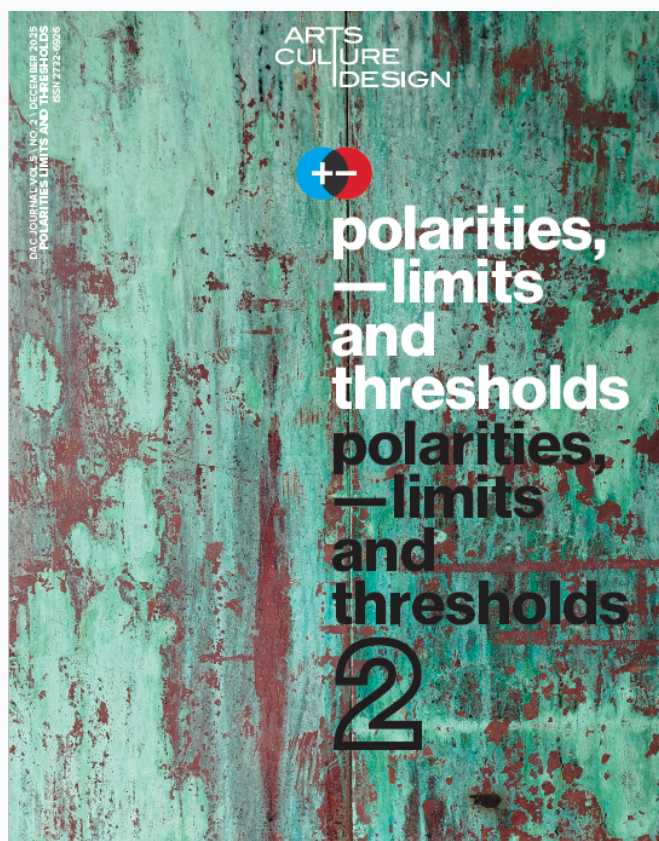


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POLARITIES, LIMITS AND THRESHOLDS



The prosthetic imagination: limits, polarities, thresholds, and the cultural meaning of bodily enhancement

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THE PROSTHETIC IMAGINATION: LIMITS, POLARITIES, THRESHOLDS, AND THE CULTURAL MEANING OF BODILY ENHANCEMENT

ABSTRACT

This paper investigates the intersection of medical function and aesthetic expression in the design and use of prosthetics. Traditionally, prostheses were conceived as medical devices that restored lost function or concealed physical difference, aiming to approximate a normative bodily form. However, contemporary practices reveal a shift toward visibility, individuality, and creative expression, suggesting that prosthetics operate not only as tools for repair but also as sites of aesthetic and cultural innovation.

Drawing on case studies ranging from historical developments in Victorian medical aids to contemporary practices such as The Alternative Limb Project, this research situates prostheses within a broader lineage of enhancement and repair. The study engages with theoretical frameworks from cultural theory, design studies, and medical humanities, including Freud’s notion of the “prosthetic God”, Haraway’s cyborg theory, and Kupperts’ exploration of scars and visibility.

The analysis demonstrates that prostheses function as more than functional replacements: they are extensions of identity, embodiments of social values, and catalysts for rethinking disability and normality. Central to this argument are the concepts of polarities, limits, and thresholds: prostheses expose the polarity between concealment and display, press against the limits of the human body, and mark thresholds where medical necessity becomes artistic expression.

The paper highlights how the fusion of medical utility and aesthetic innovation can empower users, reduce stigma, and foster new understandings of embodiment. In doing so, the research contributes to debates on enhancement, ethics, and the role of aesthetics in medical practice, positioning prosthetics as crucial mediators between technology, identity, and cultural meaning.

INTRODUCTION

Throughout history, human beings have sought to overcome the limitations of the body through technological, medical, and aesthetic interventions. From ancient prosthetic devices to contemporary biomedical engineering, the body has been continually reimagined, repaired, and extended. The development of prosthetics is particularly significant, as it embodies both the functional imperative of restoring lost capacities and the symbolic drive to reshape identity through design. Freud (2015) famously described man as a “prosthetic God” suggesting that technological extensions magnify human ability while simultaneously reminding us of our inherent vulnerability.

