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Jewelry in the 21st Century

Proceedings of the International Symposium
May 15th-16th-17th 2018
Fashion Institute of Technology, NY

Curated by
Wendy Yothers and **Alba Cappellieri**
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FIT **Fashion Institute of Technology** State University of New York

POLITECNICO MILANO 1863

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September 2019

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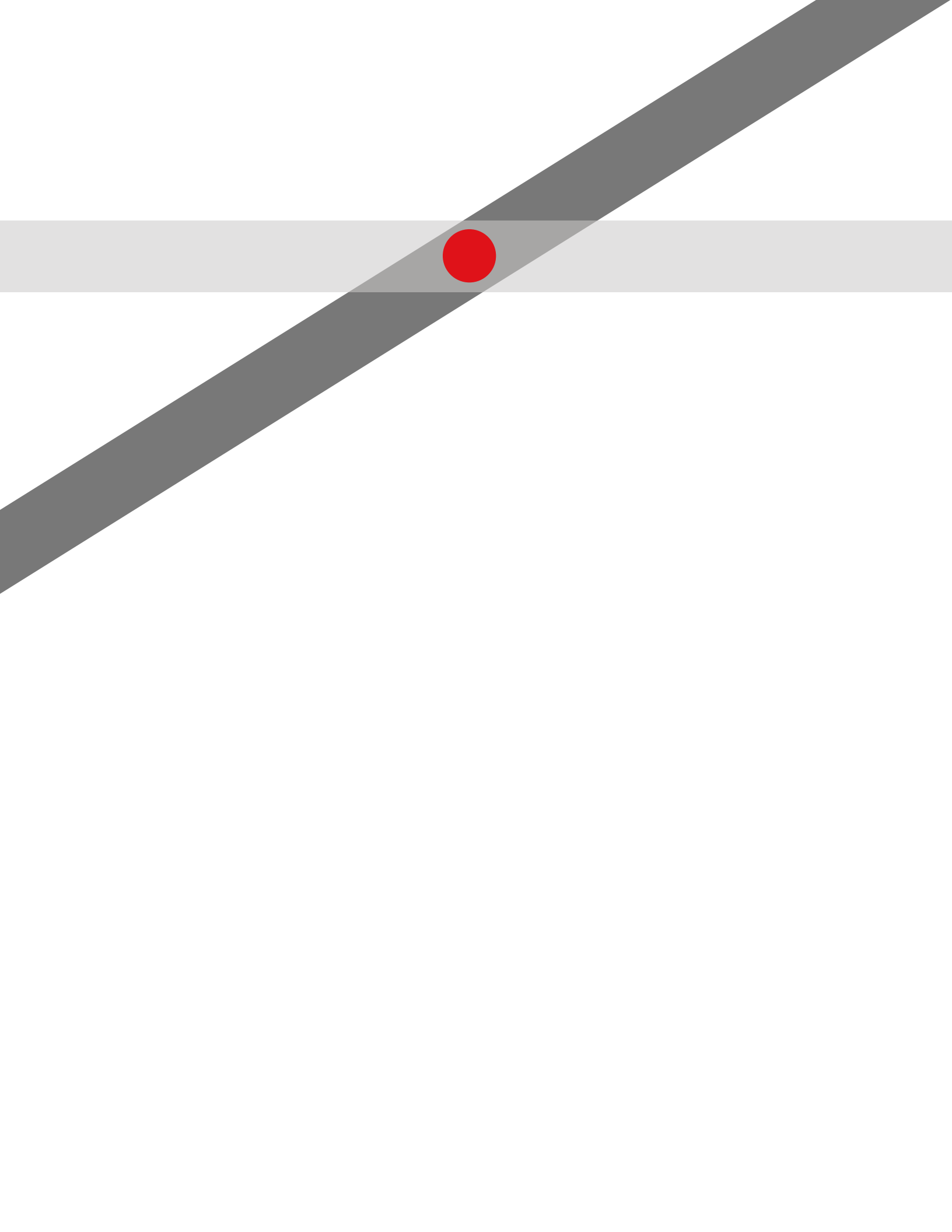
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Jewelry Interactions: from Analog to Digital

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Abstract

Digital technologies and scientific advancements, besides having revolutionized the entire jewelry supply chain, overturning the phases and the roles of the actors involved, have permeated the products themselves, affecting their physical and aesthetic features and the systems of interaction they enable.

