FASHION NOW!
CRITICAL THINKING FOR CHANGE TOWARDS BIO-DIGITAL COUTURE

MARIA ANTONIETTA SBORDONE
Università degli Studi della Campania “Luigi Vanvitelli”
mariaantonietta.sbordone@unicampania.it

Data Availability Statement: All relevant data are within the paper and its Supporting Information files.
Competing Interests: The Author(s) declare(s) no conflict of interest
DOI: https://doi.org/10.36253/fh-2266

Abstract

Pursuing change in complex production areas requires attention and foresight that invests design research with advanced perspectives attentive to the fundamental balance between the artificial and the natural. The attitude or posture of contemporary design acting in actuality takes its cue from a strong impulse for multidisciplinarity that evolves into intricate trajectories that foster the grafting of knowledge and practices. In a field like Fashion, design culture and critique of the current model result in a radical future prediction; digital technologies at the encounter with new logics of making, far from the goals of productivity, prefigure a radical reversal of the current model. The paradigm of the organic meeting the digital and the latter expressing mutualistic behavior builds a solid perspective to drive change.

Keywords: Critical Design, Prediction, Bio-Digital Couture, Matiére Brute, Inverse Matter

Introduction

Reflection on the current content of Fashion especially when discussing the necessary revision of the processes that shape the supply of manufactured goods that circulate globally, and from whose circuits it seems unable to escape, imposes an attitude, a posture that investigates to unhinge certain assumptions. The result is a general flattening on questions that are certainly urgent, effects of indiscriminate but not definitive doing to which answers must be given, reformulating their assumptions.
Questions about identity that unravels among so many belongings whose fluid nature is sometimes insubstantial; about individual and collective responsibility regarding the cognitive-technological surplus that is transformed into productive and consumer surplus; about the inability of autonomy from the circuits of the economy-world that neutralizes and flattens every difference and singularity; about the need to form and transfer knowledge between human and natural ecosystems. These, are some reflections arising within society and the market focused on the fashion system and its necessary change.

Questions that, in parallel, call for another look that investigates beyond the systems, formulates an out of the box of immanent causes whose effects need to be answered and remedied: where and when did the dialogue between the design and creative culture of Fashion, and the intrinsic quality required for the necessary fulfillment of the need to dress break down (?); how is the representation of the self realized today in the digital age and how are belongings made explicit (?); how do we recompose the relationship with the context that is not only social and cultural, but of the human immersed in the virtual dimension and, despite everything, at the opposite in the natural one (?); furthermore, bio-digital couture can constitute a fruitful ambivalence to access a new paradigm (?). Questions that arise within the critical reflection to contemporary society, to the forms of civilization that are explicated in as many forms of government, and of models of design and production inspired and guided by the lead to time productivity paradigm that pursues the creation of surplus value that is not distributable, not accessible and, at best, generator of inequalities, otherwise conflicts.
The investigation of the multiplication and complexity of the socio-political-economic system,

as we experience, implement and perceive it today, includes another dimension; from the more sensitive one, of experientialization that sets in motion emotional levers with a strong appeal to a different degree of perception of ourselves and the environment, to those, now widely tested, referable to the neutral acceptance of the countless challenges of daily living. It runs the obligation to equip ourselves with new tools of field investigation and speculative/imaginative observation in order to recover a margin of critical construct that places ever ahead in a plausible future, man's ability to prefigure, to predict, to formulate worlds, to behave as a mystical futurologist or better yet a reliable prescientist about the fate of man on earth.
From the side of reflection and critique of the current model of life and development, the heterodox narrative proposes new methods of indoctrination, understood as a profound reconnection of man to nature acting in the psychological sphere, representing new possible approaches.
The human-nature relationship is widely described as diriment and headed for a sharp caesura (Beery et al., 2023), tells of the tearing of ties, the devastation of ecosystems, and the impoverishment of the ethno-zoo-botanical genetic heritage. The foreshadowed scenario outlines a scope for reflection on survival by reflecting, on the one hand, on the heralded disappearance of humans on earth, issuing a call for human persistence; on the other hand, on the role of restorative through tools for elaborating new thinking that requires an awareness that goes beyond data and statistics (Antonelli, 2019).
The reaction to the current crisis takes various forms; repairing the lost human-nature link and identifying interventions requires an anthropological shift that brings the new approach of doing to purposes closer, foreseeing each and every effect (Van Gelder, 1996).
On the other hand, the reliable prescientist bases his or her imaginative knowledge on premonition fueled by the imagination as an experienced futurologist; in psychology these are called "self-fulfilling prophecies" (Merton, 1971) and lead to finding and interpreting data so that our expectations are met, enabling us to act positively, to raise the level of awareness.
The matrix of self-fulfilling prophecy responds to the identification of a purpose that motivates the achievement of a positive outcome (Heidegger, 2016), in this case with a strong emphasis on premonition of the effects that correspond to those causes.

