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FASHION  
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**PAD. Pages on Arts and Design**

International, peer-reviewed,  
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founded by Vanni Pasca in 2005

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**Publisher****Aiap Edizioni**

via A. Ponchielli 3 – 20129 Milano – Italy

aiap@aiap.it – www.aiap.it

PAD © ISSN 1972-7887

#20, Vol. 14, June 2021

[www.padjournal.net](http://www.padjournal.net)

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# Sustainable Fashion

## From Material to Immaterial Through Biodesign

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### **Keywords**

Slow Consumption, Fast Fashion, Biodesign, Bio-Textiles, Bio-Processes.

### **Abstract**

The current consciousness about the environmental impact of fashion request an urgent need for intervention on both the technological production and the processing plants in the textile sector; but these are not the only aspects to be considered. Focusing on an approach based only on the sustainability of materials and processes, and not considering the gears that move the fashion system, would lead to a *symptom based* solution that does not involve the roots of the problem. The intangible, social and symbolic aspects that invest the fashion sector have significant repercussions on material production and stimulate the phenomenon of *fast-fashion*.

The purpose of this contribution is to individuate a further approach which looks at recent technological advances in the field of sustainability, not only as alternatives to production and processing in the textile sector, but aims to investigate its potential in aesthetic and semantic terms, to establish new correlations between material and immaterial aspects. Specifically, reference will be made to the field of *biodesign*, which considers the collaboration with living organisms as a design tool that, if applied to the textile sector, will allow energy efficiency savings and to reduce environmental impact, but also generate new ways of interaction, use and customization of clothing.

## 1. Clothing is Material Production; Fashion is Symbolic Production (Fletcher, 2007)

To address the theme of sustainability in the field of Fashion it is appropriate to keep in mind the aforementioned distinction. The intangible, social and symbolic aspects that invest the fashion sector have significant repercussions on material production and stimulate the phenomenon of *fast-fashion* (Bhardwaj & Fairhurst, 2010). A constant demand for novelty, fuelled by a constant reformulation of identity, leads to a consumerist approach that pushes to buy garments at very low prices that are destined to become waste in a very short time (Fletcher, 2012). In order to better understand the theme, it is appropriate to define the dynamics behind the transformation of a product from being a good to a became a waste, which is generally considered as something to be discarded since is no longer able to meet requirements that justify its use. However, what are these requirements?

Obsolescence is a condition that doesn't concern only the need to replace a product when its use is compromised, but it occurs even when products or services are still usable but replaced by newer and/or fancier products and services (Woolley, 2003). This is the case of *relative* obsolescence and it's related to some psychological aspects connected with the perception of products in terms of aesthetic, stylish or social identification (Rees, 1961) (Burns, 2010).

Fashion field lives on the production of relative obsolescence. It is in fact very rare that garments are discarded because they are no longer able to perform their useful functions, but rather they are dismissed because their symbols and meanings have lost value and aroused a lack of interest that no longer moti-

vates the use. This phenomenon is clear when considering the increasing practice of “Second life” pursued by manufacturers and associations in the clothing sector; through a collection system the garments, still intact or not worn, are reintroduced in the market and revived for new uses (Cadioli, 2006).

In relation to the use of fashion products, we are therefore faced with a dualism between material and immaterial characteristics in a field in which the latter have a much greater impact for production, purchase, use and disposal of clothing. In the fashion sector is appropriate to refer to *aesthetic markets* (Bovone, 2016), since the value of products is not determined by functional aspects, related to materials, technological processes, production, but whose value is determined by the symbolic, formal and aesthetic characteristics that represent the very meaning of the object. Fashion sells an idea, an image, a symbol; the issue is that the fashion market aims at a continuous renewal of these symbols and images.

If we look at the fashion system from this point of view, it is clear that an urgent change in technological production and processing plants is needed in the textile sector that can conduce to the decrease of environmental impacts. But it is also true that relying on an approach focused only on the sustainable aspects of materials and processes, without considering the gears that drive the system, would result in a “symptom based” solution that does not consider the root problem (McDonough & Braungart, 2002).