The paper aims to investigate the different systems of interactions within the field of jewelry, focusing on the transition from an analog to a digital context.

First, the effects of digital technologies on the supply chains in terms of interaction are briefly described. In particular, the paper finds a possibility to generate an important value for the consumers in open structures, engaging them in co-creating the products along the different phases.

Furthermore, the analysis focuses on the product, describing the evolution of interaction mediated by jewelry conceived as an interface, from analog to digital.

To this end the paper suggests a classification of the different types of interaction systems enabled by jewelry as a medium: the static linear system (analog jewelry), the dynamic linear system (relational jewelry), the close circuit dynamic system (jewelry made with smart and reactive materials), the open circuit dynamic system (wearable technologies). The different systems are described in terms of relationships, features and elements of interaction.

The analysis demonstrates how circular open systems represent a turning point for the evolution of body ornaments. This system resulting by new technological and scientific advancements from one side enhances some features that were already intrinsic in the more traditional jewelry systems, such as the relational component and, on the other side, it offers other powerful tools to create a one-of-a-kind and made-to-measure experience for the wearer.

1. Jewelry from Emotion to Experience

The inclusion of digital technologies has revolutionized the jewelry system, shattering and fluidifying it. The distinction among the different areas is increasingly blurred, the production paradigms tend to blend and contaminate each other.

During the last century jewelry was univocally conceived in terms of precious materials, and characterized for passing to future generations. The contemporary jewelry landscape instead is extremely heterogeneous, animated by such a plurality of languages, concepts and meanings, sometimes in contrast among themselves, that makes it difficult to formulate a univocal definition (Cappellieri, 2016, p.18).

Investment or fashion accessory, ornament or sculpture, industrial or handmade, mass produced or one-of-a-kind, the multiplicity of interpretations suggest however to a common element: the emotional component intrinsically linked to jewelry (Carcano at al., 2005).

The value of the ornament can be connected to the attributed meaning, to the emotion that is able to raise. Whether it is associated to its uniqueness, to the preciousness of materials and to the manufacturing expertise, to the symbolic value of representing a memory or a gift, to the ornamental spectacularity, or to the idea, to the project value, jewelry may convey emotions for the wearer. The widespread distribution of digital technologies, despite having affected the process in terms of optimization and improvement of performances for jewelry companies, it has also created the possibility to impact the final consumer experience. The new powerful technological tools in fact describe an open system, allowing the consumer to take part in the different phases of the process. This systemic interaction generates an added value in terms of experience, amplifying the product's emotional component.

New technologies in fact enable the designer to engage the final consumer in a dynamic way from the design phase to the production. This leads to products' ability to respond to the needs of the clients, in terms of wearability and aesthetics.

Additive technologies and parametric modeling software not only have revolutionized the aesthetics of the final product, allowing the implementation of shapes and finishing otherwise unobtainable for timing and cost with traditional tools, but also put into effect the possibility for the user to intervene in the production of physical objects, starting from digital tools.

Digital co-creation platforms set up a new virtual space for collaboration, where the role of the designer is no longer related to the definition of the final structure of the object, but it consists in regulating and programming the very procedure: therefore design lies increasingly in defining parametric algorithms able to generate struc-

tures with infinite variations, thus maintaining a common coherent matrix. A pioneering example of virtual interactions within the jewelry sector is represented by Nervous System. This tech-oriented design studio, recurring to generative systems, additive manufacturing and digital platforms, enables consumers to easily create their own customized products. Through the use of these tools users can directly interact with the graphic interface, creating unlimited formal variations, generating organic-like structures, such as the perfect geometries of the fractals, extremely complex and always new figures, which become one-of-a-kind pieces, produced on demand.

Virtual platforms valorize the role of the consumers, shortening the supply chain while making the process interactive. Shapeways, Sculpteo and Igniverse are examples of companies whose use of technology enables the users to upload digital sketches, choose materials, prototype pieces and potentially sell them online.

New technologies not only allow the user to create highly customized and one-of-a-kind products, but also "made-to-measure" pieces, adjustable to the size of each and every body. 3D scanners offer the possibility of measuring and accurately tracing the three-dimensional shape of the human figure. The end product will fit the precise contours of the intended client.

