

## Article

# For a Coexistence with the More-Than-Human: Making Biomaterials from a Philosophical Perspective

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**Abstract:** This paper discusses the domain of do-it-yourself (DIY) biomaterials applied to design, by analysing aims, speculative value and aesthetics emerging from this encounter. From a transdisciplinary perspective, the convergence of postanthropocentric philosophies with systematic experiments in two different laboratories, located in Italy and China, demonstrates how design practices can contribute to new forms of human–nature relationships, highlighting a pluriverse way to understand life. Because of the dual approach of philosophical theories and hands-on experiments, biomaterials become tangible tools which change the very idea of “designed objects”: they assign to artefacts circular, living, and integrated properties, thereby placing them within the notion of an ecosystem. Nevertheless, beyond bio-based properties, the three most interesting qualities emerging from this theoretical–practical study are (1) 1:1 scale of production, (2) organic-formless aesthetic, and (3) multispecies coexistence. We argue that through such a model of bioproduction, the designer can assume the role of catalyst for a postanthropocentric vision, dismantling the feeling of separation, alterity, and not-belonging between the human and the nonhuman, between objects and organisms.

**Keywords:** speculative design; DIY biomaterials; coexistence; material culture; formless; aesthetic; postanthropocentrism



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## 1. From the Anthropocene to the Pluriverse Coexistence: Recognizing the Agency of Nature, beyond Human

Landing in the Anthropocene, where our actions are leaving traces on the very rooted fabric of the planet, we are called to the challenge of moving towards a postanthropocentric paradigm. Undoubtedly, this is a philosophical as well as pragmatical challenge, since all of the ontologies, epistemologies, and languages, which sustain current societies, have the notion of “anthropos” at their core. Likewise, design discipline is intrinsically human-centred, acting and developing as a continuous transformation of matter into products and processes, in a steady flow of supply. Design is explicitly materialistic, it extracts from the whole system to produce something that will mainly sustain human well-being; at the essence of such materialism, there is the notion of “natural resources”, a concept belonging to the lexicon of extraction, semantically connected to the idea of exploitation. In postanthropocentric lenses, in a decolonized design discipline, the concept of natural resources will not be recognized nor accepted anymore.

Therefore, what does it mean, the doing and undoing outside of such dominance? How can we reconfigure the notions of “materials” and “resources” not as exclusive objects at human disposal but as subjects of agency and creativity beyond humans? How can we create collaboration with such entities in the same way we would work with a transdisciplinary approach?

By discussing our laboratory experiments and their outcomes, we argue that materials that we use in design may, and ultimately shall not be resources that we exploit. Rather, they actually may become resources themselves, in the reverse process where “undoing human

agency” can leave space for other forms of “doing”, precisely in the scope of pluriversal coexistence. We believe that in order to do this we have to look at nature, perhaps with technological support, yet with a humble focus on learning, before making.

“Design” and “bio” have been crossed in many different ways, from biomimicry approaches to biotechnological studies, experimenting with different ways of looking at life and its transformation. Nevertheless, these approaches do not necessarily challenge the notion of nature as a resource, nor do they push forward a more explicit collaborative paradigm with nature, since they still consider the human side as the pivotal beneficiary of the relationship. The language that we use is often the indication of such anthropocentric bias, their sense of dominance, and yet their limitations: when we discuss biotechnological innovation as the technology able to “grow the future” because “it is spreading into every aspect of our lives—from our materials to our everyday products”, we are perhaps overlooking the fact that nature is, in fact, already “growing the future”, and could potentially manifest (instead of spread), “into every aspect of our lives” [1].

Understandably, the biodesign ecosystem offers great economic and industry opportunities; yet within an anthropocentric paradigm, biomaterials would be one more of the resources to manipulate and exploit. Beyond, or rather, before their benefit in production, we argue that biomaterials represent a unique opportunity of learning the “undoing”: by embodying and manifesting the cycle of life at a scale that we can fully observe and engage with, they bring us in front of a pluriversal way of creation, making, and agency; they may sustain a deeper reconnection with the idea of life itself. Biomaterials bring us close to observing and practising the transformation of matter whose focus and measurement is beyond human systems: cycles, connections, decay, biochemical alliances, in microscopical complexity and macroscopical diversity. Leaving behind the idea of materials as resources in favour of the notion of materials as agents opens the possibility of more-than-human coexistence, if not collaboration.