The Limits Imposed. Anthropogenic Mass

Design looks at "real people" (Antonelli, 2012) is developed in a collaborative environment with experts from all fields, ready to test their theories and, thus, with the activation of critical thinking to re-locate new constructs. Paola Antonelli in her essay "Vital Design" (2012) asserts that design is about "life" and ensures, in an era of great technological acceleration and as many crises extended from the environment to politics, greater attention to human beings, reconstructing their essential values.
The ability to collaborate to produce critical thinking about the current state of the human-nature pair introduces an intricate concept of collaboration and for that matter one with more complex implications that track the goal. Critical thinking reflects on human beings on their role, and not being alone, their actions have effects to be anticipated and anticipated with each process that is intended to be undertaken.
Ultimately, a new way of creating value moves from deep, critical and evolutionary thinking, embraces adaptive doing, orienting to continuous regeneration of equilibria, establishes a relationship of mutual cooperation between artificial systems and living, sentient beings. The irrationality of the current model, according to some authors

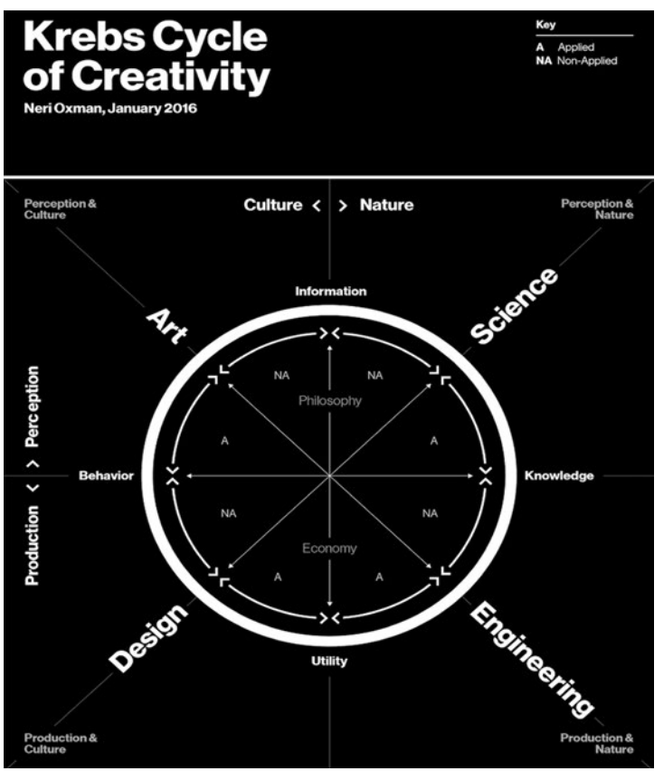

Fig. 01

Fig. 02

(Lagioia, 2022), is self-evident, and in the face of incontrovertible data on the, by now, ascertained dangerousness of human action, believing that the current model of development is unique and irreplaceable, does not mean that procrastinating its end, does not mean that this will never be written or, worse yet, never proven.
The issue arises from the intense research activity that results in profound debates on the evidence of irrefutable scientific data testifying to irreversible ecosystem transformation processes that, on the contrary, must be kept in balance and for which initial values must be reconstituted as much as possible. Humanity has become a dominant force in shaping the Earth to such an extent that the pressing question is how the overall material production of human activities compares with the overall natural biomass. “Here we quantify the mass produced by humans, called the anthropogenic mass, and compare it with the total living biomass on Earth, which currently equals about 1.1 ternatone 10.11. We find that Earth is exactly at the crossover point; in the year 2020, the anthropogenic mass, which has recently doubled roughly every 20 years, will exceed all global living biomass. On average, for every person on the globe, an anthropogenic mass equal to more than his or her body weight is produced every week. This quantification of the human enterprise provides a quantitative and symbolic characterization based

