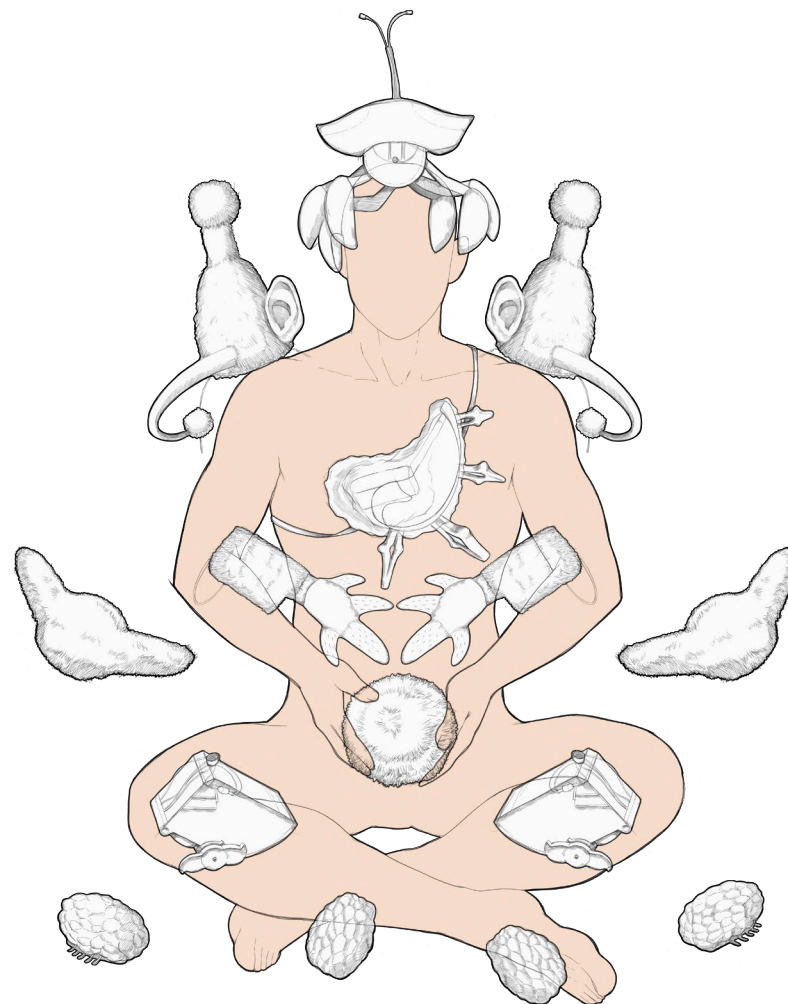




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Cover image: Zhiyang Ding, (2025), *Mechanical Jewellery Pyramid Structure*, Digital Illustration.

Research into, through, and for jewellery: Reflections from the Editor

Author: *Roberta Bernabei*



As the *Journal of Jewellery Research* (JJR) continues to grow internationally, we have welcomed an increasingly diverse community of authors, reviewers, and readers. This year, I am delighted to publish contributions from authors who are based in, or originate from, China, Denmark, France, India, Italy, Portugal, Russia, and the United Kingdom. This diversity reflects not only the journal's expanding international reach but also the increasingly global arena of jewellery research and the wide range of academic traditions represented within our community. The publication of each new volume provides an opportunity not only to introduce the contributions gathered within its pages but also to reflect on the continued development of jewellery research as a field. Over the years, my roles in academia and as JJR's editor have offered a unique opportunity to observe a growing confidence within the jewellery community in identifying, articulating, and presenting its work within a research framework. The wider discourse within our community, together with the contributions gathered in this ninth volume, highlight two particularly significant developments in the field. First, the term *research*, in the jewellery context, has become firmly established within our field. Once used cautiously, it is now employed with increasing confidence and conviction by researchers, educators, curators, practitioners, and higher education institutions alike. This reflects, not merely a change in terminology, but a broader recognition that jewellery can be the subject of rigorous scholarly inquiry and a powerful means of generating and communicating new knowledge.

Secondly, I have observed a remarkable evolution in the ways research is understood and articulated. Through the manuscripts submitted to JJR, I have encountered an expanding range of methodologies, critical perspectives, and the re-definition of key terms such as *contemporary jewellery* and approaches to knowledge generation.

The title of this editorial deliberately echoes Christopher Frayling's influential essay 'Research in Art and Design' (1993), in which he proposed the now widely recognised distinctions between research *into*, *through*, and *for* art and design. More than three decades after Frayling articulated this framework, these distinctions remain remarkably relevant. As I reflect on the papers published in JJR over the past nine volumes, it is evident that jewellery research has reached a level of maturity where these different modes of enquiry not only exist but are thriving. Whether investigating jewellery as a historical and cultural phenomenon, generating knowledge through creative practice, or developing new methods, materials, and pedagogies for the discipline, the contributions published in JJR reveal a field characterised by epistemological plurality and methodological diversity.

These developments have also prompted me to reflect on the role of JJR itself. Every editorial decision contributes, in some measure, to shaping an emerging discipline. The published papers inevitably influence how jewellery research is understood, discussed, and developed, and this brings both privilege and responsibility. As editor, reviewers, and advisors, we cannot claim complete neutrality: assessing

submissions necessarily involves applying criteria concerning intellectual rigour, methodological clarity, scholarly apparatus, coherence, and contribution to knowledge. JJR publishes papers not simply because they are about jewellery, but because they make a meaningful contribution to knowledge about jewellery. At the same time, applying these principles does not mean that we recognise a single way of producing or demonstrating research. As an international journal, we seek to respect the plurality of voices, methodologies, epistemologies, and research traditions through which knowledge about jewellery can be generated and communicated.

What constitutes a meaningful contribution may therefore take different forms across national, cultural, academic, and institutional contexts. Recognising this plurality does not mean lowering standards or treating all approaches as equally persuasive; rather, it means maintaining rigorous criteria while remaining open to different research approaches. The questions authors ask, the forms of evidence they employ, and the ways in which they articulate the significance of their findings are often shaped by their particular environments. National research assessment systems provide one illustration of this diversity. The United Kingdom's Research Excellence Framework (REF), for example, sets out specific criteria about the evaluation of research quality and impact, while other countries may place emphasis on different forms of scholarly, cultural or social contribution (UK Research and Innovation, no date). JJR therefore aims to bring different research approaches into dialogue, while maintaining a shared commitment to intellectual rigour,

methodological transparency, and a meaningful contribution to knowledge.

Volume 9 brings together a range of these diverse research approaches into, through, and for jewellery. In '*Porous Ceramics as Fragrance Carriers in Jewellery*', Inna Cheskidova explores the potential of porous ceramic materials to absorb and gradually release fragrance, placing scent at the centre of the jewellery experience. Through systematic material experimentation with earthenware and semi-porcelain, the study investigates how ceramic porosity can be controlled and adapted for jewellery applications, identifying distinct possibilities for different forms and structures. Moving beyond conventional approaches in which fragrance is contained within a vessel or applied to the body, the research proposes integrating scent directly into the materiality of jewellery itself. A prototype featuring interchangeable porous elements demonstrates the practical possibilities of this approach. Bringing together material research, jewellery design, and sensory investigation, the paper expands contemporary discussions of jewellery beyond the visual and tactile, highlighting the potential of scent as a medium for multisensory adornment and sensory art objects.

Narrowing the wider context of material research in jewellery design to focus on a more personal and playful relationship between technologies and the body, Zhiyang Ding, Sarah Kettle, Beverley Hood and Zhixin Zhang, in '*Mechanical Jewellery as Playful Design: Entangling Human and Machine*', argue an interesting role of 'mechanical jewellery' in

contemporary jewellery practice. This artistic project is grounded in practice-based research and aims to identify how mechanical jewellery (MJ) can reconfigure and extend the experience of wearing jewellery and reshape relationships between bodies and ‘artificial companions’, conceived as simple mechanical wearables. This investigation is carried out through playful and embodied interaction as key generative modes of enquiry, with the aid of iterative prototyping with performative and participatory workshops. Concentrating on movement and behaviour, MJ is utilised as a prompt to challenge our expectations and study how, with playful engagement, MJ can stimulate new forms of bodily awareness and deepen our comprehension of our relationship with non-human elements. The intriguing preliminary findings reinforce the notion of jewellery as a more-than-human practice capable of advancing our understanding of material agency. They also strengthen the position of playfulness as an epistemic condition within jewellery, suggesting that experimentation, humour and unpredictability can generate knowledge through the actions of making and wearing.

In relation to the enquiry relegated to the study of the impact of wearing jewellery, we see the research by Yajie Hu, Roberta Bernabei, and Diane Gyi in the paper *‘An Exploratory Investigation into the Impact of Wearing Jewellery on Individual Well-Being’*. Using a qualitative approach that combined diaries with interviews, analysed through a hybrid thematic approach, with deductive coding, the investigation uses prompts in the form of jewellery pieces defined as ‘researcher-made’ jewellery to investigate whether

wearing this kind of jewellery might have an impact on the wearers. The pieces of jewellery ‘can be regarded as a new form of production that is inspired by contemporary jewellery but purposefully designed for research engagement’. They were worn by a number of participants for two weeks and their engagement was captured by a diary and the use of PERMA. Overall, the findings suggest that wearing researcher-made jewellery might support individual well-being by evoking positive emotions, facilitating social connection, and generating personal meaning. The study also offers insights into how participants experienced and engaged with the jewellery in their everyday lives, highlighting the potential of wearing jewellery as a means of supporting well-being. It therefore encourages further research into the relationship between jewellery and well-being, as well as the role that objects can play in shaping everyday experiences.

Interestingly, two papers in this issue, *‘Embodied Jewellery or the Disappearance of the Object’*, by Zoé Kiner-Wolff, and *‘Medically Prescribed Jewellery: An Artistic Research Project on the Aestheticisation of Medical Repair’*, by Olga Noronha and José Simões, extend existing discussions around the visible and invisible presence of jewellery, respectively within the contexts of contemporary jewellery and medically prescribed jewellery. While approaching the subject from very different perspectives, their contributions demonstrate how the boundaries of jewellery can be explored through its relationship with the body, medical intervention, and other forms of material and conceptual practice. This also reflects the increasing

diversity of research approaches within the field, where established definitions of jewellery may not always be sufficient to describe emerging practice. In particular, Kiner-Wolff investigates embodied jewellery through the conceptual work of selected jewellery artists such as David Roux-Fouillet and Tiffany Parbs, examining practices in which the boundaries between jewellery and the body dissolve. Through examples ranging from marks on the skin to bodily interventions and invisible forms of adornment, the paper challenges conventional understandings of jewellery as an object. In doing so, it extends existing debates on embodiment and adornment, offering a nuanced perspective on jewellery's relationship with the body and the meanings that remain when the object itself disappears.

Similarly, Noronha and Simões, with their speculative research project, offer a compelling exploration of how visible and invisible medical implants might be reimagined through the application of the characteristics to their design of filigree. The paper examines hypothetical forms of intervention across different layers of the body, considering how jewellery might operate across a spectrum ranging from externally worn orthotic supports to implants integrated within the musculoskeletal system. The authors propose the concept of medically prescribed jewellery as a speculative framework that brings jewellery, prosthetics, and medical into dialogue. Through a series of speculative artefacts, the study invites reflection on the aesthetic and emotional dimensions of visible and invisible medical implants, prosthetics, and surgical interventions. Rather than treating these technologies solely as functional devices, the paper explores how

they might also be understood as meaningful extensions of identity. In doing so, it contributes to ongoing discussions on embodiment, care, and the role of jewellery in shaping human experience

Moving from the body as a site of experimentation and intervention to jewellery and its making tools as a carrier of cultural heritage, *'Exploring the Traditional Tools and Jewellery of the Kumaun Himalayas of Uttarakhand'* by Reetesh Sah and Rohit Kumar Singh Bhakuni is a study based on field data that examines a selection of traditional jewellery-making tools and ornaments of the Kumaun Himalayas of Uttarakhand and highlights the central role of the Verma community in preserving this cultural tradition. Predominantly, Interviews with artisans explore the most common and traditional jewellery-making tools used in that area. Conducted under the academic affiliation of Kumaun University, Nainital, the study forms part of the project *"Traditional Technologies of the Kumaun Himalayas"*, funded by the Indian Council of Historical Research (ICHR). This important Indian institution is dedicated to promoting historical research and scholarship (Jammu Kashmir Study Center, 2025). In this context, the paper reflects an approach to research that places particular emphasis on documenting ornaments and tools typologies contributing to the preservation of cultural knowledge and the fostering of national identity. This institutional and cultural context is important in understanding the research's aims and contribution, particularly its focus on documenting the tools, and traditional ornaments of Kumaun.

Drawing on discussions from the 2025 Fair Luxury conference at Goldsmith's Centre in London and a range of industry sources, this exploratory paper '*Sustainable Development in the Jewellery Industry*', by Karen Westland, offers a timely reflection on the state of sustainable development within the jewellery industry between 2015 and 2024. Mapping developments across gold, diamond, and coloured gemstone supply chains, the study examines how attitudes and practices have evolved over the past decade, highlighting growing engagement with traceability, responsible sourcing, carbon reduction, and transparency. While acknowledging that progress remains modest on a global scale, the paper argues that the foundations for meaningful change are now increasingly well established, simultaneously recognising the complex situation in which industry is situated and the potential for addressing one issue to generate negative consequences elsewhere. Particularly insightful is its analysis of the complex social, economic, and geopolitical challenges embedded within global supply chains, framed as interconnected 'wicked problems' requiring collaboration across stakeholders. By documenting both achievements and ongoing challenges, the study provides an important reference point for understanding the evolving discourse of sustainability in the jewellery sector in this particular context and identifies key areas for future action, accountability, and research.

We conclude the journey offered by this volume with a stimulating exhibition review. '*Federica Sala's Open Studio*', presented during Milan Jewellery Week on 16-17 October 2025, is thoughtfully introduced by Josefine

Spjeldnaes. The review offers an intimate encounter with the artist's ongoing practice, where glass, emotion, and making converge. By opening her working space to the public, Sala shifts attention from finished objects to the processes, materials, and imperfections through which they emerge. In doing so, she foregrounds the research dimension of creative practice, positioning the studio not only as a site of production but also as a methodological tool and a space of exhibition. Her exploration of beauty, fragility, and material unpredictability lends the work a quiet intensity, while the studio itself becomes an integral part of the exhibition experience. This review offers a closer look at Sala's practice and at *Open Studio* as both a space of making and a space of display.

The papers presented in this ninth volume reflect the richness and diversity of contemporary jewellery research. Despite their differences in subject, methodology, geographical context, and disciplinary perspective, each contributes new knowledge and extends our understanding of jewellery. I hope you find the contributions engaging and that they enrich your knowledge of jewellery research today.

Before closing this edition, I would also like to thank the many people whose interest and support have contributed to bringing it together. I am deeply grateful to all authors who expressed an interest in publishing with us. While, unfortunately, not all submissions could be accommodated in this volume, I hope to continue supporting and welcoming their contributions in future editions.

A special thank you goes to everyone who has supported this edition behind the scenes—our advisors and reviewers, whose time, thoughtful feedback, and generosity have helped shape this volume. I am particularly grateful to Dr Zelal Basodan, Dr Tincuta Heinzl, Ilaria Ruggiero, Dr Stefania Sansoni, Dr Anneleen Swillen and Dr Charlotte Vanhoubroeck for their particularly valuable support throughout the peer review process as invited *reviewers*. A special thank you to Professor Stephen Bottomley and Ben Lignel, who have served as advisors to the JJR Board. This year, they have passed the baton to our new advisors, and I am delighted to welcome Dr Cristina Filipe and Professor David Huycke to the JJR Board.

We are pleased to acknowledge the generous support of **Hedendaagse Sieraden**, which joins us as a sponsor for the first time as it celebrates its 10th anniversary with a series of guest columns. This free online jewellery encyclopaedia, written in Dutch, offers a rich body of knowledge that, thanks to the translation tools available in today's browsers, can be accessed by readers around the world. We are very grateful for its support of this Volume. We also acknowledge the continued support of the **Associazione Gioiello Contemporaneo** (AGC), with whom JJR has a joint agreement. Within this collaboration, JJR supports the Maria Cristina Bergesio Award, which forms part of the M|B Award. Our longstanding institutional assistance comes from **Loughborough University**, which has supported the journal since its inception as an idea in 2015, first presented by myself at Politecnico di Milano. Its continued recognition of the journal's

significance within the field and beyond has been an important part of its development.

Finally, this year we welcomed our new editorial assistants, Nathalie Mornu and Saskia van Es, and layout director Dr Annarita Bianco. Their work has been brilliant, and I would like to express my deepest thanks for their enthusiasm, commitment, and invaluable support.

—Roberta Bernabei, 2026

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Porous Ceramics as Fragrance Carriers in Jewellery

Author: *Inna Cheskidova*



ABSTRACT

This study explores porous ceramic materials as carriers of aromatic compounds within the context of jewellery design. The primary focus is on the development of a material capable of retaining and gradually releasing fragrance, as well as its integration into wearable objects.

Two types of ceramic materials were investigated, including earthenware (majolica body) and semi-porcelain. Porosity was achieved through the incorporation of burnout additives and porous fillers, followed by controlled firing. The material properties examined included water absorption, open porosity, density, shrinkage, and pore structure. Adsorption capacity was evaluated using aromatic compounds as model substances.

