned. Design and fashion will have the task, or at least the possibility, of bringing the results of the most daring scientific progress closer to a human being and tolerable dimension.

SCENARIO

AI FEELS

Dormio by Fluid Interfaces, MIT Media Lab, 2018. Source: Fluid Interfaces Group, MIT Media Lab

AI FEELS

SOCIAL / BEHAVIOURAL / EMOTIONAL

Theodore Twombly: 'I've never loved anyone the way I loved you.'
Samantha: 'Me too. Now we know how.'

A completely normal dialogue, if it wasn't for the fact that it involved a man and a machine. This happens in Her, the movie written by Spike Jonze.

No field in computing is as hot or heavily hyped right now as artificial intelligence. Once a science fiction dream, AI is now a big part of our everyday lives; whether it's commonplace tech like fraud prevention systems, online recommendations, or the speech recognition tools driving smart assistants — all the way through to innovative new technologies like self-driving cars and autonomous delivery robots.

In computer science, Artificial Intelligence (AI), sometimes called machine intelligence, is intelligence demonstrated by machines, unlike the natural intelligence displayed by humans and animals. Colloquially, the term "artificial intelligence" is often used to describe machines (or computers) that mimic "cognitive" functions that humans associate with the human mind, such as "learning" and "problem-solving". (Russell & Norvig 2009, p. 2.) Modern machine capabilities generally classified as AI include successfully understanding human speech, (Russell & Norvig 2009.) competing at the highest level in strategic game systems, autonomously operating cars, intelligent routing in content delivery networks, and military simulations. (Allen, Gregory, 2020).

A more elaborate definition characterizes AI as "a system's ability to correctly interpret external data, to learn from such data, and to use those learnings to achieve specific goals and tasks through flexible adaptation."(Kaplan et Haenlein, 2019). "Siri, Siri, in my hand: Who's the fairest in the land? On the interpretations, illustrations, and implications of artificial intelligence". Business Horizons. 62 (1): 15–25.) But what is changing is that artificial intelligence is taking on human features and is not only a functional tool but also brings with it emotions, feelings and experience. Just like a human being.

Her by Spike Jonze, 2013.

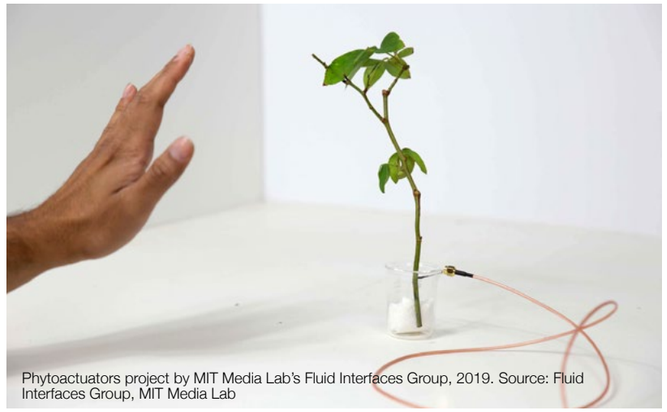
MICRO SCENARIO

INDUCED BEHAVIOURS

INDUCED BEHAVIOURS describes new behaviours that are generated through the use of technology in particular in relation to nature or objects. These objects behave, communicate through their gestures and create a relationship with the user or the system around them.

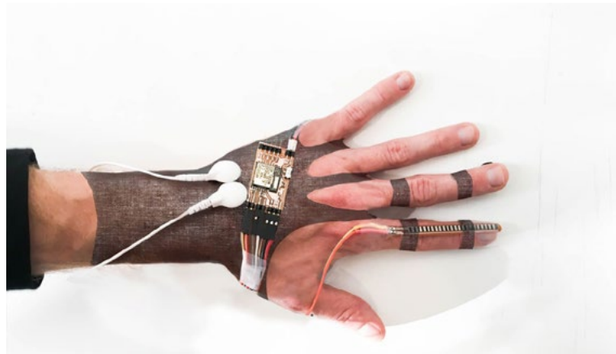
Phytoactuators project by MIT Media Lab's Fluid Interfaces Group, 2019. Source: Fluid Interfaces Group, MIT Media Lab

CURRENT FORWARD LOOKING PROJECTS



Phytoactuators project by MIT Media Lab's Fluid Interfaces Group, 2019. Source: Fluid Interfaces Group, MIT Media Lab

Elowan by MIT Media Lab' Fluid Interfaces Group, 2018. Source: Fluid Interfaces Group, MIT Media Lab

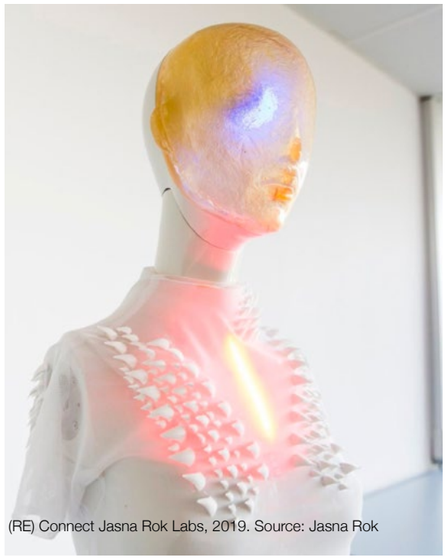


Dormio by Fluid Interfaces, MIT Media Lab, 2018. Source: Fluid Interfaces Group, MIT Media Lab

Project Oasis by Harpreet Sarren, 2018. Source: harpreetsareen.com

Mercedes-Benz Vision AVTR, 2019. Source: Mercedes-Benz.it

Flowing Water, Standing Time by Ying Gao, 2019. Source: Ying Gao



(RE) Connect Jasna Rok Labs, 2019. Source: Jasna Rok

Flowing Water, Standing Time by Ying Gao, 2019. Source: Ying Gao

CURRENT FORWARD LOOKING PROJECTS

These first projects describe a world based on hybrid electronics that includes natural, biological and artificial elements to communicate the digital and natural world through computing.