on the human-induced mass of the Anthropocene" (Elhacham et al., 2020.). For the first time in the history of our planet, human-designed constructs-materials, products, and the buildings-exceed the entire terrestrial biomass. "Although humans are part of the natural world, human activity and the "goods" we design and build-from our clothes to our cities-have increasingly set us apart from nature, negatively impacting ourselves and our planet" (Oxman, 2020).

Unorthodox Approaches. The Interwoven Knowledge Movement

Based on the assumption that the current model of knowledge is interdisciplinary that is based on a clear integration of collaborative disciplines, at the opposite end of the spectrum, the "anti-disciplinary" or interwoven knowledge model is at the antipodes: "it is about working in spaces that simply do not fit into any existing academic discipline, anti-disciplinarity is a specific field of study with its own particular rules, frameworks and methods" (Ito, 2016). It substantiates the hypothesis that integration between Design and other disciplines, including Science can take place in an "antidisciplinary" way, in order to configure a rigorous yet engaging model that thrives, making an original and unorthodox contribution. Since 2016, Ito has been investigating the possibilities inherent in an "antidisciplinary" approach as a direct consequence of the mutualistic approach of creative-technical-scientific disciplines, proposed in Neri Oxman's Krebs Cycle of Creativity (2016) [Fig. 1]. Significantly, the slogan with which the recruitement of MIT's Media Lab is carried out, in fact it is based precisely on the dialectic between the disciplines that does not find a point of contact, because this simply does not exist, quotes, "if you do not fit into any existing discipline either because you are between disciplines or simply beyond traditional disciplines (...), come to the Media Lab only if there is nowhere else to go. We are the new Salon des Refusés." (Ito, 2016).
In the face of a non-location, almost of rejection from the established interdisciplinary establishment, the image of the space of antidisciplinarity is represented through dots that emerge from a white substrate and can be translated into isolated but closely related dots; they find their place in the heterogeneous humus where