The value of such materials that we create in the laboratory, and the impact of discussing their making, is, therefore, not in their final utilisation within existing industrial processes: it is a value intrinsic to the transformation of the materials and their capacity to manifest in different, unpredictable, incomplete, intermediate, and formless shapes.

The notion of “intrinsic value” is not new, and it is fundamental in ecological epistemology. In fact, it is the first of the eight principles that constitute Deep Ecology, an environmental philosophy built around the convergence of ecological science and ecological wisdom. The principle mentions “inherent value”. The well-being and flourishing of human and nonhuman life on Earth have value in themselves (synonyms: intrinsic value, inherent value). These values are independent of the usefulness of the nonhuman world for human purposes” [2]. Through these lenses, (bio)material experimentation and speculations are interesting because they are reproductive, they bring us back to a relationship with life; when observing the materials, you grow the laboratory; researchers become learners of the modes and details of how life processes emerge [3].

In this paper, we discuss these concepts, starting from practical and preliminary more-than-human encounters of our materials experiments. The process of growth, transformation, mutation, and unpredictable manifestation calls our design sensitivity to frame and focus on a different kind of formless aesthetic, and perhaps because it continues, an alternative to planning, organic in its deeper nature, perhaps a form of ecological aesthetic.

## 2. Making Biodesign from a Philosophical Perspective

Our biomaterials experiments and their discussion situate in the creation of fashion and design-oriented artefacts in a transdisciplinary vision that brings together heterogeneous scientific competencies. The research investigates the affirmation of a practice-based awareness that combines biohacking techniques, speculative design [4], and environmental awareness.

Along with the expansion of biodesign processes and entering the laboratory for material investigation, design culture is hybridised with heterogeneous sectors such as

chemistry, the physics of materials, and natural sciences in general. Accepting the multiple entanglements of knowledge [5], the seed of a deeper purpose of contemporary design culture is hidden: it reveals the indissoluble interdependence between human beings and other, nonhuman existences [6].

Since 2000, with the increase in projects and biodesign exhibitions (Antonelli, Myers, Brayer, and Ginsberg), the productive design paradigm has deeply shifted towards a new horizon of circular manufacturing and living. The current research scenario, at the edge between biology and design [7,8], imagines and experiments with new interactions with the concept of life, in its processes of cyclical genesis, according to the renovated perspective of postanthropocentrism [9,10]. It is no coincidence that the urgency of a different approach to the consumption and disposal of resources reveals how this orientation can be an exciting impulse for the design sectors.

Triggered by the phenomena of the Anthropocene, climate change, and the sixth extinction, the global value system has now ultimately shifted the centre of gravity from humans to the entire planet. In a coevolutionary perspective and in the wake of the claim that “There is no Planet B,” the postanthropocentric orientation expresses an antihierarchical and holistic conception through the total fusion of humans with nature and their coexistence with other living kingdoms [11].

In this perspective, the processes described in the essay—experimented through the collaboration between the two laboratories *Officina Vanvitelli* in Caserta and *FabLab Shanghai* at Tongji University—are intended as a trigger for divergent thinking and assume the capacity, through their narratives, to act in reality by raising the awareness of new behaviours and human–world interactions. In this framework, the samples developed during the experiments aim to create active short circuits to change how the designer can manipulate and construct its objects.

From a methodological point of view, the collaboration between the two laboratories began in 2020, as evidenced in the essay *Pluriverse Skins* which focuses on the ecological circularity and a multiverse “skin” concept. In the conclusions of this research phase, it is stated, “The next step of the research is to visualise all the bio skins realised, focusing more on their speculative and aesthetic interconnection. The idea is to verify the sensory interactions that these physical results can produce and the reflections they can trigger” [12].

This paper addresses this more operative second part, documenting the research conducted between 2020 and 2021 through the staging of two exhibitions in Shanghai and Caserta, together with the fielded workshop experiences. In addition, this second phase delves into the philosophical value of making biomaterials, arriving to identify three postanthropocentric qualities related to these experimental laboratory practices.