## 2. Material and Immaterial

Designers, stylists and artists are facing the current production needs through incisive practices that engage the dualism

between the material and immaterial dimension through different approaches, but for which often, the aspects related to the material temporary, are opposed to those linked to the emotional and symbolic durability of the products.

## 2.1. Designed to Disappear

In the field of clothing the cyclical proposal is more formalized than that of other sectors; in fact it is possible to refer to fashion not only in the singular form but as *fashions*: a multitude of trends, often cultural, related to contexts and seasonality, bringing the consumers to as many directions, often even in contradiction with each other (Bovone, 2009). This system has increased a ravenous market based on the continuous purchase and early disposal of clothing. In response to this “hunger for newness” different experimentation researches are looking for solutions that look at the use of natural materials and fabrics, biodegradable, compostable or completely recyclable matter. We can define this category as “designed to disappear” garments (Goldsworthy, 2018): products characterized by a limited temporality, designed for seasonal use. In addition to the rediscovery of natural fibres, a series of materials are emerging from disparate derivations, drawing from the plants and organic dimension, from the reuse of residues of the agro-food chain, as yarn obtained from orange peel to skin made with grapes, from the use of algae and grass. It’s the case of *Algiknit*, a thread made by Seaweed by Aleksandra Gosiewski, realized not only to be biodegradable but even to release healthy substances to the ground (Fig. 1); or *Flora Fur*, from Isabella Bruski and Noah Silva, a sustainable, biodegradable, fauna-free fur made from milkweed.





**Figure 1.** Aleksandra Gosiewski, AlgiKnit. Biodegradable yarn realized with seaweed, winner of the biodesign Challenge.



Figure 2. F-ABRIC, Compostable Jeans, FREITAG Lab.

The issue of disposal in these examples becomes as central as that of production. Users can take part in this closed loop system of production, disposal and regeneration or composting. This is the case of the projects Short Life by Kay Politowicz and Sandy MacLennan, a collection of disposable garments for single or very limited use, based on an innovative material developed in the paper industries that can be recovered many times in a recycling loop. Or the project *F-abric* from Freitag, a collection made of cellulosic fibres obtained from plants (Fig. 2). The products are realized without toxic treatments or bleach, in this way they can rot into the ground and become fertile soil for new raw material.

An emerging strand related to this category is known as *bio-fabrication*: in these processes, not only the materials and fibres are completely natural, but their production has an impact almost equal to zero since they are *literally manufactured* by living organisms.



Figure 3. Suzanne Lee, Biocouture, Biofabricated garments, Central Saint Martin.



An example is the iconic *biocouture* of the designer Suzanne Lee (Fig. 3), which exploits the process of fermentation of bacteria and yeast to produce a material similar to leather, used to create garments, jacket and shoes. The vegetative apparatus of fungi, *mycelium*, is the subject for other experimentations with fabrics such as *Mycotex*, made by a white and soft material which is already quite diffused for applications in several fields of product design, including fashion. The collaboration with the living organisms, as well as for the fabrication, has been pushed to replace the traditional techniques of working, in particular the dyeing processes that are known to be the most toxic in the sector.

In this field the examples have gone beyond the experimental phase, entering to all intents and purposes in the market: is the case of the line of *Puma. Living colours* (Fig. 4). The project uses purple pigments resulting from the growth process of some bacteria, to dye fabrics for a sport collection, replacing the traditional chemical dyeing processes that are the most polluting in clothing production.

## 2.2. Designed for Emotional Longevity

If the strands described meet the needs related to the material aspects of fashion production – in particular raw materials and processes – another approach is opposed to the ephemeral and ravenous character of the fashion system. This last encourages the production of durable garments that are able to counteract not only technical obsolescence but also *psychological obsolescence*, aiming at what Chapman calls *emotional durability* (Chapman, 2005), and Normann *thoughtful behaviour* (Norman, 2004).