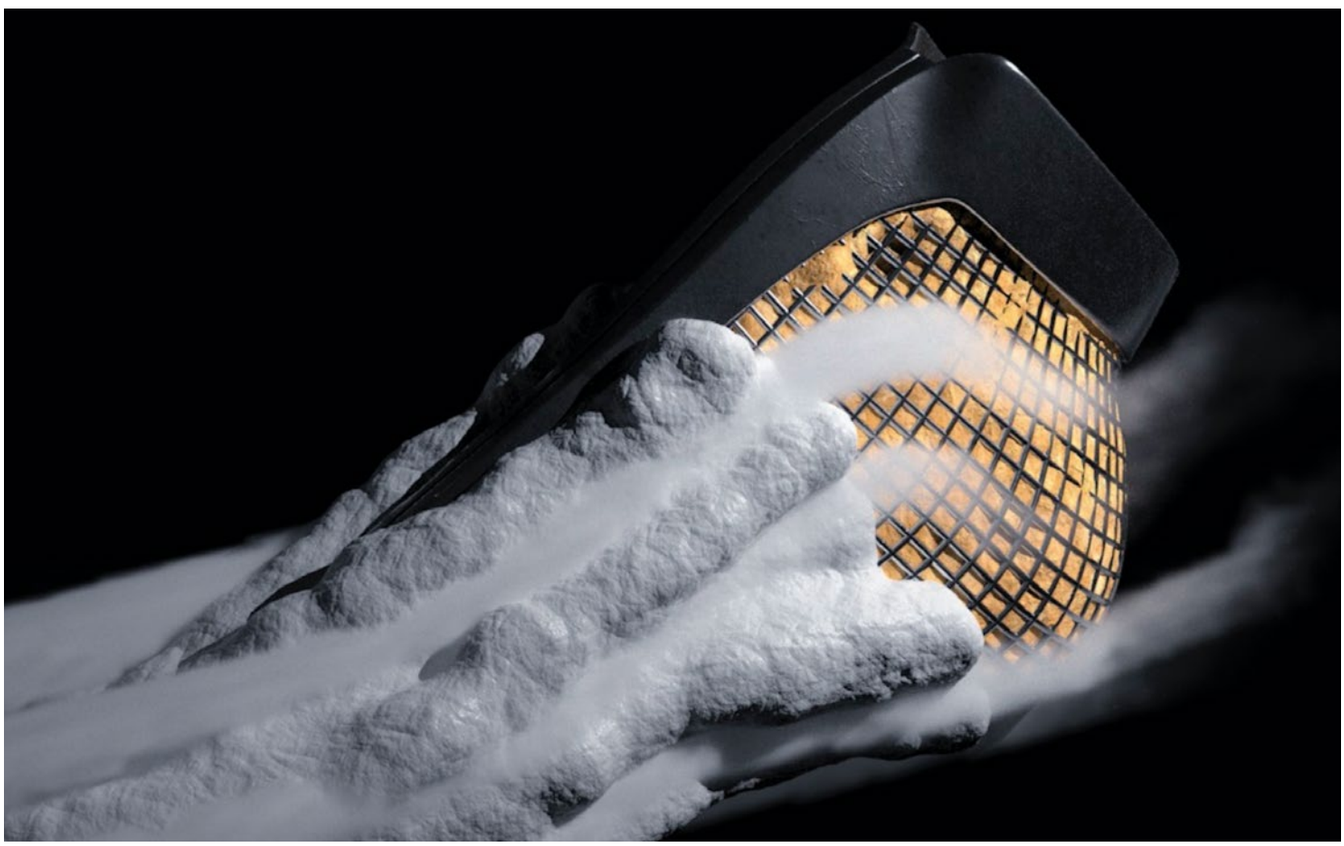

Fig. 03

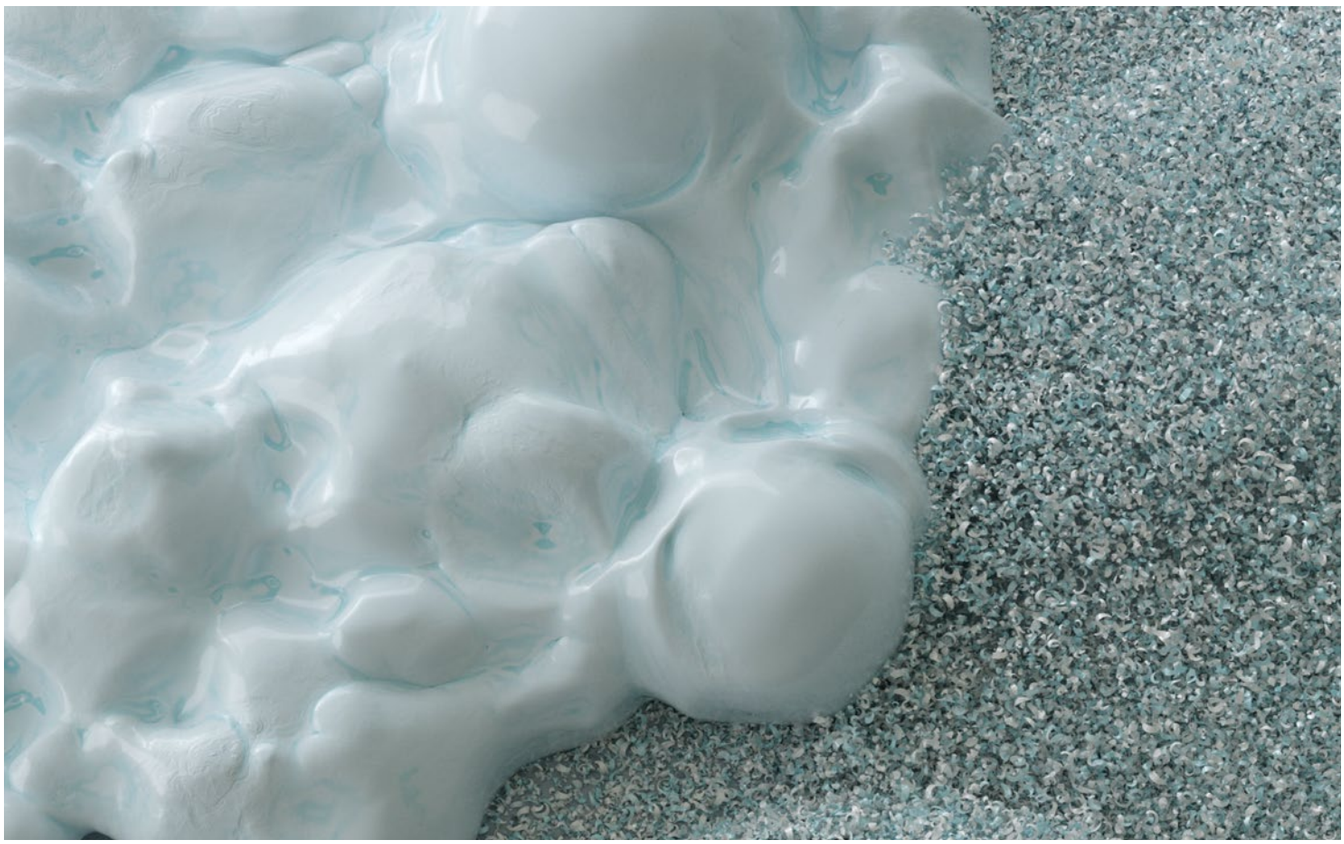

Fig. 04

they were generated that plays the role of condenser and medium of diffusion. The representation of the space of antidisciplinarity makes use of the following image: "When I think of the 'space' we have created, I like to think of a huge piece of paper representing 'all science.' The disciplines are little black dots on this white paper. The huge amounts of white space between the dots represent the anti-disciplinary space" (Ito, 2016). The available white space has the essential characteristic, in addition to anti-disciplinarity, of a kind, of "de-specialization," the black dots represent anchors, where the placement of disciplines, understood in the current way, finds an uncertain, voluntarily fluid and variable placement, dependent on time rather than space. The urgency of dealing with complex problems often referred to as wicked problems, requires a substantial effort in redefining the approach, which, of course, cannot exclusively satisfy the condition of interdisciplinarity. The hypothesis in terms of the scientific approach is geared toward defining a collaborative model as opposed to the proliferation of approaches that make up a complex mosaic of so many different disciplines. Often, spatially and temporally interconnected disciplines that do not clarify the terms of the same problem when investigated from another point of view, by virtue of an approach that derives from a substantial orthodox operational tool setting and for that reason unavailable to participation.

Design of 'Reverse' Matter

Various design approaches make their way, from materials innovation, to creative technological exploration, to speculative design, a great convergence of intent and vital energies emerges from different disciplines explored by design.
