

ANCESTRALITY AS A MEANS TO LOOK FORWARD: THE PRESENCE OF INDIGENOUS KNOWLEDGE IN FOUR LATIN- AMERICAN BIODESIGN PROJECTS.

Andrea Bandoni^{*a}, Maria Cecília Loschiavo dos Santos^b

a Universidade de Lisboa, Faculdade de Belas-Artes, Portugal

b Universidade de São Paulo, Faculdade de Arquitetura e Urbanismo, Brazil

* andrea@edu.ulisboa.pt

DOI: 10.63442/SQWC7937

**KEYWORDS | BIODESIGN, BIOMATERIALS, LATIN-AMERICAN DESIGN, INDIGENOUS KNOWLEDGE,
ECOLOGICAL PRACTICES**

ABSTRACT | The contemporary design discourse has witnessed a heightened usage of the terms “vernacular,” “bioregional” and “ancestral”, particularly against the backdrop of the prevailing climate crisis. Traditional knowledge of materials and techniques have been referred to as those capable of illuminating the future and frequently serves as a starting point for Biodesign, an emerging design approach that often commits to ecological practices. However, despite being a growing trend, there is a lack of well-documented case-studies that clearly connect contemporary design practices to ancient knowledge. Within this milieu, Latin-American design has recently arisen prominently, benefiting from the region’s abundant biodiversity and the indigenous presence. This study delves into the examination of four projects related to bio-products or biomaterials design undertaken in Latin America by different designers in the last five years, each employing indigenous ancient knowledge – clearly mentioned by the designers, in three different countries. As a result, we present clear evidence on contemporary design projects that incorporate indigenous knowledge as a pivotal reference point, spanning regenerative practices, biotechniques development, and biodiversity preservation. The subsequent discussion and conclusion show that, even though it is not always the first intention of their work, these designers have been amplifying the voices of relegated groups, inviting us to engage in intercultural dialogue and review the design field (Santos, 2008). We also identify a design trend wherein designers, in their pursuit of ecological practices related to Biodesign and Biomaterials, recognize traditional knowledge as a legitimate and invaluable source for contemporary design endeavors.

1. Introduction

1.1 Local and Traditional Knowledge's Relationship to Biodesign

The worsening of the climate crisis at the start of the new millennium has prompted designers to explore novel avenues. One discernible trend in recent years is the growing interest in local and traditional knowledge, evident in design-related exhibitions, events, and publications. In the global North, still considered the design mainstream and the birthplace of the discipline following the Industrial Revolution, three noteworthy examples underscore this thematic shift:

1. “Bioregional Design Practices” is the title of a 2023 book showcasing the endeavors of Atelier Luma, a French initiative established in 2016 and led by design curator Jan Boelen, supported by Foundation Luma in Arles. Boelen mentions that the practice started by mapping the surrounding territory of Arles and identifying local resources for contributing to social and environmental improvement. The term “bioregional,” elucidated in a footnote, draws from John Thackara's definition emphasizing natural rather than political or economic boundaries (Atelier Luma, 2023, p.22). Atelier Luma's projects, featuring circular design and biomaterials like natural dyes, salt, sunflower panels, and algae-based objects, have gathered attention in major European design exhibitions. The book organizes these projects into four phases: finding, connecting, engaging, and sharing. During the “finding” phase, designers actively seek various resources, including agricultural byproducts and artisanal skill sets passed down over generations, highlighting the high value placed on traditional knowledge (p.27).
2. “Super-Vernaculars” was the name of the 27th Biennial of Design in Ljubljana, 2022. The curator Jane Withers explains that the term “vernacular” in design denotes practices based on local traditions, materials and ecological knowledge—representing structures deeply rooted in local culture, terrain, and climate (Withers, 2022, p.12). While acknowledging the past, the Biennial's exhibition aimed not to evoke nostalgia but to inquire about lessons from history for shaping a more sustainable future and seeking inspiration for innovation (p.13). The exhibition catalogue showcases design projects intimately connected to their respective territories and populations, with some projects explicitly recognizing their reliance on Indigenous knowledge.
3. “Lo-TEK: Design by Radical Indigenism,” a 2019 publication by Julia Watson, amplifies this interest by bringing together indigenous examples of architecture and landscape design. Watson's objective is to demonstrate how societies labelled as primitive possess knowledge embedded in shaping our future (Watson, 2019, p.27). Traditional Ecological Knowledge (TEK) is elucidated as a cumulative repository of multigenerational knowledge, practices, and beliefs, inherently sustainable and responsive to environmental extremes (p.21).