The **Phytoactuators project by MIT Media Lab's Fluid Interfaces Group**, for example, has developed a way to transmit an electronic signal and then convey a message through plants. Plants act as natural interface devices for all soft notifications to lessen cognitive overload by communicating to the user that something has changed but it is not critical to focus on it (Sareen & Maes, 2019; Sareen, Zheng & Maes, 2019). Another example is **Elowan**, a cybernetic lifeform, a plant in direct dialogue with a machine. The plant is interfaced through its own internal signals with a robotic extension that drives it automatically towards the light.

Harpreet Sarren also explores nature focusing on how the medium of our conversation with nature is so visual and multi-modal, in contrast to what we do with do with technology today. Weather on phones or computers doesn't invoke the same senses as literally seeing or feeling the weather. **Project Oasis** is a Voice Terrarium you can talk to. It's a self-sufficient closed ecosystem that mimics outside weather but inside a box. You can ask the terrarium about 'Weather in Seattle' as a response to which it might start pouring inside the box. The terrarium can also generate clouds, mist or change the lighting to represent other weather conditions. This experiment expands our conversation with technology and the natural world. We live in-between nature and technology and traditionally look at them as two very different worlds. Oasis is an ecological conversation but naturally - neither programmed nor chaotic.

In this micro-scenario also objects become alive: from cars to accessories. **Mercedes-Benz Vision AVTR** is an avatar-inspired concept car that is meant to feel more like a living creature than an automobile. Mercedes-Benz chief design officer Gordon Wagener said of the Vision AVTR concept in a keynote speech at CES 2020, "we wanted to create something like a living organism." The vehicle as an immersive experience space. Human being and machine linked with biometric data. Although it is an electric and autonomous vehicle, user can still take control, even if traditional commands are absent. Through a surface in the centre console the driver can position his/her hand and connect to the vehicle, so to provide the vehicle with the biometric data. By moving the hand, holographic menus can be displayed to control other vehicle functions, while the curved dashboard display and large glass surfaces create continuity with the outside world. This creates a real relationship between the car and the user.

About accessories, **Dormio** is a Wearable device designed by the **Fluid Interface Group of MIT** to hack your dreams. And, they hope, help change them for the better. The user wears a gloved device, a little bit like one of those old Nintendo Power Gloves from the 1980s, that collects biosignals which track changes in sleep stages. These signals are tracked via the hand using data related to a wearers' finger muscle tone, heart rate, and skin conductance. While we may not realize it, all of these are things that change when a person is asleep. When the biosignals appear to signal the end of a sleep transitional state, the device triggers an audio cue to be played, waking the user slightly, but not enough to jolt them back into a state of full wakefulness. They enter the dreams as new content, making it possible to alter the course of a person's dream. The system then quietens down until biosignals appear to signal another transition into a deeper sleep.

Technology unites, technology divides.

Some projects applying technology and science to fashion, to explore new dimensions of human interactions and build Wearable objects that could help us to better understand ourselves and others.

Jasna Rok Labs developed **(RE) Connect**, a piece of smart Fashion-Technology which helps not to lose the emotional contact of people around us. The project focuses on emotion technology, a new field that is creating new business models and applications based on human emotion. (RE) Connect is an emotion identifier which is emotionally enhancing humans by creating new levels of empathic communication. The reactive emotional fashion piece can

CURRENT FORWARD LOOKING PROJECTS

identify and track feelings by speech and provide real-time visual and haptic feedback to the wearer and the wearer's environment.

Montreal stylist **Ying Gao** created robotic clothes, **Flowing Water**, **Standing Time**, which respond to colours in their immediate vicinity, wrinkling, expanding and contracting as if they were alive. The pieces evolve between two states and show perpetual metamorphosis as they react to the colour spectrum. The reactive garments use colour and light sensors, as well as micro cameras connected to a raspberry PI computer, to gather information about their environment. These data then activate actuators and magnets interlaced with silicone to generate undulations and tissue movements.