In materials innovation, virtual reality used for the visualization of certain 'concept-materials' concretizes a new design thinking that responds to an 'inverse' process to the customary practice of the design process. Custom follows the model from design, to prototyping, to choosing materials or the best configuration to produce, use and communicate it, and eventually recycle it; the nonlinear model reverses the perspective.
The process goes backwards, stemming from an overall idea that is structured into a digital (parametric) matrix that simulates matter in different stages and related configurations from: a prediction of its decomposition to

dematerialization; from the creation of matter-second from reprocessing waste; from a concept of hybrid biological and technological structures, through proliferation and mutualistic growth; from data that is organized according to purpose and informs matter (informed matter). The perspective, then, is the regeneration of natural and artificial cycles that define its purposes and intentions.
In the first instance, a kind of 'virtual raw material' is developed, which retraces by visualizing it, the whole process, according to one or more of the previous options and subsequently materializes into an object or artifact that contains one or more results, descended from those design intentions. This is the matiére brute that arises from a deep understanding of processes; it is an 'inverse raw material' that has undergone, ideally or rather virtually, all the processes of an ordinary raw material (in the old logic point of departure), observes the memory of it, and is therefore designed to reconnect man and his actions to the regeneration of natural-artificial cycles of matter and energy.
So many are the approaches of designers, critics, creatives, and researchers who walk through one or more options/intentions in their projects, we highlight, among the most significant examples, some common traits; the critique of the current production model and especially the development of a reflection that goes beyond sustainable, or conscious behavior and beyond approaches to circularity and resilience of systems, in order to reproduce ancestral mechanisms that adopt the molecular dynamics of the living.