A closer examination of the content within the aforementioned books and exhibition reveals proximity to the design approaches of Biodesign or Biomaterials, both emerging design practices with a central ecological concern. Biodesign is commonly defined as a strategic approach that incorporates nature or living entities in its processes to generate alternative sustainable materials or products (Camere & Karana, 2018; Collet, 2017; Karana et al., 2020; Myers, 2018). This sets it apart from Biomimicry, a well-known approach proposed by Benyus (1997), where designs emulate biological forms, processes, patterns, and systems through analogy (Kennedy, 2017).

In the realm of Biodesign, the predominant justification for the utilization of living organisms is to create material artifacts with a minimal ecological impact, while creating novel material expressions and functions (Karana et al., 2020). Myers (2018) posits that initiatives in Biodesign signify “an overdue shift in social priorities towards sustainable approaches to building and manufacturing” (p.8). He further asserts that through the harnessing of biological processes, Biodesign projects hold promise in replacing industrial methodologies while demanding fewer resources of both materials and energy. Aligned with Myers' viewpoint, numerous authors argue that Biodesign marks the start of a new frontier or signifies a paradigmatic shift within the domain of Design (Esat and Ahmed-Kristensen, 2018; Karana, 2020; Mironov et al., 2009).

Some scholars extend the boundaries of Biodesign to include properties of formerly living organic elements (Esat & Ahmed-Kristensen, 2018; Mironov et al., 2009), incorporating Biomaterials into Biodesign practices. Ginsberg and Chieza (2018) define Biodesign as the practice of Design that operates concerning Biology, encompassing three fundamental modes: “of,” “with” and “from” Biology. They also note that, despite its contemporary veneer, Biodesign is rooted in traditional practices such as the refinement of organisms through selective processes, as exemplified in agriculture and animal husbandry.

In line with this comprehensive definition, the example of “The Living Root Bridges of the Khasis, India” showcased in the book “Lo-TEK” (Figure 1), featuring a bridge made from the surrounding tree's roots that withstands monsoonal rains, serves as a clear manifestation of Biodesign. Despite taking centuries to develop and not conforming to a typical Western design project, this example integrates local trees, highlighting the interconnectedness between traditional practices and the recent Biodesign trend. Another pertinent example is the project “Bananatex,” developed by Swiss designers in 2018 and exhibited at “Super-Vernaculars.” The canvas-like textile made from abaca fibers serves as an alternative to polyester: “One of the strongest of all-natural plant-fibers, they have been used to make textiles in the Philippines for hundreds of years. The Portuguese explorer Ferdinand Magellan recorded the use of abaca to make textiles when he visited the Philippines in 1521.” (Withers, 2022). These instances underscore the interplay between traditional practices within the design domain and the contemporary Biodesign trend, often associated with Biotechnology and innovation, with little acknowledgment of these venerable and significant roots.



Figure 1. The Living Root Bridges of the Khasis, India. Source: Watson, 2019.

1.2 The Latin-American Approach: Ancestrality

The current Design community's interest in local and traditional knowledge is a global phenomenon, extending beyond the confines of the global North¹. Notably, Latin-American designers stand out in this trend, benefiting of the region's abundant biodiversity and the resilience of indigenous peoples, whose profound connection to nature is increasingly considered advantageous from an ecological perspective, steering new directions in Design and related disciplines. Several noteworthy events and publications across different Latin-American countries underscore the prominence of this thematic shift in the region:

1. The “What Design Can Do Mexico” event in 2023 dedicated a segment of its program to discussions on “Ancestral Knowledge and Heritage.” Speakers included Gabriel Calvillo, co-founder of Refugio, focused on design as a tool for native pollinator conservation; Rosa Hanhausen, curator of the exhibition 'Replicating Resistance: Landscape Revolutions,' based on research she conducted on the impact of maize on urbanization in Mexico; and Gerardo (Jerry) Osio, co-founder of Tierra de Saberes, a project that investigates, documents, and disseminates traditional knowledge in northeastern Mexico (What Design Can Do, 2023).
2. The magazine “Piseagrama,” established in 2010 in Brazil with a focus on public space discussions, has increasingly featured indigenous-related or, more recently, indigenous-authored texts. In 2022 and 2023, the platform launched books such as “Vozes indígenas na Saúde” (Indigenous Voices in Healthcare), “Saberes dos Matos Pataxó” (Knowledge of the Pataxó Forests), and “Terra: Antologia afro-indígena” (Earth: Afro-indigenous Anthology), aiming to provide direct access to the ideas of underrepresented groups and envisioning possible futures in alliance with various resistance collectives (Piseagrama, 2024).
3. The Latin-American Biodesign and Biomaterials meeting “Biopolimérica 2023” in Valdivia, Chile, organized by LABVA (Laboratorio de Biomateriales de Valdivia), emphasized the selection of projects based on the use of local biological raw materials and regional identity. The catalogue of the event describes Latin America as “a territory as diverse and abundant as it is exploited” and mention a growing articulation that positions Latin America as a reference for new and diverse material possibilities from the understanding of its own territory. The event proposed a space for understanding, recognizing and reflecting on this movement, as well as the opportunity to express from the material, sensory, personal and territorial aspects what characterizes and differentiates this community (Besoain et al., 2024).
4. In 2023, Brazil received the award for the best National Participation at the Venice Architecture Biennale with the pavilion “Terra” (Earth). Curators Gabriela de Matos and Paulo Tavares sought to reevaluate the past to design possible futures, spotlighting Afro-Brazilian and Indigenous communities often overlooked by architectural mainstreams (Angelopoulou, 2023). The pavilion, filled with earth, symbolized both memory and future, urging a reconsideration of architecture in the face of contemporary urban, territorial, and environmental challenges.