Additionally, the potential use of a highly porous filler based on rice husk and straw ash was explored as part of a multi-component carrier system aimed at extending the duration of fragrance release.

The results demonstrate that porous ceramic materials can effectively function as carriers of aromatic compounds, enabling their sustained release. Semi-porcelain exhibited superior performance in the fabrication of thin-walled and structurally stable elements suitable for jewellery applications.

Within the study, a prototype jewellery object incorporating replaceable porous elements was developed, demonstrating the feasibility of integrating functional ceramic materials into wearable forms. The findings indicate strong potential for the use of porous ceramics in the creation of sensory objects that combine material functionality with design considerations.

Keywords: *Olfactory Jewellery; Porous Ceramics; Aromatherapy; Adsorption; Jewellery Design; Burnout Additives*

INTRODUCTION

Contemporary research indicates that human attention is inherently unstable: in everyday life, a significant proportion of time is characterised by disengagement from the current activity (mind-wandering), which may occupy up to 30–50% of waking time (Killingsworth & Gilbert, 2010; Mrazek et al., 2013). In this context, there is a growing interest in practices aimed at maintaining conscious awareness and regulating emotional states, including mindfulness-based approaches, which have been extensively studied in recent decades (Keng et al., 2011; Yavuz Sercekman et al., 2024).

According to the Global Wellness Institute, the global wellness economy reached a value of \$6.8 trillion in 2024 and continues to grow (Global Wellness Institute, 2025). At the same time, wellness is increasingly understood as a personalised practice integrated into everyday life, reflected in the rising demand for products and solutions associated with individual experience and embodied practices (McKinsey & Company, 2025).

Within this context, scent presents particular interest as a sensory component capable of complementing such practices. Research shows that olfactory stimuli can influence emotional states and physiological responses, including levels of stress and anxiety (Herz, 2009; Lehrner et al., 2005).

Historically, wearable aromatic objects (such as pomanders and vinaigrettes) were used as means of engaging with scent; however, their prevalence declined in the twentieth century due to shifts in

cultural practices and the development of the perfume industry (Classen et al., 1994; Corbin, 1986).

Contemporary developments demonstrate a renewed interest in integrating scent into wearable forms, including jewellery, allowing such objects to be considered as entities that combine aesthetic, functional, and sensory dimensions.

The integration of aromatic compounds into wearable objects requires addressing challenges related to the selection of materials capable of both adsorbing and releasing fragrance while maintaining the technological and aesthetic qualities of the object. In particular, the use of porous materials necessitates balancing functional properties (porosity, adsorption capacity) with the structural requirements of jewellery design. This study proposes the use of porous ceramic materials as carriers of aromatic compounds, with their subsequent integration into jewellery objects. The aim of the study is to develop a porous ceramic material and a jewellery object based on it, capable of retaining and releasing aromatic compounds, as well as to investigate its properties and potential applications in wearable objects, including within the context of sensory practices influencing psycho-emotional states.

To achieve this aim, the following objectives are addressed:

- selection of ceramic material composition depending on its intended function;
- achieving high material porosity (including the study of burnout additives and porous fillers);
- maintaining structural strength while achieving optimal porosity (through optimisation of composition

and firing regime);

- ensuring effective adsorption of aromatic compounds (including analysis of the relationship between pore size and adsorbate molecule size);
- development of a jewellery design incorporating the fragrance carrier with the possibility of replacement;
- analysis of the potential application of the developed object as a sensory element linked to perception and individual user experience.

BACKGROUND AND RELATED WORK

OVERVIEW OF HISTORICAL INTEGRATION OF SCENT INTO WEARABLE PRACTICES

The integration of scent into embodied human practices can be traced back to ancient civilisations. Ancient Egyptian texts include references to the application of aromatic substances to the head

Fig. 1
Figures wearing head
cones, wall painting
from Amarna, Egypt
(Stevens et
al., 2019).
Reconstruction: F.
Weatherhead



(Lichtheim, 1973, p. 196), indicating early forms of bodily integrated scent use. Visual sources from the New Kingdom depict so-called “perfumed cones” (Fig. 1), placed on the heads of figures (Manniche, 1999). Archaeological studies have confirmed the existence of wax cones containing organic substances; however, their precise function remains a subject of scholarly debate (Stevens et al., 2019).

In medieval Europe, more stable forms of integrating scent into wearable objects emerged, most notably pomanders—portable aromatic ornaments intended for personal protection against “corrupted air” within the framework of miasma theory (Duffin, 2022). These objects consisted of perforated containers filled with aromatic mixtures, with openings facilitating the gradual release of scent. Pomanders were worn on the body, suspended from chains or rosaries, and functioned simultaneously as adornment, talisman, and protective device (Fig. 2).



Fig. 2 (left)
Ambergris ball in
gold filigree cage,
17th century. V&A
849-1892. Photo:
Victoria and Albert
Museum, London.

Fig. 3 (right)
Tiffany & Co.
“Heart” perfume
bottle and diamond
ring, c. 1896. Rock
crystal, platinum,
gold, rubies and
diamonds. Lent by
Tiffany & Co.
Archives.

In the eighteenth and nineteenth centuries, these practices evolved into more compact and individualised forms, such as vinaigrettes. These small decorative containers held a sponge infused with aromatic substances and were used for the intermittent inhalation of scent. Unlike pomanders, whose function was associated with protective beliefs, vinaigrettes reflect a shift towards individual sensory experience (Fig. 3). Their portability and decorative character position them as a continuation of the tradition of engaging with scent, now within a personalised context (Ganoksin, 2016).

In the twentieth century, olfaction in Western culture underwent a significant transformation, becoming less culturally prominent (Classen et al., 1994). This shift is linked to processes of deodorisation of both the urban environment and the human body (Corbin, 1986, pp. 176–210). Rather than a disappearance, scholars interpret this as a reconfiguration of olfaction's cultural role (Jenner, 2011, pp. 338–343). As a result, fragrance increasingly became a standalone product associated with the perfume industry, while its integration into wearable objects declined.

Fig. 4
Elsa Peretti for
Tiffany & Co. gold
perfume bottle
pendants (left); Diane
Kordas Amulette
Collection pendants
(right). Image
source: Dupon
(2017).



CONTEMPORARY APPROACHES TO OLFACTORY JEWELLERY

Contemporary olfactory jewellery is an emerging interdisciplinary field combining jewellery design, perfumery, material research, and technology. At the industry level, it is predominantly realised as container-based objects, where fragrance is enclosed and gradually released through body heat (Murray, 2026; Dupon, 2017). These approaches continue the historical tradition of wearable scent containers, shifting towards personalised sensory experience (Fig. 4).

In contemporary practice, however, approaches to scent integration are expanding. Here are two selected examples of this succinct overview. Maria Gower's work (Fig. 5) treats scent as part of an artistic statement, exploring the tension between material permanence and ephemeral olfactory expression (Gower, n.d.). In contrast, Melinda Young (Fig. 6) emphasises processuality, using materials that evaporate through wear, leaving an olfactory "trace" and transforming jewellery into a temporal experience (Young, 2023). Thus, contemporary approaches range from preserving scent to its gradual transformation and disappearance.



Fig. 5 (left)
Maria Gower, *Olfactory
Projection Scent Bottle*,
2017. Silver. Photo: M.
Williamson & G. Maggi.
Image source: Klimt02.

Fig. 6 (right)
Melinda Young, *The
trace of you Neckpiece*,
2018, Pears soap, amber,
silk thread. Image
courtesy of the artist.

TECHNOLOGICAL AND MATERIAL APPROACHES TO SCENT INTEGRATION

In parallel, the field of human–computer interaction has developed technological approaches in which scent is treated as a channel of interaction in wearable devices. Projects such as inScent (Fig. 7.) (Dobbelstein et al., 2017) and the scent-based wearable system Abhushan (Mehrotra et al., 2022) demonstrate the possibility of transmitting information and emotional states through olfactory signals, framing olfactory jewellery as an interactive interface. However, these approaches rely on external technological systems. In contrast, the present study shifts attention to the material itself as a carrier of scent, where retention and release are governed by structural properties.

Unlike container-based models, in which fragrance remains external to the object, the use of porous structures allows it to be integrated into the material system of the object (e.g., Diptyque’s Eau Rose perfumed brooch from the Prêts-à-Parfumer collection). Porous materials are characterised by high specific surface area and a developed system of micropores, enabling effective adsorption and subsequent diffusion of volatile compounds.

This principle is widely applied in fragrance delivery research. For instance, the encapsulation of volatile aromatic compounds in zeolite structures significantly enhances their stability, protects them from thermal and oxidative degradation, and enables controlled release over time (Costa et al., 2022). Zemmour et al. (2023) proposed a method for generating nanoporous structures on metals (aluminium, gold, titanium), followed by the incorporation of polymer nanoparticles containing thymol. Mechanical retention of particles

within the pores enabled prolonged scent release compared to application on non-porous surfaces. As a demonstration, the authors developed a prototype metal ring with a porous structure functioning as a fragrance carrier.

These studies reflect a transition from a storage-based model of scent to a material-based model, in which pore structure, distribution, and interaction with molecules determine the temporal behaviour of fragrance. In this context, porous materials can be understood as a foundation for creating objects in which scent becomes an intrinsic property of materiality rather than an externally applied component.

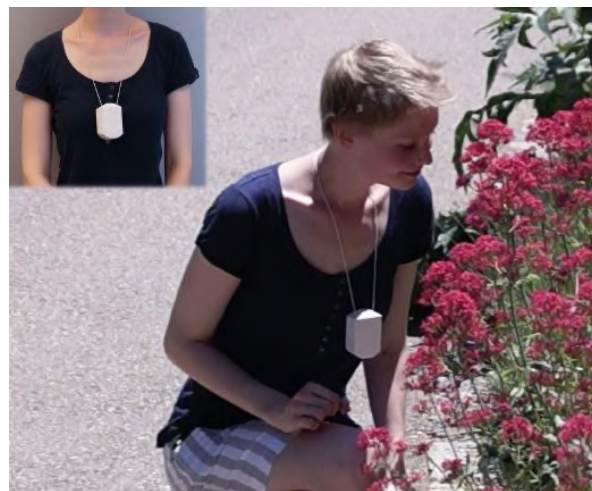


Fig. 7
inScent prototype
(Dobbelstein et al.,
2017). Photo:
Dobbelstein et al.
Image reproduced
from ResearchGate.

OLFACTION, MEMORY, AND SENSORY EXPERIENCE

Contemporary olfactory jewellery can thus be described through several key models: container-based, processual, interactive, and material-based. This diversity reflects a shift from understanding jewellery as a static object to interpreting it as a multisensory and temporal experience, in which scent acts as a key medium.

In this context, studies on the influence of olfactory stimuli on cognitive and emotional processes are particularly significant. Research on odor-evoked autobiographical memory (the “Proust effect”) demonstrates that scents can act as triggers for autobiographical recall. Such memories are characterised by high emotional intensity and a strong sense of re-experiencing, which is associated with the close connection between the olfactory system and limbic brain structures involved in memory and emotion (Hackländer et al., 2019). While olfactory cues may trigger memories less frequently than other sensory stimuli, they tend to evoke more intense emotional responses when they do occur.

Thus, scent can be understood not only as a memory trigger but also as a factor influencing emotional states. Studies in aromatherapy indicate that inhalation of essential oils may reduce anxiety and improve subjective well-being, although the magnitude of these effects depends on research conditions and methodologies (Tan et al., 2023).

In parallel, research in targeted memory reactivation (TMR) demonstrates that olfactory stimuli can be used as cues to reactivate previously formed associations.

Amores et al. (2023) proposed a wearable system in which scent is presented during learning and subsequently reintroduced during recall and sleep. In their experiment (N = 32), participants performed spatial memory tasks, with scent presented during both task execution and sleep in the experimental condition. The results indicated improved memory recall compared to the control condition.

The key mechanism lies in the association between a sensory signal and a specific experience; whereby subsequent perception of the signal reactivates related cognitive processes. In this sense, scent functions as a trigger that activates a corresponding state.

Within the present study, this mechanism is reinterpreted: whereas in TMR scent is used to enhance memory, in the proposed approach scent is understood as an olfactory anchor associated with a pre-formed concept (“carpe diem”) and functions as a short-term sensory trigger that redirects attention to the present moment.

Thus, the proposed approach positions olfactory jewellery as a tool for subtle state regulation through the interruption of automatic perceptual patterns. Here, fragrance release is governed by the properties of the material, enabling the realisation of a sensory trigger within a jewellery object without the use of electronic systems.

MATERIALS AND METHODS

CERAMIC MATERIALS AND SAMPLE PREPARATION

Within the scope of this study, two types of ceramic materials with different technological and functional characteristics were investigated, alongside the production of a porous filler derived from organic raw materials, intended to complement and enhance ceramic-based structures.

As the first ceramic system, an earthenware (majolica) body (MKF) was used. To generate a porous structure, a burnout additive—cellulose—was incorporated into the composition. Samples were fabricated using forming techniques and subjected to thermal treatment under controlled firing regimes.

Despite the suitability of the majolica body for forming porous structures and studying adsorption properties, this material presents limitations in terms of formability, particularly for thin-walled and hollow elements typical of jewellery objects.

For this reason, a semi-porcelain-based ceramic composition with improved forming properties was also investigated. This material exhibits higher plasticity and enables the fabrication of complex geometries, including thin-walled and enclosed forms.

The use of burnout additives allows for control over pore size; however, such materials typically exhibit reduced mechanical strength. Experimental observations showed that an elongated pore structure contributes to improved strength of ceramic samples. An appropriate burnout additive was identified that does not leave combustion residues within the pores and remains economically viable.

Semi-porcelain samples were formed and subjected to double firing. After the first firing, a glaze layer was applied to the surface.

MATERIAL CHARACTERISATION METHODS

The following properties of the ceramic samples were determined: linear shrinkage (drying, firing, and total), flexural strength, water absorption, open porosity, bulk density, and adsorption characteristics.

Linear shrinkage was calculated based on changes in sample dimensions during forming, drying, and firing, in accordance with standard ceramic testing methods (Guzman, 2004). Flexural strength was determined using a three-point bending test (Guzman, 2004). Water absorption and open porosity were measured via water saturation followed by hydrostatic weighing (Guzman, 2004). Adsorption properties, including specific surface area and pore size distribution, were determined using low-temperature nitrogen adsorption with a Gemini VII 2390 t analyser, in accordance with ISO 9277:2010 (ISO, 2010).

POROUS FILLERS FROM ORGANIC RAW MATERIALS

As an additional fragrance carrier, potentially used as a filler within hollow porous ceramic objects, powders of rice husk ash (RHA) and rice straw ash (RSA) were investigated. These materials consist predominantly of silica (SiO_2) and are characterised by fine dispersion

and relatively uniform structure (Voronkov et al., 1978). The ash was obtained by thermal treatment of the raw material at 600 °C, with a heating duration of four hours followed by a one-hour hold at the target temperature. Thus, semi-porcelain was selected as the primary material for the development of a jewellery prototype combining porous structure with the formability required for the intended design.

FRAGRANCE ADSORPTION EXPERIMENTS

To evaluate adsorption capacity, solutions of sweet orange essential oil in ethanol were used. Ceramic samples were ground and immersed in the solution for a fixed period. Changes in the concentration of aromatic compounds were determined using spectrophotometric analysis. Adsorption was calculated based on the difference between initial and equilibrium concentrations, taking into account the mass of the adsorbent and the system volume.

WEAR TESTING OF JEWELLERY PROTOTYPE

To assess fragrance behaviour under real conditions, a prototype jewellery object was tested during everyday wear by five participants over a period of approximately eighteen months in different climatic conditions. All participants took part in the wear testing voluntarily and provided informed consent. Fragrance perception was assessed qualitatively based on observations during wear and recorded in terms of perceived intensity, duration, and frequency of occurrence. Factors influencing fragrance release included body temperature, ambient temperature, physical activity, and environmental humidity.

Fragrance perception was recorded in terms of intensity, duration, and frequency of occurrence.

This approach allows the wearable object to be considered as a system operating in interaction with the user's body, where fragrance behaviour is determined not only by material properties but also by environmental conditions.

SELECTION OF AROMATIC COMPOUNDS

For porous carriers, it is preferable to use pure (100%) essential oils or their ethanol-based solutions. Essential oils typically contain dozens of components, primarily terpenes, which are characterised by small molecular size and high permeability (Bakkali et al., 2008; Dhifi et al., 2016). In contrast, lipid-based formulations occupy pore space and reduce adsorption efficiency, leading to weaker fragrance intensity (McClements, 2015).

Within this study, particular attention was given to three compounds: sweet orange essential oil, eugenol, and vanillin. Sweet orange essential oil was selected for experiments with the majolica body due to its availability and broad applicability. The oil is obtained mechanically from the peel of *Citrus sinensis* without heating (Voitkevich, 1999) and is non-irritating, non-sensitising, and not phototoxic.

For experiments with the semi-porcelain system, eugenol and vanillin were selected. Eugenol is an aromatic phenolic compound derived from clove buds, widely used in aromatherapy (Soldatenkov and Kolyadina, 2006). Vanillin is a phenolic compound with a characteristic vanilla scent, occurring naturally in *Vanilla planifolia*.

Both compounds exhibit suitable volatility and solubility in ethanol, making them effective model substances for evaluating fragrance retention and release.

Fig. 8
UV absorption
spectrum of sweet
orange essential oil
Image:
Inna Cheskidova.



Fig. 9
Ethanol solutions of
essential oil with
ground porous
ceramic samples.
Photo:
Inna Cheskidova.