The advantages of digital technologies are not only addressed to optimize processes and to create highly adaptive products, scattering the concept of 'size', but also to create sparks for creative experimentation within the sector. *Portrait me*, the project by Vivian Meller and Laura Alvarado, for example, reinterprets the traditional cameo in a modern and ironic way. The characters have been dressed up with historical costumes and then accurately reproduced through the use of a 3D scanner. The shapes were then printed with a laser sintering technique in a brooch collection.

Digital technologies have also revolutionized the retail experience, offline and online. This has not only overturned the dynamics of product distribution and sale through e-commerce, but also promoted the development of online spaces enabling interactive experiences where the user can virtually try on the product via augmented reality before buying it. Boucheron is one of the first luxury brands that understood the potentialities of this digital marketing strategy. Since 2010, through the use of augmented reality, the company has been offering customers the opportunity to try on its precious creations and digitally visit the boutique on the website. New technologies, besides having highly influenced the entire productive system, overturning the phases and the roles of the actors involved, have permeated the products themselves, affecting their aesthetic features, increasing the performanc-

es and conferring new meanings.

2. Jewelry as Interface

Traditionally, jewelry has always acted as a cultural vehicle, transmitting information about the identity of the wearer. However, ornaments have also played the role of a practical tool, with shapes, functions and meanings that have changed over time. The practical functionality was highly emphasized in the first pieces of jewelry produced by ancient civilizations: Kenyans utilized finger-knives to cut shrubs and gather berries, Indians recurred to the use of heavy bracelets whose weight and sharp profiles made it a great tool for personal defense (Cappellieri et al, 2014). The instrumental utility of the ornament has fallen by the wayside, until it almost completely got lost during the modern history. The introduction of digital technology has partially restored the binomial of function and aesthetic: this has marked the transition from aesthetic-ornament to prosthetic-ornament, reactive objects, highly autonomous, designed with the ambition of overtaking the limits imposed by the human body, which is amplified, empowered and monitored.

The introduction of the technological element changes the nature of the product that, from a mostly static piece it becomes an open, dynamic and functional structure.

To this purpose, Baudrillard's considerations about the concept of functionality are particularly interesting (Baudrillard, 2005). The term 'functional' moves away from its common sense of 'responding to a precise scope', but corresponds to 'adapted to a specific order or system': functionality is the property of organically integrating in a context. Therefore, the functional object, according to Baudrillard, is not an object whose primary aim is to satisfy a need, but an element of gaming, of combination and calculation in a universal system of signs. The objects are conceived as 'open structures', characterized by a configuration that makes them assimilated to concepts: despite their apparent formal finitude, they are not defined in use and content. This margin of indetermination makes them highly interpretable. This has influenced the consumers' experience of use: users not only wear the piece of jewelry, but they contribute to complete its sense, defining it, conferring a meaning. These objects "liven up", thanks to the voluntary or involuntary interaction they have with the wearer and/or the surroundings. They are highly customizable because they can perfectly adapt to the wearer's behavior. The most essential difference compared to traditional jewelry is this degree of indetermination: incomplete objects, interface-jewelry items, that are defined in the moment of use, enabling dynamic interactions at different levels.

The transition from the analog context to the digital system has modified the features of the interaction, not only between the users and the piece of jewelry, but also of the relationship, mediated by the ornament, among users, users and environment, users and their own bodies, users and other objects, enabling also other forms of interactions, such as the one with the system.

This research aims to outline and classify the different types of systems enabled by jewelry items. To this end, the following macro categories have been identified:

-the static linear system: analog jewelry;
-the dynamic linear system: relational jewelry;
-the close circuit dynamic system: jewelry made with smart and reactive materials;
-the open circuit dynamic system: wearable technologies.

The areas are described in terms of systemic and relational features that result by the different interaction enabled by jewelry.

Even though the technological and scientific experimentations have facilitated complex dynamic systemic interactions to a significant degree, the seed of the relational component can be seen also in some typologies of jewelry within the traditional analog system.

3. Analog System Interaction
3.1. The Static Linear System

The traditional jewelry system describes a mainly static system, where the consumer interacts with the piece of jewelry wearing it, conferring different meanings to it. This procedure doesn't contemplate either a practical instrumental functionality, nor the possibility of actively taking part to the design phase and modifying the aesthetic features.

The traditional system provides an experience between the user and the product mainly based on analog inert components, such as the physical features of the material, the surface treatments and the overall shape.