¹ The Australian Design Centre, for example, mentions clearly their engagement with First Nations in their website and how it relates to the practices of the museum. Source: <https://australiandesigncentre.com/latestnews/celebrating-first-nations-engagement-at-adc/>.

In the Latin American context, unlike the global North, it is common to reference “ancestral” knowledge and employ the term “heritage” when discussing local and traditional knowledge. Labva designers observe that in Latin-America, biomaterials practices, while acknowledging the influence of the global North, primarily focus on the link with the origin—territorial and cultural—of materials and their potential in terms of biodegradability and compostability (Weiss & Besoain, 2022).

Arturo Escobar, in the book “Design for the Pluriverse,” underscores that ancestral knowledge, while rooted in a community's history and long-term practices, does not imply an inflexible attachment to the past. Instead, it represents a “living memory directly connected to the ability to envision a different future” (Escobar, 2018). Indigenous philosopher Ailton Krenak explains that ancestral peoples, retaining a spiritual connection to nature, learn through rituals to “get back to the root of existence,” where they transcend individual identity, experience other forms of life, traverse the future and past, and return to the present. Ancestral memories, according to Krenak, originate from ancient ancestors, and rituals serve to revive these memories (Krenak, 2023, p.37).

2. Methods

Although ancestrality is frequently mentioned in biodesigners' and specialized media texts as a “component” of many recent product design-related projects, the explicit integration of traditional knowledge is often challenging to discern, and comprehensive studies on this topic are lacking. In light of this, and with a focus on Latin-American examples, the primary inquiry of this study revolves around the question: how exactly these Biodesign projects incorporate ancestral indigenous knowledge?

This research was conducted between October 2023 and January 2024. Following a review of the events and exhibitions highlighted in the introduction section and an examination of key terms that motivated this study (traditional, vernacular, ancestral), we compiled an extensive list of projects that could serve as examples of the integration of Biodesign and ancestral knowledge. The projects of this first list were sourced from various outlets, including relevant publications (when accessible), events' catalogues or press releases (Biopolimérica 2023 and What Design can Do México), the designers' official websites and Instagram accounts, and texts

from reputable online specialized media (such as websites like Dezeen, Designboom, Wallpaper, Domusweb, and Frameweb). The criteria for inclusion in this list were the project's origin in Latin America and the presence of specific keywords in the project description, such as “ancestral,” “heritage,” “indigenous,” “traditional,” “historical,” as well as terms related to Biodesign and Biomaterials.

The refinement of this list, which led to the selection of the case-study projects (Table 1), involved using selection criteria that explicitly mentioned, in the project description texts provided by the authors, the utilization of indigenous ancestral knowledge, ensuring it was a deliberate design decision. A second criterion was to ascertain whether the specific knowledge could be identified for subsequent analysis. This was only possible when scrutinizing the designer's texts. This meticulous approach was necessary due to the observation that many projects vaguely reference the use of “ancestral references,” making it challenging to discern the precise ancestral component, such as a material, technique, or specific use of an object. Additionally, the selection process aimed to encompass a variety of Latin American countries and approaches, resulting in the identification of four case studies, one of which was developed by the primary author.

Table 1. Case studies selected.

Project	Designer(s)	Year	Country
Totomoxtle	Fernando Laposse	2017	Mexico
Maqui Biotextile	Labva	2021	Chile
Cuia Colab	Andrea Bandoni	2022	Brazil
Carmín	Edith Medina	2022	Mexico

This study delves into the examination of four projects centered around the design of bio-products or biomaterials. These projects explicitly draw upon indigenous ancient knowledge and have been executed by different designers in three distinct Latin American countries over the past seven years. The main objective is to provide concrete evidence of contemporary Biodesign endeavors that integrate indigenous knowledge as a pivotal reference point, offering an analysis of their processes and outcomes whenever feasible. In the case of one of the projects developed by the authors, critical reflection also played a pivotal role in the analysis, contributing to a comprehensive examination of the integration of indigenous ancient knowledge within the design process.