RESULTS

RESULTS FOR MAJOLICA BODY

In this study, specially fabricated porous ceramic samples were used as solid carriers (adsorbents). A 10% solution of sweet orange essential oil was prepared, followed by a series of dilutions to obtain lower concentrations suitable for recording absorption spectra. The electronic absorption spectrum of the essential oil solution (Fig. 8) was recorded in the near UV region spectrum of sweet orange essential oil. The absorption bands are characteristic of terpene compounds present in the essential oil. The undiluted oil exhibited a yellowish colour, whereas diluted solutions were colourless.

Porous ceramic samples were produced from an earthenware (majolica) body (MKF). To achieve a high level of porosity, cellulose (3 wt%) was added as a burnout additive. Samples were fabricated by both hand forming and pressing. The maximum firing temperature was 1050 °C with a dwell time of 30 minutes. For adsorption experiments, the ceramic samples were ground (Fig. 9).

Identical ethanol solutions of sweet orange essential oil were used with different masses of ground ceramic samples. The samples were kept in the solutions for 25 days.

After this period, 1 ml of solution was taken from each test tube, diluted in 3 ml of ethanol, and analysed using the LEKISS2110UV spectrophotometer. Following spectral measurements, equilibrium concentrations of the essential oil solutions were determined.

Adsorption was calculated using the following equation:

$$A = (C_0 - C) / m \times V$$

where A is the adsorption value of essential oil components ($\% \times \text{m}^3/\text{g}$); C_0 and C are the initial and equilibrium concentrations (%), respectively; m is the mass of the adsorbent (g); and V is the volume of the solution (m^3) (Frolov et al., 1986). The results are presented in Table 1.

Table 1
Adsorption values for
different masses of
ground ceramic
samples. Image:
Inna Cheskidova.

Sample	C_0 , %	C, %	m, g	V, m^3	$A \times 107$, ($\% \times \text{m}^3$)/g
1	0,0392	0,0210	1,05	0,000005	0,9
2	0,0392	0,0161	1,39	0,000005	0,8
3	0,0392	0,0136	2,11	0,000005	0,6

Based on the obtained data, the adsorption of aromatic compounds from the ethanol solution of sweet orange essential oil is approximately 30%. The results indicate that this type of porous ceramic material can be used for the production of fragrance-carrying objects through the application of aromatic compositions (essential oils, blends, or perfume formulations). For the fabrication of jewellery elements, a rolling technique was employed, in which a sheet of ceramic mass was processed in a granulator to form bead-like elements. These were shaped into small spherical and lentil-like forms, mounted on a support, fired, coated with a low-melting coloured glaze, and subjected to a second firing (Fig. 10). The essential oil was introduced into the unglazed portion of the object.



Fig. 10
Beads made of
porous ceramic in
various shapes and
colours. Photo: Inna
Cheskidova.



RESULTS FOR SEMI-PORCELAIN

Preliminary experiments established the firing temperatures (Fig. 11) and the proportion of burnout additive required (Cheskidova et al., 2018) to achieve sufficient mechanical strength while maintaining high open porosity and water absorption (Table 2). Firing under the second temperature regime, with the addition of burnout additives, resulted in the desired glaze effects while maintaining high open porosity (33.3%) and water absorption (19%).

Table 2
Physical properties of ceramic samples fired under the first (I) and elevated second (II) firing regimes.
Image: Inna Cheskidova.

Measured properties	Body without additive (I firing)	Body without additive (II firing)	Body with additive (I firing)	Body with additive (II firing)
Water absorption, W (%)	14.4	8.1	25.5	19
Open porosity, P _o (%)	26.7	16.7	39.3	33.3
Bulk density, ρ (g/cm ³)	2.1	2.1	1.9	1.8
Linear shrinkage (%)	6.6	8.8	11.2	12.3

Fig. 11
Semi-porcelain samples after first firing with burnout additive. Photo: Inna Cheskidova.



An alternative approach involving highly porous fillers derived from RHA and RSA was also investigated for use within ceramic carriers. The ashes were obtained by thermal treatment to produce amorphous silica (Fernandes et al., 2014) and subsequently ground to a fine powder. Two methods of introducing the filler were examined: (a) incorporation of ash powder directly into the ceramic body; (b) incorporation in the form of granules.

In method (a), powdered ash was first dispersed in water and then mixed with the semi-porcelain body prior to forming. This approach proved ineffective, as it resulted in insufficient porosity. Consequently, the method of additive introduction was revised.

In method (b), granules were produced using wallpaper adhesive (Master Klein) as a binder in a water-to-adhesive ratio of 25:1. The granules were inserted into semi-porcelain samples containing burnout additives, without mixing the ash with the ceramic body (Fig. 12). After firing, the samples were sectioned, and the internal material was analysed separately (Fig. 13).



Fig. 12. Granule of rice husk ash. Photo: Inna Cheskidova.
Fig. 13. Sample with rice husk ash granule after firing. Photo: Inna Cheskidova.

Further analysis focused on the porous structure of both ceramic and powdered carriers. Measurements were conducted using an automatic surface area and porosity analyser (BET method; Gemini series, Micromeritics). Nitrogen gas was used as the adsorbate. The results are presented in Table 3.

Table 3
Pore structure characteristics of ceramic and powder-based carriers.
Image:
Inna Cheskidova.

Sample No	Absorbance	Concentration (mmol/L)
1 (pink)	1.9328	0.0024
2 (blue)	1.5928	0.0019
3 (dark blue)	0.9673	0.0012
4 (violet)	0.3868	0.0005
5 (green)	0.1949	0.0002

The results indicate that RHA exhibits significantly higher specific surface area and pore volume (143.2 m²/g; 0.28 cm³/g) compared to RSA (8.94 m²/g; 0.074 cm³/g) and the ceramic sample (0.88 m²/g; 0.0047 cm³/g). However, the average pore size of RHA (6.51 nm) is smaller than the molecular dimensions of the aromatic compounds used, namely eugenol (7.9 nm) and vanillin (7.68 nm). Consequently, RSA (43.9 nm)

Sample	Specific surface area (S _{BET}), m ² /g			Pore volume (V _p , cm ³ /g)		Average pore diameter (nm)	
	Micropore range	Mesopore range	Total	Micropores	Mesopores	Adsorption	Desorption
Ceramic body	0.093	0.78	0.88	0.000033	0.0047	83.74	43.87
Rice straw ash (RSA)	4.36	4.58	8.94	0.0019	0.072	64.70	36.51
Rice husk ash (RHA)	-	149.28	143.18	-	0.28	8.92	6.51

and the ceramic body (36.5 nm) are more suitable as fragrance carriers. To quantify the retention of aromatic compounds, spectrophotometric analysis of ethanol solutions of eugenol and vanillin was performed using a Shimadzu UV-1800 spectrophotometer.

Based on the spectral analysis data (Table 4), a calibration curve for eugenol was constructed. The working wavelength was 282 nm. The absorption peak at this wavelength was selected for further analysis because, at this value, the calibration curve exhibited a linear relationship (Fig. 14).

For the analysis, an eugenol solution with a concentration of 0.0024 mmol/L was selected. The molar extinction coefficient was calculated as follows:

$$\varepsilon = A / (l \times C) = 1.9328 / (0.1 \times 0.0024) = 8053.33 \text{ L} \cdot \text{mol}^{-1} \cdot \text{cm}^{-1}$$

Based on the results of the study of vanillin solutions in ethanol, the following data were obtained (Fig. 15).

Based on the spectral analysis data, a calibration curve for vanillin was constructed (Fig. 16). The spectrum of this compound exhibits two pronounced absorption peaks at wavelengths of 280 nm and 310 nm. For

Table 4
Concentrations of eugenol solutions used for calibration curve construction.
Image:
Inna Cheskidova.

further analysis, the peak at 280 nm was selected because, at this wavelength, the calibration curve showed a linear relationship. For the analysis, a vanillin solution with a concentration of 0.174 mmol/L was selected. The molar extinction coefficient was calculated as follows:

$$\varepsilon = A / (l \times C) = 1.8353 / (0,1 \times 0,0017) = 10796,05 \text{ L} \cdot \text{mol}^{-1} \cdot \text{cm}^{-1}$$

The calculated molar extinction coefficients for eugenol and vanillin were used to convert spectrophotometric data into quantitative values of fragrance content. Based on the measured specific surface area, open porosity, and the calculated monolayer surface area for eugenol and vanillin, the approximate sorption capacity of the samples was estimated. For the high-porosity sample, the estimated retention was approximately 8.0–8.5 mg/g for vanillin and 7.4–7.8 mg/g for eugenol. For the low-porosity

Fig. 13
UV spectra of
eugenol solutions in
ethanol at different
concentrations.
Image: Inna
Cheskidova.

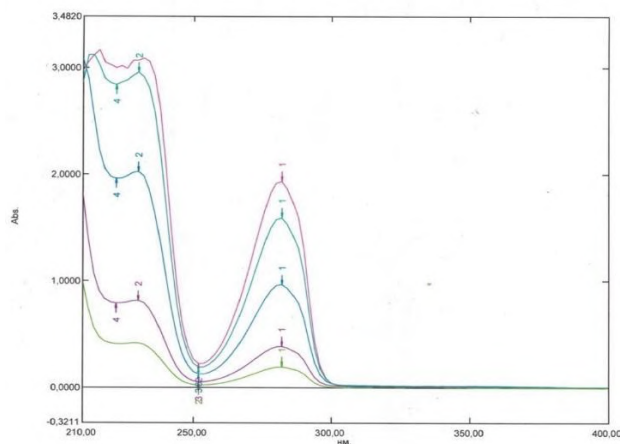


Fig. 14
Calibration curve
for eugenol.
Image: Inna
Cheskidova.

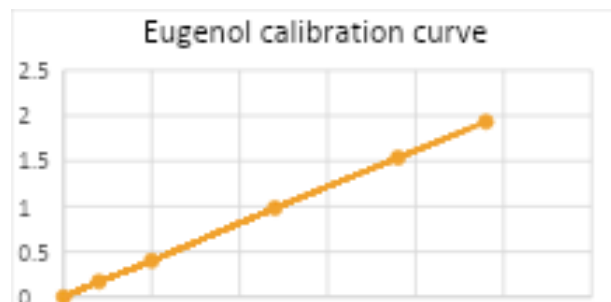


Fig. 15
UV-Vis absorption
spectra of vanillin
solutions in ethanol
at different
concentrations.
Image: Inna
Cheskidova.

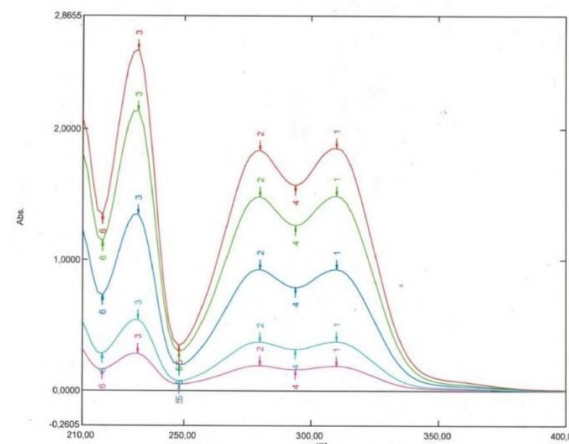
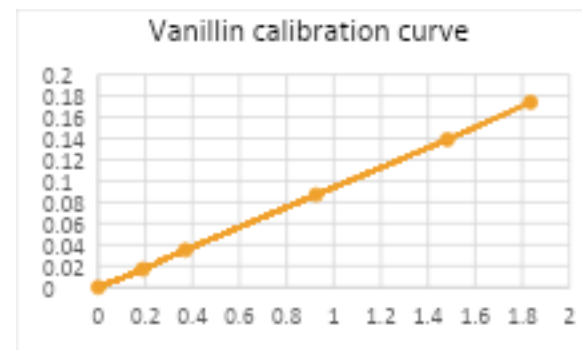


Fig. 16
Calibration curve
for vanillin. Image:
Inna Cheskidova.



sample, the corresponding values were approximately 3.0–3.2 mg/g for vanillin and 2.8–3.0 mg/g for eugenol. Thus, the optimised material demonstrates approximately 2.7 times higher adsorption capacity compared to the control sample.

DESIGN CONCEPT AND PROTOTYPE DEVELOPMENT

DESIGN CONCEPT AND PRINCIPLES

The design of the jewellery object is based on the concept of *carpe diem*, originating from Horace's *Odes* (I.11), which articulates the value of the present moment and its transience. Within the context of this study, this concept is interpreted as a foundation for

Fig. 17
Concept of a falling
drop in the
“Carpe Diem”
jewellery collection.
Image: Inna
Cheskidova.



developing an object capable of supporting present-moment awareness, with the aim of reducing anxiety and enhancing subjective well-being.

The visual language of the collection is structured around the metaphor of the drop, representing the fleeting and unique nature of each moment, as well as the Fibonacci spiral, symbolising continuity, development, and harmony in natural processes (discussed further below).

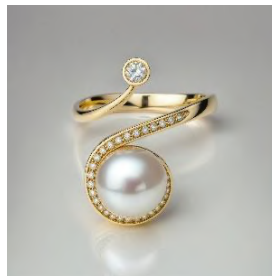
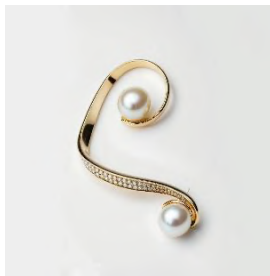
The form of the object interprets the moment of a falling drop: unlike the physical process, where the drop inevitably completes its movement, this moment is “suspended” within the object (Fig. 17).

Thus, the form functions as a visual metaphor for a preserved experience—a transient event that, once lived, continues to exist in the user’s memory. The object is conceived as a system integrating material properties, symbolic meaning, and sensory interaction. In this context, fragrance acts as a medium linking perception, memory, and emotional experience, triggering associations with the present moment.

MODULAR DESIGN SYSTEM

Within the *Carpe Diem* olfactory jewellery collection, earrings, ear cuffs, necklaces, and rings in white and yellow gold were developed (Fig. 18). The developed objects are based on a modular design principle. The construction incorporates interchangeable fragrance carriers, allowing variation in both the olfactory composition and the visual configuration.

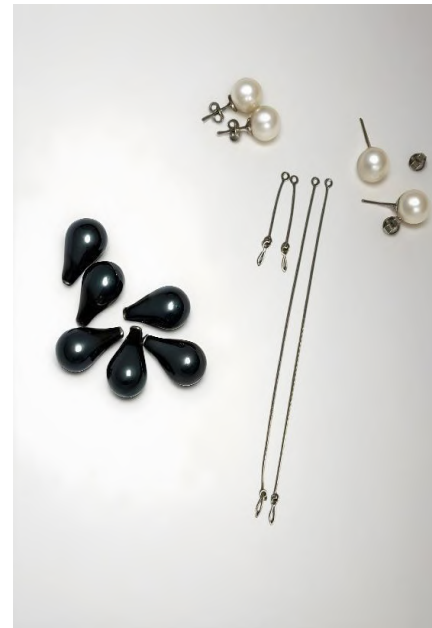
Fig. 18
Jewellery pieces from
the *Carpe Diem*
olfactory collection,
made of gold, pearls,
and porous ceramic.
The necklace,
earrings, and ear cuff
with black ceramic
shown in the first
image were exhibited
at the Museo
Nacional de Artes
Decorativas (Madrid)
as part
of the international
exhibition *X Muestra
Orfebrería
Contemporánea*
(2026).
Photo: NEO
Photography.



Approximately 30 experiments with different colours of ceramic carriers were conducted (Fig. 19), enabling coloured ceramic drops to be interchanged across all elements of the collection. In addition to the ceramic elements, the metal components of the jewellery can also be reconfigured, altering the modes of wear. For example, long or short earrings can be attached to the same studs, worn independently, combined with an ear cuff, or used as separate elements (Fig. 20).

Modularity enables personalisation and repeated use of the object, while also addressing a functional limitation: different fragrances cannot be sequentially used within the same porous carrier without altering perception. The system of interchangeable elements allows for independent fragrance modules.

*Fig. 19
Colour palette of
Carpe Diem
fragrance carriers
Photo: Inna
Cheskidova.*



*Fig. 20 Modular
structure of the
jewellery system.
Photo: Inna
Cheskidova.*

MATERIAL REALISATION AND FABRICATION PROCESS

Porous ceramic elements were produced using slip casting. The drop geometry was modelled in 3d (Fig. 21), taking into account shrinkage during drying and firing. The fabrication process included forming, demoulding, surface finishing (Fig. 22), bisque firing, and glaze firing (Fig. 23). One of the primary challenges during forming was increased adhesion of the ceramic body, caused by the presence of pore-forming additives, which complicated removal from the mould. This issue was resolved through optimisation of demoulding timing.

STRUCTURAL SOLUTIONS AND ENGINEERING CONSTRAINTS

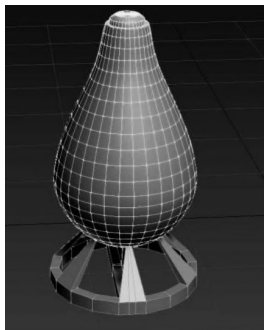
A key objective was the development of a reliable and reusable mechanism for replacing fragrance carriers within the jewellery object.

Threaded connections were considered but rejected due to the fragility of thin-walled ceramic elements and the high risk of mechanical failure.