These concepts start from the assumption that we “consume experiences, more than objects, feelings more than stuff” (Chapman, 2012). The things we own become mere vehicles’ or carriers’ of meaning. Garments in particular can be considered as a second skin, with which it is possible to create a really intimate relationship. Long lasting garments can become a repository of memories; they are worn and moulded by the experience of use, they are sculpted and personified over time and they can map events of our life. The concept of *Evolving Narrative* by Puma is based on these themes. The use of the shoes and their consumption are part of its pattern and decoration, becoming so a sort of customization. The possibility to participate, in part, in the designing process, to obtain something unique and personal is a solution individuated for the durability of products and garments. The fashion software company *Unmade* bases its activity and success on this aspect. The company works with brands to offer an accurate customization of garments and products. Consumers feel involved and engaged in the experience and therefore feel more involved and engaged too with the product itself. This process leads not only to a major appreciation of the product, because it responds to the specific request of the user, but create a strong connection with him/her because he/she participated in its creation.

This type of relation and attraction, which Normann defines *reflective*, is characterized by a more lasting temporality; it is not dictated by a momentary interest or attraction, but concerns long-term relations, includes the interaction between the product and cultural identity. “Through reflection we can recall the past and contemplate the future” (Norman, 2004).

### 3. Bio, Alive and Interactive Garments

The two categories described in the previous paragraph represent two ways of approaching the theme of sustainability. In the following steps we intend to investigate a further approach able to integrate the founding elements of the two strands; this approach looks at recent technological advances in the field of sustainability and bio-fabrication not only as alternatives to production and processes in the textile sector, but also to investigate its potential in terms of aesthetics and semantics, with the aim of establishing new correlations between material and immaterial aspects. *Biodesign* is a design practice, at the intersection with science, in which new collaborations are created between man and nature (Mayers & Antonelli, 2018) and its applications in the field of fashion are able to create a high level of innovation at different scales. Through the analysis of some case studies, divided under some *key concepts* previously identified by Chapman (2005), we want to show how the use of natural, sustainable, alive processes and materials could actually affect the market and patterns of consumption of clothing, not only as a guarantee of a lower environmental impact in terms of production and disposal but also because they can stimulate new ways of perception, use and interaction with clothing. In this way these will be able to arouse a sense of attachment that is free from the trends of the moment.

*Narration:* garments are able to tell something about themselves, where they come from, how they were produced. In the case of *Made by rain* by Dutch artist Alike van der Kruijs, the designer defines her textile an *elemental concept*, that imprints the experience of rain on a silk fabric (Fig. 5).



**Figure 5.** Alike van Der Kruijs Award, Made by rain, pluvigraphy process to texturize through rain drops.



Through her patented *pluvigraphy* technique, the woman literally paints with rain through a water-sensitive film. The result is a collection of unique “prints”, different depending on the climate of the place where the fabric was made, that is able to restore a sort of territorial connotation to the product. This characterization makes the fabric singular, assigns it a story, a lived experience, a personality that deter the dismissing pattern or replace it. The uniqueness and a strong narrative nature are also the characteristics of the project *Dancing Bacteria*, the *biodesign* project from dutch designers Laura Luchtman and Ilfa Siebenhaar; a particular typology of bacteria that react to sound frequencies is used for dyeing textile and create different patterns. The frequencies in fact influence the mode of aggregations during growth that then are shown in the form of dye as a result of the metabolic process; in this way they are able to create patterned fabrics rather than random one, that can be customized. The process, in this case, as well as constituting a completely natural and non-toxic dyeing technique, give an added value to the textile. The product tells part of its history making and this not only gives it peculiarity, but makes its owners more aware of what lies behind our daily products.

*Graceful aging*: the product ages, changes pleasantly, triggering a tangible characterization process during use.