Central to this exploration are the themes of polarities, limits, and thresholds. Prosthetic technologies expose the polarity between absence and presence, natural and artificial, concealment and visibility. They press against the limits of the human body, both physical and psychological, testing what it means to repair, enhance, or even exceed/extend natural capacities. At the same time, prosthetics mark thresholds, liminal points where the body and technology merge, where medical necessity becomes aesthetic choice, and where cultural anxieties about authenticity, identity, and normality come to the fore.

In recent decades, advances in biotechnology, tissue engineering, and digital fabrication have blurred distinctions between the functional and the aesthetic. Prostheses are no longer designed solely to conceal absence or replicate “normality” but increasingly serve as sites of artistic expression, individuality, and even glamour (Pullin, 2011; Mullins, 2009). This shift reflects a broader cultural movement that regards the body not as fixed but as malleable, a canvas for transformation through medical and technological means (Haraway, 2013a; Morra, 2007).

At the same time, the history of prosthetics reveals an enduring tension between repair and enhancement. While traditional prostheses sought invisibility, contemporary practices, including bespoke prosthetic design and “medical jewellery”, embrace visibility, reframing disability as difference and prosthesis as opportunity (Kupperts, 2007; Serlin, 2004). This suggests that prosthetic design must be understood not only as a medical or technical endeavour but also as an aesthetic and cultural practice.

Sigmund Freud’s notion of the “prosthetic God” offers a foundational perspective on the relationship between humanity, technology, and embodiment. In *Civilization and Its Discontents* (1930/1961), Freud argued that technological extensions, ranging from spectacles to transportation, grant humans god-like powers by compensating for bodily deficiencies (Freud, 2015). He also emphasized that these enhancements never fully overcome human vulnerability, describing humans as “prosthetic gods” whose tools provide extraordinary power but also carry fragility and dependence. Prostheses, in Freud’s framing, are thus double-edged: they amplify human capacity while simultaneously highlighting the incompleteness of the human body.

Donna Haraway radicalises this understanding in her *Cyborg Manifesto* (1985/1991), where the figure of the cyborg disrupts binary distinctions such as human/machine, nature/culture, and male/female (Haraway, 2013a). For Haraway, the cyborg is not a supplementary prosthetic attached to a pre-existing “natural” body, but rather a hybrid ontology that emerges at the intersection of organic and technological. Unlike Freud’s

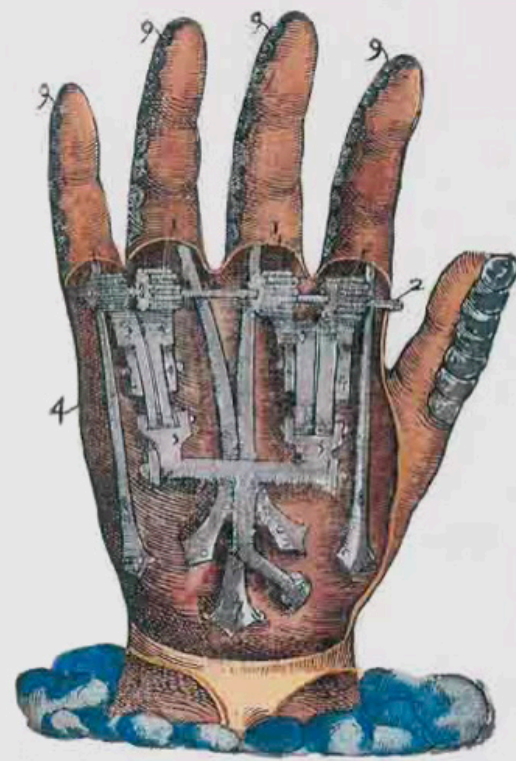


Figure 1
Instrumenta chirurgiae et icones
anathomicae (Ambroise Paré)
(Wellcome Collection, 1564).

melancholic image of prosthetic dependency, Haraway positions technological embodiment as an opportunity for political re-imagination, feminist intervention, and posthuman becoming. The cyborg signals a shift from seeing prostheses as compensatory devices to recognizing them as constitutive of identity and subjectivity itself.

From research on prosthetic technology dating from the 16th century to modernist reviews of the body itself as a machine, it is obvious that the relationship between the human body and technology has been capturing people's imagination in various ways. Ambroise Paré's had already exemplified in 1564 what Haraway later argued – in *Instrumenta chirurgiae et icones anathomicae*, the machine is structurally and aesthetically humanised (figure 1).