By restoring equal importance to the human being as well as to other living organisms, the contribution points out a potential awareness, in an attempt to implement a design culture more adherent to this “mixture” [13]. “Instead of revealing itself as a space of competition and mutual exclusion, the world opens up as a metaphysical space of the most radical form of mixing, ( . . . ) an alchemical laboratory in which everything seems to be able to change nature, to pass from the organic to the inorganic and vice versa” [14].

Therefore, the set of research proposes a working model based on direct experience in the laboratory—a path of growth–observation–learning, in the consolidation of the relationship between mankind–nature–matter and the systemic reciprocity between the human and the nonhuman.

An extraordinary opportunity emerges, indeed, from the dual exploration of theoretical framework and workshops, in the awareness that the designer must learn to manage both speculative and practical processes in order to reintroduce them into society. Concerning the materials perceptions, as Rebecca Lewin notes, in an era of climatic and social instability, it is crucial to understand that “I can perceive my laptop as a group of minerals extracted from the underground, the wooden table on which it sits as a branch of a tree, the jumper I wear as the fleece of a sheep, or the plastic soles of my shoes as oil extracted from the bottom of the sea. I begin to conceive of my existence as the connection of an

infinity of natural resources from all over the world” [15]. With this idea of nonseparation, i.e., of nonotherness, but instead of the complex belonging between the human and the nonhuman, the design culture must try to confront and react.

In this direction, the experimentation envisaged biomanufacturing processes and narratives through the use of microorganisms, such as bacteria, organic materials, technologies, and laboratory instrumentation adhering to very high levels of biodegradability and interpenetration in the matter.

To the question of how to take care of a world where beings other than humans live in close interdependence with one another, the answer lies first and foremost in design’s ability to establish a different attitude towards things, animate and otherwise. Beyond the traditional idea of progress as a productive and consumerist acceleration aimed at well-being linked to a dimension of possession–consumption–rejection, design can and must propose an alternative way [16]. It is also a question of thinking about the product as organic, living because everything is made up of nature. It involves thinking of objects and materials as circular in their primary state, in that they are meant to reintegrate into their original context and change again, respecting the ecosystems from which they came.

“A poet’s eye cannot fail to notice that there is a cloud in this sheet of paper. Without the cloud, there is no rain; without rain, trees do not grow; without trees, paper cannot be made. The cloud is indispensable to the existence of paper. Therefore, we can say that the cloud and the paper interrelate. [...] If we look deeper, we will also see sunlight on the sheet of paper. Without sunlight, forests do not grow. Nothing grows without sunlight. That is why the sun shines on this sheet of paper. The paper and the sun interact. Let us keep looking. [...] If we go deeper, we will see that we are also in the paper” [17].

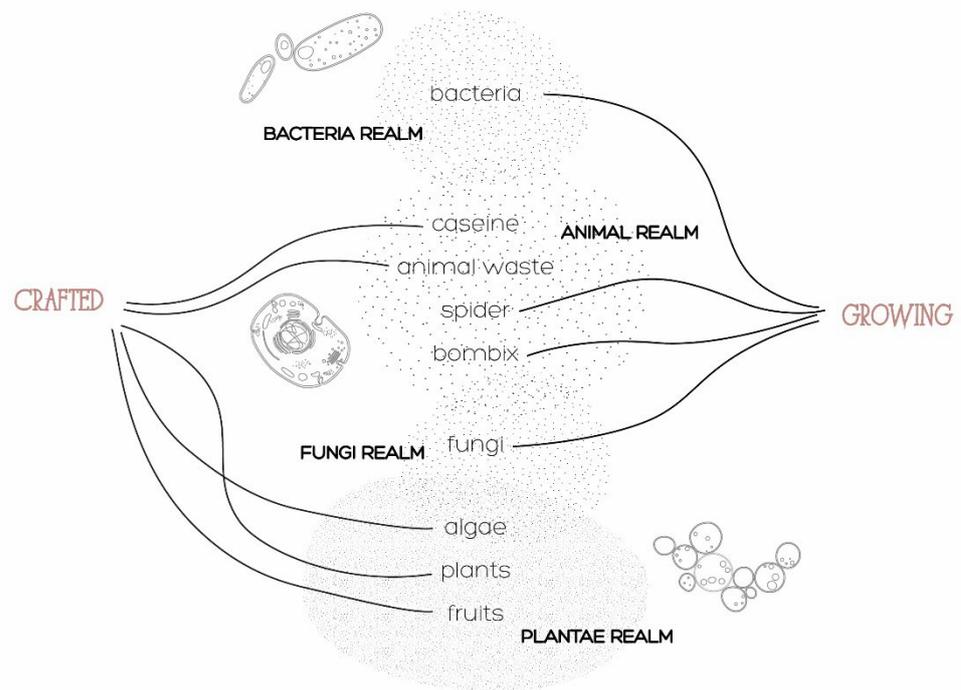
As Thich Nhat Hanh states, being means interbeing, that is, being in the world and immersing oneself in a sensitive dimension, manipulating and deconstructing matter with consciousness. So, designing in such a complex contemporaneity means acquiring this awareness deeply, feeling that we cannot be alone, alone, but interbeing with everything else.