The interaction within this context is mostly based on voluntary inputs by the wearer and passive feedbacks from the objects, usually visual or tactile. Besides the first degree of relationship between the user and the piece of jewelry, the enabled system also provides a second degree that consists in the relationship, mediated by the physical and aesthetic features of the ornament, between different users and users with their own bodies. These interactions describe a static linear system, where the jewelry-interface passively behaves without engaging with the context.

The convergence of jewelry to the design culture led to concepts that tend to overlook the preciousness of materials, to celebrate the intangible preciousness of ideas, giving value to the role of people's experiences and behaviors.

3.2. The Dynamic Linear System: Jewelry as Relational Analog Interface

Within the analog system, a particular category of jewelry is designed to enable the dynamic interactions it figures in. These pieces of jewelry can be referred to as 'relational', since they are specifically designed to enable relationships of different degrees among various actors. The jewelry item becomes a relational prosthesis for the body.

The fertile unitary system that takes shape not only links the users to the ornament in a dynamic way, inasmuch configurable and reconfigurable, but also allows them to interact with their own body, with other people, with other objects and with the context. All these different elements are asked to take part to the sense and to the aesthetics of the project.

Between users and jewelry items

Jewelry can become the interface of itself if designed to enable the interaction between the wearers and its own aesthetic features.

These are reconfigurable and customizable objects, designed to leave the final consumer free to establish a relationship with the product, ensuring a wide margin of intervention.

Although historically the goldsmith field did not structurally contemplate the active intervention of the consumer, both in terms of interaction in the process stages and in the aesthetic definition of the product. There are however, in the traditional repertoire, some interesting examples. Sentimental jewelry can be the case.

Extremely rooted in human culture thanks to their ability to convey feelings and emotions, sentimental jewelry can be traced back to ancient times and reaches its maximum expression during the Victorian Age (Cappellieri, 2014). The nineteenth-century sentimental jewelry was designed to celebrate a wide range of feelings: not just love, passion and joy for new births, but also for mourning and condolence, preferring primarily poor materials to emphasize the symbolic and immaterial value. These ornaments were often designed to be customized: the traditional type of chest-jewel meant to guard the memory of the loved ones in the form of rings, medallions, pendants and bracelets, equipped with small cavities to contain hair locks of the missing person. The pieces of jewelry were conceived as empty frames that reached aesthetic and design fullness in the moment they are

animated by the wearer.

The preciousness of materials leaves room to the preciousness of feelings, to the value of the gestures of donating and receiving, thus strengthening the physical and emotional bond between people. It is the case of modular jewelry given to new-born babies during the rite of baptism. The modular elements were then gradually added to celebrate the important moments of life: the piece changed and grew over time along with the person who wore them.

This trend has been reinterpreted over time: it is the case of Pandora, the multinational giant that started a jewelry business from the concept of customization. The bracelets, made in precious metals, can be gradually enriched with the addition of new charms or pendants with different shapes and meanings.

These typologies are based on the concept of open structure and combinational invention, in which the consumer has the possibility to personally affect the aesthetics or the mode of operation of the product by modifying the arrangement of pre-existing parts.

Sentimental jewelry is therefore an interesting example of interface-ornament that enables an interaction between the user and the object itself (through aesthetic reconfiguration) and between different users.

In contemporary times, designers carried out customization at various levels.

Modular jewels allow the users to intervene on the arrangement of predefined parts, to combine them and wear them in various ways. It is the case of *Molecole Preziose* by Massimiliano Adami, a collection made up of sub-multiples, assemblable parts, each constituting the core of structural elements of jewelry. Units to be assembled as parts of a kit, as in the project of Drilling Lab that creates a precious alphabet by reinterpreting the structures of industrial clamps; Manuganda's *Compo* describes a modular chain that can be disassembled and reassembled in different ways, stimulating the creativity of the wearer. Maria Jennifer Carew with *LessIs* reinterprets the brooch to promote combinatorial innovation: the project not only offers the possibility to compose a variety of elements, but also to arrange them on garments in different ways, wearing them without any rule.

Between users and their own bodies

The most immediate relational system describes the relationship between the ornament and the body of the wearer. Jewelry has always been conceived and designed for the human body, not only to enhance it, but also to modify it, to emphasize its features, making it theatrical, imprisoning it, forcing its transformation, temporarily or permanently. The ornament is not only able to change the aesthetics

Figure 1: Manuganda, Compo Necklace, 2007, anodized aluminum

of the wearer's body, but also alter the senses.