In establishing an emotional relationship with products, the ageing process can play a fundamental role. The semiologist Fontanille refers to the state of aging with the concept of *patina*, the superficial alteration that the time and the use bring to the objects (Fontanille, 2002). The signs on the *patina* become statements that acquire the role of characterizing and imprint-

ing in a personal experience of use on the product, not only related to actions but also to environmental contexts. Natural tissues in particular, if not subjected to chemical and polluting treatments, are subject to bio deterioration processes by organisms such as bacteria or fungi that change their appearance. The fashion designer Martin Margiela in this regard has carried out an interesting experiment. Working in collaboration with a Dutch microbiologist, Margiela exhibited in 1997 a collection of clothes deliberately subjected to biodegradation processes (Fig. 6). The purpose of the exhibition was to show that aspect from a different point of view; the result was unexpected: the clothes showed charming, pleasant and desirable colours, patterns and shades.



**Figure 6.** Martin Margiela, decay exposition, a collection of clothes aged with biodeterioration process from bacteria and yeasts.

Margiela's experiment may be the key to a reconsideration of the decay process and a first step towards the acceptance of the mutability of matter; to depart from the desire of the new, intact and immaculate and instead welcome the ephemeral aspects of things. In nature nothing is static, everything evolves, transmutes to the point of decomposition; in order to achieve the equilibrium of natural systems, which do not foresee the concept of rejection, it is also essential to begin to familiarize ourselves with changeability in the field of human production. The design, collaborating with other disciplines can therefore intervene to make this process pleasant and graceful.

*Living*: the garment is perceived as alive, as something to take care of.

Relating to a product as a living organism leads not only to greater attention and care, then to establish a personal link with that product, but also a greater awareness about it. The collection of *Jacket Biogarment*, by Canadian-Iranian designer Roya Aghighi, was born from the vision of a new type of interaction with products that aims to encourage care and awareness of its needs; this approach can lead to a transformation of values and could help reduce waste by changing our perception of Textiles (Fig. 7). The jacket is made with living algae that photosynthesize the air. The habits around the use of the garment are completely different. There is no necessity to wash it but the algae need to be regenerated through a periodic immersion into water. Behind the realization of *Biogarmentry* more than the intention to perform a particular function, which in this case is purifying air around you, there is the intent of forming a more intimate relationship between



**Figure 7.** Roya Aghighi, Biogarmentry, textile realized with alive algae.

owners and their clothing, and to transform patterns of *buy, use and dispose* into *buy, care for and compost*. The user in this case is actively involved in the “survival” of the leader that becomes his responsibility.

*Enchanting*: users undergo a fascination given by the lack of complete understanding of the product that leads to the curiosity to discover it.

Imagine to own an object that changes its appearance in an unpredictable way and which is perceived as possessing its

own autonomy; the interest aroused in the product pushes the user to consider it more than just a tool. Piero D'Angelo, a fashion designer from Central Saint Martin in London, through his experiments at the intersection with biology, created a collection of living garments that grows during the use. The designer use lichens and mushrooms, the slime in particular, to texturize his fabrics (Fig.9). The Kit *Grow Your Own* allows the user to grow some lichens on a garment that will have the function to purify air around you. More than the function what is interesting in this work is that the lichens continue growing during all the time of use of the garments; this means that it will change its aspect day by day, creating expectations and a constant interest and novelty (Fig. 8).

The examples analysed show us a design strategy that is not limited to aspects related to eco-efficiency, but goes to consider the intermediate step, between production and disposal, related to use experiences; focused on tracing the usage of products with reference to product careers and biographies. The green growth and the environmental benefits to which an eco-efficient production system would lead, would be offset by increased consumption through the rebound effect (Binswanger, 2001). It would be necessary to start an approach nearer to the concept of “Slow Consumption” that implicate as well as a sustainable production, a *sustainable consumption*, that means to have not only informed consumers but even more informed designers about consumers (Cooper, 2008). Designers, in fact, are no longer bound and involved to the mere designing principles and processes, but they manage even relations and consequences proper to the discipline.