Petra Kuppers (2007) blurs both Freud's and Haraway's frameworks by focusing on the lived experiences of disability, scars, and bodily visibility. In *The Scar of Visibility: Medical Performances and Contemporary Art*, Kuppers highlights how scars are not merely traces of trauma but also sites of narrative, meaning-making, and embodied difference. Scars destabilize the polarity of wholeness versus damage, occupying a threshold between injury and healing. Unlike Freud's universalizing claim about prosthetic lack or Haraway's utopian hybridity, Kuppers foregrounds the material and social dimensions of embodied difference, emphasizing that repair, scarring, and prosthesis are cultural as much as medical phenomena. Her work insists on visibility, not as spectacle, but as a mode of rethinking disability, resilience, and embodied diversity.

The main reason why body art/modification affectionate and practitioners



Figure 2
Laurance Sessou
aka 'Moniasse'
Photograph by Stephanie Dray,
Courtesy of Laurance Sessou

appreciate the process of scarifying is because it is never a precise and totally predictable procedure. Also, it is thought to be more natural than the injection of artificial pigments into the skin. An example is of Laurence Sessou (figure 2), where the body is partially covered in tattoos and scarification. Sessou (2015) believes the scars to be “the markings of our tribes; it shows who we are”.

Taken together, these three perspectives illustrate shifting paradigms in thinking about prosthesis and embodiment. Freud frames prosthetics as tools that underscore human insufficiency; Haraway reframes technological integration as an emancipatory reconfiguration of subjectivity; and Kuppers insists on grounding these discussions in the lived, aesthetic, and social experiences of marked and repaired bodies. The interplay of these frameworks reveals that prosthetics, scars, and cyborg identities are never neutral: they are sites where technology, culture, and embodiment converge to redefine what it means to be human.

This paper explores the intersection of medical function and aesthetic expression in prosthetics, situating them within a lineage of enhancement and repair that extends from mythological imaginings of the body's transcendence to contemporary bio-art and design. By examining how prostheses operate as both tools of repair and sites of aesthetic innovation, the research highlights their role in shaping identity, embodiment, and social perception. In doing so, it contributes to critical debates in medical humanities, design studies, and cultural theory about the meaning of enhancement, the ethics of bodily intervention, and the role of aesthetics in medical practice.



Figure 3
Icarus 1st-3rd century CE, bronze.
The British Museum, London.
The Trustees of the British Museum ©



Figure 4
Tattoo scene
from the movie Crash.

2. ENHANCING AND EXTENDING THE BODY

2.1 PHYSICAL AND PSYCHOLOGICAL DIMENSIONS

Noronha (2018) explores enhancement through different categories, each of which impacts distinct conceptions of the body. Here, we will briefly establish the basis for distinguishing physical and emotional/experiential forms of enhancement, while emphasizing how enhancement constantly negotiates polarities (e.g., natural/artificial, human/machine), tests limits (the boundary of what the body can or should endure), and crosses thresholds (moments of transition into new states of being).

Enhancement is often associated with comic book heroes, endowed with superhuman strength or the ability to fly. These figures foreshadow ideas of transhumanism, both the study of and the attempt to transcend human limitations by using technology to transform and extend body and mind. As Sargent (2012) notes, one might even imagine enhancement as a pill capable of making us smarter or extending our lifespan. The desire for “more” exposes a tension between aspiration and danger - a polarity between empowerment and risk.

The myth of Icarus exemplifies this (figure 3). His flight embodied a transgression of human limits, yet his fall revealed the peril of crossing thresholds without caution. The image of wings has long been a materialised metaphor for transcending our earth-bound condition. The story demonstrates how technologies, acting as prosthetic “wings” can momentarily suspend natural laws, but always within the shadow of collapse.

This polarity between liberation and downfall continues to shape contemporary

debates on enhancement. Technologies extend our natural capacities, but also remind us of fragile limits and thresholds - ethical, physical, and psychological - that must be negotiated.