From a deep ecological perspective, [18] this research aims to experiment with cooperative practices with living and organic matter by creating material samples that can be used for different applications and sectors of design. In this framework, nature is no longer an object but a subject, while the project embraces an entangled coexistence, conscious and informed. In this sense, the investigation of bio-based materials can offer a profoundly symbiotic point of view between us and the rest of the world.

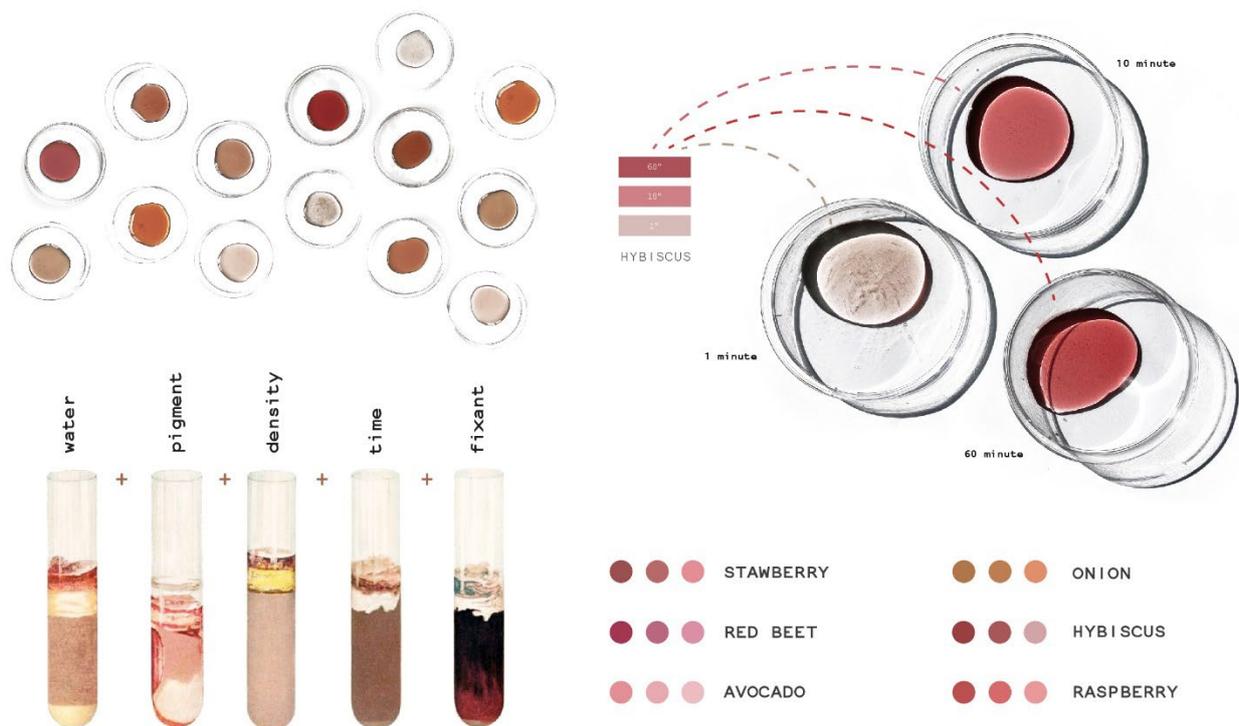
### 3. Entangled Biomaterials

We come to discuss the practice in the form of a long-distance collaboration of two university laboratories (in China and Italy) that operated according to similar biohacking processes. In line with the aforementioned theories, the experiments arose from observing specific evolutionary parameters of nature, such as growth, adaptation, metabolism, and self-repair, adopted as functional logic within new biomaterials production. The intention of these two remote lab experiences has been the juxtaposition of several biomaterials belonging to different realms, as a sensitive sampling for the pluriverse coexistence between all species, at human and more-than-human scales.