Body modification using ornaments is a practice already popular among the different cultures of the world in ancient times. This habit is still current among some specific ethnic groups, such as the Mursi's labial plate or the Kayan women's neck rings in Thailand. These body altering practices, besides having a specific symbolic value, allow the user to join certain aesthetic criteria and thus to stress his own identity of belonging to a specific ethnicity.

The jewelry-mediated relationship between users and their own bodies has been extensively investigated in contemporaneity, raising the interest of designers and artists who have explored the jewel-body interaction through experimentations in different ways.

These are mostly conceptual and paradoxical projects, whose aim is to astonish and to offer cause for reflection to the observer, beneficiary of the work. The wearability of these pieces is secondary to the message that the designer-artist wants to communicate.

Jewelry can embody temporary traces on the body, exhibited and declared as in the case of Gijs Bakker's *Shadow Jewelry* series, or hidden and intimate, as it is for Ineke Hans's jewel for Chi Ha Paura? (*Forever Yours*). They may be designed to hide part of the face, taking on the behavior of masks that change the real perception of the wearer's body, as in Akiko Shinzato's *Another Skin Jewelry Collection*, or as in Mint Design's protection masks.

Jewelry can also be disruptive in its body modification process. The following projects describe situations where the skin is forced to temporarily adapt itself to 'unwearable' ornaments. Real body-cages are those made by Ren Kurosawa, who re-interprets the prohibition of the fundamentalist Catholic religion in a metaphorical way. Sascha Nordmeyer focuses on the mouth, creating ironic and eccentric objects with the aim to force the smile in unusual grim faces, while Naomi Filmer designs jewelry to lock the hands in precise positions. Jennifer Crupi also refers to gestures and she is particularly interested in the communication between people through body language. She creates a collection of sculptural jewelry that encourages precise actions and specific plastic poses.

The reflection and the more-or-less-veiled critique about the role of aesthetic surgery in defining a common aesthetic in the contemporary society is an inspiration for several designers. They can be eye-catching objects such as Zhilu Cheng's *Self Image collection*, made with stainless steel elements that make the gums visible and stretch the mouth in different and unpleasant ways; or they may be in the form of a series of discrete prostheses designed to distort facial and body expressions

as for Imme Van Der Haak's and Burcu Büyükünal's projects. Also *Urban Dolls* by Valma Vaiciule, a series of micro prostheses that partially alter the face, challenges the canon of common beauty; while Studio X creates an object halfway between an ornament and an aesthetic surgery device that corrects somatic features, modifying the shape of the eyes. Lucy McRae and Bart Hess (Lucyandbart) deal with ornaments and low-tech cosmetic surgery. At the MU gallery in 2008 they set up a performance during which they apply hooks on the face of visitors to redefine their aesthetic features.

Some designers, on the other hand, explore the relationship between functionality and beauty, placing themselves in a hybrid area between orthopedics and accessories: Francesca Lanzavecchia, for example, reinterprets temporary disability prosthesis designing embroidered collars, while Una Burke is inspired by the world of orthopedic braces to create her *Re.Treat collection*, where sculptural shapes that, like casts, force the movements of the human figure.

The *Medically Prescribed Jewelry collection* by the Portuguese designer Olga Noronha is fully involved in the medical field. Hers is an alternative approach to jewelry, exploring the mix of science, medicine and ornament. The project involves the combined use of real surgical instruments mixed with precious materials with the aim of creating functional jewelry that not only are closely in contact with the body but also substantiate it: some pieces are in fact implanted, they disappear into the skin, becoming visible only through X-rays.

This category not only includes jewelry designed to modify the body, but also prosthesis-ornaments that can alter the perception of reality. In fact jewelry can be designed with the aim of mediating the sensory experience of the wearer. They can enhance, alter or cancel the senses involved. After the famous Getulio Alviani's *Monorecchino*, a work of art that, amplifying the ear-piece size, increases the hearing ability of the wearer; Gina Hsu also focuses on hearing, designing *Hear Ring* for Chi Ha Paura?. It is a small acoustic-instrument-shaped ring that amplifies the sounds when brought to the ear. Émile Voirin, on the opposite side, addresses her *Earbling* - a silver necklace with small colored ear plugs - to those who want to indulge in moments of isolation.

Natha Khunprasert's *Finger Tips* challenges the sense of touch, altering the sensitive perception of fingers, trapping them in glass spheres; while Zoé Bezençon designs a phalanxes ring whose tuft allows brushing against objects without directly touching them.