The 2012 exhibition *Superhuman: Exploring Human Enhancement from 600 BCE to 2050* at the Wellcome Collection, curated by Emily Sargent, questioned whether technology always improves life or whether we should instead strive for authenticity and “normality” (Sargent, 2012). Presenting artefacts spanning centuries, the exhibition foregrounded how enhancement sits at the threshold of cultural fascination and unease. Sargent frames technological enhancement as both exciting and unsettling, prompting reflection on the polarities between progress and preservation, self-improvement and identity loss.

This aligns with Haraway’s (2013a) perspective of the body as a site for transcending entrenched binaries - human/inhuman, man/machine, female/male, physical/technological. Enhancement thus becomes a process of threshold crossing, destabilising what was once considered fixed. Similarly, the reflections articulated in J. G. Ballard’s novel *Crash* (1973) and David Cronenberg’s film adaptation (Ballard & Cronenberg, 1996) remind us that contemporary life is increasingly shaped by the fusion of flesh and technology, dissolving established categories of organic and artificial. As Cronenberg himself notes, the narrative explores the attempt to “transcend (the body) by transforming it (...) absorbing and embedding technology and having it become a part of us, literally” (Cornea, 2003). Critical readings of *Crash* (figure 4 illustrates a tattoo scene) likewise emphasize how the novel and film collapse the distinction between car and body, where “flesh (is) likened to the glitzy, fetishised surface of cars” (Brown, 2001, p. 91).



Figure 5
Angiogenetic Body Adornment
Cherry, 2013.
(photographic simulations)

Figure 6
Biojewellery Project
(Kerridge et al., 2008)

Examples such as Norman Cherry's Angiogenetic Body Adornment (Cherry, 2013) (figure 5) and Kerridge, Stott and Thompson Biojewellery (Kerridge et al., 2008) (figure 6) project, vividly illustrate the convergence of biomedical technology and aesthetic practice. Both projects transform processes typically confined to medical science into artistic and cultural interventions, deliberately collapsing polarities between science and art, function and beauty, therapy and adornment. Cherry's work envisions the body as a site of controlled cellular growth, where angiogenesis, the natural process of blood vessel formation, is harnessed to sculpt and modify the human form. Biojewellery, by contrast, situates tissue-engineered bone within a symbolic and relational framework, embedding personal and emotional narratives into the scientific manipulation of living cells.

These works probe the limits of tissue engineering, expanding its potential beyond conventional medical objectives and challenging the boundaries between repair and enhancement. Participants are positioned at thresholds of transformation, navigating the liminal space between the body as received and the body as consciously designed. Here, the body becomes both a medium and a message: a canvas upon which identity, desire, and cultural meaning are inscribed alongside cellular structures. The interplay of control, collaboration, and aesthetic intention highlights the relational and ethical dimensions of these interventions, raising questions about autonomy, embodiment, and the social significance of body modification.

Moreover, the projects foreground the emotional and experiential aspects of

enhancement. By allowing participants to engage actively in the shaping of their own tissue or symbolic representation, Cherry (2013) and Martin (2006) cultivate a sense of agency and self-authorship. The threshold between medical treatment and artistic practice becomes a site where the human subject is simultaneously repaired, transformed, and aesthetically extended. In this way, enhancement is not merely technological but also profoundly cultural and emotional: it mediates identity, challenges societal norms regarding the body, and cultivates new narratives about the possibilities of human embodiment.

Ultimately, these projects exemplify how the body can function as a site of experimentation at multiple levels - biological, aesthetic, and ethical - where polarities are questioned, limits are explored, and thresholds of transformation are actively negotiated. They invite a rethinking of enhancement as a continuum that encompasses repair, augmentation, and expressive self-fashioning, revealing the interdependence of the physical, psychological, and cultural dimensions of human experience.

2.2 EMOTIONS AND EXPERIENCE

Not only the physical and tangible aspects of the human body are matters for enhancement and extension; emotions and experience can also be augmented through design. A compelling example is Sompit Fusakul's practice-based Ph.D. research at the Royal College of Art (RCA), entitled Interactive Ornaments: Emotions in Motion. Fusakul's project consisted of a series of jewellery pieces designed to enhance the expression of emotions through interactively changing compositions (Fusakul, 2002). These computational pieces detected the wearer's heartbeats and responded dynamically, translating physiological data into visual forms that mediated emotional communication. He demonstrates that jewellery, or what has been termed "internet wearables" (Mura, 2008), can serve as a medium for conveying psychological and emotional states, extending the concept of bodily enhancement beyond the purely physical.

