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***Melanie Sarantou is a full professor of social design at Kyushu University in Japan and an adjunct professor at the University of Lapland, Finland. Her PhD consolidated her many years of experience working and lecturing (University of Namibia 1998-2007) in the Namibian craft-design field by holistically mapping Namibian craft and design identities and narratives through a postcolonial lens. Sarantou worked as a post-doctoral researcher in the artistic research project 'Margin to Margin' (2016-2019), funded by Koneen Säätiö and Profi 2 Strategic Funding from the University of Lapland, investigating how arts and narrative practices impact marginalised women in communities in various global locations, for example in Namibia, Finland and Australia. Between 2020 and 2022, her research as a European Commission Research Fellow focused on the transformational potential of the***

***arts in societies living on the margin of Europe. This research, titled 'Action on the Margin: Arts as Social Sculpture' (AMASS, grant number 870621), was funded by the European Commission Horizon 2020 programme. Her recent research in the TRUST project (2022-2024) explored the role of transformational social design and arts-based methods in generating a more holistic understanding and workable solutions for ethically navigating cultural tensions existing with the processes of digitising Indigenous Cultural Heritage. Sarantou lectures in areas of Social Transformation Design at the Faculty of Design of Kyushu University. She specialises in arts-based research and bioart, enabling her research methodologies to intersect with food plants, textiles, materialities and cultural identities. Sarantou co-edited seven highly ranked books, of which four were published by Routledge. Titles include: Empathy and Business Transformation, Arts-Based Methods for Decolonising Participatory Research, and Managing Complexity and Creating Innovation through Design.***

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# **Biomimicry's Roots in Creating Social Change**

*Prof Melanie Sarantou*

## **Abstract**

**Design inspiration deriving from the natural world, often represented as biomimicry, can generate diverse solutions to societal complexities through social innovation. Societal challenges need solutions that drive interactions and organisational processes to deliver impact not only on a social scale, but at a broader societal realm, which comprises the social and environmental contexts of such challenges. For this purpose, researchers, artists and designers sometimes adapt or reject behaviours and patterns observed from nature to create innovative solutions. An escalating need is how to change our interactions and relationships with our communities and the natural environment to enable futures that can better deal with societal challenges.**

***Keywords:* BioDesign, Biomimicry, Societal Challenges, Communities, Natural Environment, Non-humans**

## **Introduction**

**Nature remains an unlimited source of inspiration. Nearly a quarter of a millennia ago, Latour (1999) called for breaking with modernist frameworks by moving to alternative agendas that consider the natural environment and include non-humans to sustain life on a scarred planet. The previous couple of decades also saw a rise in interest in attempts to use biology, design and engineering to reshape natural systems. BioDesign is an area of practice and research that includes non-humans and, specifically, living**

organisms in creative processes. With the aim of developing more sustainable futures, the concept of social biomimicry is explored to reach beyond the obvious observations of nature, for example, the study of social insects. This brief exploration asks: "How might biomimicry drive societal change?" and "How might BioDesign inform and support designers' reflection on understanding social change?" Social design should include areas of practice and research such as BioDesign to implement the farther reaches of nature.

## **Theoretical Considerations**

The term biomimicry is associated with Janine Benyus (1997), who, in her seminal work titled *Biomimicry: Innovation Inspired by Nature*, describes the fundamental dimensions of humanity's connection to the natural world. She defines biomimicry as the practice of learning from and mimicking nature's forms, processes, and ecosystems to challenge the status quo by driving change that can create sustainable solutions (Benyus, 1997). Due to inspiration flowing from nature, living organisms and other than humans, the results of these processes are often studied and mimicked for deriving solutions to design challenges through, for example, research or product-service development.

Gough et al. (2021, p. 1583) introduced the concept of 'bioaffordances', which refer to biological organisms' inherent properties, functions, or capabilities that can be analysed, re-interpreted and applied in design processes. These affordances arise from organisms' natural behaviours, structures, or processes. They can inspire innovative interactions and solutions to various design challenges by applying art, engineering, or technology. These authors define BioDesign as using an organism's affordances by introducing the Bio-Inquiry model, which integrates user-

centred, scientific, and critical inquiries for designing interactive artefacts. Such artefacts are extended to the intersection of BioDesign and Human-Computer Interaction (HCI) to shape future technologies.

