Stymphalian Birds - Exploring the Aesthetics of A Hybrid Textile

Figure 1: Installation made of Stymphalian textile.

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Abstract
Stymphalian Birds is an art installation, exploring the aesthetics and the societal impacts of a hybrid textile at the crossroads of electronics and haute couture. The exhibited textiles are hybrid in various ways. They combine traditional handcrafts with digital technologies, chemical processes and elements created by nature. The audience will learn how these four different approaches seamlessly connect traditional featherwork and materials science. The resulting textiles provide a rich multi-sensory experience: complex haptic interactions with feathers and textiles are sonified in acoustic soundscapes.

Author Keywords
Media Arts; E-textiles; Tangible Interaction; Digital Craftsmanship; Featherwork; E-featherwork; Embroidery.

CCS Concepts
•**Human-centered computing** → **Human computer interaction (HCI)**; •**Applied computing** → *Arts and humanities;* •**Hardware** → Sensors and actuators;

Introduction
Stymphalian Birds – human-eating pets of Artemis in Greek Mythology – are said to have metallic feathers. Using their feathers as arrows, they incarnate a dangerous beauty. Stymphalian Birds is also the name of this art installation

Figure 2: Feather preparation.

of textiles, augmented with electrically conductive feathers. Both the feathers augmenting the textile, and the feathers of the original Stymphalian Birds thwart our expectations: though the feathers themselves might appear mundane, their material properties make them extraordinary.

This art installation explores the aesthetics and the societal impacts of hybrid textiles at the crossroads of electronic and haute couture (See Figure 1). The textiles combine traditional handcrafts with digital technologies, chemical processes and elements created by nature. The audience will learn how these four different approaches seamlessly connect traditional featherwork and materials science. The resulting textiles provide a rich multi-sensory experience : complex haptic interactions with feathers and textiles are sonified in acoustic soundscapes.

The textiles are not only a hybrids in respect to their physical materials, they are also hybrid in time. They combine featherwork practised in the early 19th century and traditional Lunéville embroidery with state of the art fabrication methods [6] which make the feathers electrically conductive and interactive. The result is a futuristic textile, which stands upon old craftsmanship traditions, preserving antique savoir-faire.

Stymphalian Birds invites us to reconsider interactions of living beings with their environment, introducing the periphery of the body as an interface. The project explores the ability of cyber organisms to be sentient beings communicating across boundaries.

Stymphalian Birds were created in Datapaulette, an independant eTextile laboratory in Paris, which is both situated within the broader culture of hackerspaces, as well as connected to the Parisian textiles scene.

Context & Related Work

Featherwork

Feathers have been used to enhance the human body since prehistory. In more contemporary times, Europe and in particular France, experienced a high popularity for featherwork in fashion and shows [9], eclipsing in the golden age of the featherwork industry, between 1870 and 1910. In the 20th century, the popularity of featherwork declined, as environmentalists and ornithologist fought for protection of birds known for ornamental feathers, leading to a ban of wild bird trade [2]. Decreaseing availability of feathers and changes in fashion resulted in a decreasing demand. Today, featherwork is a craftsmanship in the process of disappearing.

However, the rarity of *plumassiers* and the inherent beauty of feathers have led artists and designers to reconsider featherwork and to augment it with new poetic interactions. Following the path paved by Royal Hawaiian featherworks [8] and *plumassiers* like Maison Lemarié[1], contemporary artists and designers Ricardo O'Nascimento and Ebru Kurbak [10] or Rebeccah Pailes-Friedman in BioWear [11] have explored kinetic featherworks.

Textile

Unlike feathers, which serve as special adornments, textiles are everywhere. In a room, we can find them on the wall, on the floor, suspended. Textiles are connected to our body, from birth to death, from diapers to burial sheets. [7] Textiles are the medium of our closer bulwark and protection, like feathers are for the birds. However, similar to feather, textiles first and foremost also act as adornment, before modesty and protection. While some human cultures might not use clothing, humans will never be without adornment [4].