Alternative external fastening mechanisms (e.g. hook-based systems) were also explored; however, these disrupted the visual integrity of the object, reducing the perception of the form as minimal and “floating”.

As a result, a concealed internal fixing mechanism was developed (Fig. 24). The final solution is based on an elastic geometric element that ensures secure fixation of the ceramic carrier while preserving an opening for fragrance diffusion. The construction allows repeated replacement of the carriers without loss of functionality or aesthetic quality. The mechanism was tested under everyday wear conditions, across different users (Fig. 25, 26), including variations in temperature, humidity, contact with water, and physical activity, demonstrating durability and resistance to wear.

*Fig. 21
3D model of the drop
geometry used for
porous ceramic
elements. Image:
Inna Cheskidova.*



*Fig. 22 (left)
Surface finishing of
porous ceramic elements
after demoulding.
Photo: Inna Cheskidova.*



*Fig. 23 (right)
Porous ceramic
elements after glazing
and firing. Photo: Inna
Cheskidova.*

Fig. 24
Removable
mechanism of the
fragrance carrier.
Image: Inna
Cheskidova.

construction of the piece

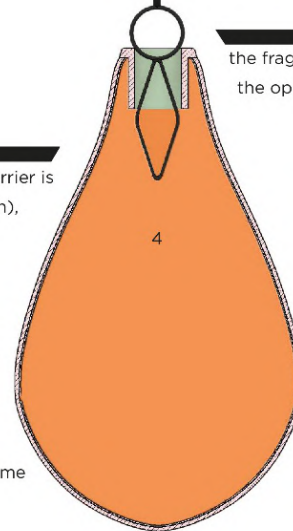
the main

fragrance carrier is
porous ceramic (porcelain),
forming the drop (4)

as the fragrance evapo-
rates, it is adsorbed into
the pores of the ceramic
body (4)

remains inside, and is
gradually released over time

the fragrance exits through
the opening in the stopper (3)



- 1 - chain
- 2 - fastening element
- 3 - stopper with opening
- 4 - porcelain

PROTOTYPE AND USER INTERACTION

The developed prototype is a jewellery object incorporating a replaceable porous ceramic element designed to be infused with fragrance prior to use. The fragrance is introduced into the porous structure through an opening in the closure using a syringe. Unlike laboratory conditions, fragrance behaviour during wear is determined by interaction with the body and the surrounding environment, including skin

temperature, movement, humidity, and contact with clothing. As a result, the fragrance is not perceived as a constant background but emerges intermittently as short olfactory episodes, intensifying with heat and movement. This intermittency constitutes a key characteristic of the proposed approach. Fragrance appears as a sensory event with heightened perceptual significance due to its episodic nature. Within the

conceptual framework of the object, it functions as an olfactory anchor associated with a pre-formed concept (“carpe diem”), redirecting attention to the present moment.

Fig. 25
Long earrings with
black porous ceramic
elements.
Photo: Inna
Cheskidova.



Thus, the prototype demonstrates the feasibility of integrating porous ceramic materials into jewellery objects, where fragrance functions not only as an aesthetic component but also as a tool for short-term activation of attention and embodied perception.

CONCLUSION

Based on the results obtained, the material derived from the majolica body can be applied in objects with open geometries, such as beads. At the same time, for the fabrication of thin-walled and hollow jewellery forms, a semi-porcelain-based composition was selected due to its superior forming properties.

The parameters for producing ceramic materials suitable for jewellery applications were established. High porosity is achieved through the incorporation of burnout additives and sorbent materials. A two-stage firing process—bisque and glaze firing—was identified as optimal. Despite glazing, which leads to a partial reduction in open porosity, the material retains its ability to adsorb and release aromatic compounds. This enables the ceramic to function not only as a functional carrier but also as an independent decorative element, supporting a transition from container-based approaches to integrating fragrance into the material structure. This study does not specifically address the wearability aspects of the jewellery designs. Instead, it focuses on the exploration of scent as the primary subject of investigation.

Fig. 26
Long earring
combined with an ear
cuff. Photo: Inna
Cheskidova.



The properties of the semi-porcelain fragrance carrier were determined as follows:

- water absorption: 19%
- open porosity: 33.3%
- bulk density: 1.8 g/cm³
- linear shrinkage: 12.3%
- specific surface area: 0.88 m²/g
- pore volume: 0.0047 cm³/g
- average pore size (desorption): 43.87 nm

Highly porous fillers were also obtained. In further studies, rice husk ash is effective as a fragrance carrier for compounds with molecular dimensions not exceeding 6.51 nm. Rice straw ash, characterised by a specific surface area of 8.94 m²/g, pore volume of 0.074 cm³/g, and average pore size of 36.51 nm, is suitable for the adsorption of eugenol and vanillin. Due to its higher porosity compared to the ceramic matrix, RSA can be introduced into the interior of a ceramic object in the form of a granule, thereby enhancing fragrance retention. The combination of spectrophotometric data and porosity characteristics enables a substantiated prediction of the increased adsorption capacity of the optimised ceramic carrier and its effectiveness for use in olfactory jewellery.

The developed prototype demonstrates the practical feasibility of this approach. The use of interchangeable porous elements and a modular design enables variability in use, while the non-continuous nature of fragrance release allows it to be interpreted as a sensory trigger associated with present-moment perception.

Thus, the proposed approach integrates material research, jewellery design, and sensory interaction, forming a basis for the development of multisensory jewellery objects. The results may be applied both in jewellery design and in the creation of sensory art objects.

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The authors used AI-assisted tools solely for language editing (grammar and clarity). All scientific content, interpretations, and conclusions are the sole responsibility of the author.

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Mechanical Jewellery as Playful Design: Entangling Human and Machine

Authors: *Zhiyang Ding, Sarah Kettley, Beverley Hood, Zhixin Zhang*



ABSTRACT

This paper investigates mechanical jewellery as a contemporary jewellery medium that reconfigures human-machine relations through playful and embodied interaction. Drawing on Donna Haraway's concepts of Companion Species and Making Kin, and informed by Artificial Life, mechanical jewellery is approached as an artificial companion whose meaning emerges through movement, resistance, and behavioural response in close bodily proximity. Grounded in practice-based research, the project combines iterative prototyping with a performative workshop at a UK art and design institution. Prototypes were developed using low-tech mechanical systems and reconfigured electric toys, foregrounding material behaviour and unpredictability. Participants engaged through wearing, movement exploration, and co-creation, highlighting how mechanical jewellery shapes bodily awareness and interaction. Informed by Playful and Participatory Speculative Design and supported by Interpersonal Process Recall interviews, the study suggests that mechanical jewellery operates as a relational wearable medium, offering a playful and performative perspective within contemporary jewellery practice.

Keywords: Mechanical Jewellery; Play Design; Speculative Design; Material Agency; Human-Machine Relations; Embodied Interaction

INTRODUCTION

Contemporary design research increasingly foregrounds play as a generative mode of inquiry that fosters curiosity, improvisation, and co-creation (Gaver, 2002; Sicart, 2014). Within contemporary jewellery practice, play extends beyond methodology to how adornment operates as an embodied and socially situated practice. Jewellery is not only a visual or symbolic object but a form of close bodily engagement, where meaning emerges through proximity, touch, and social perception. Wearing therefore involves both personal sensation and social articulation, positioning the body as an active site through which material, affect, and meaning are negotiated (Skinner, 2013).

In this context, play offers a lens for examining how wearable objects engage the body through movement, material behaviour, and affect. Play Design provides a framework for exploring relationships between bodies, materials, and technologies as they unfold through wearing. This research draws on Playful Speculative Design, which works with tensions between the believable and the absurd, and Participatory Speculative Design, which foregrounds collaborative imagination. These approaches are used to examine how mechanical jewellery, as a wearable and performative medium, extends the relational dimensions of jewellery into dynamic forms of interaction.

Against this backdrop, this research investigates how mechanical jewellery can reconfigure experiences of wearing and reshape relationships between bodies and technologies. While contemporary jewellery has long

foregrounded materiality, embodiment, and conceptual engagement (Skinner, 2013), this study extends these trajectories by focusing on movement and behaviour. It asks how playful engagement with mechanical systems may challenge expectations of jewellery as materially passive and behaviourally stable, and whether such interactions generate new forms of bodily awareness, social perception, and relational agency in participatory and performative contexts. Mechanical jewellery prototypes are treated as active wearable artefacts that provoke movement, bodily adjustment, and affective response, with play emerging through encounters between bodies, objects, and making processes.

Building on practice-based research, the paper presents mechanical jewellery prototypes and a participatory workshop conducted at a UK art and design institution. Participants engaged through observation, movement exploration, and co-creation, experiencing how mechanical behaviour reshaped bodily awareness and interaction. These encounters were examined using Interpersonal Process Recall (IPR) interviews (Larsen et al., 2008; Kettley et al., 2015). The findings suggest that mechanical jewellery operates as a relational and performative medium, in which wearing involves ongoing negotiation between movement, bodily response, and social perception, offering insights into agency, embodiment, and more-than-human co-creation in contemporary jewellery research.

THEORETICAL BACKGROUND

MECHANICAL JEWELLERY AS A MEDIATORY AND EXPRESSIVE MEDIUM

Since the mid-twentieth century, contemporary jewellery has developed beyond associations with precious materials, ornamentation, and market value, foregrounding conceptual inquiry, material experimentation, and the body as a site of meaning-making (Unger, 2019). Within this field, the term art jewellery is often used to describe practices that position jewellery as a critical and artistic medium, emphasising relationships between object, body, and context (Skinner, 2013). In this research, contemporary jewellery is used as the primary term to acknowledge this breadth, while recognising art jewellery as one of its key trajectories. Jewellery operates not only as a visual or symbolic object but as a form of close bodily engagement. Through wearing, it shapes relationships between material, sensation, and social perception, influencing how the body is experienced and interpreted. Contemporary practices explore this through scale, placement, and material intervention, often creating moments of awareness, adjustment, or discomfort (den Besten, 2011; Scarpitti, 2021). Jewellery can therefore be understood as a medium through which bodily experience and social meaning are negotiated in specific contexts.

In this context, contemporary jewellery has increasingly engaged with technological possibilities, giving rise to practices described as digital jewellery, where electronic components and computational systems are incorporated into wearable forms.

Terms such as computational jewellery, smart jewellery, and interactive jewellery are often used interchangeably, reflecting the field's conceptual and disciplinary fluidity (Koulidou and Mitchell, 2021). Recent work demonstrates diverse approaches, from expressive wearable systems to responsive artefacts. For instance, Nantia Koulidou combines found materials with embedded sensors and microcontrollers to create wearable artefacts that integrate digital processes into intimate, body-centred experiences of wearing (Koulidou and Mitchell, 2021). Similarly, Katharina Vones explores chromic materials, tactile silicone, and microelectronic components to produce jewellery that reacts to touch, light, and movement, generating dynamic visual and sensory responses (Vones, 2017). These practices show that technological elements can extend jewellery beyond functionality, contributing to evolving relationships between body, material, and interaction.

Building on this understanding of digital jewellery, mechanical jewellery is defined in this research as a practice situated within contemporary jewellery discourse that similarly engages with technological approaches while placing particular emphasis on mechanical structures, movement, material behaviour, and bodily interaction. References to mechanical or kinetic jewellery can be found across both commercially produced and contemporary jewellery practices incorporating hinges, joints, or moving parts.

However, these works differ significantly in intention and effect. Sigurd Bronger's *Laboratorium Mechanum* series, for example, combines readymade objects with mechanical structures to destabilise familiar meanings through wearable mechanisms (Veiteberg et al., 2011). Similarly, Dong Ding's *Symkinetic* series explores relationships between body and wearable object through synchronised movement and dynamic mechanical interaction (Ding, 2025).

Although these practices employ mechanical structures in different ways, and use terms such as kinetic or *mechanum* jewellery, their aims differ from the definition proposed in this research. Here, "mechanical jewellery" refers more specifically to an approach in which simple mechanical systems, often combined with low-tech electronic components, generate movement that is irregular, responsive, or difficult to fully predict. These systems are frequently adapted from existing mechanisms, such as modified electric toys, and combined with materials including metal, silicone, and textiles to form hybrid wearable artefacts that foreground bodily interaction through motion. Rather than opposing other approaches, this research positions mechanical jewellery as an exploratory contemporary jewellery practice examining how movement and material behaviour shape the experience of wearing.

This perspective resonates with low-tech approaches to Artificial Life discussed by Simon Penny (2010), where lifelike qualities emerge from simple embodied systems rather than complex computation. Drawing on Braitenberg's *Vehicles* (1986), minimal sensorimotor relationships can evoke the impression of responsiveness without advanced programming.

In this context, such behaviours are understood as perceptual and experiential phenomena that influence how wearers relate to the object. Mechanical jewellery is therefore defined not by technological novelty, but by its capacity to generate movement-based interactions that reconfigure how jewellery is experienced on and through the body.

PLAYFUL SPECULATIVE DESIGN & PARTICIPATORY SPECULATIVE DESIGN

Within this research, Playful Speculative Design (PSD) and Participatory Speculative Design are treated as two established variations of Play Design, offering complementary strategies for working with uncertainty, imagination, and embodied experimentation. While Play Design provides an overarching orientation, PSD and Participatory Speculative Design function as the primary methodological approaches through which mechanical jewellery was designed, iterated, and explored.

PSD integrates playfulness with speculative inquiry to probe human-machine relationships through openness, provocation, and unpredictability (Rahbek, 2021; Kinch et al., 2024). Central to PSD is the notion of playful tension, understood as a balance between order and disorder that sustains engagement. Rahbek (2021) argues that without such balance, play collapses into either uncontrolled chaos or rigid functionality, limiting its exploratory potential. Kinch, Rahbek, and Behrendtzen (2024) formalise PSD through a three-layer framework comprising purpose, concept, and form, ranging respectively from concerned to provocative, serious to ridiculous, and believable to

absurd (Fig. 1). This framework enables designers to construct speculative artefacts that deliberately test the boundaries of plausibility.

In this research, the framework guided the iterative development of mechanical jewellery by sustaining playful tension across material and behavioural experiments (Fig. 2). Early prototypes repurposed toy motors and simple circuits, producing lively yet fragile movements that elicited humour, hesitation, and curiosity. Subsequent experiments using Arduino systems increased precision but reduced spontaneity, rendering the jewellery overly controlled and industrial. This contrast highlighted the importance of imperfection and material resistance as drivers of playfulness. Subsequent iterations therefore reintroduced toy-based mechanisms to rebalance coherence and unpredictability, allowing the jewellery to operate as a performative, non-human companion rather than a passive object.

Participatory Speculative Design extends this approach by foregrounding collaboration and plurality in imagining technological futures (Gerber, 2018; Ye and Zhang, 2024). Participants are engaged as co-speculators whose embodied responses and interpretations actively shape the research process. In this study, it informs the development of a workshop framework as an experimental setting in which interactions with moving jewellery generated unplanned gestures, laughter, hesitation, and affective insight. Participants were also encouraged to imagine and develop their own speculative prototypes, which serve as references for the iterative development of future mechanical jewellery. Although such openness introduces variability, it expands the imaginative scope

of the research, positioning workshops as live explorations of playful tension.

Together, PSD and Participatory Speculative Design enable mechanical jewellery to function as a medium for embodied, playful, and speculative engagement. PSD provides the conceptual scaffolding for balancing believability and absurdity, while Participatory Speculative Design activates jewellery in social and performative contexts where meaning emerges collaboratively. Through this combined approach, mechanical jewellery becomes a site where human and machine co-agency is negotiated through play.

PERFORMANCE & JEWELLERY

Performance and installation art have long challenged fixed boundaries between artwork and audience. While traditional performance relies on the stage as a clear division between performers and spectators, installation art situates viewers within the spatial environment of the work, transforming observation into embodied experience (Bishop, 2006). Dorothea von Hantelmann (2014) describes this shift as the ‘experiential turn,’ in which artworks are realised through participation and temporal encounter. Within this lineage, artists have developed hybrid practices that merge installation and performance, treating exhibition space as a performative field where bodies, objects, and materials co-produce meaning (Bishop, 2012; Coessens, 2016). However, Claire Bishop offers a critical perspective on participation and relationality in the arts, arguing that such encounters are often framed in normative terms, idealising engagement as frictionless and presuming successful interaction.

META LEVELS	PLAYFUL SPECULATIVE TENSIONS	
PURPOSE <i>motivation & aim</i>	<i>Concerned</i>  <i>Provocative</i>	
CONCEPT <i>scenario & narrative</i>	<i>Serious</i>  <i>Ridiculous</i>	
FORM <i>materials & aesthetics</i>	<i>Believable</i>  <i>Absurd</i>	

Fig. 1 Playful Speculative Design Framework, Kinch, Rahbek & Behrendtzen, 2024.

	META LEVELS	PLAYFUL SPECULATIVE TENSIONS	
ABSTRACT	PURPOSE <i>motivation & aim</i>	<i>Concerned</i> → ← <i>Provocative</i>	
	EMPIRICAL QUALITIES	<i>Encourages reflection on the future of machine companionship through wearable machines</i>	<i>Triggers diverse emotions through autonomous movement and ambiguous agency</i>
	CONCEPT <i>scenario & narrative</i>	<i>Serious</i> → ← <i>Ridiculous</i>	
CONCRETE	EMPIRICAL QUALITIES	<i>Envisions speculative multispecies futures where mechanical jewellery 'lives' with its wearer, where machines 'lives' with humans</i>	<i>Imagines my mechanical jewellery as a creature with absurd emotions, showing the behaviour of the creature</i>
	FORM <i>materials & aesthetics</i>	<i>Believable</i> → ← <i>Absurd</i>	
	EMPIRICAL QUALITIES	<i>Crafted with basic programming motherboard, motors and textile-wrapped shells that appear functionally plausible</i>	<i>Resemble semi-animated artefacts, halfway between companion species and electric toys</i>

Fig. 2 Mechanical Jewellery and Playful Speculative Design Framework. Table: Zhiyang Ding, 2025.