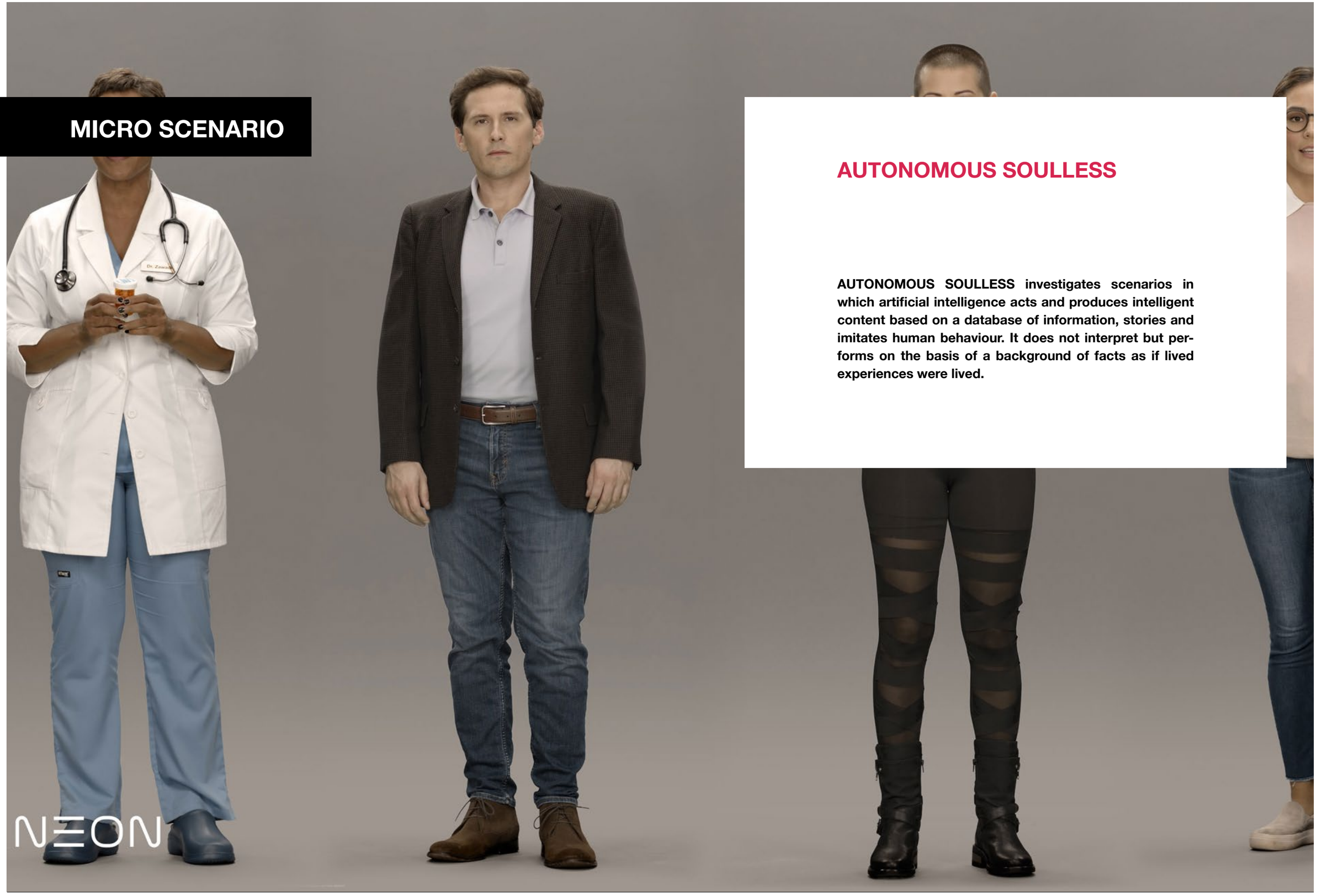
Some projects then use artificial intelligence to generate interactions.

This is the case of the experimental project developed by some researchers from **King Saud University in collaboration with Heilongjiang University**. Mental health has become a serious problem that significantly affects people's quality of life. With the development of science and technology, a completely new direction has emerged for the improvement of mental health by using the interaction between robots and people. The project consists of an autonomous emotion-sensitive system that integrates a personal robot, intelligent clothing and a cloud terminal. It is a "people-centred" emotional interaction mode: personal robots and intelligent clothing complement each other seamlessly and interact jointly with users. Artificial intelligence technology are used to design the perception of emotions and interaction algorithms including intelligent recommendations, recognition of relationships, recognition of emotional expressions.

MICRO SCENARIO

AUTONOMOUS SOULLESS

AUTONOMOUS SOULLESS investigates scenarios in which artificial intelligence acts and produces intelligent content based on a database of information, stories and imitates human behaviour. It does not interpret but performs on the basis of a background of facts as if lived experiences were lived.



Neon by Samsung STAR Labs, 2019. Source: Samsung

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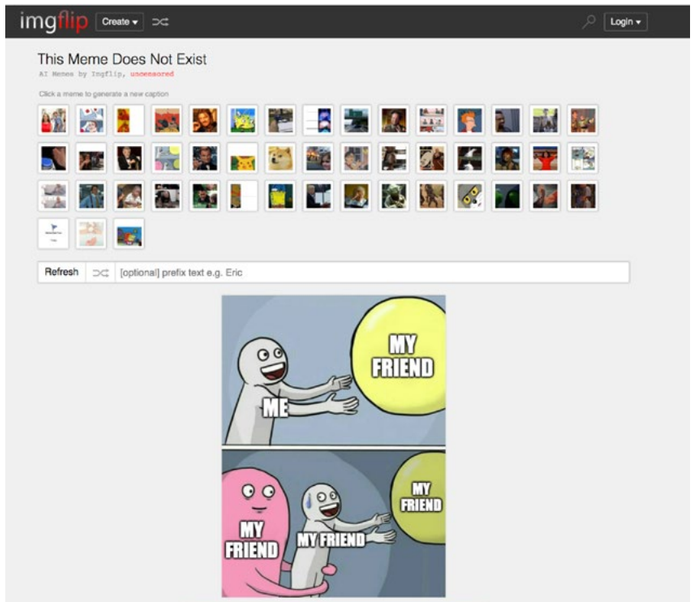
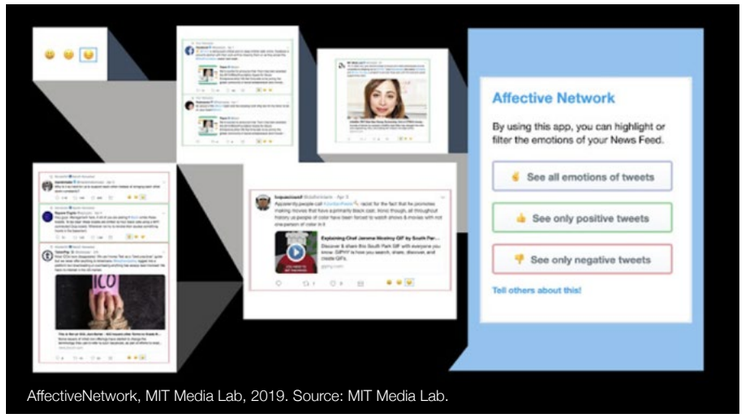