The surface of products, fabrics and Textiles in this case, acting as a filter between user and relating to the sensory perception sphere, that is responsible of the emotional involvement, reveal still themselves as a vehicle of meanings and lead us into new ways of interaction with objects that will customize the individual user experiences.

Design historically, through design, responds to the needs of the society in which it lives, dealing with the methods and technologies of the time; born with the Industrial Revolution it changes its character in a constant and consistent manner to technological advances, generating innovations.

The mobile end evolving world we live in is reflected into the new materiality that is imagined as able to self-transforming, to adapt, to fold, to respond to stimulus and able to interact with the environment, through collaboration with living organisms and *biodesign*. The new languages, the aesthetics and the interactions, if studied and exploited, can lead to a radical change in the fruition of the products. The approach to *biodesign* has to go beyond only considering it as problem solving but can be the basis to rebuild the design process and to re-think some aspects of the fruition of products, like the decay, the temporality, the customization and the disposal. The main goal is to avoid the comparison between this new typology of materiality and Synthetic-traditional materials, but consider them as something completely new, still unexplored but with a high potential. This become particularly true in the fashion system, which follows very rooted dynamics but actually can provide germs of innovation both in terms of functions and aesthetics.





**Figure 9.** Piero D'Angelo, Dye with slime, Biodesign Here Now', London Design Festival.



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Designer and Phd Student at the department of Pianification, Design and Technology of Architecture of "Sapienza Università di Roma". Her doctoral research investigates the field of new paradigms of material and processes related to the theme of sustainability.

She is conducting her studies at the intersection of Design and Science, in particular related to the application of biologic processes in substitution of the conventional manufacturing processes, in order to exploit their potentiality in terms of new aesthetics, languages and fruitions patterns. She has conducted several department researches and experimentations in the field of biomaterials, obtained from the re-use of organic waste from the agri-food chain, and collaborated as teaching assistant on the topic. She is actually part of the team of the Interdepartmental Center Saperi&Co of Sapienza University.

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### **Rossana Gaddi**

MS in Design and PhD in Design and technologies for the enhancement of cultural heritage at Politecnico di Milano. From 2020, she is assistant Professor at the Department of Architecture of the University "G. d'Annunzio" of Chieti-Pescara. She teaches communication design for the fashion system as contract professor in the inter-university consortia Poli.Design, Milan Fashion Institute (Politecnico di Milano, Bocconi University, Catholic University) and Ard&nt (Politecnico di Milano, Brera Academy).

Visiting Professor at the School of Fashion and Design (SOFD) of the GD Goenka University in Gurgaon (New Delhi, India) and at the EDC Business School (Ecole des Dirigeants et des Créateurs d'entreprise) in Paris.

From 2011 to 2020, she has been a contract lecturer at the School of Design of the Politecnico di Milano and from 2009 to 2018 research fellow at the Design dept of the Politecnico di Milano, developing research on communication for the fashion system and on the relationships between design, culture and territory.

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### **Leonardo Giliberti**

After the three-year course in Bologna in "Industrial Product Design" he graduated at CDLM in Fashion System Design at University of Florence. He is interested in the creative sphere, confronting different expressive disciplines such as illustration, painting, videomaking, DIY, gaming, musical composition and writing.

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PhD, Architect, she is a Researcher in Design at the Dipartimento di Architettura of the University of Florence (DIDA-UNIFI). Since 1991 she works on the issues related to Sustainable Local Development and the social implications of the project starting from the Cultural Heritage.

For over 20 years she worked in projects in Ethiopia, Algeria, Tunisia, Morocco, Yemen, Jordan, Haiti, with the most important national and international donors WHC - UNESCO, UNCCD, World Bank, European Commission, WMF, AICS. Since 2011 she has been collaborating with the DIDA UNIFI especially in projects around Maghreb countries and in the social field promoting Social Design projects and workshops using co-design methodologies.