We articulated our material exploration in two phases: the first one reflecting on the creation of new materials (Figures 1 and 2), and the second one with the implementation of object-driven uses of new materials (Figures 3 and 4). In the first applied phase, the researchers experimented with three kinds of DIY biomaterials: algae-derived biomaterial (Plantae realm), food waste-derived biomaterial (Animalia realm), and bacteria-derived biomaterial (Bacteria realm). Starting from a preliminary knowledge of biohacking practices [19], the laboratory experiences have processed, in different ways, these three substances to create similar in-depth and colour bioskins.



**Figure 1.** Study graph of biomaterials studied and divided through realms and methodologies of making. From the *Postdigital Manufacturing Processes Research Project*.



**Figure 2.** Light pink palette study to dye biomaterials: shades intensity and main parameters from flowers and fruits. From the *Postdigital Manufacturing Processes Research Project*.



Crafting is then mainly an action belonging to human fabrication and concerns a sequence of hand-made actions in the mixing of the components involved in the process (Figure 1).

In all these processes, we have dried the obtained membranes with the help of the sun, or sometimes, depending on the kind of substance, with ovens regulated at a constant but low temperature. Some bioskins have taken hours to harden. Others, according to the water quantity contained in the recipe proportion, have taken days. In each trial, we tried to maintain a depth of 0.5 cm of matter, to be able to intersect and connect them in a logical and orderly display. At the end of this phase, we treated the different substrates with specific agents, such as bio-oils, beeswax, and ethanol, to realise membranes of similar consistency and pliability. All of the membranes resulting from the manipulation, if later optimised, could be used in design and fashion products, as packaging, objects, and wearables, according to their affordance, durability, and performance.

During the manufacturing process, to emphasise the postanthropocentric reflection, we decided to use a single pink palette as a metaphorical sample of the human skin. For this reason, we tested with many natural pigments derived from fruits and flowers capable of rendering different shades of pink.

Among them, we dyed with strawberries, raspberries, onions, hibiscus, avocados, and red beets, to find interesting and innovative shades of pigment. For each natural substance, we used the same procedure, adjusting these four factors differently: the amount of water (mL), the amount of pigment (density), the amount of time (minutes), and the addition of a fixative. From these tests, we created different tints and used them, depending on their degree of conformity, as a kind of palette for the bioskins we simultaneously constructed. Their combinations generated results that were as unexpected as they were unusual, due to the beauty of the shades generated, the result of a unique, bio-based interaction (Figure 2).

In the second phase of the exploration, we moved to consider how biomaterials can evolve and transform into bio-objects, and how to define the design context in which such objects can be used. The instrument of speculative design can be utilised in a rich way to imagine how such materials can populate and transform our material landscape, from the objects of personal use to those that compose and fabricate our public places. At the current stage of research, we present two speculative scenarios that we use to deconstruct the human–plant–animal ecology, looking at the very notion of contact and tactile experience (first case) and spatial interaction of the city (second case).

In the first case, we speculate on the skin as the first barrier of life for the body of humans as well as any other living creatures, to protect from attacks or unfavourable conditions. In the more-than-human relationship, there are divergent understandings and uses for “skins”: in winter, people use mink coats or rabbit fur hats to keep warm, transforming this protective skin into a resource for themselves. On the other hand, people consume the bodies and fruits of plants, and their outer skins mostly end up in landfill. In fact, the outer skins of plants, which are usually discarded, also have properties that are overlooked. In the project *Skin of Nature*, students re-discover the self-protection mechanism of the biological epidermis to fabricate future wearable materials, thus reducing the use of animal leather. The project reconfigures plant skins as a surface material for wearable products, using the material itself to achieve a self-protective effect. Combined with plant-based glues and environmentally friendly preservatives to treat plant materials to resist decay, these skins preserve their original form and properties (Figure 3).