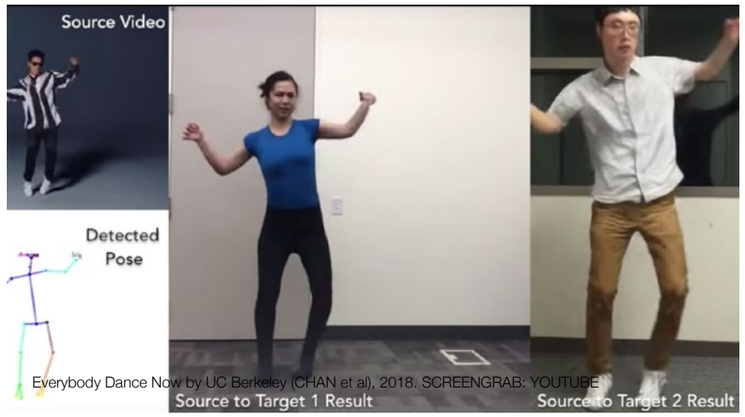
This Meme Does Not Exist, 2020.Source: https://imgflip.com/ai-meme.

Neon by Samsung STAR Labs, 2019. Source: SamsungA



AffectiveNetwork, MIT Media Lab, 2019. Source: MIT Media Lab.

SK-II, Affectiva, Unruly, 2017. Source: www.thedrum.com



Everybody Dance Now by UC Berkeley (CHAN et al), 2018. SCREENGRAB: YOUTUBE

CURRENT FORWARD LOOKING PROJECTS

Let's start with 'light' applications. Memes are one of the things that make us human. They are, by design, massively shareable images based on some universal (or at least semi-universal) lived experience that draws on some aspect of popular culture, but seeds it with additional meaning. Titled **This Meme Does Not Exist**, after the plethora of other similar A.I.-generated projects, this new online tool (we use that term loosely) lets you select a popular meme image and then generates a new funny caption to go alongside it. Users have the option of saving and sharing particularly absurd ones or simply continuing to click to see what insane idea the computer will come up with next. About leisures' applications, in a paper posted to the arXiv preprint server, researchers at **University of California Berkeley** demonstrate how they designed AI that, given a video of an expert dancer and an amateur, can transfer the moves from one to the other and create a convincing video of the amateur pulling off some seriously impressive rug-cutting. But that's not all. The paper is called **Everybody Dance Now**, which is charming because it conjures ideas like recreating the entire "Evolution of Dance" viral video with algorithms and minimal physical effort. But it also represents the latest step forward in creating a highly realistic video that can put people in situations that they were never really in.

But there are also more functional and useful application, the ones of the medical field. Researchers from the **University of California, San Francisco**, have developed a brain implant which uses deep-learning artificial intelligence to transform thoughts into complete sentences. The technology could one day be used to help restore speech in patients who are unable to speak due to paralysis.

Last but not least, the fake-humans by **Samsung**. Samsung's future factory **STAR Labs** has developed **Neon**, AI-powered virtual beings that look and behave like real humans. Unlike artificially intelligent (AI) assistants like Siri or Alexa, STAR Labs' computationally created beings aren't programmed to be "know-it-all bots" or an interface to answer users' questions and demands. Instead, the avatars are designed to converse and sympathise "like real people" in order to act as hyper lifelike companions.

Emotional contagion in online social networks has been of great interest over the past years. **Affective Network**, by the **Laboratory for Social Machines and the Affective Computing group at the MIT Media Lab**, aims to help users better understand which emotions they experience on this social network. It is a Google Chrome extension, powered by machine learning algorithms, that enables Twitter users to filter and make explicit - through coloured visual marks - the emotional content in their news feed.

Artificial intelligence is not only able to measure and analyse facial expressions, gestures, voice, sweat and heart rate, buy new "affective" information technologies allow digital devices to track and respond to human emotions, with strong implications for marketing, sales and assistance and for product development.

Emotions and feelings largely influence the perception of the brand and guide consumers' behaviours, especially for the fashion and luxury sector where impulse buying is very frequent.

The artificial intelligence company **Affectiva** has developed an emotion recognition technology capable of analysing facial expressions and emotions through cameras. In Hong Kong and Taiwan, the premium skincare brand **SK-II** uses Affectiva technology through a partnership with video advertising technology company **Unruly Media** that analyses the audience's emotional responses to SK-II video ads. This emotional targeting ability allows SK-II to focus its content on the audience who are more likely to be interested in its products to create an emotional connection.

TAN GIB LE EMOT IONS

Artificial intelligence, autonomy and feelings will shape the fashion system from design to retail, automatically adapting strategies in response to customers' emotional reactions.

In this scenario body equipment is not only a medium enabling different types of interactions, but it also behaves autonomously, amplifying the emotions, touching the intimate dimension of the wearer. Fashion products feel and reveals the feeling.

The scenario challenges companies, designers and consumers to confront crucial technological, ethical and social issues.