Directly connecting this to healthcare applications, Leon Williams' Ph.D. research at the RCA, The Development of Digital Technologies for Use in Jewellery with Medical Applications, explores how jewellery can enhance both the usability and desirability of medical devices (Williams, 2009). Williams argues that integrating qualities traditionally associated with jewellery, such as elegance, personalisation, and aesthetic appeal, can improve patient interaction with medical devices. His research focuses on digitally enhanced jewellery capable of monitoring health parameters and reimagining devices like the diabetic insulin pen, asthma inhaler, and HIV medication carrier as wearable, user-friendly objects. For example, Williams' "Slim-line Asthma Inhaler" (figure 7) was designed to reduce the social stigma associated with conventional inhalers. The device is compact, lightweight, and visually appealing, allowing it to be carried in a pocket or worn as a necklace. Trials reported that approximately 87% of users found the redesigned inhaler improved usability, with 80% expressing interest in it as a commercial alternative (Williams, 2009). Similarly, his pill-pomanders integrate modular, magnetic components for storing and organising tablets, combining practicality with aesthetic pleasure. Protective covers provide discretion, allowing patients to carry medication with dignity while retaining control over their appearance and personal expression. These examples illustrate how careful design at the intersection of jewellery and medicine can enhance both functionality and emotional experience.



Figure 7
Gold Slim-line Inhaler
with Silver Grip and Engraved
Canister (Williams, 2009).

Figure 8
LJP IU
jewellery pieces (Potter (2003).

Laura Potter’s research further explores this intersection in a different context. In her project, Potter (2003) investigated women’s perceptions of intrauterine devices (IUDs), framing them as a form of “internal jewellery” (figure 8). Rather than collecting purely quantitative data, she explored women’s emotional and intuitive responses to IUDs, which resulted in the creation of eight jewellery pieces reflecting the interplay between medical device and personal meaning. Potter’s work demonstrates that aesthetic and structural qualities of medical devices influence emotional responses and engagement, highlighting the potential for jewellery-based approaches to humanise and personalise medical technologies.

Taken together, these projects suggest that jewellery shares two key characteristics: it is intimately connected to the body, whether worn externally or internally, and it evokes personal meaning, curiosity, and admiration. By leveraging these qualities, designers can transform medical devices from purely functional objects into tools that enhance emotional experience, autonomy, and user confidence. As Pullin (2011) argues in Design Meets Disability, medical gadgets can become objects of joy and empowerment rather than anxiety and stigma, if designed with the same attention to desirability, aesthetic value, and personal expression as jewellery. In this way, enhancement and repair extend beyond mere physical restoration, encompassing emotional, psychological, and social dimensions, ultimately allowing patients to engage with their bodies and treatments with agency, pleasure, and dignity.

3. REPAIRING THE BODY WITH PROSTHESES

The history of prosthetics reveals a continuous negotiation of polarities, limits, and thresh-



Figure 9
Victorian ear trumpet

olds, showing how human ingenuity has long grappled with absence, presence, and transformation. Prostheses occupy a liminal space between loss and compensation: they are simultaneously remedies for the body’s deficiencies and instruments for producing new forms of embodiment. Rather than merely filling a functional gap, prosthetic devices operate at the intersection of the practical and the symbolic, challenging conventional understandings of wholeness, identity, and bodily integrity. In this sense, prosthetics are as much cultural artefacts as they are medical devices, reflecting evolving societal attitudes toward disability, beauty, and capability. Historically, prostheses have oscillated between the desire for concealment, imitating the “natural” body, and the embrace of visibility, celebrating artificiality as a deliberate statement of identity, aesthetic preference, or technological ingenuity (Noronha, 2018).

During the Victorian era, prosthetic devices vividly illustrated these tensions between utility and display, necessity and luxury. Objects such as hearing trumpets (figure 9), corsets (figure 10), and walking canes functioned not only as medical aids but also as markers of taste, refinement, and social status. These devices mediated the experience of the body, shaping how individuals presented themselves to society while simultaneously negotiating personal limitations or losses. Prosthetic and assistive devices thus extended beyond simple restoration of function: they explored the limits of design, identity, and social acceptability. In occupying this in-between space, they blurred the distinction between pragmatic medical aid and personal ornamentation, demonstrating that repair could be both functional and performative. In essence, prostheses became cultural texts, artefacts through which values, desires, and social hierarchies were communicated, negotiated, and performed.