If Studio Eric Klarenbeek designs contact lens-jewelry to improve the sense of sight, Ana Blagojevic creates *Senza Sensi*, a set of elements to be worn together,
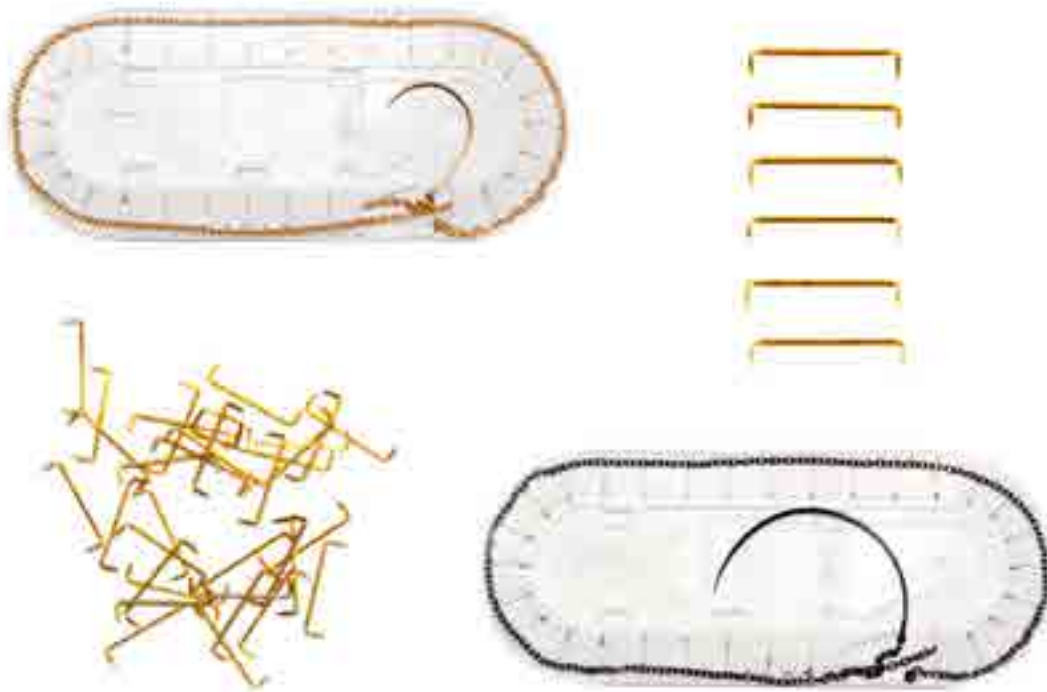
Figure 2: Olga Noronha, Sub-Dermal and Exo-Dermal, Medically Prescribed Jewelry, 2013, suture staples and suture wires, precious metals, source: olganoronha.com.

each of which cancels a specific sense: the destruction of all senses amplifies the perceptual experience for the couple (Finessi, 2012).

Between users and other objects
As an extension of the human structure, jewelry can increase the body's performances by wearing it, becoming an instrumental prosthesis and performing practical functions.

Jewelry belonging to this category is no longer merely an aesthetic ornamentation, but becomes useful, enabling the relationship between the wearer, the environment and other objects. The aesthetic of these ornaments expresses their functionality: these items are designed to be used, suggesting precise modalities of intervention by the consumer.

Already in 1987, Alessandra Cusatelli revolutionized the concept of cutlery by designing ornamental tools to be worn directly on the fingers, revisiting not only the aesthetics of traditional instruments, but also the gestures related to the ritual of meals. Paolo Ulian laughs about the contemporary way of feasting, designing a handy toothbrush for those who eat food quickly and frequently throughout the day. Even Moloudi Hadji revises the toothbrush: the personal hygiene tool is reduced in size and takes on the wearability of a tongue piercing. For literature lovers, Matteo Ragni has designed a small object with wings that serves as a precious and functional ring: it keeps the book open, allowing a 'handy' reading.

Some jewels may be transformable, in a reversible or irreversible way: turning from purely ornamental into functional objects fulfilling a certain purpose. *Nap Collection* by Camille Cortet, for example, consists of objects that can be converted as needed: the spherical necklace pendant, if opened, becomes a small portable pillow for emergencies.