SCENARIO

Trashy Muse fashion show, Paris SS20 fashion week, 2019. Source: Trashy Muse

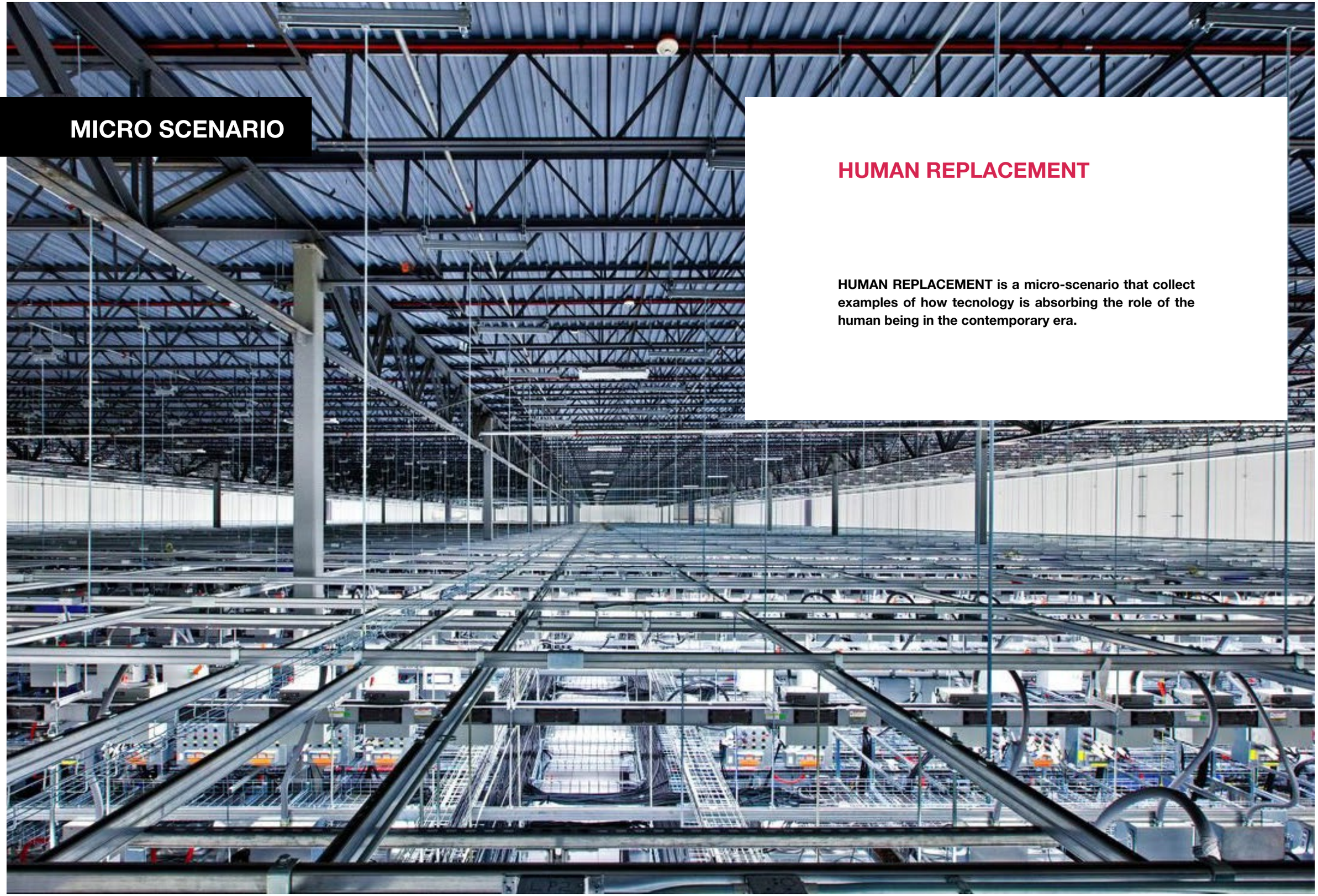
PHY GIT AL SE LF

PHYGITAL SELF

BEAUTY / FILTER / SENSES

Living in a connected world - where people are 24/7 online - the borders between reality and on-line presence become more and more liquid.

This forms a hybridization of digital and physical life, where transitioning dynamically from one world formed by pixels to the other and back to reality becomes normality. To experience these new dimensions people create digital avatars of themselves, for which creativity and freedom of self-expression have no boundaries. Also, products lose their physical essence to become virtual. “Nosedive” is the first episode in the third series of the British science fiction anthology series Black Mirror. The episode is set in a world where people can rate each other from one to five stars for every interaction they have, which can impact their socioeconomic status. Lacie is a young woman overly obsessed with her ratings; she finds an opportunity to elevate her ratings greatly and move into a more luxurious residence after being chosen by her popular childhood friend as the maid of honour for her wedding. Her obsession leads to several mishaps on her journey to the wedding that culminates in a rapid reduction in her ratings. This episode traces in an interesting way the importance that digital worlds have assumed today, equal if not superior to what the real world has. In addition, what happens in the digital world has an impact on the real world. Just think about misinformation. A 2019 study published by the Pew Research Center found that more than half of U.S. adults get news from social media often or sometimes (55%), up from 47% in 2018, and despite 88% reporting that these same companies have at least some control over the content that they see. Add to that tools like AI, which can now be leveraged to automatically generate, post and even comment on a steady stream of nonsense from made-up stories to entirely made-up people, and the plot literally thickens, albeit with a totally different brand of intrigue. The two worlds, apparently separate, are in continuous dialogue or whatever happens in one of the two has an impact on the other. In particular, technologies are producing physical and digital avatars which, in the first case, totally cancel the role of the human being and create new spaces and new architectures to live in; in the second case, instead, they dematerialize objects, habits, behaviours and bodies to replicate them in the virtual world.