Some forms of BioDesign use Living Artefacts, extending their usefulness to design through their *livingness* and throughout their use (Kim et al., 2022). Karana et al. (2020, p. 37) understand BioDesign as living organisms such as fungi, bacteria, or plants as part of the materiality and 'material sources' of design processes. They (Karana et al., 2020) proposed a framework for designing artefacts, viewing livingness as a biological, ecological, and experiential phenomenon. Thus, explorations of BioDesign occur more frequently in artefact design and materiality, HCI, architecture (Ng, 2020), and other areas such as the development of brand identity.

BioDesign is less frequently used in social innovation contexts. More closely related to social processes, Roshko (2010) explored BioDesign in educational methodological development, while with my co-authors, I have opened up possibilities of BioDesign in socially transformative processes using biotextiles (Sarantou et al., 2024). This research explored theories of change in creative bioart experiments to analyse process flows and key tipping points in transformational change that can be informed by biological growth or decline. In the same vein, Karana et al. (2020, p. 37) note that opportunities for interactive design present themselves in the 'livingness' of artefacts created from such living organisms. Such notions present the clues how biomimicry can become a valuable approach to creating solutions by drawing from the bioaffordances presented by our engagement with non-humans. However, when viewing Benyus's (1997) theories somewhat closer, her referral to the fundamental dimensions of humanity's connection to the

**natural world specifically indicates nature as model, measure and mentor. Therefore, the earliest form of biomimicry (a term coined by Benyus) was directed towards creating social value.**

## **Discussion**

**In the figures below, documented from my biotextile experiments conducted at the Bioartex Laboratory at the University of Lapland in Finland (2021-2022), I draw from Benyus's (1997) referral to nature as model, measure and mentor to illustrate the more direct connotations to community values drawn from biomimicry that can serve BioDesign in social contexts.**

**My biotextiles in Figure 1 represent socially specific themes such as connections and disconnections, or what Christensen and Jensen (2011, p. 146) refer to as 'roots and routes', illustrating how biomimicry and the livingness of the biotextiles can inspire social design practice. This example can be based on Benyus's (1997) theories of nature as social model by referring to untangling and re-tangling of social connections and relationships. The biomimicry also illustrates how social realities on the surface of a social fabric are not always as they seem.**





**Figure 1: Biotextile experiments. Photography by the author (2021-2022)**



**Figure 2: Biotextile experiments. Photography by the author (2021-2022)**

**My biotextiles in Figure 2 illustrate the role of nature as a social measure, where obvious harmonious co-existence (first image) and healthy roots (second image) can lead to, or even hide, social**

demise. These images may be useful to social designers to detect tipping points and guide the implementation of social measures with communities to prevent such drastic or unexpected social change. However, amidst the social decline mimicked by the rotting roots of the sunflower seedlings (Figure 2), intricate web-like growth (third image), reminiscent of sheer silky textile, sets in. This form of continued growth, which is better detected through microscopic photography, signals any society's ability to transform into at first undetected new forms of growth amongst the hideous rot which can be interpreted as social demise.

The biotextile in Figure 3 mimics nature as social mentor as connotations to education and learning are evident. For example, the growing roots do not attach well to the wool bed (first image), which may be interpreted as a social fabric, yet growth continues. At the same time, it may represent the detachment of the roots while growth continues. In educational contexts, this may mimic the detachment from a mentor embedded in the social fabric is essential for social growth to continue. While some seeds may sprout, others don't; some may grow tall and strong, while others don't (third image).

Figure 3 mirrors how differences in the seedling's growth can mimic learning. Some mentors may be disappointed at the speed of growth, yet often they do not realise that educational development may occur through different pathways, remaining undetected or taking on different directions. Learning may show itself quite unexpectedly and in dissimilar temporalities despite the seeds being sewn under similar conditions.





Figure 3: Biotextile experiments. Photography by the author (2021-2022)

## Conclusion

These biotextile explorations present new opportunities for BioDesign as biomimicry could well inform social design processes apart from the usual engineering-based or product design approaches, for example studying spiders' legs for improving robotics (Göttler, 2021). Although such research is utterly relevant and important, the continuously pressing and changing needs for social innovation offer ample avenues for further research and scope for improving our complex societal challenges. In extending Benyus's (1997) biomimicry framework for human connection using nature as a model, measure, and mentor, BioDesign should be further explored as a mirror of social transformation. Thus, I invite future social design practitioners to contemplate the following questions:

- How can biomimicry inspire resistance to unsustainable social and environmental futures?
- How can the values connected to design be changed through biomimicry, embodied and holistic social design and practices?

- **How can collaborations with communities and non-humans, including digital tools and expressions, lead to early detection and resistance to unsustainable outcomes in society by drawing from bioaffordances?**

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