Drawing Tools by Laimé Lukosiunaite are used to stimulate creativity: chalks-ending claws that transform the limbs into drawing tools; Hilary Sanders's graphite ring instead is more wearable and subtle, enabling the user to new gestures, to a new dimension of artistic performance. Kyeok Kim designs a collection of soap-shaped rings: in contrast with the value of eternity conferred to jewelry, the ring dissolves with few gestures, leaving behind only a sweet aroma.

In all these examples, shapes are closely related to functions, suggesting the users' behaviors and partially predefined intervention procedures.

Between users

From ordinary complementary heart-shaped pendants, which in their entirety create an overall readable figure, to *Vera Laica* by Angelo Mangiarotti, the wedding ring that works thanks to the two parts that compose it. The history of sentimental jewelry conveys several examples of ornaments that can bind people in an experience, both metaphorically and physically.

These relational products not only exploit the value of the ornament as a communicative interface between individuals, but also suggest interactive actions thanks to their aesthetics, telling what people can do, together. They are not entirely defined

Figure 3: Laimé Lukošiūnaitė, Drawing
Tools, Source: laimeluko.com.

Figure 4: Michael Leung, Wishbone, 2007
pendant, porcelain, Source: chpjewelry.com.

dynamic products, whose essence suggests a sharing experience among several actors, creating new rituals. *Wishbone* by Michael Leung for Chi Ha Paura?, for example, is a fragile porcelain pendant that can be broken together with a friend while making a wish. The very fracture confers a customized aesthetics to the piece.

Jewelry can measure relationships, as *Friend or Foe* by Lin Cheung proves. It is a ribbon necklace that ironically attributes a label to the rapport depending on the distance between people; but jewelry can also facilitate and moderate relationships, such as in Didier Faustino's prosthesis-accessory: a mask for two, which induces and facilitates a kiss action.

Jewelry may even physically bind people. *Ring For Two* by Otto Künzli and *Pair* by Sun Kyoung Kim are 'tandem rings' designed for the couple.

All these jewels require a joint participation of people to create the experience, creating contextual, extemporized and unique performances, involving individuals in their sociality. These objects generate a physical and emotional bond between people, evoking relational meanings.

4. Closed Circuit Dynamic Interaction

Technical-scientific experiments brought by the Third Industrial Revolution have significantly influenced the evolution of both natural and artificial materials by introducing the concept of 'designed material'.

The matter is molded at micron resolution, and its features are designed considering specific functions to solve technical problems. These interventions alter and improve the characteristics of the materials, making them appropriate for targeted purposes: not only high performances, innovative functionality but also responsiveness and behavioral autonomy. Smart materials are in fact special materials designed to describe and incorporate complex behaviors, to produce specific action-reaction depending on the stimuli produced by the human body or the surrounding environment (Ferrara and Lucibello, 2009).

With the concept of 'material design', the idea of the static nature of matter fails: the material changes, assuming different features.

Widespread in the field of active wear, these smart and programmable materials have opened the jewelry field to unprecedented opportunities, for practical and aesthetic applications.

From the simplest and most common thermochromics jewelry to those that exploit the reactive properties of some particular stones: Elena Corchero conceives pendants with Albedonite, which, if stimulated by the sun rays, passes from light pink to intense magenta, to warn of the danger of UV exposure.

Figure 5: Formafantasma for Chi Ha Paura..?,
My Own Show, 2013, Head piece, titanium.

Federica Francisco for *Lumina biomorphic collection* takes advantage of the phenomenon of photoluminescence: tapered glass stones collect daylight and release it into the dim light, illuminating who wears them. *My Own Show project* by Formafantasma moves around the theme of light. The shining head ornament makes it impossible to take pictures of the wearer: it reacts to the flash of the camera with an intense light that covers the user's face blinding the photographer.

The dynamics of natural mechanisms are often a source of inspiration for innovative design solutions. For example, Neri Oxman and the MIT Media Lab team designed a series of 3D 'wearable skins' that can facilitate synthetic biological processes allowing man to survive on other planets. *Wanderers: An Astrobiological Exploration* is a four pieces collection made with a living substance. This interacts with the environment and creates a micro-habitat suitable for humans by chemically modifying the atmosphere.

Smart materials confer to jewelry a partial behavioral autonomy, creating a dynamic interaction between the wearer and the surrounding environment.

This closed-circuit system binds the involved actors in a circumscribed dialogue. The interaction inputs of the wearer are often unintentional, material reactions only partially controllable and hardly quantifiable from a numerical point of view.