Figure 10

A brass corset used to minimise te waist or as an orthopaedic device to support the back or correct a spinal deformity, probably English, 19th Century, Wellcome Images, Wellcome Library, London, Museum No. A158256, L0035600, London.

In contemporary practice, designers and artists have radicalised this interplay of thresholds and polarities, transforming prosthetic limbs into sites of creativity, self-expression, and identity-making. Figures such as The Alternative Limb Project by Sophie de Oliveira Barata (The Alternative Limb Project, n.d.) (Figure 11) exemplify this conceptual shift. Similarly, Alexander McQueen's carved wooden prosthetic legs for Aimee Mullins (Kenion, 2022) (Figure 12), along with jewel-encrusted or sculptural limb designs, destabilise conventional notions of repair, functionality, and corporeal integrity. These prostheses operate not merely as medical replacements but as objects of aesthetic experimentation and symbolic reconfiguration. They traverse thresholds of identity, reframing "disability" as a site of creative possibility rather than limitation.

By engaging with prosthetic limbs as tools for self-expression and performative embodiment, Mullins, through her role as wearer, challenges entrenched binaries between ability and impairment, medical necessity and artistic intervention, utility and adornment. The prostheses she uses demonstrate that enhancement and repair need not be exclusively restorative; they can also be transformative, expressive, and socially meaningful.

The concept of repair extends beyond prosthetics into the broader terrain of surgical intervention, body modification, and even scarification, where physical alterations occupy liminal spaces between injury, healing, and transformation. Scars, as Kuppers (2007) observes, are simultaneously markers of trauma and carriers of narrative meaning: they signify survival, resilience, and personal history. Scars blur the polarity between damage and wholeness, existing in a threshold state that is neither entirely broken nor completely restored. Similarly, textile-based surgical implants and projects such as Julian

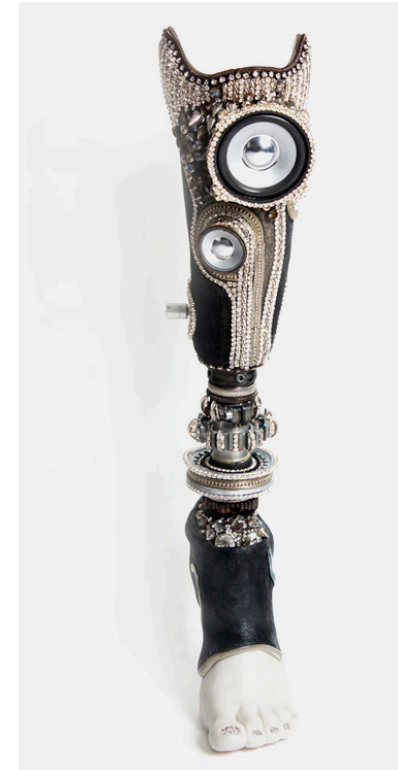


Figure 11

Prosthetic legs
The Alternative Limb Project
by Sophie De Oliveira Barata,
London.



Figure 12

The cherry wood prosthetics,
designed by Alexander McQueen
for Aimee Mullins (Kenion, 2022).

Ellis' embroidered "snowflake" shoulder implant interrogate the boundaries between medicine, art, and identity (Ellis, 2000). These interventions occupy hybrid spaces where functional, aesthetic, and symbolic registers converge, highlighting the potential for repair to be generative, performative, and transformative rather than merely corrective.

Across both historical and contemporary contexts, prosthetics and other forms of bodily repair reveal that interventions in the body are never purely functional. They operate at the intersection of absence and presence, utility and ornament, trauma and regeneration, disability and possibility. By negotiating these thresholds, such interventions challenge rigid binaries and conventional hierarchies, suggesting that the body, and its prosthetic, surgical, or augmentative extensions, is a dynamic site where material innovation, cultural meaning, and personal identity continuously converge, collide, and redefine one another. Prosthetics and bodily interventions, then, do more than restore, they reimagine the body, expanding the possibilities of embodiment, identity, and social engagement.