[1] https://www.lemarie-paris.com/en/history/

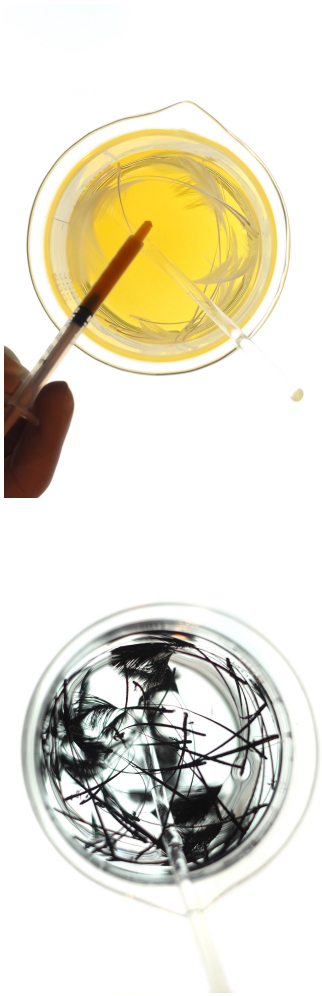

Figure 3: Top: Feathers are submerged in pyrrole solution. Bottom: Once polymerization is complete, feathers turn black.

Stymphalian Birds use silk, to have two animal based materials and create a biomimetic design, mimicking the protective cocoon. Just as feathers are crafted by birds, silk is crafted by the silkworm – both are designed by nature. Like feathers, silk it is a protein fiber and they are considered as luxury objects [3]. As technology becomes ever more closely integrated in our lives, electronics are starting to permeate the textiles which accompany our lives as well, both those worn on the body [5] and in the environment around us [12].

Conductive Polymers

Feathers offer an experience by themselves, thanks to their capacity to react to touch, their flexibility to react like a spring, their softness and their delicate shape and details. The combination of electronic circuits and in-situ polymerization to give electrical conductivity to a feather enhance this experience and will now permit it to detect touch and respond to it by a sonic feedback.

Polymerization is commonly used to functionalize textiles, for example for creating bio-compatible batteries[1]. The feathers used in Stymphalian Birds were polymerized according to simple instructions provided by Honnet et al [6].

Installation & Implementation

We will present two textiles: a surface and a dress. The process of creating these artifacts will be shared as a curiosity cabinet – a mini exhibit. The curiosity cabinet will include various polymerised feathers and the tools for eFeatherwork. People will be invited to interact with the textiles, touch the feathers and manipulate them to know more about the embroidered circuit. When someone will touch a feather, it will trigger a sound feedback. This sound will be extracted from a library of harmonious metallic sounds. Users can interact with multiple feathers at the same time to create a melody. More details regarding the process and the final result can be found online[2].

Feathers

The feathers were prepared using dyeing methods, traditional featherwork and polymerization [6]. The feathers used are from roosters, shedded during the natural molting process. The rooster tail feathers were stripped to both mimic filoplumes, and for the aerial and playfulness of the resulting shape (see Figure 2). Each feather is a flexible sensor designed by nature and each feather tip appears as a suspended electrode above the textile. When an external body approaches, these newly created biometric sensors will be the first in contact ; this is the biomimicry of filoplumes which fulfill the role of sensory receptors on birds. The feathers were then polymerized with pyrrole and Iron (III) Chloride to make them electrically conductive (see Figure 3), using a method presented by Honnet et al. [6]. Consequently, the feathers were wire wrapped and hand embroidered, using the hook technique from Lunéville. These progressive steps in textile design enable the creation of a standalone system in which the feathers are sensors which react to touch by emitting sounds. This process is displayed in installations and garments.

Textile

Several silk *chiffons* were needle-punched together to create a textured surface. This textile is then stretched onto an embroidery frame. The textile then forms the substrate for the flexible circuit, to which the feathers are embroidered.