She is professor of Service Design at DIDA UNIFI, professor of Design for Cultural Heritage in the License Course in Design at Ecole Euro-Méditerranéenne d'Architecture Design et Urbanisme de l'Université Euro-Méditerranéenne de Fès EMADU – UEMF in Morocco and visiting professor in some universities in Mediterranean countries.

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He is Associate Professor in ICAR 13 sector, Industrial Design with lectures in the Design for Fashion at the DADI Department of Architecture and Design Industrial from 2001. He is the coordinator of the Job Placement of the department and for Curricular Internships. In 2018 he obtained national scientific qualification as full professor I level (ssd ICAR 13).

A scientific training gained in the national and international design environment gives him research and strategic planning skills in Design and Design for Fashion, thanks the relationship with supranational research and training institutions as Iacocca Institute of Lehigh University USA; Oxford Brookes University, England; Saint Petersburg University of Technology and Design, Russia; Goenka University, New Dheli, India; Tecnologico de Monterrey, Campus Sonora Norte, Mexico; BIFT Beijing University of Fashion Technology, Beijing, China; ESMOD Japan, School of Fashion Design, Tokyo, Politecnico di Milano.

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**Gabriele Pontillo**

He is an Italian product designer. In 2015 he graduated in Design for Innovation at the University of Campania “Luigi Vanvitelli”. In 2019 he obtained a Doctoral Research Fellowship in Environment, Design and Innovation at the University of Campania “Luigi Vanvitelli”.

Main focus of his line of research are parametric design, medical design, and advanced manufacturing – knowledge acquired during his academic path. The Ph.D. course with industrial characterization has allowed him to carry out and consolidate his research activity, as well as at his university, also at the Escuela Técnica Superior de Ingeniería y Diseño Industrial (Universidad Politécnica de Madrid, Spain) and a company from Campania, based in Gricignano di Aversa, to design a system of innovative orthopedic devices through parametric design.

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**Elena Pucci**

A graduate of the CDLM in Fashion System Design, is interested in art, music and writing. She coordinates the virtual lab at DIDA (Department of Architecture) of the University of Florence (Italy), Design Campus section. Currently she works in communication projects of and for CDLM in Fashion System Design. She was involved in “Metamorphic Fashion Design” offering her contribution in the design of environments, as well as in the collection and organization of material.

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**Paolo Pupparo**

Graduated from the Master’s Degree in Design at the University of Florence, currently a PhD student in “Sustainability and innovation for the built environment and product system design (cycle XXXVI - a.y. 2020/2021). During his research interests concerning the development of methodologies applied to creative processes.

He is currently engaged in the research project: “Design, Art and Business: innovation, strategy and sustainable channels for the creation of value”, which focuses on the analysis and collection of information relating to the mapping of the relationships between Design, Contemporary Art and Companies starting from the Tuscan territory.

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**Sandra Regina Rech**

She is an Associate Professor at the Santa Catarina State University (UDESC/Brazil) - Fashion Department; Tenured Professor of the Graduate Program in Fashion (PPGMODA/UDESC) - Professional Master’s Degree in Apparel and Fashion Design and Leader of the Research Group on Fashion Design and Technology (UDESC/CNPq).

She was a Visiting Professor at the Politecnico di Milano (Italy) and was awarded a CAPES PVEX scholarship (2019/2020). She is the Editor-in-Chief of ModaPalavra e-periódico (UDESC), Coordinator of the laboratory FPLab - Futuro do Presente (UDESC), Collaborating Researcher at the University of Lisbon (CIAUD/Portugal), and Integrated Researcher at the Trend-sObserver platform (Portugal).

Her areas of interest are focused on the following themes: Fashion Design, Trend Studies, Scenarios, Consumer Culture, Qualitative Research, Methodologies.