Figure 3 is a snapshot of the material library that students created utilising 15 different plant-based bodies and transforming them into wearable concepts where the boundaries of human skin extend to embody and make visible the protective qualities of more-than-human skins. By using palm, pineapple, cucumber, and structural bark as the main ingredients, students re-discovered their intrinsic value: the naturally hydrophobic fibres of the palm bark’s midsection allow for flipper gloves that enhance swimming speed in water; thick pineapple bark makes facial jewellery that protects the cheekbones while keeping them moist and breathable through small holes on the inside; and the spines on the cucumber’s skin keep insects and bacteria at bay (Figure 4).

The *Skin of Nature* (Skin of Nature, designed by Wei Qianjie, Yang Yanbin, Zhang Jinwen. A complete description of the project is available at our research lab website <https://ecology.shanghai-visual.org/web/skin-of-nature/> (accessed on 8 March 2023)) has led to a rethinking of the relationship between humans and nature. Instead of through industrial manufacturing, people are learning from nature by recycling and planting to create wearable products. In the future, the byproducts of planting could be further processed, while retaining their epidermal biological characteristics, to become biological materials as a second skin for humans, reducing the use of animal leather and thus reducing environmental pollution and harm to animals. The second scenario looks instead at the built environment in the city [20]. Whilst the *Skin of Nature* creates tactile hybrids, the project named *Unintentional Urban Mutualism* (UUM) (designed by Lu Wentao, Wu Yichen, Liu Yingxuan) speculates on the possibility of urban infrastructures that support multispecies city dwellers. Many natural elements we encounter in urban areas are maintained, influenced, and manipulated by humans, such as plants in our pots, green areas along roads, and pets we keep in our homes. Meanwhile, there is much different urban nature, like sprouts out of cracks, moss in corners, birds in holes, insects in books, shadows on concrete objects, falling away from human intentionality, yet falling short of their control; these urban natural elements are not manipulated, and they appear surprising, vibrant, and uniquely natural. They convey the presence of nature all around us, spilling over the protocols of our interventions and the regulations of the built environment of cities. What if this mutuality would be a principle to build unintentional multispecies interaction? The scenario speculates that an 18th Sustainable Development Goal (SDG) of UUM would protect these forms of urban nature, would support citizens in acts of noticing and appreciation, and would be considered a cornerstone element of urban fabric. SDGs are moved forward by targets, and UUM has them as well, for example, to support urban plants spreading farther and prospering unintentionally. Within UUM framework, the *SEEDIDAS* project (Figure 5) pioneers blended seeds from urban plants into a bioplastic made of agar and then moulded into shoe soles. In daily use, seeds in the soles will drop off randomly as the soles gradually wear off. The bioplastic will decompose in a few days and the seeds will sprout and prosper.



**Figure 5.** SEEDIDAS shoes which implement the UUM SDG target: stimulating plant reproduction in urban cracks.

The second target speculates on an environment built using waste products instead of creating waste as a byproduct. *LeftoVersace* (Figure 6) uses wet waste in cities to make decoration tiles for building surfaces. The tiles will allow continuous changes in the urban landscape. They provide food for birds and insects, which creates a more subtle and mutually beneficial environment for urban animals, and they also add a circular value to wet waste, finding a better life before landfill.