This critique foregrounds the complexities, tensions, and potential failures inherent in participatory situations, challenging assumptions of harmonious co-presence.

Extending these performative conditions into wearable contexts, certain contemporary jewellery practices introduce related modes of performance. As jewellery is worn on the body and encountered through movement, gesture, and social interaction, it can be understood as inherently performative (Hindle et al., 2016). From this perspective, contemporary jewellery has long functioned not only as a mode of display but also as a means of activating relationships between body, object, and audience. Jewellery and installation artist Caroline Broadhead explores what she describes as the “interface between a person and an object” through wearable works that foreground touch, movement, and change (Broadhead, 2005). Similarly, Sian Hindle’s research conceptualises art jewellery as a form of performative leisure, in which wearing becomes a mode of identity play rather than a means of stabilising social roles (Hindle et al., 2016).

Through such engagement, participants are able to experiment with non-normative forms of self-presentation, extending the range of embodied practices available to them. Jewellery in these practices can therefore provoke, disrupt, or reconfigure bodily presence, while the act of wearing itself becomes a situated and relational performative event. In this sense, jewellery unfolds through bodily movement, perception, and social interaction, while also incorporating elements of play through experimentation, ambiguity, and embodied engagement.

In this context, wearable and interactive mechanical jewellery in this research are examined in relation to these performative conditions. When jewellery moves, vibrates, or responds to touch, the act of wearing becomes an event shaped by bodily adjustment, attention, and response. Rather than assuming stable or predictable interaction, these encounters often involve negotiation, resistance, and moments of uncertainty, aligning with Bishop’s critique of participatory norms (Bishop, 2012). From this perspective, jewellery can be understood as a body-centred practice through which interactions between human and non-human elements are enacted through wearing. The mechanical jewellery workshop presented later is therefore framed not only as a participatory experiment, but as an exploration of how jewellery operates as a performative medium, in which play, material behaviour, and social encounter emerge through embodied engagement.

PRACTICE-BASED EXPLORATION

This practice-based research examines mechanical jewellery as a speculative medium for rethinking human–machine relations through iterative cycles of making, interaction, performing, and reflection. The workshop was designed to explore participants’ embodied engagement with mechanical jewellery and to examine how movement, material behaviour, play, and co-creative imagination shape perceptions of agency and relational experience.

Participants were recruited through an open call at the University of Edinburgh, targeting art and design research students. All activities followed institutional ethical guidelines, with prior approval obtained and

informed consent provided for participation, recording, and academic use of identifiable images.

PROTOTYPING AS INQUIRY

In this research, prototyping is treated as a method of inquiry through which material, conceptual, and relational questions are explored, rather than solely a process of technical development. The work draws on the ideas of Donna Haraway, a feminist scholar of science and technology studies, who introduces the concept of “companion species” to describe relational beings that co-evolve through ongoing, reciprocal processes rather than existing within hierarchical human–nonhuman divisions (Haraway, 2003). This perspective emphasises that humans and nonhumans are entangled in mutual processes of becoming, where agency emerges through interaction rather than control. In *Staying with the Trouble* (2016), Haraway further develops the idea of “making kin”, extending kinship beyond biological lineage toward situated practices of cohabitation and interdependence. Rather than proposing technological solutions, she foregrounds the importance of sustaining complex, often unresolved relations across species boundaries. Building on this perspective, mechanical jewellery in this research is approached as a form of artificial companion species, where wearable artefacts participate in dynamic, affective, and embodied interactions with the wearer. In this sense, prototyping becomes a means of materialising these relational conditions. The prototyping phase therefore functioned as a site of material investigation and conceptual reflection. Drawing on Haraway’s notions of Companion Species and Making Kin and informed by

Artificial Life (A-Life), the prototypes were conceived as artificial companion species within a speculative wearable ecosystem (Fig. 3). Adapted from Haraway’s descriptions of ecological stratification, a pyramidal diagram organised the pieces into different ‘species’ occupying distinct bodily zones and forming a dynamic multispecies assemblage.

The prototypes were developed using low-tech artificial life principles, prioritising minimal electronic systems to generate lifelike yet unpredictable behaviour. Mechanically, the pieces were constructed through the modification of existing electric toys, in which internal motors, circuits, and basic sensors were reconfigured to produce irregular, responsive, or oscillating movements. These internal mechanisms were combined with external materials such as metal structures, silicone, and soft textiles, creating hybrid artefacts that integrated mechanical function with tactile and bodily qualities. Rather than relying on complex computation, the mechanicality of these pieces was expressed through visible motion, resistance, and rhythmic variation, often producing behaviours that appeared intentional yet remained indeterminate. In this sense, their “liveness” emerged from material and mechanical interaction rather than digital control.

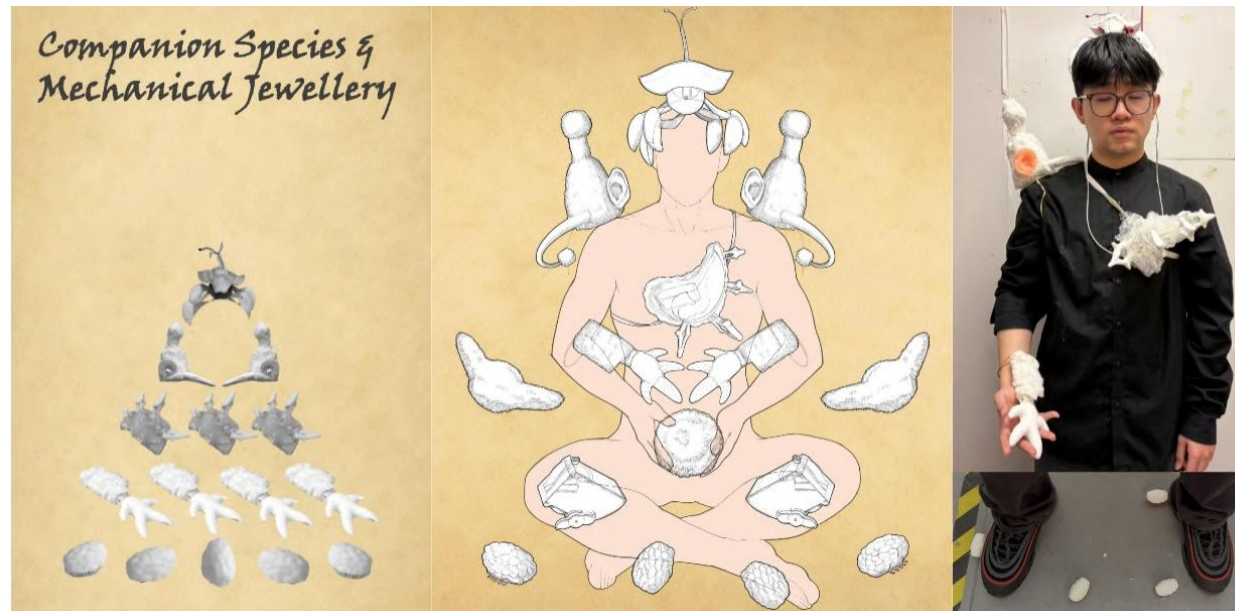


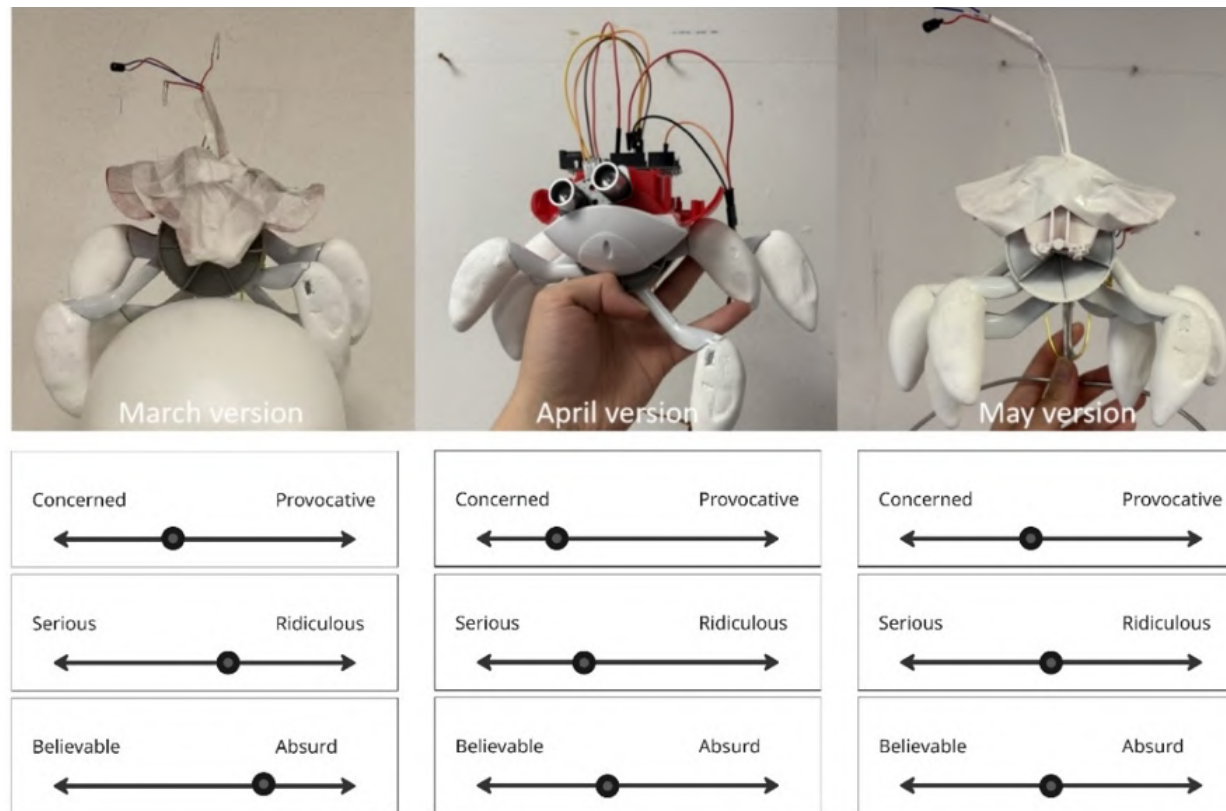
Fig. 3 (left) Mechanical Jewellery Pyramid Structure (left,middle) and Prototypes (right). Photo: Zhiyang Ding, 2025.

Aligned with the theoretical framework outlined earlier, the prototyping process was guided by principles of Playful Speculative Design, with playful tension operating as a heuristic for examining how movement, resistance, and absurdity contribute to speculative engagement. Prototyping was approached as an exploratory process in which material behaviours shaped imagination, interaction, and embodied response. Across three iterative stages between March and May 2025, represented by the prototype Toptickle, mechanical jewellery was developed using combinations of metal, textiles, silicone, and low-voltage electronics. The March iteration, constructed from modified electric toys, produced erratic yet lively movement that evoked curiosity and amusement. The

April iteration, redesigned using Arduino boards, sensors, and servo motors, offered greater technical precision but reduced spontaneity, weakening affective resonance and collapsing playful tension. In response, the May iteration returned to toy-based mechanisms, restoring a productive balance between coherence and unpredictability (Fig. 4).

Each iteration was evaluated using the Playful Speculative Design framework, particularly its three axes of purpose, concept, and form (Fig. 2). The March version scored highly in absurdity and unpredictability; the April version emphasised believability at the expense of playfulness; and the May version achieved a more effective equilibrium, sustaining engagement

Fig. 4 *Toptickle* prototype — March version (left), April iteration (middle), May iteration (right). Photo: Zhiyang Ding, 2025.



through a calibrated interplay of order and disorder. This confirmed the importance of playful tension as a driver of speculative openness. By May 2025, eight prototypes had been completed and assessed using the playful speculative tension model (Fig. 5).

Throughout this process, prototyping functioned as thinking through making, where mechanical failure, absurdity, material resistance, and improvisation became productive forces for exploring relational agency between human and nonhuman actors through jewellery.

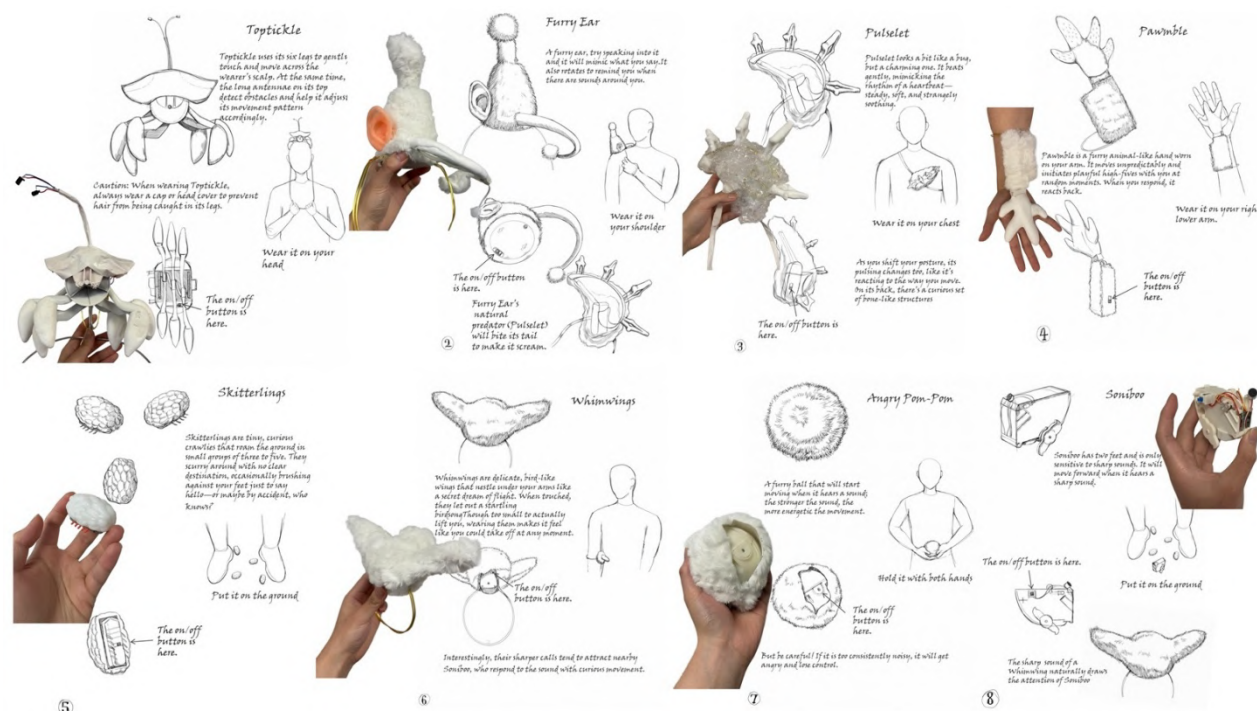


Fig. 5
Diagram and
narrative
descriptions of eight
mechanical jewellery
prototypes. Photo:
Zhiyang Ding, 2025.

MECHANICAL JEWELLERY WORKSHOP AS PARTICIPATORY SPECULATIVE EXPERIMENT

The September 2025 workshop extended the inquiry from prototyping to embodied and participatory speculation (Fig. 6). The workshop participants were recruited through an open call within the University of Edinburgh, specifically targeting research students in art and design disciplines. The recruitment aimed to include participants from diverse disciplinary backgrounds, including architecture, textiles, interaction design, and fine art, allowing for a range of perspectives and embodied responses (see Table 1). The workshop was designed to accommodate different levels of familiarity with wearable interaction by offering multiple modes of engagement, including observation, hands-on interaction, movement exploration, and co-creation. All activities were conducted in accordance with the University of Edinburgh’s ethical guidelines, with prior ethical approval obtained, and all participants provided informed consent for participation, audio-visual recording, and the academic use of identifiable images.

In line with the principles of Participatory Speculative Design, the workshop was not intended to validate functional design solutions but to open a space where participants could imagine, negotiate, and perform alternative human–machine relations through playful interaction. Nine international art and design students took part.

Participant	Background in the Field	Domain Keywords
P1	Service Design	Elderly care
P2	Interaction Design	Meditation and interaction design
P3	Architecture	Comedy film and architecture
P4	Art History	21st-century Chinese contemporary art
P5	Landscape Design	Green space design
P6	Landscape Design	Public landscapes and community infrastructure
P7	Fashion and Textile Design	Sustainable textiles and garment construction
P8	Interaction Design	New modes of representing female biodata
P9	Fine Art	Female illness, identity, and performance

Table 1
Background Information of the Nine Participants



Fig. 6
September 2025
Mechanical Jewellery
Workshop. Photo:
Zhiyang Ding, 2025.

The workshop unfolded in three interconnected phases: First Encounters, Interaction and Movement, and Co-Creation, documented through video, audio, and photography. In the first phase, participants were invited to pick up, touch, and examine the mechanical jewellery designs freely, without any prior explanation (Fig. 7).