3. Case-Studies: Indigenous Knowledge Applied to Design in Latin America

This section encapsulates the principal information regarding the selected case studies, providing an overview of each project and complementing it with a figure. Following this, Section 4 delves into the findings and interpretation of the case studies, and Section 5 summarizes the main conclusions drawn from their analysis.

3.1 Totomoxtle (Mexico)

Totomoxtle (Figure 2) is a biomaterial crafted from the vibrant husks of native Mexican maize. This sustainable veneer is derived from the naturally colorful leaves of native Mexican corn and is developed in collaboration with the community of Tonahuixtla, an Indigenous farming community.

These farmers lost their native seeds after the introduction of genetically modified corn to the area, and their traditional methods of growing native corn are at risk. This is because the small producers face unfair competition with big companies and the hybrid maize, which when combined with synthetic herbicides and fertilizers has bigger yields than native species. The consequence is that traditional farmers leave the area (Laposse, 2024).

In response to this situation, the Totomoxtle project, with the support of the world's largest maize seed bank (CIMMYT), undertook the reintroduction of 16 endangered varieties of heirloom corn with colorful husks native to Tonahuixtla. By incorporating these husks into the craft, the project not only adds value to the material but also creates local employment opportunities. Prior to the project, corn husks were considered leftovers, but now they contribute to the material's worth, generating additional income for locals and incentivizing the continued cultivation of native Mexican corn species.

According to Laposse, the creator of Totomoxtle, aiding a small community in Mexico in preserving their native corn is crucial. The risk associated with depending solely on few types of grain makes societies more susceptible to famine. Laposse (2024) emphasizes the importance of biodiversity in cultivated plants as a guarantee for the future, asserting that it is essential for adapting to the challenges posed by climate change.



Figure 2. Totomoxtle. Source: Dezeen, 2019.

3.2 Maqui Biotextile (Chile)

The *Aristotelia chilensis*, commonly known as the Maqui tree, is a native and abundant species in Chile (Figure 3 – left). Revered by the Mapuche community, it holds sacred significance as a symbol of benevolence and peaceful intent (Vogel et al., 2014). The Mapuche people incorporate Maqui into their daily diets, and, in their cosmovision, the Maqui tree plays a pivotal role, with its fruits serving as food, natural dyes, and medicine (such as wound healing and diarrhoea treatment).

The maqui is a pioneer species: the first to take over degraded soils, establishing the ideal conditions for other native plants to grow and also a food source for birds (LABVA, 2022). The Maqui fruits, classified as “superfruits,” boast extraordinary antioxidant capacity and offer a range of health benefits, including anti-inflammatory, antimicrobial, antiatherogenic, anticancer, astringent, analgesic, and nutritional properties (Fuentealba-Sandoval et al., 2021).

Labva's Maqui Biotextile project is a manifestation of the designers' commitment to understanding local abundance and fostering autonomy and sovereignty in biomaterial production (Abud, 2022). This unique biomaterial (Figure 3 – right), made of bacterial cellulose with textile applications, is derived from Maqui trees located in the native forests of southern Chile, where Labva is physically based. The biofabrication process involves fermentation, akin to the kombucha production process, where bacteria and yeasts from the microbiota of the *Aristotelia chilensis* leaves and fruits engage in a symbiotic process. The outcome is a fully biobased, environmentally friendly material characterized by high mechanical resistance and flexibility, with a texture and appearance reminiscent of leather (LABVA, 2022). The designers emphasize their incorporation of information from ancestral processes, stating, “we borrowed the information that came from ancestral processes” (Abud, 2022, p.21).

In addition to its material attributes, the Maqui Biotextile project has heightened Labva designers' awareness of various details in processes. This increased consciousness enables them to confidently assert the environmental benefits, positive impacts on human well-being, and the promotion of biodiversity (Abud, 2022, p.21).



Figure 3. Maqui tree (left) and the material created (right). Source: Labva, 2022.

3.3 Cuia Colab (Brazil)

Cuia Colab is a project conducted in Pará, Brazil, within the context of the Amazon Forest. Cuias, derived from the fruits of the *Crescentia cujete* tree, have a rich history of artisanal transformation by women in the Santarém region. Historically utilized as daily objects, particularly vases, bowls, and containers, cuias bear a distinct black color, resulting from a natural resin that enhances their durability and allows for intricate ornamentation, carved onto them. These objects hold significant cultural value, embodying a profound partnership between humans and plants (Bandoni et al., 2023). Presently, the traditional craft of making cuias in the Low Amazon is recognized as a cultural heritage of Brazil, with local riverine artisans continuing this age-old practice (Carvalho, 2011).