5. Open Circuit Dynamic Interaction

The 1980s are the period in which, alongside the Internet explosion, consumers witness the entry of the first wearable technologies, *Walkman*, mobile technologies, mobile phones and laptops, into the everyday life. With the birth of computers, industrial machines leave room for intangible assets, moving from hardware to software (Dery, 1996).

A dense and pervasive network system spreads out, progressively encasing what finds on its way: The Internet of Things. Materiality of products is here combined with immateriality of connections, whose crossroads are made up of everyday objects.

The technology-enabled system describes an open, conversational circuit that transforms the product into a highly responsive and time-sensitive interface-subject, a 'spime' (Sterling, 2005), able to communicate with other interfaces by transforming the user from recipient to mediator.

The main feature of these products relies in their ability to enable the users to new interactions, connecting them with their own body, with other users, and with the surrounding environment. In order to improve and guarantee new performances to the user, these connections generate a multitude of discrete data that can be used

in real time, but also exchanged and archived through a constant dialog with the pervasive system.

A greater part of wearables is smart-bands. These bracelets with embedded technology are mainly used in the sports field, as measuring tools for performances that then can be compared to others'. *Fitbit*, for example, aims to monitor the physical activity and is presented in different versions, from a smaller-free screen to a bulkier one approaching aesthetics similar to a watch. *The Sony Smart Band*, *Samsung Gear* or *Vivosmart Garmin* additionally receive notifications of phone calls or messages; *Razer Nabu* creates a social network among all those who wear the smart-band to exchange information and compare similar interests. All these products have a poorly designed aesthetic in common: wrist bands, with or without screens, interacting with the wearer through sounds or vibrations signals. *LumoLift* brooch, thanks to a reduced number of functions, aspires to almost imperceptible dimensions. The smart brooch monitors the posture and alerts the user with a slight vibration to remind to keep shoulders back and head raised. Some products are linked to the medical sector, *Embrace* by Emaptica prevents seizures besides measuring stress, anxiety, and sleep. *Moodmetric Smart Ring* measures emotions and monitors the nervous system signals in order to control and improve the quality of life. From the connection with the own body and with other people to the one with other objects. Jewelry for example can become the interface for the smartphone. Thanks to the access via smartphones, some jewels take advantage of the power of images: *Purple Locket*, harking back to the traditional aesthetics of a medallion, is a tool to share pictures, or the *Tago Arc*, a wrist Kindle that can be customized by the user with different textures. The 'projectables' are based on the role of images as interfaces: in most cases they exploit the holograms to reproduce the screen of the smartphone, as in the *Cicret* bracelet, in other cases they simply have an aesthetic function, as the *Neclumi*.

The smartphone is not the only object that can be controlled by these technological ornaments. A range of jewels has been designed to enable gestures to control the music volume, to take photos or to answer phone calls, as in the case of *Logbar*. Hiris allows the user to control all smart devices at home, and *Neyya* transforms each phalanx in a controller to adjust the sound, make phone calls or send messages.

Some pieces of jewelry aims to create a connection between the user and the environment. *Juno* by Netatmo records the amount of UV rays hitting the body and alerting the user.

Instead, the Shanghai government has adhered to the use of *Shuashua*, a bracelet

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Figure 6: LIBER8 Technology, Targo Arc, 2015,
Bracelet, golden metal, E Ink display.

enabling payments with NFC not only for public transportation, but also for restaurants, supermarkets, gas stations, movie theaters and hospitals.
Widespread multifunctionality, constant connectivity, intuition and immediacy. The trend of interaction has shifted from being screen-centric (systems where users interacted with devices through keyboards, or screen, generating a series of new gestures) to 'interaction everywhere'. The most avantgarde projects developed by the biggest multinational companies are trying to enable interactions with every kind of surface, eliminating the physical element, transforming the gesture into the interface.

6. Conclusions
The analysis demonstrates how circular open systems represent a turning point for the evolution of body ornaments. These advanced products tend to stress some features that were already intrinsic in the analog linear jewelry system, such as

the relational component. Within this context new technological and scientific advancements are transforming objects from open, customizable, therefore passive, relational interfaces to reactive and increasingly autonomous entities. The renewed interaction takes on the feature of a dialog, a conversational system that considers objects able to independently behave. Technological interactions not only enable all-senses-experiences, but also produce quantifiable data that can be collected, exchanged and stored, impacting on the possibility for jewelry to create a one-of-a-kind and made-to-measure experience for the wearer.

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