Biodesign

Neri Oxman pursues the path of "matter cultivation as an alternative to assembly" this mode pursues the idea that natural systems can establish a close dialogue with human technology (digital soft) and help develop living systems from an artificial matrix and vice versa.
The idea of a bio-digital age, where "the confluence of computational design, additive manufacturing, materials engineering and synthetic biology is programmed, enables the creation of new generations of materials" (Oxman, 2016a, 2016b) [Fig. 02]. One finds here the concept of matter generated and re-generated through the concrete co-evolution of the biological living with the engineered artificial. In co-evolutionary processes, the biological matrix is grafted onto an artificial

Fig. 05a

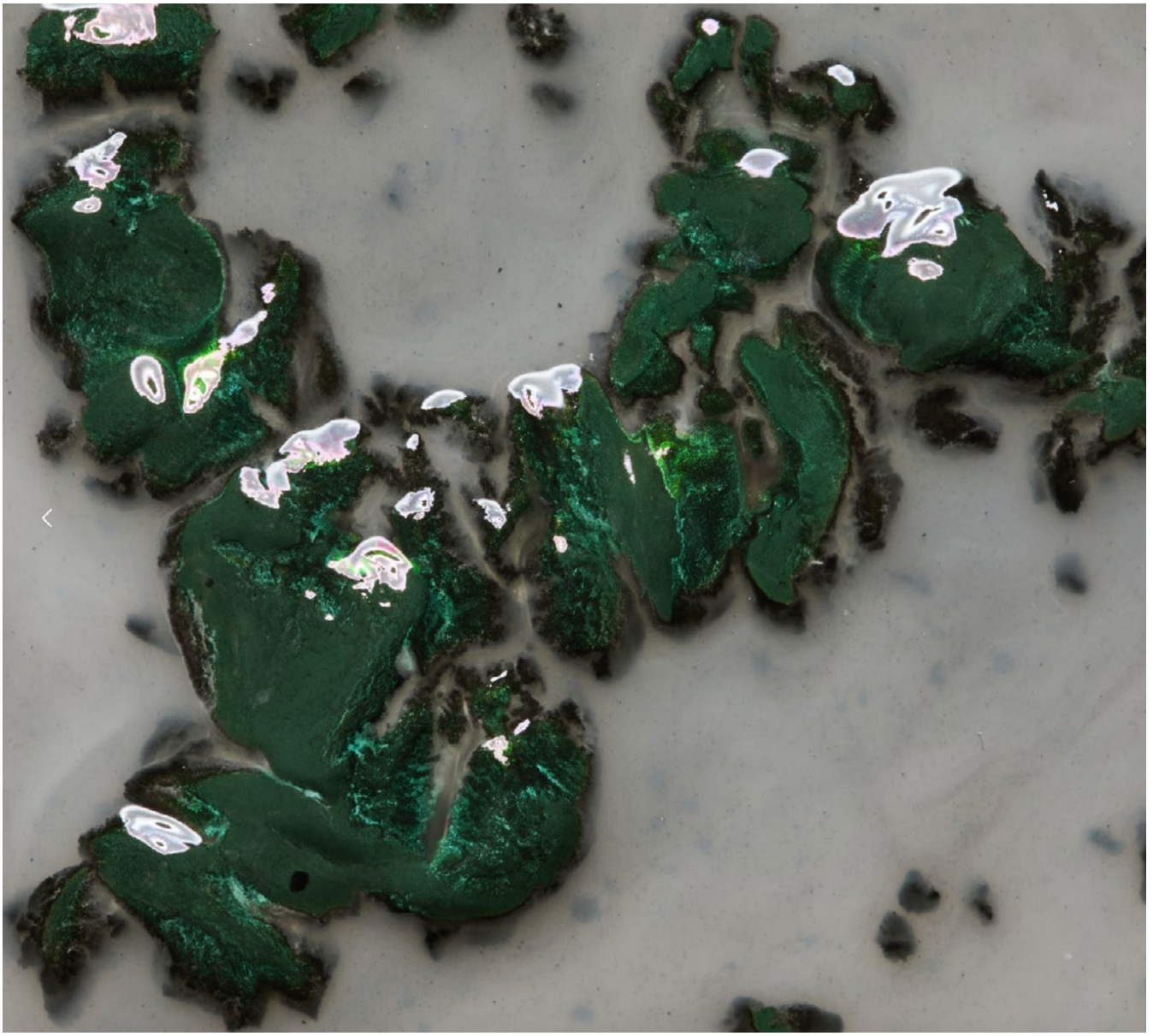

Fig. 5b

material or structural matrix that provides direction and naturally intertwines the two works concordantly. It is, albeit of co-evolution, to intervene in time, in the design capacity to predict the response of biological growth adhering to the technological structure.