**Figure 6.** *LeftoVersace* tiles implement UUM SDG target: the circularity of wet waste.

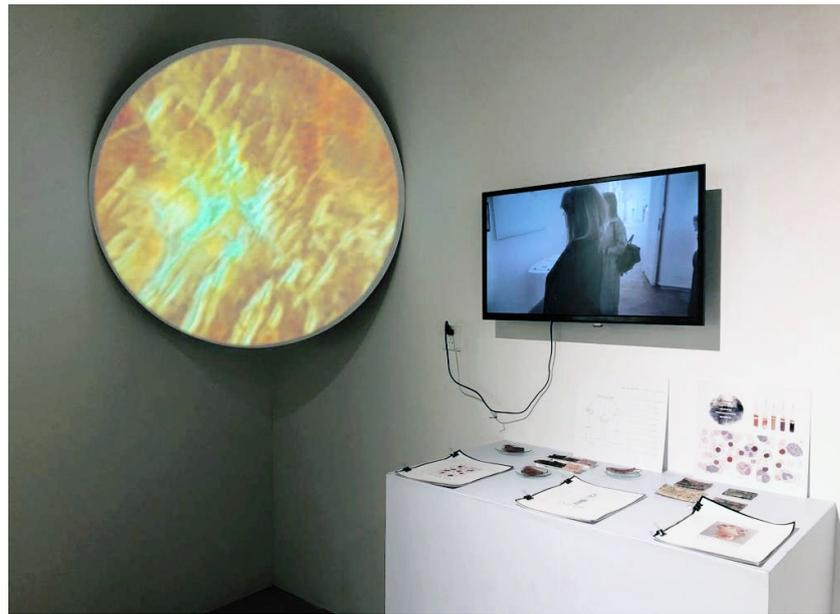
#### 4. The Postanthropocentric Qualities of Biomaterials

In light of the different experimentations conducted, the last part of the research shows how a bio-based approach to materials can encourage a deep ecological approach to manufacturing and consumption within a postanthropocentric theoretical framework. From this perspective, the investigation seeks to define how biodesign culture can impact the production, aesthetics and perceptions of design objects—what may be the future trajectories in the ever-closer interconnection between humans and more-than-humans [21]. What may be the role of biomaterials in raising awareness of this coexistence? What do the processes of direct interaction with matter, through mixing, growth and manipulation reveal to us?

To reply to these plural questions, the research team set up two parallel exhibitions—in Caserta and Shanghai (Figure 7)—to show these physical sampling, videos, reflections and map results.



**Figure 7.** *Cont.*



**Figure 7.** Part of the research was set up in two exhibitions in the Officina Vanvitelli at the Monumental Complex of San Leucio in Caserta, Italy, and at the Tongji Design Week 2021, organised by the College of Design and Innovation in Shanghai, China. Concerning the exhibition in the Officina Vanvitelli, a short video of the project is available at this link: <https://youtu.be/Nxi3nayFieU> (accessed on 8 March 2023).

Three significant qualities emerging from the two exhibitions define this theoretical–practical experience. In summary, they highlight:

- A 1:1 production;
- An organic and formless aesthetic;
- A multispecies coexistence.

#### 4.1. A 1:1 Production

In these experiences, in the two laboratory exhibitions, according to a criterion of co-creation between plural subjects, the biomaterials realised are conceived on the level of cultivation and cooperative creation rather than homologated reproducibility. The operative character emerging from these processes is not pure standardised repetition but is a work of continuous co-creation that generates, thanks to the uniqueness of the biological element, outputs that are always unpredictable and singular. The use of bacteria, substances derived from algae or animal waste, mixed with different kinds of agents and pigments, offers a very diverse sample of biomaterials that is difficult to reproduce on a large scale. The heterogeneity of the samples should not be seen as a defect but as an indicator of nature’s work.

Biomaterials, moreover, overcome the conflict between an old concept of object permanence—often unreasonable—and the continuous metamorphosis of the material through a design, which is understood as an agent capable of exploring precisely this temporal property to its advantage. Distancing themselves from an image of perfection and asepticity, the biomaterials generated by DIY practices follow the logic of the unpredictable, and the imperfect, according to a collaborative approach of co-creation with the natural substances and organisms employed.

The emotional dimension that characterises manual experimentation contains new sensitive qualities that are useful for a closer understanding of the closeness between the human and nonhuman worlds. In order to activate these dynamics, with the contribution of some biologists, we have tried to understand the processes from within, experimenting with substances in person, studying formulations and testing variants.

The adoption of biomaterials in design productions implies a radical shift from the manufacturing of identical and standardised materials—clearly exemplified by the previous industrial paradigm—to the biomanufacturing of singular materials, according to a renewed 1:1 relationship between human and object (1 human:1 singular object). The principle of uniqueness that emerges expresses the obvious result of a constructive dynamic resulting from workflows and irreplicable parameters. “Objects and organisms have never been so close, as they are elaborated through similar processes and a new paradigm of reproducibility more akin to nature and its regenerative modes” [22].