4. JEWELLERY BECOMES THE BODY

Since Greek times, the base principle of medicine has been the care of people in vulnerable conditions, guided by ethical commitments to healing and bodily integrity (Sternberg, 2003). Traditionally, medical practice has centred on diagnosing what type of intervention is required and how it should be executed. However, contemporary scholarship on embodiment highlights that care also involves how bodies are perceived, mediated, and



Figure 13
Examples of Medically Prescribed Jewellery (Noronha, 2018)
a) Filigree Cervical Collar, gold plated silver, hand-made Portuguese filigree (photography credits: Artur Cabral)
b) Gold osteosynthesis and arthrodesis bone plates, (one with protruding tourmaline set 'piercings', another with pave set tourmalines and two with no gemstones), set with gold plated surgical screws to a hand anatomical model;
c) Running-X stitch gold plated silver beaded chain suture, with an onyx "figa" talisman in swine anatomical part, submerged on formaldehyde solution;
d) Lombostat (spinal orthoses) – polypropylene, gold plated silver hand-made Portuguese filigree and elastic.

materially extended through objects, technologies, and practices (Csordas, 1994; Shilling, 2012). This conceptual shift is central to understanding how medical devices and body modifications increasingly blur the boundaries between the biological body and its technological augmentations.

The notion of embodiment, wherein objects become integrated into bodily identity, lies at the core of Olga Noronha's Ph.D. thesis (Noronha, 2018). Drawing on theories of material agency and the porous, extended nature of the body (Ihde, 2002), Noronha interrogates "the becoming of the body beyond its very boundaries." Her work operates within the broader theoretical framework of posthumanism and body modification studies, which argue that the body is not fixed but continuously reshaped through artefacts, prostheses, and aesthetic interventions (Haraway, 2013b; Braidotti, 2013).

By bridging medicine and body modification, Noronha challenges traditional conceptions of bodily limits and proposes that the jewel, conventionally regarded as an aesthetic accessory, can function simultaneously as ornament, medical device, and bodily extension. Within embodiment theory, these hybrid objects can be read as technologies that "naturalise" themselves into the sensorimotor and symbolic experience of the body. They not only aestheticize the wearer ("it becomes you") but also merge with corporeal identity, operating as prosthetic surrogates and psychological or functional augmentations of the self.

Noronha's approach frames the body as an object of re-design, aligning with theoretical perspectives that view the human body as a site of continuous negotiation between biology, materiality, and technology. Her practice humanises the 'object' by recognising jewellery, medical science, and technological craft as collaborators in the enhancement or reconstitution of the body. Consequently, "becoming the body" encompasses: aesthetic enhancement; integration and naturalisation of the object as part of the body; completion or repair of bodily structures; and prosthetic expansion of physical and symbolic capacities.

The images in figure 13 exemplify the typologies of jewellerys presented in Noronha's doctoral work, illustrating how jewellery operates simultaneously as medical apparatus, aesthetic artefact and embodied extension.

4. CONCLUSIONS

Enhancement and repair can thus be understood as practices that continuously negotiate polarities, probe limits, and traverse thresholds. Polarities emerge in the tension between natural and artificial, hidden and visible, functional and aesthetic, revealing how bodies are always simultaneously biological, social, and symbolic. Limits surface in the ethical, psychological, and physiological boundaries of what bodies can endure, accept, or imagine, underscoring that interventions, whether surgical, prosthetic, or decorative, are never neutral but always culturally and personally situated. Thresholds, in contrast, mark transformative junctures, moments in which bodies are not simply restored but remade, entering new states of being through enhancement, prosthesis, or adornment. These thresholds reveal repair not as a return to a prior state, but as an invitation to exploration, self-fashioning, and creative agency.

Ultimately, this suggests that the act of repair is not merely restorative but generative. It produces new relationships between the body, the self, and the social world, revealing that in the spaces between polarities, beyond established limits, and across thresholds, the body becomes an evolving canvas for experimentation, expression, and transformation.

By foregrounding these dynamics, this research positions medical jewellery as a practice that inhabits precisely these in-between spaces. Rather than functioning solely as remedial devices or decorative objects, medical jewellery reframes prostheses and interventions as sites of possibility and thresholds of becoming. In this framework, repair and enhancement are not endpoints of loss but processes of transformation, where medicine, art, and identity intersect.

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