Upon delving into the history of cuias, Bandoni observed disparities between ancient objects found in books and museums, credited to the indigenous populations of the area, and contemporary cuias. The older objects exhibited a broader spectrum of colors and modified shapes, with evidence indicating that ancient indigenous populations employed molds on growing fruits, reflecting an early form of “Biodesign” (Bandoni et al., 2023), a knowledge that had been forgotten over time.

In response, Bandoni initiated the Cuia Colab project with the aim of creating moulded cuia-objects including traditional techniques still practised by local artisans. This involved designing reusable molds placed on the cuia's buds as they grow on the tree, resulting in varied shapes and textures (Figure 4). Post-harvest, local artisans would then complete the objects by sanding and applying resin to the cuias. The project sought to provide a durable and fully compostable alternative to domestic objects while simultaneously strengthening local artisan communities. Cuia Colab emphasizes the collaboration with the tree and the crucial role of riverine women artisans who, due to their lifelong coexistence with cuieira trees, possess profound knowledge of the cuia craft and the intricate process involving the black resin cumate (Bandoni et al., 2023).

Initially supported by a Brazilian start-up program focused on bioeconomy and propelled to expand production, Cuia Colab encountered scalability and logistical hurdles during its first phase. These challenges, coupled with the prospect of adverse environmental repercussions, prompted a reevaluation of the project's trajectory. This stance underscores dedication to an approach that prioritizes the local environment and its ecosystem over large-scale production methodologies.



Figure 4. Cuia Colab prototype being molded (left) and the harvested object (right). Source: Andrea Bandoni, 2022.

3.4 Carmín (Mexico)

Carmín (Figure 5) is a material development project that harnesses the potential of “grana cochinilla,” a substance derived from the insect *Dactylopius coccus*, renowned for its ancestral applications in the realm of dyes. The utilization of this insect has historical roots in Mesoamerica, where it was traded and used, and it has been domesticated in southern Mexico since pre-Hispanic times (Besoain et al., 2024).

Designer Edith Medina conceptualizes Carmín as a venture that goes beyond the conventional use of cochineal for dyeing. Instead, it aims to rediscover and accentuate the insect's value as a substrate for creating a robust and pliable biopolymer. This biopolymer serves as the foundation for various textile applications, including organic sequins and bioleather (Medina, 2023). The unique chemical composition of cochineal opens avenues for revaluing and expanding its applications. By incorporating cochineal into this contemporary project, the designer not only accentuates its local significance but also broadens its applications beyond traditional dyes, imparting social, cultural, and economic value to this ancient material.

Medina explicitly emphasizes that the primary objective of Carmín is not mass-scale material sales but rather the reevaluation of the production of a historically significant insect in the context of material history (Besoain et al., 2024). This perspective underscores the project's commitment to fostering a deeper understanding of the intrinsic value of cochineal and its potential contributions to the material landscape.



Figure 5. The production of Carmín (right) and a detail of the biopolymer created (left). Source: Besoain et al., 2024.

4. Results and Analysis

The case studies presented above showcase diverse ways in which ancestral indigenous knowledge is incorporated into contemporary design projects. Each project highlights specific Indigenous knowledge and demonstrates how it is integrated into the design:

- **Totomoxtle:** The knowledge of growing native corn in the region of Tonahuixtla, Mexico, is central to the project. This knowledge enables the creation of a variety of corn husk colors showcased in the veneer panels and products. Moreover, the social aspect of the farmers' condition is also addressed, with the project not only creating local employment opportunities but also reviving the ancestral technique of planting a diversity of native corn varieties.
- **Maqui Biotextile:** The project draws inspiration from the knowledge and importance of Maqui in Mapuche culture and the diverse possibilities of utilizing the tree's resources. This aspect led the designers to pay attention to the tree's microbiota and explore symbiosis with its yeast and bacteria to produce bacterial cellulose. Natural dyeing properties of Maqui are also incorporated into prototypes, adding value to ancestral knowledge and to the many non-human species involved: the Maqui tree, the bacteria and the yeast.
- **Cuia Colab:** The indigenous knowledge integrated was the reintroduction of the Biodesign or Biofabrication technique involving molding cuias while they are still growing on the tree, a practice no longer known or utilized by contemporary artisans. The project involves riverine artisans with knowledge inherited from ancient indigenous practices related to utilizing black resin and practical details when working with the cuieira tree. Concerns about social and ecological impacts are demonstrated in the process.
- **Carmín:** the grana cochinilla's dyeing properties, indigenous knowledge, was revisited by the designer, who found that its use could be expanded through a biomaterial exploration. The knowledge of the designer on the field definitely played a crucial role to produce in generating Biomaterial innovations.