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**Giulia Scalera**

Designer and PhD, is a Research Fellow at the dept. DADI of the University of Campania “Luigi Vanvitelli”. She is the author of “Il design nella società estemporanea” (2015) and “Open Brand. Nuovi linguaggi visivi per la moda” (2019); two monographs that represent her two main strands of research. One oriented to the study and innovation of design and production models of the design oriented industry and the other to innovation and experimentation, including design, of branding.

Since 2015 she has been teaching fashion and communication design courses at the Accademia delle Belle Arti di Napoli. Since 2009 she has been working as a professional visual designer and in 2017 she is co-founder of the Pluff design studio specialized in visual communication projects of national and international importance.

Among the main projects are the visual identity of the Italian Pavilion at the Venice Biennale (2015) and the creative direction of Milano Book City.

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**Juliet Seger**

She is a vocationally trained tailor, clothing engineer and designer. Her academic path at The University for Applied Sciences Hamburg (Clothing – Technology and Management B. Eng., 2019) and The University of Edinburgh (Design for Change MA, 2020) was paired with diverse practical experience in the fashion industry. Following placements in bespoke tailoring and an extensive tailoring training with the HOLY Fashion Group, she worked as technical designer and studio manager for menswear designer Alex Mullins in London and spent one season with Proenza Schouler in New York. For several years she led sewing workshops for children and supported the student sewing lab at HAW Hamburg. Her label PAID VACATION functions as creative platform for contemporary tailoring and made-to-order fashion design. Since Autumn 2020 Juliet is based in Berlin where she works as fashion product developer.

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**Sónia Seixas**

PhD student in Design, Fashion and Textile Designer, teacher of subjects related to fashion and textile design through Technological Specialization Courses and Technical Higher Education (level V ECVET), Professional Technical Courses (level IV ECVET) and, Modular Training Certified. Her research interests concern the design in the universe of fashion and textile related to education.

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**Renato Stasi**

He has been involved in the creation of clothing and accessories collections for the fashion segment for almost thirty years, as a designer and responsible for the development of the collection, he has worked for several companies including the LVMH Group, Redwall, Hettabretz. He is an adjunct professor at the DIDA - UNIFI Department of Architecture, in the CDL in Industrial Design and CDLM Fashion System Design. Lecturer at IED, where he is the coordinator of two three-year courses. He has carried out supplementary teaching activities at the Politecnico di Milano for several years. He has held seminars and workshops in various universities. Stasi is Coordinator of the Steering Committee of the Master's Degree Course in Fashion System Design of the University of Florence - School of Architecture - DIDA.

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**Margherita Tufarelli**

Designer, PhD in Design. Currently a research fellow at DIDA (Department of Architecture) of the University of Florence (Italy), Design Campus section. The PhD thesis, with the title "future heritage and heritage futures. An exploration on meanings of the digitized Cultural Heritage" aimed at investigating the role that the digital archives of Cultural Heritage can have in the contamination between the culture of the past and contemporary creativity.

Her research interests concern the heritage/creativity sphere within the digital evolution; thus, the application, impact and opportunities that lie in the relationship between digital technologies and cultural heritage. She is currently working on a research project titled "Living archive. Disseminating and reusing the Fashion cultural heritage" funded by Regione Toscana.

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**Kellie Walters**

She is a color, materials, and finishes (CMF) designer at Garmin International and previously at Newell Brands spanning professional experience in consumer electronics and home goods. She is also a published researcher on trend forecasting and CMF trends as well as a published theorist on future aesthetics after artificial general intelligence is created and society heads toward artificial superintelligence. Kellie is focused on the direct impact that social and political events have on future aesthetics and their relationship with the economics of design.

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**PAD. Pages on a and Design**

International, peer-reviewed,  
open access journal  
ISSN 1972-7887

#20, Vol. 14, June 2021

[www.padjournal.net](http://www.padjournal.net)



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