#### 4.2. An Organic-Formless Aesthetic

Far from a cold material technicality, DIY biomaterials convey a fascinating sensorial dimension, strengthening the aesthetic category of the organic–informal. This category has its roots in the definition–manifesto that Bataille first wrote in the programmatic entry in the appendix *Dictionnaire Critique* of the second issue of the journal ‘*Documents*’ in 1929. It is a universe that cannot be reduced to a precise form, ‘like a spit, a spider, or a worm’ [23]. Later, Paul Valéry better described the complexity of this perception seemingly devoid of logical construction, as indefinite and open to all possibilities [24], and then this category was investigated by art historians as a critical and interpretive tool of contemporaneity [25,26].

In a subversive way, the aesthetics of the organic–informal replace a reassuring image of the design and indicate a multiverse perspective from which to undo and redo the world. It recovers other senses such as the sense of smell—very present within these practices—and overcomes the supremacy of the eye, which denies the tactility of matter. At the antipodes of a classical ideal of perfection, the aesthetic of biomaterials is punctuated, blurred, imperfect, antihierarchical, opaque, indefinite, and unpredictable. In this sense, it destabilises the viewer, stimulating curiosity and introspective thinking [27].

The formless, the organic, the living, the mutable, and the decadent are interdependent: they are parameters resonating with the living matter of a continuous circular process, destined to exhaust itself and regenerate under new forms.

The experiments conducted at both laboratories lead to opaque and rarefied textures, indefinite patterns, and soft colours similar to those of human flesh and natural organisms: they are the mirror of a postanthropocentric design that penetrates beyond the surface of the products to brutally denounce the now undisputed urgency to change perspective.

#### 4.3. A Multispecies Coexistence

The direct manipulation of biomaterials—in the exploration of their symbolic suggestions—can provide a way of approaching a more-than-human nature and its multifaceted complexities. Biohacking experiences such as these highlight the urgency of postanthropocentric productive thinking that blurs the division between the living/natural/subject and the nonliving/artificial/object. These experiences represent, for the matter, new possibilities for the philosophical questioning of living coexistence, against an assumed superiority of the “*Homo sapiens*” species.

The juxtaposition of biomaterials and the two parallel exhibitions show how, in these productions, there is no unambiguous boundary of subjective bodies (animals, plants, bacteria), but multiple connections between substances. The materials often move through continuous metamorphic transitions, changing their appearance day by day, sometimes hour by hour. These qualities are also speculative and exceed the only functional potential.

In a sensitive dimension where multiple kingdoms coexist, these samples act as instruments for an unexpected dialogue: a boundary that establishes an experience of multispecies belonging. It is a matter of “generating kinship—making kinship—and exercising one’s care for the other (...). These are processes that broaden the imagination and can change history. (...) Expanding and redefining kinship is a process legitimised by the fact that all creatures on Earth are related in the deepest sense of the term, and that we should have long since begun to care more for creatures, related as assemblages, and not for species one at a time” [14].

## 5. Conclusions

Through a series of experimental procedures and theoretical frameworks, the contribution highlights how the topics of “pluriverse coexistence” and “postanthropocentrism” can be two crucial concepts in the development of a sustainable and circular design culture. This paper identifies these two directions as crucial for the near future of design, identifying the manipulation of biomaterials as a pioneering tool for approaching such awareness.

This paper demonstrates that a *deep ecological approach* can be established, first and foremost, on an existential and introspective level. Timothy Morton calls it “a virus that infects all other areas of thought. It has to do with capitalism and what might exist after capitalism. It has to do with pleasure, beauty, ugliness, disgust, irony, and pain. It has to do with society. It has to do with coexistence” [6].

This is a provocative and disruptive vision, but one that at the same time proposes design as a responsible and active agent for taking on new behaviours and ways of living and looking at materials. Through the two physical exhibitions, the research has finally strived to disseminate such insights into matter and multispecies material coexistence, grafting new awareness and questions.

The ecological and social future that design envisions must start from the “life we live individually” [28]. An ecological life is already feasible now, in the acceptance of being connected to the whole, to the pluriverse, and not presuming our superiority over other life forms. The distance between our idea of the future and present exists only because of the lack of confidence in the immediate potential of our ecological actions. There are multiple ways of living and producing in the world. Many of them have not yet been explored.

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