MICRO SCENARIO

HUMAN REPLACEMENT

HUMAN REPLACEMENT is a micro-scenario that collect examples of how tecnology is absorbing the role of the human being in the contemporary era.

“Machine Landscapes: Architectures of the Post-Anthropocene” book, 2019. Source: Wiley

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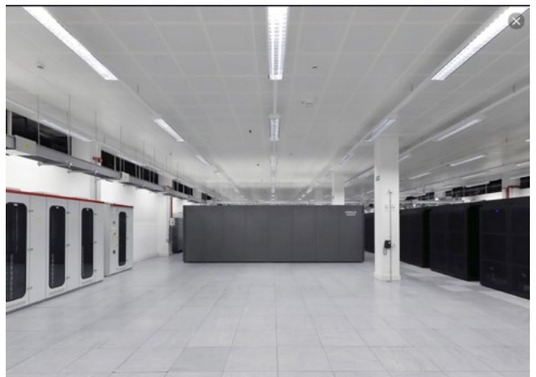
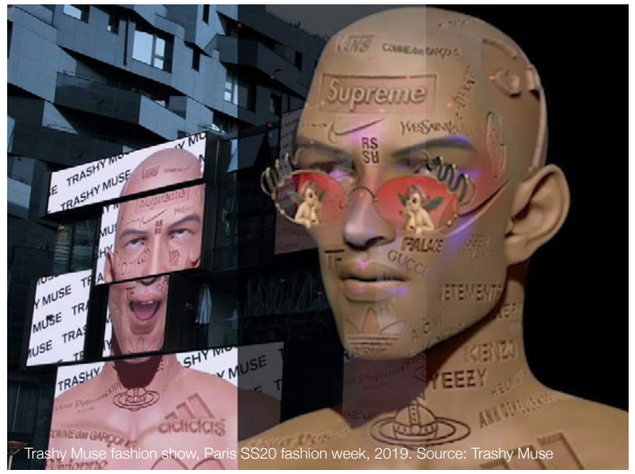


"Machine Landscapes: Architectures of the Post-Anthropocene" book, 2019. Source: Wiley

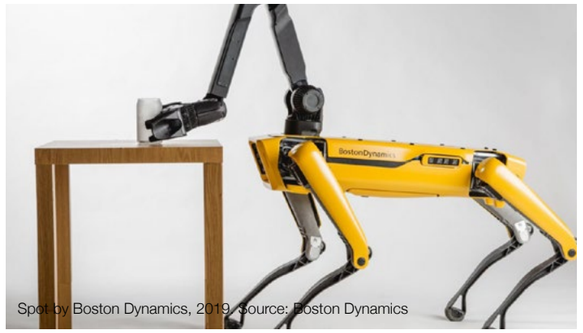
Trashy Muse fashion show, Paris SS20 fashion week, 2019. Source: Trashy Muse

Avatar robots attend graduation in place of students in Tokyo amid coronavirus concern, 2020. Source: BBT University

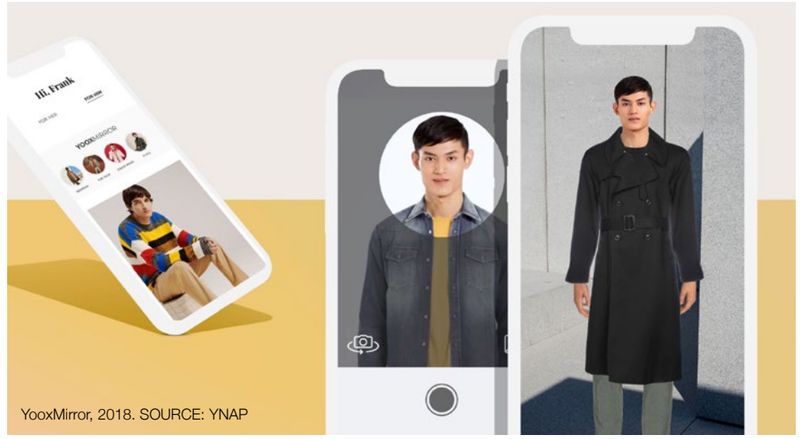


Trashy Muse fashion show, Paris SS20 fashion week, 2019. Source: Trashy Muse

FXMirror True Fit, 2018. Source: FX Mirror



Spot by Boston Dynamics, 2019. Source: Boston Dynamics



YooxMirror, 2018. SOURCE: YNAP

CURRENT FORWARD LOOKING PROJECTS

"**Machine Landscapes: Architectures of the Post-Anthropocene**" by (Young, 2019) is a book that explores the new typology of the post-human and shows how technology and artificial intelligence are now computing, conditioning, and constructing our world. The most significant architectural spaces in the world are entirely empty of people. The data centres, telecommunications networks, distribution warehouses are occupied by server stacks and hard drives, logistics bots and mobile shelving units, autonomous cranes and container ships, robot vacuum cleaners. These sites, architectures and infrastructures are not built for us, but whose form, materiality and purpose is configured to anticipate the patterns of machine vision and habitation rather than our own. They describe a period where it is the technology and artificial intelligence that now computes, conditions and constructs our world. Marking the end of human-centred design, the issue turns its attention to the new typologies of the post-human, architecture without people and our endless expanse of Machine Landscapes.

Machines have taken man's place in various roles. Let's think about the **Spot by Boston Dynamics**: a nimble robot that climbs stairs and traverses rough terrain with unprecedented ease, yet is small enough to use indoors. Built to be a rugged and customizable platform, since the beginning of March 2020, Boston Dynamics has been testing how their spot robot can help the fight against COVID-19. The dog bot has been on trial at the Brigham and Women's Hospital in Massachusetts, where it has been used as a mobile telemedicine platform. It has assisted in ad-hoc environments, such as to remotely triage patients in tents and parking lots.