This open format aimed to foster their most instinctive and natural responses to the form, materiality, and perceived ‘personality’ of each piece. Some participants experimented with different ways of wearing the prototypes, while others moved spontaneously, stretching, walking or adjusting their posture to observe how the jewellery reacted to bodily gestures. This spontaneous contact foregrounded intuitive bodily responses, highlighting the jewellery’s capacity to invite play and imagination.

In the second phase, participants were introduced to the mechanical jewellery prototypes through a structured demonstration. Each participant received an instruction booklet outlining basic operation, after which the researcher demonstrated how each piece was worn, where its switches were located, and how it moved with the body (Fig. 8).

Fig. 7
Workshop Phase 1:
First Encounters.
Photo: Zhiyang Ding,
2025.



*Fig. 8
Workshop Phase 2.1:
Detailed introduction
of jewellery
prototypes. Photo:
Zhiyang Ding, 2025.*



*Fig. 9
Workshop Phase 2.2:
Performance by
professional dancer.
Photo: Zhiyang Ding,
2025.*



*Fig. 10
Workshop Phase 2.3:
Interactive
exploration. Photo:
Zhiyang Ding, 2025.*



*Fig. 11
Workshop Phase 2.3:
Interactive
movement relay.
Photo: Zhiyang Ding,
2025.*



Fig. 12 Workshop Phase 3: Co-Creation & Group Reflection. Photo: Zhiyang Ding, 2025.

Following this introduction, a professional dancer performed using three prototypes, illustrating how bodily movement and mechanical rhythm could become entangled (Fig. 9). She received only a brief introduction and remained unaware of each prototype's motion patterns, allowing her responses to stay intuitive and improvised rather than choreographed. Participants observed how the jewellery behaved in this live setting and later described during the IPR interviews how its unpredictability appeared to shape the dancer's gestures and rhythm. After the performance, participants were invited to wear the jewellery themselves, exploring its behavioural characteristics and shifting from observer to performer (Fig. 10). The session then moved into a

movement development task. Participants were divided into three groups of three, with each group selecting one prototype and creating a short movement sequence in response to it. This phase culminated in a "movement relay": the first participant performed an action with the jewellery, the second repeated it while adding a new gesture, and the third expanded the sequence further (Fig. 11). Each trio ultimately produced a brief improvised choreography embodying a shared dialogue between human movement and mechanical behaviour.

The final phase focused on making and reflection. The nine participants were presented with nine different motorised toy mechanisms and invited to choose one

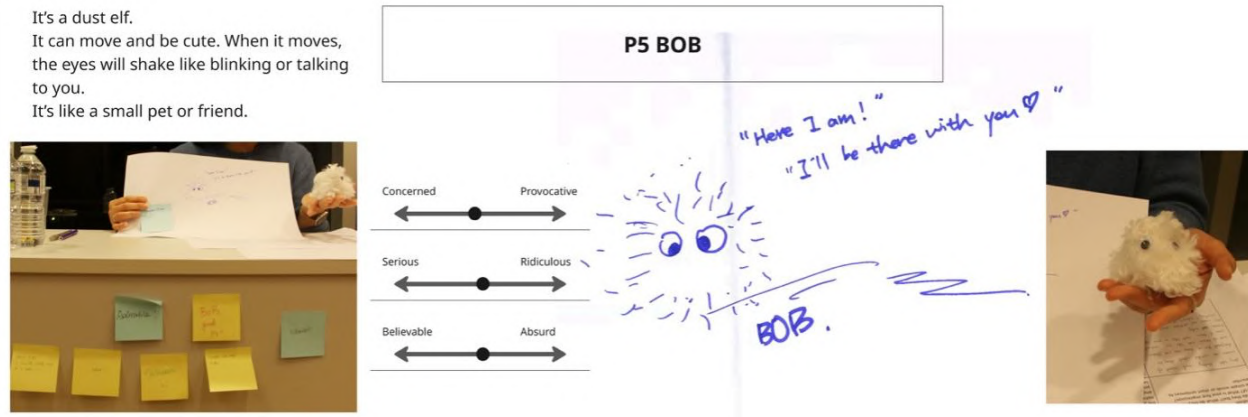


Fig. 13
Participant 5's
prototype BOB and
its Playful
Speculative Tension
evaluation. Photo:
Zhiyang Ding, 2025.

that interested them as the basis for their companion-species jewellery. They modified these mechanisms using clay, textiles, aluminium wire, and hand tools (Fig. 12). Some began with sketches, while others worked directly with materials, shaping forms around the toy's movement. Several experimented with altering the mechanisms to create new motion or vibration patterns. In line with Participatory Speculative Design, this phase emphasised imagination and plurality, prompting participants to discuss possible future behaviours, lifelike qualities, and relational potentials of their creations.

Once all prototypes were completed, a collective reflection session was held (Fig. 13). The Playful Speculative Tension framework was introduced at this stage. Participants used sticky notes to offer keywords describing the form, concept, and purpose of each piece, such as believable to absurd, serious to ridiculous, and concerned to provocative. These peer-

generated insights were later synthesised into a Playful Speculative Tension evaluation table for each prototype.

The workshop functioned as a participatory speculative experiment that relied on embodied interaction rather than verbal feedback as its primary mode of inquiry. It combined the openness of Participatory Speculative Design with the evaluative lens of Playful Speculative Tension, offering insight into how people from different disciplinary backgrounds respond to mechanical jewellery as a more-than-human play material.



Fig. 14 IPR interview session showing workshop video playback alongside the Zoom interface, enabling participants to pause and reflect on key interaction moments during the interview. Image: Zhiyang Ding, 2025.

INTERPERSONAL PROCESS RECALL (IPR)

The Interpersonal Process Recall (IPR) method was originally developed within counselling and educational contexts to facilitate reflective learning through video-assisted recollection (Larsen, Flesaker & Stege, 2008). It enables participants to revisit recorded events—such as dialogue or embodied action—while verbalising thoughts, sensations, and emotions that were tacit at the time. Unlike conventional interviews, IPR focuses less on factual reconstruction and more on eliciting felt meaning and affective awareness. This research builds on the adaptation of IPR from therapeutic and educational contexts to participatory design (Kettley et al., 2015). Participants revisited

video footage of workshop moments involving mechanical jewellery using a split-screen format (Fig. 14), allowing them to pause or replay meaningful moments, including those that felt awkward, humorous, or affectively charged. Facilitators maintained a minimal-intervention approach, using open prompts to support embodied reflection.

Auto-transcription and captioning features significantly enhanced accessibility and analytical efficiency, particularly for the fourth author (hard of hearing), enabling more accurate capture of content and emotional nuance. Captioned text also improved

Core IPR Prompts	
1.	→ What were you feeling at this moment? What came to mind?
2.	→ Did you notice any changes in the jewellery's movement or behaviour?
3.	→ How did the jewellery influence your actions or reactions?
4.	→ How did your body feel at this moment (comfortable, awkward, surprised, etc.)?
5.	→ Did you notice other participants' reactions? Did that influence you?

Fig. 15
Sample Interview
Questions. Table:
Zhiyang Ding, 2025.

traceability of participants' statements and transparency in coding (Pink et al., 2016).

The IPR process involved multi-angle recording of the workshop, followed by editing into individual 8–10-minute video segments. Each participant then completed a 40–60-minute individual IPR session via Zoom, reviewing footage and controlling playback.

The researcher used open-ended prompts, such as “What were you thinking at this moment?” and “How did your body feel when the jewellery moved here?” (Fig. 15), to support reflection. These sessions functioned as individual recall processes rather than debriefs, focusing on sensory, affective, and interpretive experience.

Participants summarised insights during and after viewing, with interpretation

emerging through dialogue with the recorded material. Recordings were destroyed after transcription and data extraction, retaining only verbal accounts. Data were analysed through iterative thematic interpretation, focusing on embodied interaction, play, and agency, adopting a generative approach to participants' reflections.

The IPR sessions produced an additional layer of introspective and embodied data, complementing workshop observations. By enabling immediate reflection through video playback, participants could revisit sensory and kinaesthetic moments, articulating subtle bodily responses such as hesitation, micro-expressions, and shifts in attention in relation to the jewellery's movement.

FINDINGS AND DISCUSSION

PLAYFULNESS ACROSS JEWELLERY, BODY, AND INTERACTION

Across iterative development and participatory workshops, playfulness emerged as a continuous and generative force shaping both the mechanical jewellery artefacts and the research process. During prototyping, playfulness manifested through cycles of experimentation, failure, and reconstruction. Each iteration negotiated a balance between technical control and spontaneous absurdity, revealing a productive tension between engineering rationality and poetic unpredictability. The resulting artefacts combined mechanical logic with humorous vitality, situating jewellery practice between scientific inquiry and imaginative play.

During participant interaction, playfulness became visible through the jewellery's unpredictable movements and the spontaneous bodily responses they provoked. Participants frequently laughed, improvised, and expressed surprise, describing the experience as engaging and liberating. Such reactions challenged instrumental understandings of design, positioning play as a legitimate mode of knowing and making. This perspective was echoed in interviews with the nine participants from art and design backgrounds. As Participant 6 noted, interactive devices or mechanical jewellery did not need to convey profound meaning; rather, *“their purpose is simply to be played with”*, suggesting that playfulness itself becomes the meaning of these pieces.



Fig. 16

Fig. 17

Participant 8
interacting with the
jewellery prototype.
Photo: Zhiyang Ding,
2025.



Other participants emphasised how the autonomy of the jewellery and the structure of the workshop encouraged curiosity and collective exploration. Participant 8 observed that the playfulness of the workshop emerged largely from the jewellery itself, prompting participants to explore, interact, and discover different modes of

engagement together. Participant 9 similarly described the experience as “*rediscovering the joy of playing*”, noting that the mechanical pieces invited multiple interpretations, without being tied to fixed or predetermined meanings. Across the workshop phases, playfulness was intentionally embedded through observation of a dancer’s performance, participants’ own embodied experimentation, and co-creation using toy mechanisms and mixed materials. This multi-layered enactment of play created a fluid relationship between observation, action, and making, foregrounding curiosity, improvisation, and co-creation as central to mechanical jewellery practice.

EVALUATING PARTICIPANT CREATIONS THROUGH THE PLAYFUL SPECULATIVE TENSION FRAMEWORK

The nine prototypes created by participants during the third phase of the workshop demonstrated a diverse range of imaginative interpretations. Their characteristics were analysed using the three axes of the Playful Speculative Tension framework: purpose (ranging from concerned to provocative), concept (from serious to ridiculous), and form (from believable to absurd). Overall, most participants situated their prototypes toward the concerned end of the purpose axis, with only a few leanings toward a more provocative stance. Along the form and concept axes, the prototypes tended to cluster near the middle, reflecting a balanced interplay between believability and absurdity, as well as between seriousness and playfulness. One of the most striking examples was Participant 6. His prototype, titled Mr. Orange, modified a toy mechanical dog and represented the

most provocative work among the group (see Fig.18). He described the piece as a humorous critique of his own tendency to procrastinate in the office, portraying the jewellery-companion as a mischievous and unproductive colleague. Interestingly, his Interpersonal Process Recall interview revealed a parallel disposition: he approached the workshop with playfulness, emphasising fun, amusement, and the non-serious atmosphere of the experience. His prototype and reflection together underscore how attitude and personal narrative shape speculative purpose.

In contrast, many of the concerned-oriented works reflected themes such as compassion for marine life, care for emotional wellbeing, or self-motivation. On the form and concept axes, nuanced patterns also emerged. Participant 4, whose background is in art history, created a piece that skewed slightly toward believability and seriousness; in her interview she acknowledged feeling more cautious than peers from studio-based disciplines. Participant 7, trained in textile design, produced one of the more absurd and playful pieces, demonstrating a higher tolerance for uncertainty and a freer, less constrained creative approach.

Taken together, these observations suggest that participants’ professional backgrounds, workshop experiences, and personal attitudes influenced how they engaged with the three dimensions of the framework. Despite having no prescribed aesthetic or functional expectations, participants demonstrated a strong ability to understand the companion-species concept and to maintain balance across the axes of Playful Speculative Tension during the co-creation process.

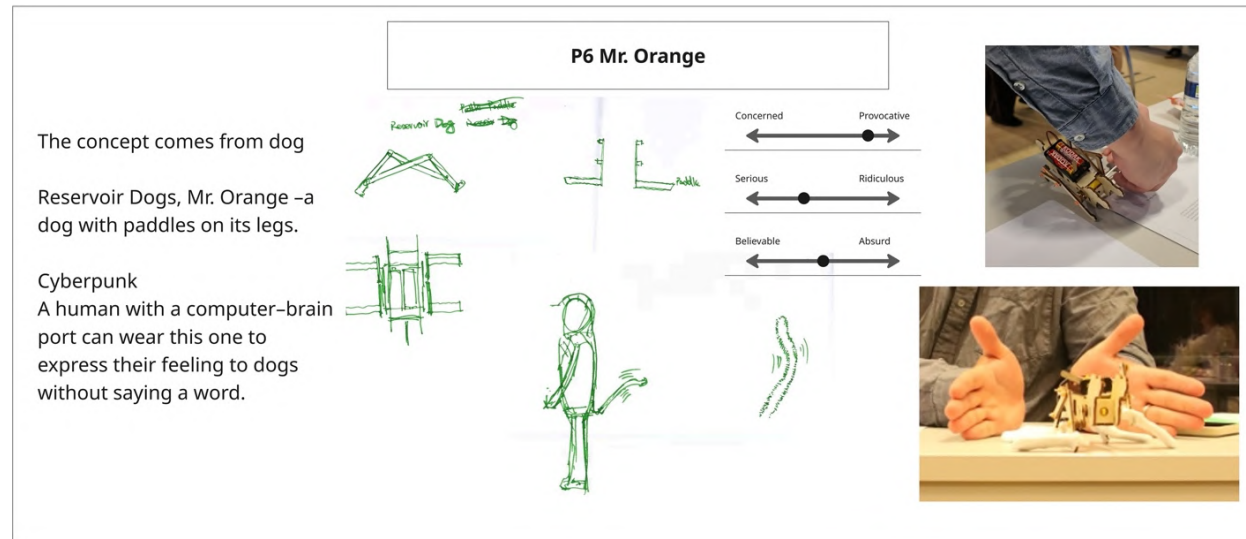


Fig. 18
Participant 6's
prototype Mr.
Orange and its
Playful Speculative
Tension evaluation.
Image: Zhiyang
Ding, 2025.

IPR AND PERSONALISED MEANING-MAKING

Across the IPR sessions, participants produced highly personalised interpretations of the mechanical jewellery, shaped by their professional backgrounds, life experiences and individual sensibilities. Participant 7, for example, compared the dancer's first interaction with the jewellery to a scene from Tarzan, where a monkey encounters a human infant, an image she used to describe tentative curiosity, unfamiliarity and gradual recognition between dancer and artefact. Participant 3 drew on *The Little Prince*, describing the dancer–jewellery relationship as one of companionship and mutual ‘taming’, emphasising reciprocity rather than control.

The dancer's own recollection deepened this relational framing. When performing with the Pawmble prototype, she initially felt its vigorous movements were something she needed to tame, but when the piece unexpectedly stopped and could not be revived, she described a sense of loss and helplessness (Fig. 19). This moment embodied a dynamic of “testing each other”, “loving and resisting” and “realising attachment only through disappearance”, suggesting the jewellery's behaviour had become entangled with her emotional experience.



*Fig. 19
Dancer performing
with the Pawmble
prototype during
Workshop Phase 2.
Photo: Zhiyang Ding,
2025.*

Other participants also characterised the prototypes as expressive beings rather than objects, describing them as nervous, curious, stubborn or alive. Participant 1 observed:

“The small spherical piece has a playful personality, while the shoulder piece with the ear-like form is rather noisy.”

Participant 9 reflected on the jewellery’s autonomy: “You can’t really control it. It has its own vibration pattern and its own way of interacting with you. You have to learn its temperament. This subverts my previous understanding of accessories; traditional jewellery serves the body, but these pieces do not occupy a passive position. They have a certain subjectivity.”

Together, these interpretations reveal that participants engaged with the mechanical jewellery as companion species, entities with relational presence and behavioural agency.

Their metaphors highlight a shift away from anthropocentric assumptions of human dominance, suggesting instead that agency is negotiated through movement, resistance and shared adaptation. Through these embodied encounters, mechanical jewellery became a catalyst for more-than-human relational imagination.

CONTRASTING ON-SITE BEHAVIOUR WITH IPR REFLECTIONS

An intriguing contrast emerged between participants’ observable behaviour during the workshop and the depth of insight offered during Interpersonal Process Recall interviews. In the workshop setting, some participants appeared highly enthusiastic—laughing, experimenting freely, and actively interacting with the jewellery—while others were noticeably quieter, more reserved, or hesitant to engage. However, the IPR results reversed many of these surface impressions.

Participants who appeared shy or understated during the workshop often produced more extended reflective narratives. For instance, Participants 8 and 9 interacted minimally on site and occasionally observed from the periphery, yet each took part in interviews lasting nearly 60 minutes, far exceeding the average duration of 45 minutes, and offered detailed reflections and recollections on the workshop process, their interactions with the jewellery, and their creative experiences (Fig. 20). In contrast, participants who were highly expressive and playful during the workshop did not always demonstrate comparable levels of engagement in IPR. Participants 2 and 3, who displayed frequent laughter and visible excitement while interacting with the jewellery, participated in comparatively brief interviews of around 35 minutes, providing more concise responses when prompted (Fig. 21).