Several parallels emerge when discerning and aligning the approaches of the aforementioned projects. While the maqui fruit in the Maqui Biotextile project and the corn husks of Totomoxtle may not be readily identified as conventional design materials, projects Cuia Colab and Carmín center around pre-existing materials and methodologies, ingeniously re-evaluating their inherent worth. It is noteworthy that, in the instances of Maqui Biotextile and Carmín, the integration of scientific knowledge, particularly in the realms of chemistry and biology, played a pivotal role in conceiving and materializing innovative biomaterials. This strong interdisciplinary collaboration constitutes a necessity of the field of Biodesign (Bandoni et al., 2022).

Furthermore, the inclusion of diverse perspectives is manifest in Totomoxtle and Cuia Colab. Designers deliberately involve local actors, such as farmers and artisans, who serve not only as practitioners but also as custodians of ancestral knowledge. This intentional incorporation of different viewpoints underscores the projects' commitment to cultural heritage and social engagement.

Table 2 summarizes the analysis and gives an overview of each case study, emphasizing how indigenous knowledge was utilized, and the outcomes of the projects.

Table 2. Synthesis of the case studies.

Project	Ancestral Indigenous knowledge	Biomaterial outcome	Other outcomes
Totomoxtle	The cultivation of native corn in Tonahuixtla, Mexico.	Veneer / panels made with native Mexican corn leaves that are naturally colorful	Inclusion of the local farmers and alternative income generation
Maqui Biotextile	Importance of Maqui from a Mapuche perspective and the tree's versatile uses.	Bacterial cellulose with textile applications, derived from Maqui trees' microbiota	Discovery of a symbiosis between maqui's bacteria and yeast
Cuia Colab	Biodesign or Biofabrication technique with cuias while growing on the tree.	Cuia-objects that ally biofabrication to other traditional techniques	Revival of a forgotten technique and inclusion of local artisans
Carmín	Grana cochinilla's dyeing properties	Biopolymer with textile applications such as organic sequins and bioleather	Expansion of the applications of the insect

5. Discussion and Conclusion

Ibarra and Ribeiro (2014) assert that since the mid-20th century, design has been approaching and embracing pre-industrial modes of production, emphasizing vernacular solutions. This shift has prompted designers to appreciate local expertise, revive traditional practices, document them, and, in essence, acquire a substantial repertoire of opportunities. The adoption of a pre-industrial approach appears fitting, especially in an era where envisioning solutions to the environmental challenges posed by humanity becomes increasingly complex. As Santos (2008) wrote, a critical reassessment of design is imperative, and the precondition for this is the reconsideration of its cultural dimensions within the plurality of various cultural universes.

This study presents compelling evidence of the incorporation of ancestral indigenous knowledge as a central reference point in design projects. These works align with what LABVA designers' term "territory-based biomaterials" or "situated biodesign" (Weiss & Besoain, 2022, p.10). To varying degrees, these projects encompass regenerative practices, the development of ecological techniques, and biodiversity preservation. Each of them has produced fully biobased and compostable materials and objects, underscoring the Latin-American designers' foundational ecological concerns. Additionally, it can be

asserted that, while not always the primary intention, these designers have been amplifying the voices of marginalized groups, prompting an invitation to engage in intercultural dialogue and reconsidering the Design field (Santos, 2008).

These works illustrate a trend wherein designers, in their pursuit of ecological practices associated with Biodesign and Biomaterials, acknowledge traditional knowledge as a legitimate and invaluable source for contemporary design endeavors. Despite their looking at the past, these works are not driven by nostalgia; instead, they revere ancestrality and value indigenous knowledge, recognizing its distinct relationship to nature—one that is more respectful than the prevailing Western perspective. Therefore, it is suggested that this indigenous knowledge can illuminate our future as a species. Notably, in the recent past, Indigenous peoples and their references were entirely marginalized in the designers' scope. Today, there is a substantial interest among designers in this subject, although many projects still appear to remain at a superficial level.

The superficial treatment of traditional knowledge raises ethical considerations. On one hand, designers must “ensure that Indigenous communities who are most at risk from climate change aren't once again exploited for their knowledge” (Withers, 2022, p.17). On the other hand, there is an imperative to learn from these communities, actively engage with their knowledge, and contribute to its evolution. Addressing the issue of cultural appropriation demands robust discussions aimed at identifying pathways that mutually benefit all stakeholders. As emphasized by Aílton Krenak, “the future is ancestral” (2022).

5.1 Limitations and Suggestions for Future Studies

This study was limited to the analysis of four case studies featuring design practices originating from Latin America. It is noteworthy that in different geographical contexts, the methodologies employed by designers may diverge from those elucidated within this study. Examining other regions where Biodesign intersects with traditional knowledge can yield novel insights and unveil nuances that may hold greater significance within alternate contexts.