United Matters (English collective)

The English collective starts from a variety of design approaches to provoke people to change the way they live in the real world. The change in recent decades focuses on social and cultural issues to promote more sustainable development. In manufacturing, companies are moving with different speed and intent in adopting and petroleum-based materials and processing to the point of producing technically advanced products. “Cells are like tiny factories. They have evolved over billions of years to have highly specialized functions (Rutherford, 2013). By designing living systems, we can apply the technologies that nature has perfected and adapt them to today’s needs” (United Matters, 2023) [Fig. 03].

Subframe Studio

Subframe Studio proposes digital visions and material constructs grounded in the narrative of production processes in various fields of action, the contribution is innovative, creative and often imaginative of reality such as it is presented and

envisioned. The future for Subframe Studio is at hand, the construction of the image is a digital fact programmed to provide answers to change, and above all, inspired by virtual reality, it encourages design with advanced intentions.
New materials take shape from ancestral matrices, others from raw-second materials from waste and related industrial processes of transformation and reuse, designs that predict behaviors in response to a set of external stresses, ultimately represent the creation of materials and configurations of digital objects whose growth and response is visualized [fig. 4]. Being spaces of possibility, the criterion is to imprint them with internal and external conditions and adaptability to tools and environment.
Among the thought-provoking projects for visual, design and construction impact, a significant application has been made in the area of Fashion for which, it becomes clear how much distance exists between the custom and habit of Fashion design to that animated by artificial intelligence.
Subframe Studio for Vollebak builds movies about inanimate nature inspired by the project "From the First Clothes Built for Mars, to Gear Built to Outlive You" (https://vollebak.com/pages/ranges) [Fig. 5]. The experience of the one becomes a mode of storytelling for the other, so that the creation and production of extremely high-performance garments arises from a transfer of knowledge to technologies from fields far removed from Fashion: "Everything they use is so durable that it was originally used as bulletproof vests, ballistic armor for vehicles, mooring systems for giant container ships, and ropes used to tie down oil rigs in violent, icy seas. The goal was to show the selected minerals in a creative, abstract way highlighting the characters of each. We focused on celadonite, hematite, ochre and volcanic soil and created four short films" (Subframe Studio).
For its part, Vollebak[1] transfers knowledge to heterogeneous materials in its design and production know-how for advanced clothing: "Our clothing addresses the fundamental challenges we will face in the next century: from extreme heat waves, floods and fires, to resource scarcity and space exploration".

1 https://vollebak.com/pages/ranges

Conclusion

In brief, a few points have been highlighted. Reacting to the complex crisis we experience nowadays starts with a substantial anthropological change that brings the new approach of doing to purposes closer, foreseeing each and every effect. Acting with the effects of every intervention in mind will be the perspective of every action; replacing the anthropocentric model of productivity with a new way of creating value moves from deep, critical and evolutionary thinking.
The assumptions are realistic and, above all, possible: adaptive doing, oriented toward continuous regeneration of equilibria, establishes a relationship of mutual cooperation between artificial systems and living, sentient beings.
The paradigm of orientation is referable to some experiments illustrated in the text that respond to the following reflections on production and processes, focused on future materials: a prediction of decomposition to dematerialization; from the creation of matter-second from reprocessing waste; from a concept of hybrid biological and technological structures, through mutualistic proliferation and growth; from data that are organized according to purpose and inform matter (informed matter). The possible perspective falls within the logic of corresponding regeneration between natural cycles and artificial cycles and which define their productive and use purposes and intentions.

References

Antonelli, P. (2012). Preview, Vital Design, in Bio Design: Nature, Science, Creativity by William Myers, Thames&Hudson, 2012.