These differences suggest that visible enthusiasm during embodied interaction does not necessarily correspond to the depth of subsequent reflection. While some participants engaged more through immediate bodily interaction, others developed more elaborated interpretations through reflective recall. The effectiveness of IPR was closely linked to the video materials provided, with curated replay sequences of approximately fifteen short clips capturing micro-gestures, expressions, and reactions that enabled participants to re-enter and verbalise experiences not readily articulated during the workshop.

MECHANICAL JEWELLERY AS A RELATIONAL MEDIUM: COMPANION SPECIES, EMBODIMENT, AND SOCIAL MEANING

The findings suggest that mechanical jewellery can be understood as a relational medium, approaching what Donna Haraway describes as a companion species, whose movements, resistances, and rhythms shape the encounter. The interactions observed indicate a distributed dynamic in which both human and non-human elements contribute to the experience. This relationality is expressed not only through participants' responses, but also through the behaviour of the jewellery itself. The prototypes exhibited irregular and responsive movements generated through simple mechanical systems, producing oscillations and shifts in rhythm that prompted participants to adjust posture, attention, and action. These interactions formed feedback loops that blurred distinctions between actor and acted-upon. While such encounters suggest a more-than-human dynamic, the temporal scope of the workshop limits engagement with longer-term processes of companionship.

The interactions observed here are therefore situated and exploratory, offering insight into how such relationships may begin to emerge.

Although some of the prototypes may at first appear as attachments or wearable devices, they are understood here as jewellery through their mode of bodily engagement. These pieces are designed to be worn in close proximity to the body, occupying specific sites such as the head, shoulder, or arm, where they shape perception and posture.

Fig. 20
Participant 9:
On-site photograph
and online interview
screenshot (top), and
interview
transcription
(bottom).
Image: Zhiyang
Ding, 2025.



Zhiyang Ding (28-10-2025 16:38:48)

Ok, I will pause here. That concludes the first exploration phase. Before I begin the questions, is there anything you would like to share?

Participant 3 (28-10-2025 16:39:01)

No, nothing in particular.

Zhiyang Ding (28-10-2025 16:39:03)

Alright. The first question concerns the initial exploration stage. When you encountered the jewellery without any prior explanation, where was your attention mainly focused? For example, on material, tactility, colour or how it might be worn?

Participant 3 (28-10-2025 16:39:36)

I was mostly focused on how it could be worn. The metal rings, for example, reminded me a bit of a bag. I think my main concern at that moment was figuring out how to put it on and how it would sit on the body.

Zhiyang Ding (28-10-2025 16:39:58)

Good. The next question is: during the exploration, did you notice the behaviour or actions of the other participants, and did that have any influence on you?

Participant 3 (28-10-2025 16:40:23)

I noticed that some people were playing with the small insect-like piece. That caught my attention, but it did not really influence me.

Zhiyang Ding (28-10-2025 16:41:14)

Ok, great. The third question is: during the exploration, when all the pieces were placed on the table without any explanation or instructions, how would you describe these mechanical objects in that state?



Fig. 21
Participant 3: On-site
photograph and
online interview
screenshot (top), and
interview
transcription
(bottom).
Image: Zhiyang
Ding, 2025.

Zhiyang Ding (27-10-2025 14:04:37)

From your personal perspective, based on your own subjective judgement, was there anything in the workshop that particularly surprised you or felt especially interesting?

Participant 9 (27-10-2025 14:04:49)

One thing that really struck me was one of your jewellery pieces that expanded and contracted. I am not sure how to describe it precisely, but there was a kind of tension in that movement. As a wearer or user, you cannot control it, and it feels as if the piece has its own vibration rhythm and its own way of interacting with you. You have to gradually learn its temperament, almost like getting to know someone's personality. This completely challenged my usual understanding of accessories. Normally, accessories are supposed to serve the wearer or the body, but these pieces felt much more like subjects in their own right. For a moment, I felt that the accessory was no longer occupying a passive, object-like position. That experience was very intriguing for me.

Zhiyang Ding (27-10-2025 14:06:19)

So would you say that these mechanical jewellery pieces, in some way, challenge anthropocentrism by decentering the wearer?

Participant 9 (27-10-2025 14:06:28)

Yes, absolutely.

Participant 9 (27-10-2025 14:08:26)

I also had another thought. For me—and I think for other participants as well—when we were playing with the jewellery, we were often unsure how the objects were meant to be used or worn. So we did not approach them like ordinary accessories, where you immediately think about whether they feel comfortable on the body. Especially when watching the video clips later, I realised that the main question for me was: how *should* this piece be worn? I was more focused on exploring its function, or what it was capable of doing, rather than treating it as a conventional piece of jewellery.

Rather than serving functional or instrumental purposes, their significance lies in how they mediate relationships between body, material, and others, aligning with contemporary jewellery practices that foreground adornment as an embodied and relational experience (Skinner, 2013).

Participant 8 articulated this dynamic vividly:

“The dancer’s first reaction to the jewellery felt like a mutual testing—each side trying to sense, to control, and to find who is taking the lead. It felt like a negotiation between the two... With the ear-shaped jewellery, you can actually talk to it. It turns ordinary conversation into something unfamiliar, and once you get used to it, you want to keep talking to it.”

This relational entanglement extended beyond physical interaction into emotional and symbolic dimensions. Participants frequently attributed personality, intention, or temperament to the prototypes, transforming mechanical motion into shared aesthetic and affective events.

Beyond the workshop context, these dynamics suggest how mechanical jewellery might function within everyday and interpersonal social situations. When worn in the presence of others, such pieces could alter how the body is perceived, approached, or interpreted, introducing moments of curiosity, hesitation, or ambiguity. The shifting behaviours of the jewellery may disrupt habitual bodily presentation, making the wearer more aware of their own gestures while also inviting attention from surrounding observers. In this sense, mechanical jewellery extends beyond controlled experimental settings into a socially situated practice in which meaning is negotiated not only between wearer

and artefact, but also within broader cultural and interpersonal contexts.

In this way, the jewellery’s vitality can be understood as a material-discursive phenomenon, in which meaning emerges through co-presence rather than human dominance. These encounters suggest how mechanical jewellery can support post-anthropocentric forms of play, where design operates as a mode of relational inquiry and material behaviour contributes to the production of situated knowledge through participants’ embodied interactions and reflective accounts within the workshop and IPR processes.

CONCLUSIONS

This early-stage research demonstrates the potential of mechanical jewellery as a playful and interactive medium within contemporary jewellery practice. Through iterative prototyping, participatory workshops, and reflective analysis, mechanical jewellery is explored as a form of wearable engagement that reshapes how wearers and makers experience agency, movement, and co-creation. In doing so, it contributes to discussions of adornment as an embodied and relational practice, where jewellery participates in companionship and playful interaction, shaping lived bodily experience. Its behaviours and resistances invite post-anthropocentric perspectives, suggesting that meaning in jewellery emerges through relational encounters between human and non-human elements.

The research contributes to jewellery research and practice in three ways. First, it positions playfulness as an epistemic condition within jewellery, framing experimentation, humour, and unpredictability as

central to how knowledge emerges through making and wearing. Second, it advances understandings of material agency by showing how mechanical motion and bodily response generate affective and conceptual insight through wear. Third, it expands practice-based jewellery inquiry by demonstrating how workshops function as reflective spaces where jewellery facilitates embodied encounters between bodies and materials. These implications extend beyond conventional ornamentation toward broader dialogues in contemporary jewellery, wearable installation, and performance practice.

Mechanical jewellery operates as both a conceptual lens and a practice-based medium for exploring how jewellery might act, respond to, and accompany the body. By foregrounding materiality, play, and embodiment, this research positions jewellery as a more-than-human practice that reconfigures how bodies, materials, and machines coexist through wearing and interaction.

AI USE DISCLAIMER

The authors used AI-assisted tools solely for language editing (grammar and clarity). All scientific content, interpretations, and conclusions are the sole responsibility of the authors.

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An Exploratory Investigation into the Impact of Wearing Jewellery on Individual Well-Being

Authors: *Yajie Hu, Roberta Bernabei, Diane Gyi*



ABSTRACT

Everyday objects, such as jewellery, can play a role in shaping emotional and social experiences, yet little is known about their impact on overall well-being. This paper presents part of a doctoral research project undertaken by the first author at Loughborough University between October 2021 and September 2025, supervised by the second and third authors. The study explored the potential impact of wearing jewellery on individuals' well-being, using a qualitative approach that combined diaries with interviews, analysed through a hybrid thematic approach, with deductive coding guided by the PERMA framework.

Findings indicated that all five PERMA dimensions were reflected in participants' experiences, with Positive Emotion and Relationships most prominent. Participants also reported negative feelings, such as frustration when brooches did not match outfits or were forgotten. Some participants became used to wearing the pieces, and all male participants noted that men rarely wear jewellery, particularly brooches.

The study suggests that wearing jewellery may enhance well-being particularly by fostering positive emotions, social connections, and personal meaning, while acknowledging limitations such as the short intervention period. These findings offer insights into the everyday experience of jewellery and highlight its potential role in supporting individual well-being.

Keywords: *Wearing Jewellery; Well-being; Jewellery and Well-being; PERMA; Therapeutic Jewellery; Arts and Health*

INTRODUCTION

In contemporary society, economic pressures, social demands and various other challenges are increasingly affecting individuals around the world, leading to anxiety, stress, depression and other mental health difficulties. The World Health Organization reports that 970 million people worldwide are living with a mental disorder, affecting not only their personal well-being but also their relationships, education, and work life (WHO, no date).

Throughout history, jewellery has served a variety of functions and carried multiple meanings, including symbols of social status, religion and decoration. While there are research and practice on jewellery and well-being, most studies focus on its emotional significance in personal relationships, memory, or grief, rather than its potential therapeutic benefits or role in enhancing overall well-being.

This paper presents one study from the first author's doctoral research project, informed by extensive literature review and research design. In particular, it focuses on exploring participants' experiences of wearing researcher-made jewellery over a 7-day period. In this paper, 'researcher-made' jewellery can be considered as a new form of production situated between contemporary jewellery and research probes - objects that are inspired by contemporary jewellery but purposefully designed for research engagement. It aimed to investigate how wearing such jewellery might influence individual well-being. A qualitative approach was employed, integrating data collected through

diaries and interviews. A hybrid thematic analysis was conducted, combining inductive and deductive approaches, with the deductive analysis guided by the PERMA framework, encompassing Positive Emotion, Engagement, Relationships, Meaning, and Accomplishment.

This study serves as a qualitative pilot study that advances our understanding of the role of jewellery in supporting well-being, offering interdisciplinary insights that bridge jewellery studies and psychology. It contributes to knowledge on the therapeutic potential of jewellery, enriches the expanding literature on well-being, and supports the growing field of arts and health.

LITERATURE REVIEW

UNDERSTANDING WELL-BEING

Well-being has been explored across multiple disciplines, such as psychology, social sciences, and philosophy, each holding its own perspective on the definition of well-being (Dodge et al., 2012; Margolis et al., 2021). There is no universally agreed definition because it is considered as a complex multifaceted concept that is challenging to define (Diener, 2009; Barley and Lawson, 2016). Although various definitions of well-being have been proposed, it is widely understood as a combination of 'feeling good and functioning well' (Huppert and So, 2013).

In psychology, hedonic and eudaimonic approaches are the two main theoretical perspectives on human well-being (Ryan and Deci, 2001; Dodge et al., 2012). The hedonic approach emphasises the pursuit of pleasure and the avoidance of pain, while the eudaimonic approach suggests that well-being arises from leading a life rich in meaning, purpose, and the fulfilment of one's potential (Ryan and Deci, 2001). The most prominent hedonic model is Subjective Well-Being (Diener, 1984), which consists of 'Life Satisfaction' and the balance between 'Positive Affect' and 'Negative Affect'. One of the most widely recognised eudaimonic theories is Ryff's (1989) Psychological Well-Being, measured through variables such as 'Purpose in Life', 'Personal Growth', 'Self-Acceptance', 'Environmental Mastery', 'Autonomy' and 'Positive Relations with Others'.

There has been a debate between hedonic and eudaimonic theorists about how well-being should be understood. From a eudaimonic perspective, subjective well-being models have been criticised for their narrow focus and their limitations as indicators of healthy living. In contrast, advocates of the hedonic approach argue that eudaimonic measures are often determined by experts, whereas subjective well-being respects individuals' personal opinions of what constitutes a good life (Calvo and Peters, 2014). However, Calvo and Peters (2014) suggest that both approaches can offer valuable insights for technology design, sometimes even when combined. Evidence from various researchers indicates that well-being is best understood as a multi-dimensional concept, involving both hedonic and eudaimonic aspects (Ryan and Deci, 2001).

PERMA is an example of a well-being model that integrates both hedonic and eudaimonic perspectives, distinguishing it from other well-being theories (Huppert and So, 2013; Farmer and Cotter, 2021). Developed by Seligman (2011), a leading figure in positive psychology, it identifies five core elements of well-being: 'Positive Emotion', 'Engagement', 'Relationships', 'Meaning' and 'Accomplishment'. According to Seligman (2011), Positive Emotion reflects how we feel, including pleasure, rapture, ecstasy, warmth, comfort and the like. Engagement refers to the state of 'flow' (Csikszentmihalyi, 2002), in which an individual becomes fully absorbed in an activity, experiencing timelessness and a loss of self-consciousness. Relationships are integral to well-being, encompassing feelings of support, love and being valued by others. Meaning refers to 'belonging to and serving something that you believe is bigger than the self' (Seligman, 2011, p. 17). Accomplishment refers to 'a life dedicated to accomplishment for the sake of accomplishment' (Seligman, 2011, p. 19) and can be realised through the creation of a tangible object or the demonstration of skill or mastery (Farmer and Cotter, 2021).

THE ROLE OF JEWELLERY IN WELL-BEING

Wearing jewellery has remained a consistent aspect of human existence since the earliest times (Phillips, 1996). During the prehistoric period, jewellery was believed to possess magical properties. For example, amulets were understood to protect people from danger and misfortune, while talismans were believed to endow positive magical powers (Gregoriotti, 1969). Andrews (1994) further explained that amulets were expected to provide magical protection, a concept

supported by the fact that three of the four Egyptian words translated as ‘amulet’, namely meket, nehet and sa come mainly from verbs meaning ‘to guard’ or ‘to protect’. The fourth, wedja, has the same sound as the word meaning ‘well-being’.

Andrews (1994) also provided concrete examples of these practices in ancient Egypt. Funerary amulets, for instance, were prescribed as funerary jewellery and were purely amuletic in function. They were created to accompany the wrapped mummy during burial, offering aid and protection on the journey to the Other World and in the Afterlife.

In fact, every human holds an innate, subconscious belief that unseen forces influence our destinies, as part of a self-preservation mechanism (Howes, 1975).

Howes (1975) stated that the power of a lucky charm depends largely on the individual’s belief in it; thus, a charm may bring remarkable benefits to its owner but have no effect for anyone else. For example, a person may possess a simple, low-cost object that seems ordinary, but if it is associated with a positive outcome on first use, they are likely to continue using it, strengthening their belief in its perceived luck. Similar behaviours can be observed among athletes; for instance, one well-known professional footballer mentioned in an interview that he always wore an old pair of socks while playing (Howes, 1975).

Together, such items, including amulets and other prophylactic objects, have historically been associated with protection and good fortune, reflecting a connection to personal well-being.

Furthermore, previous research has highlighted the mnemonic and emotional significance of jewellery. For

instance, Wallace et al. (2013) examined how digital jewellery might support a woman living with dementia in maintaining her sense of self and relationships as her condition progressed. This approach aimed to facilitate reminiscence and create a lasting legacy, illustrating how digital jewellery can enhance the experience of those living with dementia by preserving identity and nurturing social connections. Similarly, Bernabei (2016) explored how jewellery imbued with personal memories can support well-being through participatory exchanges with elderly participants. The project functioned as a therapeutic intervention, demonstrating that wearing jewellery imbued with personal memories helps preserve those memories, as frequent recall reinforces their solidity.

Holm (2004) noted that jewellery functions not only as an integral component in acts of memory, but also as a tangible carrier of memories for remembering the dead, the gone, or the separated. Wearing or possessing jewellery belonging to lost loved ones can help individuals cope with grief following bereavement (Ahde-Deal, Paavilainen and Koskinen, 2017).

The social and cultural reasons for the flourishing of mourning jewellery during the sentimental period encouraged the appreciation and use of human hair as a raw material for creating items such as mourning rings and lockets (Holm, 2004). In these objects, hair functioned as a substitute for ‘bony remains’ since cremation was not practised in the eighteenth-century Europe, and hair was considered to last forever whereas the body could not (Holm, 2004).

This association between jewellery and personal loss continues in contemporary jewellery practice. The

works of Lin Cheung (Memoria, 1999) and Hiroko Ozeki (Tear, 2001) explore personal narratives of loss by transforming lived experiences into jewelry pieces that are both beautiful and poetic (Wallace, Dearden and Fisher, 2007). Similarly, Kate Maconie cast one of her mother's rings using the cuttlefish bone casting technique. Although this method is typically used for a single casting, Maconie repeatedly recast the ring in the same mould until the original details were gradually lost. Through this process, her work traces the emotional journey of grief across a set of fifteen rings (Manheim, 2009).