Electronics

Each feather is a flexible sensor designed by nature, each is unique and each preserves its intrinsic flexibility. As the rachis of feathers are similar to standard pins used for

[2]Project page: https://audreybriot.fr/stymphalian-birds

Figure 4: Top: connecting feather stems to wires with wrapping tools. Bottom: Final textile, augmented with conductive feathers.

circuit-boards, the feathers are connected using the standard electronic method of wire wrapping using a hand wrapping tool and a very thin 36 AWG insulated wire matching with the textile substrate (see Figure 4, top). The circuit is designed in advance and transferred on the textile which has been previously stretched onto the frame. The connected feathers are laid out according to the circuit, the cables are pierced thought the textile and are crimped on the underside using crimping beads from jewelry. This results in the top side exposing the tip of the feather, the rachis (the stem) and the wrap (see Figure 4, bot), while the electrical wire is hidden bellow. Following the French embroidery Lunéville technique, the hook, held on top of the frame, makes a chain stitch with the wire underneath. Each feather is connected using this technique to a MPR121 capacitive touch controller board. The touch controller is read by an Arduino Nano microcontroller which controls a DFPlayer Mini MP3 module. The dress uses a Bluetooth Module for wireless transmission in addition to the Arduino.

References

[1] A. C. Baptista, I. Ropio, B. Romba, J. P. Nobre, C. Henriques, J. C. Silva, J. I. Martins, J. P. Borges, and I. Ferreira. 2018. Cellulose-based electrospun fibers functionalized with polypyrrole and polyaniline for fully organic batteries. *Journal of Materials Chemistry* (2018).

[2] Roger Convard. 2000. La plume dans tous ses états : la plume pour parure en France origines à nos jours. (2000).

[3] Christiane Garaud et Bernadette Sautreuil. 1972. *Technologie des tissus.* Casteilla edition.

[4] John Carl Flugel. 1971. *The Psychology of Clothes*. International University Press.

[5] Rachel Freire, Cedric Honnet, and Paul Strohmeier. 2017. Second Skin: An Exploration of eTextile Stretch Circuits on the Body. In *Proceedings of the Eleventh International Conference on Tangible, Embedded, and Embodied Interaction (TEI '17)*. ACM, NY, USA.

[6] Cedric Honnet, Hannah Perner-wilson, Marc Teyssier, Bruno Fruchard, Juergen Steimle, Ana C Baptista, and Paul Strohmeier. 2020. PolySense: Augmenting Textiles with Electrical Functionality using In-Situ Polymerization. In *Proc. CHI*.

[7] Patrice Hugues. 1983. *Le langage du Tissu*. Textile-Art-Langage Editions.

[8] Adrienne L. Kaeppler Betty Lou Kam Leah Caldeira, Christina Hellmich and Roger G. Rose. 2015. *Royal Hawaiian featherwork : Na Hulu Ali'i*. University of Hawaii Press, Honolulu, HI, USA.

[9] Bayle Mouillard and Élisabeth Félicie. 1854. Nouveau manuel complet du fleuriste artificiel ou L'art d'imiter d'après nature toute espèce de fleurs... (1854). Retrieved Jan 6, 2020 from: `gallica.bnf.fr/ark:/12148/bpt6k6292413s`.

[10] Ricardo O'Nascimento and Ebru Kurbak. 2011. Feather Tales. (2011). Retrieved Jan 6, 2020 from: `http://www.onascimento.com/new-page-3`.

[11] Rebeccah Pailes-Friedman. 2015. BioWear: A Kinetic Accessory That Communicates Emotions through Wearable Technology *(UbiComp/ISWC'15 Adjunct)*. Association for Computing Machinery, NY, USA.

[12] Bo Zhou, Jingyuan Cheng, Mathias Sundholm, and Paul Lukowicz. 2014. From smart clothing to smart table cloth: Design and implementation of a large scale, textile pressure matrix sensor. In *Lecture Notes in Computer Science*.