With different purposes but always to deal with the problems that emerged with the Covid-19 remote-controlled robots, they replaced the students in the graduation **ceremony at the Business Breakthrough University in Tokyo**. Students called into the ceremony using a video-conferencing tool zoom to display their faces on the mobile devices. The newme telepresence robots were designed by **ANA group** and work as remotely controlled, customizable avatars.

Digital world is increasingly creeping into fashion, 'replacing' some of the actors involved, from customers to models, from stylists to designers.

FXGear's FXMirror is a virtual adaptation solution that uses Mixed Reality. It is a virtual fitting device that measures the user's body. The customer stands in front of a display showing 3D clothing pieces, generated from photos, which are layered on the user's reflection on the display. The latest released version, with physics-based fitting simulation, provides users with suggestions of suitable sizes for clothes. FXMirror creates a 3D avatar starting from the customer measurements. As the user checks the appearance of each size on the body, it displays how tight or lose the size will be from the smaller to the larger ones by determining how much pressure is applied by the clothes to each body part. FXMirror suggests the most suitable size based on the analysis of the user's body measurements.

Ora again, **YOOXMIRROR** is a function that allows consumers to develop their own digitized version and have fun creating their own clothes, combining clothes and accessories and sharing their favourite looks on social media.

Ruti, founded by Israeli-born designer and former tech executive Ruti Zisser, is a fashion business which developed a technology platform that assists in the design process and supports its in-store stylists by providing customers with a hyper-personalised, high-touch experience. The system keeps building customers' profiles, having tracks of past purchases and tried on items. Also, customer feedback gathered on the database influences inventory and design process for upcoming collections. Ruti's proprietary platform uses Artificial Intelligence, customised CRM, and facial recognition that are personalised recommendations based on each shopper's fashion preferences.

Substituting designers: artificial intelligence can also be used in the design phase.

Glitch is a fashion brand that designs black sheath dresses, exploiting the potential of a type of artificial intelligence called Generative Adversarial Network, which involves two opposing neural networks to create realistic examples of something - in this case, clothes - to the point that the neural network cannot

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distinguish them from man-made designs.

Trashy Muse in 2019 launched a virtual avatar and **augmented reality fashion** show at EP7 gallery in Paris during the SS20 fashion week. With a cast of mostly digitally rendered avatars, including the a digital model Shudu, virtual superhuman Dagny and Trashy Muse's influencer, Branded Boi, the one-day show saw Instagram's AR designers collaborate to design bespoke virtual garments and accessories designed for and worn by avatars. The fashion show was a collective effort, with the work by many creators across Trashy Muse's network, consisting of 3D artists like Anthony Rosati, creative studio NDA Paris and the brains behind virtual shopping experience RELMS. These artists are part of a dedicated pocket of Instagram pushing the boundaries of augmented and virtual design into the mainstream by creating hyperreal Wearable pieces that exist only in the virtual realm.

MICRO SCENARIO

DEMATERIALIZATION

The benefits of digital transformation include simplifying processes and eliminating some of the errors, benefiting from efficiency, operation, and cost reduction. While automation has led to greater efficiency, dematerialization of information leads to a different interaction between the various actors in the scenario.

FORME Life, 2018. Source: Forme Life

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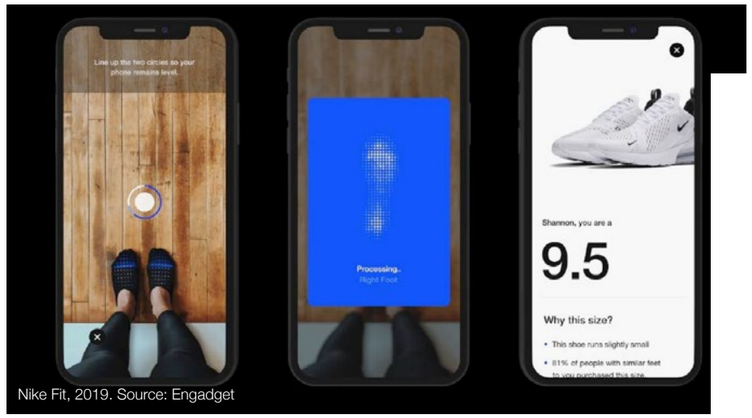
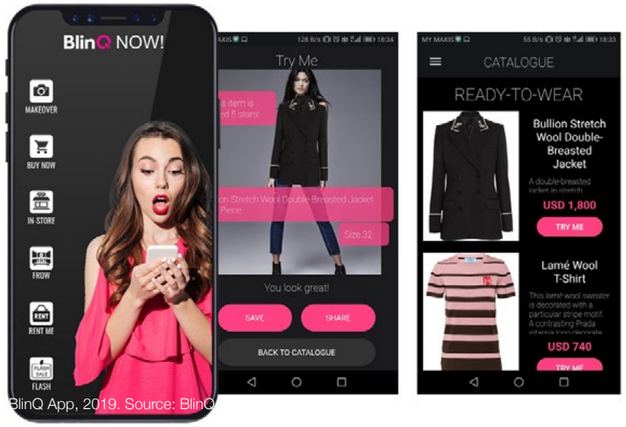
HBO Max documentary series Happily Ever Avatar, 2020. Source: HBO

