

Innovation of Embroidery: Exploring the Integration of Biomimicry and Embroidery

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ABSTRACT

Embroidery, an age-old art form, is being reinvigorated through the fusion of traditional craftsmanship and contemporary innovation. This paper delves into the amalgamation of biomimicry, a design concept drawing on nature's paradigms, into embroidery to enhance both aesthetics and utility. A thorough investigation encompasses a literature review and diverse case studies to scrutinize the integration process. The analysis reveals the transformative power of biomimetic practices to generate pioneering embroidery patterns and skillsets, suggesting substantial impact across fashion, textiles, and eco-friendly design sectors. The study provides pivotal data underscoring the role of biomimicry in propelling embroidery into a new epoch while honoring its historic essence.

Keywords: Embroidery, Biomimicry, Integration, Fashion Design, Nature's paradigms



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1 INTRODUCTION

Over the years, embroidery, a traditional Chinese art, has ushered in the incorporation of modern technologies and words into design concepts. Just a few recent years have brought a considerable upsurge in the adoption of biomimicry principles just for the sake of embroidery and have completely revolutionized innovation and creativity in this industry. It opens new dimensions in the linkage of traditional skill with design inspired of nature. For example, biomimicry has been shown to provide inspiration for new patterns, textures, structures, and so forth, inspired by the designs of nature. That has been noted as a means through which the structures of plant cells or patterns of animal skins have led to burgeoning techniques within embroidery that can seek to mimic the beauty and complexity that natural morphology represents. Moreover, the use of biomimetic sustainable and biodegradable materials has placed this integration as the major contribution to eco-friendly practice in the realm of textiles and fashion.

2 LITERATURE REVIEW

2.1 Biomimicry in Embroidery: Exploring Nature's Paradigms

Biomimicry in terms of embroidery would be translating nature's paradigms into designing the creation of the pattern. New complementary forms of the possibilities, both aesthetically and functionally, can be discovered in an approach. Observing such patterns as spirals in seashells or fractal branching of trees, designers will transpose such forms into embroidery designs to portray a unique appeal. (Ellison, 2013; Wood, 2019).

This goes even further to bring functional enhancement besides aesthetic purposes. For example, imitation of the water-repellency of the lotus leaf or strength of spider silk through embroideries can thus provide such characteristic functions to the fabric. This further extends the application of embroidered textiles, which aligns with the increasing demand for sustainable and eco-friendly products. (Błachowicz et al., 2021; Eadie & Ghosh, 2011).

The more the extraneous field of embroidery takes inspiration from and divulges into biomimicry, the more obvious this integration heralds great promise for the future of the industry: revolutionary strides in design, craftsmanship, sustainability, and the making of innovative materials. (Wang, 2019) A deep dive into biomimic embroidery would be the best example of what may redefine the boundaries of creative output and function within the realm of fashion, textiles, and environmental consciousness. (Daukantienė, 2022).

2.2 Evolution of Embroidery Techniques

The same process happens with the integration of biomimicry in embroidery: a design approach that uses nature's paradigms to design and create typical embroidery patterns. This makes the exploration of new possibilities both for their aesthetics and functionality into a spiral motion a seashell or fractal tree branching in the patterns of most trees can be turned into an embroidered pattern to reach some unique organic form in the embroidery process.

Furthermore, it achieves many functionalities other than the mere cosmetic. By using embroidery techniques to enable the imitation of wettability in lotus leaves or the structural strength of spider silk, fabrics are endowed with new functions. This goes a long way in increasing utility in embroidered textiles, and it goes only together with developing interest in durable and eco-friendly products.

2.3 Synergistic Potential of Biomimicry and Embroidery

The research discusses the theoretical framework that supports the inclusion of biomimicry in embroidery, focusing on the way this symbiotic relationship can be developed to foster environmental sustainability and creative design. The use of the principles of biomimicry in combination with the technique of embroidery is a resource available to designers in the fashion industry to further develop textiles that are not only visually appealing but also functional and sustainable.

3 METHODOLOGY

This is a qualitative work at a general level to elicit the use of biomimicry in an embroidery context based on theoretical and empirical data. A methodology is presented that explicates the process by which principles of biomimicry can be applied to embroidery in a manner commensurate with innovative, sustainable, and culturally significant textile design outputs.

3.1 Theoretical Framework

The theoretical framework was founded on design and sustainability theories focused on biomimicry, the process of learning from nature's strategies for solving human problems. This framework intimates how natural structures and systems can trigger new embroidery designs and, at the same time, restore the past and the culture-bound meaning of traditional embroidery techniques.