To extend the findings of this study, future researchers could engage in qualitative interviews with Biodesign practitioners to elicit direct insights into their engagement with indigenous knowledge systems. However, it should be acknowledged that the temporal constraints of this study, coupled with the availability of the selected designers, restricted the present analysis.

Furthermore, it is pertinent to reflect on the research question entitled “Vernacular Biotechnologies” posed by Professor Elizabeth Hénaff (2023) within the Biotechnology Design community of the Journal Research Directions: “what are we missing” in the (western) mainstream definition of biotechnology and design? She contends that despite the perception of biotechnologies as recent developments within Western scientific discourse and capitalist frameworks, societies have historically employed their understanding of biological organisms and systems to address diverse hierarchies of needs long before Western scientists. Consequently, Hénaff urges researchers to identify, evaluate, and speculate on this pressing topic.

Following Hénaff's inquiry, we may also pose the question: How can we disseminate the creative insights derived from “Vernacular Biotechnologies” to other cultures? The pursuit of answers to such questions not only underscores the importance of indigenous and traditional knowledge systems in contemporary society but also serves to mitigate colonialist perspectives within the domain of Design. This emphasizes the relevance of such inquiries in advancing the field of Design.

References

Abud, J. (2022). Labva: Un espacio de exploración de biomateriales a partir de necesidades locales. *Revista Cero*, 14–25.

Angelopoulou, S. (2023). Brazil pavilion receives the golden lion at the 2023 Venice architecture biennale. *Designboom*. Retrieved July 29, 2024, from <https://www.designboom.com/architecture/brazil-pavilion-golden-lion-venice-architecture-biennale-05-20-2023/>

Atelier Luma. (2023). *Bioregional design practices* (J. Journée, Ed.). Atelier Luma.

Bandoni, A., Almendra, R., & Forman, G. (2022). Interdisciplinarity and collaboration - A study focusing on experienced biodesign practitioners. In D. Raposo, N. Martins, & B. Daniel (Eds.), *Human dynamics and design for the development of contemporary societies* (pp. 77–84). AHFE International. <https://doi.org/10.54941/ahfe1001374>

Bandoni, A., Cunca, R., Paoliello, C., & Forman, G. (2023, October 9). Collaborating with an Amazonian tree: A bio-product design experiment with ancestral references. *IASDR 2023: Life-Changing Design*. <https://doi.org/10.21606/iasdr.2023.156>

Benyus, J. (1997). *Biomimicry: Innovation inspired by nature*. HarperCollins.

Besoain, M. J., Weiss, M. A., & Orellana, B. D. (2024). Biopolimérica 2023: Encuentro latinoamericano de biomateriales y biodiseño. *Laboratorio de Biomateriales y del Buen Vivir de Valdivia y Manifiesto*.

Camere, S., & Karana, E. (2018). Fabricating materials from living organisms: An emerging design practice. *Journal of Cleaner Production*, 186, 570–584. <https://doi.org/10.1016/j.jclepro.2018.03.081>

Carvalho, L. (2011). *O artesanato de cuias em perspectiva - Santarém*. IPHAN, CNFCP.

Collet, C. (2017). *Designing for the biocentury*. University of the Arts London.

Esat, R., & Ahmed-Kristensen, S. (2018). Classification of bio-design applications: Towards a design methodology. In *Proceedings of the 15th International Design Conference* (pp. 1031–1042). <https://doi.org/10.21278/idc.2018.0531>

Escobar, A. (2018). *Designs for the pluriverse: Radical interdependence, autonomy and the making of worlds*. Duke University Press. <https://doi.org/10.1215/9780822371816>

Fuentealba-Sandoval, V., Fischer, S., Pinto, A. A., Bastías, R. M., & Peña-Rojas, K. (2021). Maqui (*Aristotelia chilensis* (Mol.) Stuntz), towards sustainable canopy management: A review. *Industrial Crops and Products*, 170, 113735. <https://doi.org/10.1016/j.indcrop.2021.113735>

Ginsberg, A. D., & Chieza, N. (2018). Editorial: Other biological futures. *Journal of Design and Science*. <https://doi.org/10.21428/566868b5>

Hénaff, E. M. (2023). Vernacular biotechnologies. *Research Directions: Biotechnology Design*, 1, e5. <https://doi.org/10.1017/btd.2022.5>

Ibarra, M. C., & Ribeiro, R. (2014). O design e a valorização do vernacular ou de práticas realizadas por não-designers. In *Congresso Brasileiro de Pesquisa e Desenvolvimento em Design*.

Karana, E., Barati, B., & Giaccardi, E. (2020). Living artefacts: Conceptualizing livingness as a material quality in everyday artefacts. *International Journal of Design*, 14(3), 37–53.