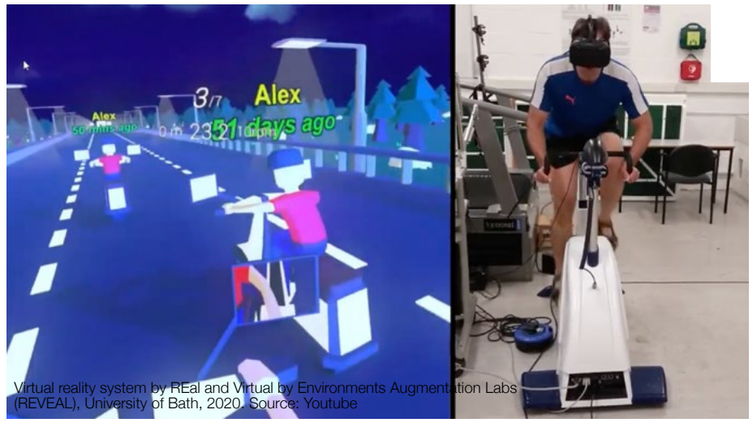


Nike Fit, 2019. Source: Engadget



BlinQ App, 2019. Source: BlinQ


FORME Life, 2018. Source: Forme LifeA



Virtual reality system by REal and Virtual by Environments Augmentation Labs (REVEAL), University of Bath, 2020. Source: Youtube


Virtual makeup experience by Dior Make-up and MNSTR, 2019. Source: diormakeup


adidas GMR, 2020. Source: atap.google.com

Digital Product Identities (IDs) by Ralph Lauren Corporation (NYSE: RL), 2019. Source: evrythng.com

CURRENT FORWARD LOOKING PROJECTS

This has an impact in different and unexpected fields. As the one of relationships. The new **HBO** Max documentary series **Happily Ever Avatar**, for examples, follows three couples whose relationships began in the games they love, only to make the leap to the real world. The 12-part series explores the way gaming brought them together and shapes the way they approach life, love, and their potential futures together.

In addition to feelings in the virtual world, real values, however intangible, such as the desire to improve and learn can exist and be tested. The members of the **REal and Virtual Environments Augmentation Labs (REVEAL)** in the **U.K. University of Bath** have developed a virtual reality system that allows people exercising in a sport using a virtual reality headset in the gym and compete against a ghostly version of themselves. “Athletes really enjoy competing against others,” says Christof Lutteroth, senior lecturer in computer science and head of the projcet, “For them, the racing experience is really exciting. It can be euphoric, exhilarating, with this cocktail of really powerful emotions. This is not really accessible to the average person — especially to people who are not motivated to exercise or maybe not very fit to begin with. It’s really difficult for them to find enjoyment in racing against another person.”

But not only people are dematerialized but also places or objects. **FORME Life**, as an example, set out to innovate both where and how personal fitness is done. What at first appears to be a six-foot, full-length mirror transforms, in an instant, into an all-in-one gym portal, bringing an array of physical and mental wellness classes right to home. When the machine is turned on, interactive instructors appear within the mirror to guide users through each motion and motivate their success. Its weight-simulating accessories and adjustable arms remove the intimidation and limited functionality of traditional resistance devices, and also track users’ progress in-app and across FORME’S own social community. In this way, the FORME Life system combines the best of conventional and boutique fitness in a single experience, mixing the convenience of home workouts with the liveliness and stimulation of one-on-one and group sessions.

AR technology is transforming the fashion industry with the aim of creating a more effective user experience. In the past, different fashion projects have revolved around the topic of digitalization, but recently some projects have revolutionized the dynamics of product use, dematerializing the experience in the retail space (Tenuta, L., Abitare 2020).

BlinQ allows consumers to virtually try on clothes before making the purchase, thanks to Augmented Reality. The cameras take photos of users to transform them into digital models on which to try and see clothes and measure their body parameters to suggest the most suitable sizes.

Size suggestions are also **Nike Fit**’s solutions to optimize the shoe buying process and reduce the number of incorrect orders. To know the correct size of the shoe, consumers only need to scan their feet with the smartphone camera. This practice not only offers a tailor-made service, but has a significant impact on the quantity of product returns. Extending interactions physical to digital and viceversa, to enhance the user experience.

In its exploration of a new form of beauty, Dior is moving beyond physical makeup. In December 2019 **Dior Make-up** in collaboration with **MNSTR** launched a virtual makeup experience for “Dior Makeup Holiday 2020”: an Instagram filter in augmented reality, co-created by Peter Philips, Creative and Image Director at Dior Makeup, and Inès Alpha, 3D Make-up artist.

Designed to create an enhanced experience for players, three world’s leading brands in sportswear, gaming and technology, **Adidas, EA SPORTS FIFA Mobile** and **Jacquard by Google** created a product that connects physical and virtual. The Jacquard tag is a small computer that connects to the Jacquard app and translates the user’s interactions into commands that Jacquard app can execute. Jacquard Tag can be embedded seamlessly into the design of the clothing items, becoming part of it.

The concept of dematerialisation also concerns product identity, shifting from physical to virtual. To give consumers the power to authenticate, **Ralph Lauren Corporation** has infused digital identities to each product of their Polo products.

PHY SIC AL AVA TAR

Fashion has always acted as an immediate interface with the surrounding environment by constantly communicating and conveying emotions, experiences and meanings; by the same token, body equipment becomes a channel through which to communicate the multiple meanings they take on, and ultimately act as a mediator between individual human beings and the rest of the world. Clothing behaves like a second skin generating and transmitting data on individual identities.

In this scenario the role of fashion is amplified: beyond make-up, filters overlap reality and create multiple layers altering the sensory perception. Avatars wearing virtual products, clothes or accessories made or adapted to the body or according to the preferences of artificial tailors, boutiques that cross the house.

Imagining and deceiving, revealing and concealing by switching on and off.

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