3.2 Data Collection

To ensure practical comprehension of biomimicry in embroidery, this research will make use of data collection through the below methods:

3.2.1 Literature Review

For this study, the methodological basis of work will be the generalization of available sources both about biomimicry and traditional and modern methods of embroidery as part of the problems of sustainable textile design. The main sources for the research paper are academic periodicals, books, and industry reports that help in understanding both the theoretical and practical sides of biomimetic design. The literature review elaborates on the key principles of biomimicry and their application in embroidery (Błachowicz et al., 2021; Daukantienė, 2022).

3.2.2 Case Studies

Detailed case studies have been analysed and the process of embroidery with work in the integration of biomimicry principles carried out. These case studies would benefit from the emerging of specific examples that integrated natural patterns and structures:

·Iris van Herpen's "Voltage" Collection: This collection uses biomimetic approaches taken from naturally created electrical designs—such as lightning bolts and electric eels—to automatically draft dynamic, strong, and visually well-embroidered designs (Eadie & Ghosh, 2011).



Figure 1 Iris van Herpen's "Voltage" Collection

·Natsai Audrey Chieza's "BioSteel Silk": Conceived in collaboration with bioengineers, the capability merges together the mechanical powers of silk and the biomimicry of spider silk, giving it the ability to generate new fabrics with enhanced properties (Wood, 2019).



Figure 2 Natsai Audrey Chieza's "BioSteel Silk"

·Sarah Angold's Geometric Embroidery: Inspired and informed by the complex geometries of coral reefs and honeycombs, the biomimicry potentials of Angold's designs mimic pushed boundaries of today's new traditional craft's complexity and beauty (Ellison, 2013).



Figure 3 Sarah Angold's Geometric Embroidery

3.3 Thematic Analysis

Thematic analysis is undertaken on data obtained from literature, case studies, and interviews to elicit similarities in patterns and themes through coding into categories of design innovation, sustainability, cultural significance, and technical advancements. The thematic analysis thus helps in understanding how biomimicry applies to the different domains associated with embroidery and textile design.

3.4 Stages of Integration

Biomimicry into the integration of embroidery is a systematic procedure cut into three key elements: observation, adaptation, and innovation.

3.4.1 Observation

The first step is to observe and study intricate patterns, and structures available in nature. It involves analysing the unique characteristics, textures, and functional properties of natural elements that would give a plethora of inspiration when one tries to transform them into embroidery patterns. For instance, this may involve the spirals of different seashells or the fractal branching of trees. (Ellison, 2013).

3.4.2 Adaptation

In the next step, designers develop the natural patterns and structures observed further into embroidery designs. The process elaborates on understanding the underlying principles of the natural elements and creatively adjusting them to suit the specific requirements of embroidery. Such might include the water-repelling ability of lotus leaves or the structural strength of spider silk (Błachowicz et al., 2021).

3.4.3 Innovation

The innovation stage comes last: in this stage, through adaptation, the natural forms and patterns, the designers come up with unique and sustainable embroidery designs. Lastly, varied stitching techniques with materials and production technology are experimented with in bringing the designs inspired by biomimetics to life, merging creativity with ecologically conscious innovation (Daukantienė, 2022). Conclude

4 DISCUSSIONS

The incorporation of biomimicry into embroidery might subsequently have the potential to greatly reduce the environmental effects of textile manufacture. The combination leads to less consumption of chemicals and an increase in the life of the textiles. Supplementarily, the research showcases the issues of the adoption of commercial embroidery, in terms of scalability and cost efficiency. The present paper discusses how the use of biomimicry as the inspiration source for design in embroidery improves the process of sustainability and eco-friendliness in the textile production cycle.

CONCLUSION

In summary, this study examined the possibility of realizing biomimicry in embroidery and how it can be used as a game-changer in the textile industry. The integration of biomimicry with embroidery is largely composed of observation, adaptation, and innovation. Designers observe the natural elements, concepts, and systems, and adapt the observed patterns to develop unique and sustainable solutions in embroidery design. The integration is supposed to offer a reduction in the environmental

burden of the industry, fostering innovation as well as the creation of textiles that are beautiful and green. Future research work might overcome practical limitations in integrating biomimicry within large-scale textile manufacture, therefore rationalizing the possibilities of developing functional textiles inspired by efficient natural processes.

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CONFLICT OF INTEREST

No conflict of interest declared for this paper.

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