Kennedy, E. B. (2017). Biomimicry: Design by analogy to biology. *Research-Technology Management*, 60(6), 51–56. <https://doi.org/10.1080/08956308.2017.1373052>

Krenak, A. (2022). *Futuro ancestral* (1st ed.). Companhia das Letras.

Krenak, A. (2023). *Um rio um pássaro*. Dantes Editora.

LABVA. (2022). Maqui tree by LABVA. *Future Materials Bank*. Retrieved July 29, 2024, from <https://www.futurematerialsbank.com/material/maqui-tree/>

Laposse, F. (2024). Fernando Laposse (@fernandolaposse). *Instagram*. Retrieved July 29, 2024, from <https://www.instagram.com/fernandolaposse/>

Medina, E. (2023). Carmín. *Biology Studio*. Retrieved July 29, 2024, from <https://biologystudio.com.mx/carmin/>

Mironov, V., Trusk, T., Kasyanov, V., Little, S., Swaja, R., & Markwald, R. (2009). Biofabrication: A 21st century manufacturing paradigm. *Biofabrication*, 1(2), 1–16. <https://doi.org/10.1088/1758-5082/1/2/022001>

Myers, W. (2018). *Biodesign: Nature, science, creativity*. Thames & Hudson.

Piseagrama. (2024). *Piseagrama - Uma revista sobre espaços públicos: existentes, urgentes e imaginários*. Retrieved July 29, 2024, from <https://piseagrama.org/>

Santos, M. C. L. (2008). Consumo, descarte, catação e reciclagem: Notas sobre design e multiculturalismo. In D. Moraes (Ed.), *Cadernos de estudo avançado em design* (1st ed., Vol. 1, pp. 60–67). Santa Clara Editora.

Vogel, H., Peñailillo, P., Doll, U., Contreras, G., Catenacci, G., & González, B. (2014). Maqui (*Aristotelia chilensis*): Morpho-phenological characterization to design high-yielding cultivation techniques. *Journal of Applied Research on Medicinal and Aromatic Plants*, 1(4), 123–133. <https://doi.org/10.1016/j.jarmap.2014.09.001>

Watson, J. (2019). *Lo-TEK. Design by radical indigenism*. Taschen.

Weiss, A. J., & Besoain, M. J. (2022). Biomateriales basados en el territorio. *Base Diseño e Innovación*, 7(7), 7–25. <https://doi.org/10.52611/bdi.num7.2022.797>

What Design Can Do. (2023). *Programme - Mexico 2023*. Retrieved July 29, 2024, from <https://www.whatdesigncando.com/events/mexico-city-2023/programme/>

Withers, J. (2022). *BIO 27 Supervernaculars: Design for a regenerative future* (J. Withers, Ed.). Museum of Architecture and Design.

About the Authors:

Andrea Bandoni is a PhD candidate researching on the possibilities of biodesign in the Amazon region. Master in Design (Design Academy Eindhoven) and Bachelor in Architecture (São Paulo University). Previously worked in institutions such as Aalto University and Istituto Europeo di Design, among others.

Maria Cecília Loschiavo dos Santos is a philosopher, Professor of Design at the Faculty of Architecture, Urbanism and Design of the University of São Paulo, curator. Specialist in the relationships between Design, Architecture, and Art. Researcher at CNPq, author of the seminal book “Móvel Moderno no Brasil”.

Acknowledgements: The project that gave rise to these results received the support of a fellowship from “la Caixa” Foundation (ID 100010434). The fellowship code is LCF/BQ/DR22/11950001. It is also funded by FCT - Fundação para a Ciência e a Tecnologia, I.P., under the Strategic Projects with reference UIDB/04042/2020.

P / REFERENCES OF DESIGN

This contribution was presented at Cumulus Budapest 2024: P/References of Design conference, hosted by the Moholy-Nagy University of Art and Design Budapest, Hungary between May 15-17, 2024.

Conference Website

cumulusbudapest2024.mome.hu

Conference Tracks

Centres and Peripheries
Converging Bodies of Knowledge
Redefining Data Boundaries
Bridging Design and Economics
Speculative Perspectives
The Power of Immersion
The Future of Well-being
Taming Entropy: Systems Design for Climate and Change
Ways of Living Together
Cumulus PhD Network

Full Conference Proceedings

<https://cumulusbudapest2024.mome.hu/proceedings>

ISBN Volume 1: 978-952-7549-02-5 (PDF)

ISBN Volume 2: 978-952-7549-03-2 (PDF)

DOI Volume 1: <https://doi.org/10.63442/IZUP8898>

DOI Volume 2: <https://doi.org/10.63442/TADX4016>

Conference Organisers

Moholy-Nagy University of Art and Design Budapest (MOME)

mome.hu

Cumulus Association

cumulusassociation.org