Antonelli P. (2019) Broken Nature. Design takes on human survival, XXII International Exhibition of the Milan Triennale (27/02/2019 - 01/09/2019). https://triennale.org/eventi/broken-nature

Beery, T., Olafsson, A. S., Gentin, S., Maurer, M., Stålhammar, S., Albert, C., Bieling, C., Buijs, A., Fagerholm, N., Garcia-Martin, M., Plieninger, T., Raymond C. M. (2023). Disconnecting from nature: Expanding our understanding of human-nature relations. People and Nature Journal published by John Wiley & Sons Ltd on behalf of the British Ecological Society.

Elhacham, E., Ben-Uri, L., Grozovski, J., Bar-On, Y.M., Milo, R. (2020). Global man-made mass exceeds all living biomass. Nature - vol. 588, pp. 442-444.

Heidegger, M. (2015). Black notebooks, edited by P. Trawny, Bompiani, Milan 2015.

Ito, J. (2016). Design and science. Can design advance science and can science advance design? The Journal of Design and Science (JoDS): MIT Press.

Lagioia, N. (2022) ...nature... Let's learn not to be the masters of the planet. Robinson, 06 August 2022.

Merton, R. K. (1971). The self-fulfilling prophecy, in Social Theory

and Structure, II, Bologna, Il Mulino.
Oxman, N. (2020). Material ecology: Neri Oxman. New York, NY.
Oxman, N. (2016a). The age of entanglement. The Journal of Design and Science (JoDS): MIT Press.
Oxman, N. (2016b). Toward a material ecology. World Economic Forum.
Rutherford, A. (2013). Creation. How science is reinventing life itself. Penguin, London.
Van Gelder, M. (1996). “The strange case of the electronic lover.” In Computerization and controversy, ed: Kling, R. London: Academic Press. In (Ed.)

Figure Captions:

Fig. 01: The Krebs Cycle of Creativity (KCC) is a map describing the perpetuation of creative energy (creative ATP or “CreATP”), analogous to the Krebs Cycle proper. In this analogy, the four modes of human creativity - Science, Engineering, Design and Art - replace the carbon compounds of the Krebs Cycle. Each of the modes (or “compounds”) produces “váluta/currency” by transforming into another. From the essay, Age of Entanglement. Neri Oxman, 2017.
Fig. 02: The masks in Vespers III are habitats for microorganisms and sites for the creation of new life. The third series revolves around death and rebirth, denoting both spiritual incarnation and biological recapitulation. To create the Vespers III masks, novel tools and techniques were developed that enable tight integration between, and control of, designed and biologically derived properties. By combining living and non-living materials using 3D printing and synthetic biology, they are creating new categories of materials, termed Hybrid Living Materials.
Research team: C. Bader, R. S. H. Smith, D. Kolb, S. Sharma, J. Costa, J. C. Weaver. Prof. Neri Oxman. Design Museum, 2018, London, United Kingdom. National Gallery of Victoria, 2018, Melbourne, Australia.
Fig. 03: Next Nature. ‘Sculpting with Air’ explores design through mycelium foam. The raw materials collected for this project comes from agricultural wastes: corn husk and hemp. Under the conditions of high humidity, high carbon dioxide, proper temperatures and airflow running constantly, a foam-like element is formed and can be used as a material. The project provides another way and opportunity to work with living materials by harnessing the growth instead of fitting them into moulds. Lars Dittrich (icw Eveline Peeters and Simon Vandelook). 2022:
Fig. 04: Subframe for Adidas makes PRIMEBLUE project provides story about ending plastic waste.
The challenge will be how we educate the public as to how PRIMEBLUE is solving the problem. That means showing how the material is made, the technology used, and the final product come to life through seamless, well-composed, live action shots and gorgeously crafted visual effects.
“We were working in close collaboration with Bemo Studio to produce CGI concepts, key visuals and animation as well. Through CGI, we’ll tell the important story of the process capture. How we collect the plastic, crush it, wash it, dry, shred, melt and thread it. Since this process has never been seen before, we’ll need to create a visual canvas that clearly illustrates the technology. Think stylized and dynamic shots of a piece of plastic being broken down into its simplest elements then transformed into something else entirely. Additionally, the sequence needs to flow where each step hits on the beat like a well-oiled machine”.