The 'Jewellery for Feel and Heal' project by Arif and Hashim (2021) aimed to design signature healing jewellery using gemstones to support individuals with minor depression. They suggested that these pieces could uplift the mood and promote calmness and confidence. In their latest research (Hashim et al., 2022), they reported that participants' feedback suggested that healing jewellery is beneficial for individuals with minor depression. However, the paper provides no data or empirical evidence regarding the effectiveness of the designed healing jewellery, and there is a lack of strong supporting literature.

The focus on jewellery as a potential tool for well-being can be extended beyond simply wearing it to include the creative process itself. Adams-Price and Steinman (2007) explored the psychological and spiritual benefits of engaging in jewellery making among middle-aged women. Participants reported experiencing psychological benefits from engaging in jewellery making, as well as spiritual benefits.

Specifically, they described increased self-esteem, reduced stress, improved productivity, validation from others, and a sense of connection to God or to other people. Similarly, Günay et al. (2022) examined the effects of bead jewellery making on state and trait anxiety levels in children with cancer. They found that engaging in this activity effectively reduced both types of anxiety. In addition, the children enjoyed wearing the jewellery they created and taking pleasure in giving their pieces as gifts to parents and siblings.

Well-being is a complex, multi-dimensional concept, and previous research has shown that jewellery can relate to it through emotional significance in personal relationships, memory, and grief, as well as historically through protective beliefs such as amulets. However, there is limited research on the lived experience of wearing jewellery and its influence on overall well-being. This study aims to contribute to understanding this impact.

METHODOLOGY

This study employs a qualitative approach to explore the impact of wearing jewellery on individual well-being. Qualitative data were collected through diaries and diary-interviews, allowing participants to record and share their daily experiences with the pieces. By combining these methods, the study seeks to provide insight into how wearing jewellery relates to well-being in everyday life. Diaries were selected as a key method because they minimise the risk of retrospection by reducing the time between an experience and its documentation (Bolger, Davis and Rafaeli, 2003). Therefore, they are valuable in avoiding a traditional research bias known as inaccurate recall (Alaszewski,

2006). Additionally, observing participants' daily activities can be challenging, making diaries a useful tool for documentation (Kenten, 2010). However, diaries require a good level of willingness to regularly complete the diary and time commitment from participants (Bolger, Davis and Rafaeli, 2003; Meth, 2003; Kenten, 2010). Their effectiveness also depends on the accuracy of participants' recordings (Alaszewski, 2006). In this study, diary data were collected over a 7-day period. This duration was selected as it was considered sufficient to capture participants' daily experiences of wearing jewellery across both weekdays and weekends, while also maintaining data quality (Butcher and Eldridge, 1990) and minimising participant burden (Williams and Brohan, 2022). Furthermore, diary-interviews were adopted as a complementary method to diaries, serving as a process of expansion that allowed participants to fill in omitted details (Zimmerman and Wieder, 1977). They also provide context for the diaries, reduce potential misunderstandings, and offer a deeper level of insight than diaries alone (Kara, 2020). In addition, diary-interviews offer participants who may find diary writing challenging an opportunity to share and describe their experiences more comfortably (Kenten, 2010). Kenten (2010) suggested that diary-interviews should be regarded as an essential component in the use of diaries as a research method. Data collected from both diaries and interviews were analysed using a hybrid thematic analysis approach, integrating both inductive and deductive methods. The deductive analysis was guided by Seligman's well-being theory, the PERMA framework, which encompasses 'Positive Emotions', 'Engagement', 'Relationships', 'Meaning',

and 'Accomplishment'. This framework was selected as it integrates both hedonic and eudaimonic perspectives on well-being and provides a useful lens for examining how different dimensions of well-being are reflected in participants' experiences of wearing jewellery. The jewellery pieces ('researcher-made' jewellery) can be regarded as a new form of production that is inspired by contemporary jewellery but purposefully designed for research engagement.

A total of 20 brooches were created using recycled paper waste, corn flour, brass wire, and recycled copper or silver wire (Fig. 1, 2). Participants were invited to select one brooch to wear for 7 days. The design and making process also took into account factors such as visual appeal, hygiene, wearability, and comfort. Participants' needs were considered, with a variety of shapes, colours, and sizes incorporated to accommodate different preferences and promote diversity and inclusivity.



Fig. 1
The final finished 20
brooches. Photo:
Yajie Hu, 2024.

Fig. 2
*A closer look at
one of the 20
brooches. Photo:
Yajie Hu, 2024.*



This paper presents one of the studies from a practice-led PhD research project. The practice element, including the making process and associated decision-making, is not included in this paper, as the focus of this paper is on discussing participants' wearing experiences and the findings derived from the data. For further details on the practice component, readers are referred to the first author's PhD thesis (Hu, 2026).

Participants were recruited using a combination of self-selection and snowball sampling techniques. Recruitment took place through multiple channels, including the email list, social media platforms, and physical posters, with additional participants referred through snowball sampling. Participants were required to be over the age of 18, able to fully understand and consent to this research, and willing to wear a brooch for 7 days. Individuals with current or previous experience as jewellers, makers, or craftspersons were excluded, as their advanced skills and experience in creating artefacts or jewellery could bias the study outcomes. Ultimately, a total of 14 participants were recruited for this study.

The study received ethical approval from the School of Design and Creative Arts, Loughborough University Ethics Review Sub-Committee prior to data collection. Ethical procedures included completing a review checklist, providing a participant information sheet,

obtaining informed consent, conducting a risk assessment, and preparing diary and interview questions. All participant responses reported in the findings and discussion were anonymised using codes to protect their identities.

FINDINGS AND DISCUSSION

The following findings from diaries and interviews are presented according to the five dimensions of PERMA framework (Seligman, 2011).

POSITIVE EMOTION

As mentioned in the literature, Seligman (2011) described positive emotions as encompassing pleasure, rapture, ecstasy, warmth, comfort, and the like. Similarly, Fredrickson (2011) identified ten common positive emotions including joy, gratitude, serenity, interest, hope, pride, amusement, inspiration, awe, and love. In this study, findings related to Positive Emotions encompass various aspects, including appreciation of the brooch design, how the brooch complements outfits, the attention it attracts, the perceived 'magical' attributes of the brooch, and the positive feelings experienced while wearing it. Most participants in this study expressed their appreciation for the brooches' design, often highlighting their enjoyment of the materials, colours, shapes, and lightweight quality. For instance, S2P2 highlighted their appreciation for the sustainable and recycled materials used to create the brooches: "I was very impressed by the collection, sustainability and recycling of materials. The brooch looks and feels great." (S2P2, diary - day 1)

*Fig. 3
Photo shared by
S2P2 in their diary
while wearing the
brooches during the
study
(November 2023).*



Many participants described feeling especially positive when the brooches matched their outfits, as this enhanced their overall appearance. For example, S2P9 noted in their diary that the brooch not only matched their clothing but also lifted their mood:

“I wore the brooch with my denim dress and the colours matched beautifully! I felt that the brooch brightened up my look – it made me feel sparkly and feminine!” (S2P9, diary - day 4)

Jewellery has long been appreciated for its decorative attributes (Rosenthal, 1973; Cunningham, 2008). Unger (2019) even noted that one purpose of wearing jewellery is to decorate one’s body as a basic need. According to Turner (1976), people adorn themselves not only to enhance beauty and sexual appeal but also for pure pleasure, highlighting the positive emotions that jewellery can evoke.

Several participants reported that the brooches often attracted attention during the wearing period, mostly

due to their distinctive visual qualities. This attention was perceived positively, fostering feelings of confidence and enhancing their sense of well-being. As an example, S2P2 stated (Fig. 3):

“People have been intrigued and interested in the brooch and the concept behind it. I have felt empowered and the centre of attention at times.” (S2P2, diary - day 7)

Many participants expressed feeling fortunate while wearing the brooches, attributing a special, magical quality to the jewellery. For instance, S2P4 considered the brooch as a symbol of good luck, believing it played a role in helping them pass their annual review: “Today I was in a good as I had finished my annual review! I felt that the brooch was a sign of good luck, which has made me really happy!” (S2P4, diary - day 7)

The interpretation of the brooches as symbols of good fortune reflects the historical role of jewellery as talismans and amulets, traditionally believed to offer protection and bring positive influence (Gregoriotti, 1969; Andrews, 1994; Bush and ten Hompel, 2017).

In addition, most participants reported that wearing the brooches generated joyful engagement, accompanied by a range of positive feelings including warmth, happiness, confidence, and enhanced mood. For example, S2P9 stated that the brooch helped lift their mood slightly on a day when they were not feeling good: “Lots of chores to do. I decided to wear the brooch anyway and popped it onto my jumper. I wasn’t

particularly in a good mood as I don't like doing chores. I think the brooch managed to lift my mood slightly. It was nice to look down and see it sparkling away." (S2P9, diary - day 5)

Overall, participants reported positive engagement with the experience of wearing the brooches, which evoked positive emotions such as happiness, enjoyment, feelings of luck, and increased confidence. This finding aligns with research in Arts and Health, which indicates that participating in or interacting with art can increase happiness, provide enjoyment, and create positive memories (Davies et al., 2014). Similar to other forms of artistic engagement, wearing jewellery can be considered an embodied and personal interaction with art, offering sensory stimulation, aesthetic appreciation, and a sense of creative connection.

ENGAGEMENT

Seligman (2011) describes Engagement as a state of 'flow' (Csikszentmihalyi, 2002) in which individuals are fully immersed in an activity, losing awareness of both time and themselves. In this study, S2P3 reported that the brooch slightly affected their behaviour, leading them to lose track of time while interacting with it.

They shared:

"Maybe because I was wearing it I probably washed my hands a bit longer than I used to. Because I did have something to look at or maybe I just looked at it and I forgot the time while washing my hands, so it's prolonged time. So I think that is one difference of my

behaviours, like actually changed because of this little brooch." (S2P3, interview transcript lines 62-65)

It is noteworthy that Engagement was highlighted by only one participant in this study, which is unsurprising given that wearing a brooch may not provide sufficient stimulation or challenge to encourage a flow state. As Thieme et al. (2012) explain, flow is an active experience that requires an activity within the individual's control, presenting challenges that are neither too easy nor too difficult.

RELATIONSHIPS

The literature indicates that Relationships encompass a wide range of interactions, including those with family, partners, friends, colleagues, and the broader community (Madeson, 2017), as well as the sense of genuinely connecting with others (Balica, 2021). In this study, the experience of wearing jewellery in relation to Relationships involved several aspects, including its role as a conversation starter, its support for social validation, and its contribution to building and strengthening connections with others.

Many participants claimed that the brooch served as a conversation starter during social events, facilitating interactions and enabling them to initiate conversations with others. For instance, S2P2 noted that the brooch allowed them to interact with people they otherwise would have never approached:

"It's a conversation piece, is such a statement piece, and drawing the eye, but then ends up being a real conversation piece ... I would never have spoken to

these people ever, probably without the brooch.” (S2P2, interview transcript lines 364-373)

This aligns with Bernabei’s (2016) view that jewellery can function as an activator of conversation and promote social interaction. Furthermore, this resonates with Hill’s (2020) claim that a fundamental aspect of human nature is the pursuit of intimacy and connection, involving both emotional and physical interactions with others.

Several participants reported receiving compliments from family, friends, and colleagues while wearing the brooches, which contributed to feelings of appreciation and social validation. For example, S2P1 described feeling uplifted when a colleague unexpectedly complimented the brooch:

“She just turned around me out of the blue and just said - that is a fabulous brooch you’re wearing or something. It’s such a lovely feeling. That’s really lovely feeling ... It’s lovely when people appreciate what you’re wearing and enough to pass comment.” (S2P1, interview transcript lines 231-235)

The brooch facilitated a meaningful interaction with their son’s teacher at a parents’ evening, emphasising that such a connection would not have occurred without the brooch:

“I wore the brooch to my son’s parents evening and had a really interesting chat with one of his teachers about the brooch. I explained the project and the way in which the brooch was made. She was super interested and loved the brooch. It was really nice to connect with one of my son’s teachers in a way that I wouldn’t have without the brooch.” (S2P11, diary - day 3)

Some participants stated that the brooches acted as catalysts for social interaction, fostering new connections and promoting deeper conversations within existing relationships, including those with family members, colleagues, friends, acquaintances, and even strangers. For example, S2P11 highlighted that wearing

These findings indicate that the brooch acted as a social object, facilitating the development and strengthening of relationships. Research in Arts and Health has shown that engagement with the arts can expand social networks (Davies et al., 2014) and support social reintegration by enhancing self-esteem, confidence, and connections with others (Gillam, 2018).

MEANING

Meaning is often shaped by an individual’s personal values, which provide direction and purpose in life (Kashdan et al., 2009). It involves a sense of belonging to and contributing to something greater than oneself and can be understood in both subjective and objective aspects, rather than solely as a personal feeling (Seligman, 2011). In this study, findings related to Meaning covered several aspects, including the emotional attachment formed during the wearing period, the use of sustainable and recycled materials in the brooches, and participants’ reflective self-awareness.

Most participants reported developing an emotional attachment to the brooches over the week. Several expressed reluctance to return them and experienced sadness at not being able to keep the brooches after the study period. For instance, S2P2 described the brooch

as a close companion, noting that wearing it each day felt like an adventure for both themselves and their ‘little friend’ (Fig. 3):

“So everybody’s been more interested about what’s happening to me and the brooch. In fact, me and the brooch have become best friends, and is me and the brooch going out to the world, and what’s going to happen to the two of us today.” (S2P2, interview transcript lines 433-435)

Versteeg, van den Hoven, and Hummels (2016) state that interacting with jewellery often becomes a part of daily routines. Through this engagement, jewellery can become integrated into an individual’s sense of identity, with people sometimes feeling ‘naked’ or ‘incomplete’ when not wearing it. Additionally, previous research has indicated that object attachment refers to the emotional attachment a person develops with an inanimate object, which can lead to feelings of loss if they were to separate from it (Schifferstein and Zwartkruis-Pelgrim, 2008). This helps to explain why some participants reported feeling sad when returning the brooches at the end of the study.

Some participants reported experiencing positive feelings when wearing a brooch made from sustainable materials, which they valued and which aligned with their personal values. To illustrate, S2P9 indicated that they were proud of wearing the brooch because it was made from sustainable materials:

“I couldn’t believe that the brooches were made out of recycling – they were stunning!!! I was proud to wear it.” (S2P9, diary – day 1)

Some individuals mentioned that the study offered an opportunity for self-reflection, including their daily experiences and life decisions. For example, S2P11 explained that they had previously purchased a lot of plastic jewellery, but participating in the study prompted them to reconsider whether they would do so in the future:

“Because I wear quite a lot of plastic or acrylic jewellery, and I haven’t thought about that sustainability. So it’s made me think about my jewellery, or if I buy any in the future.” (S2P11, interview transcript lines 136-138)

Wearing the brooches offered participants a sense of meaning, as reflecting on life choices can help clarify personal values and goals, thereby enhancing a sense of purpose. Consistent with this, van der Walt (2019) found strong positive associations between individuals’ sense of purpose and meaning in life and their mental health.

ACCOMPLISHMENT

A sense of accomplishment can develop from the pursuit and achievement goals, the mastery of tasks, and the sustaining self-motivation, thereby enhancing well-being by allowing individuals to reflect on their achievements with pride (Seligman, 2011).

In addition, accomplishment may be derived from the production of tangible items or the demonstration of expertise and skill (Farmer and Cotter, 2021). In this study, accomplishment is reflected in two aspects: wearing brooches as a new experience, and the wearing experience fostering personal growth.

Several participants shared that wearing a brooch was an entirely new experience, providing an opportunity to

Fig. 4
Photo shared by
S2P5 in their diary
while wearing the
brooches during the
study
(November 2023).



engage in something different and unfamiliar throughout the week. For instance, S2P5 described the experience as opening a new door for them and inspiring an interest in continuing to wear brooches in the future (Fig. 4):

“Really good and I wasn’t expecting for me to like it and then like wearing a brooch, but I think I do. Therefore, I might buy some more brooches. Therefore, it’s something new for me.” (S2P5, interview transcript lines 183-185)

These reflections highlight how engaging in a novel and unfamiliar activity, such as wearing a brooch, can foster a sense of accomplishment and personal growth. As Farmer and Cotter (2021) noted, stepping outside one’s comfort zone challenges individuals to learn new skills, adapt to unfamiliar situations, and expand their capabilities, thereby increasing self-confidence and a sense of accomplishment. For some participants, the experience not only disrupted their usual routines or fashion habits but also increased their confidence and

openness to future experimentation, demonstrating how even small changes in daily practices can contribute to personal flourishing.

Some individuals mentioned that wearing the brooches enhanced their confidence and influenced how they interacted with others. For example, S2P2 reflected that wearing the brooch revealed a more confident side of themselves during the week, moving from their usual tendency to remain in the background to feeling more comfortable engaging in conversations with strangers: “I’m pretty much a quiet person who likes to just be in the background. I mean I do like it when somebody says to me “Oh that’s a nice brooch”. And I often do get that, I try to pick an unusual brooch just to wear. But that’s as far as it ever usually goes. But it’s been very odd for me to be kind of the centre of attention. I’m not used to be, in a supermarket for instance. And you know I’m quiet sort of shy, just get my stuff and go sort of person ... it wouldn’t be a normal thing for me to be looking to engage for long conversations with strangers. So it’s kind of brought a different side of me out I think this week, a bit more confident, sort of person really.” (S2P2, interview transcript lines 278-291)

This finding indicates that wearing brooches enhanced participants’ confidence and influenced their social interactions, emphasising the contribution of such experiences to personal growth. As Seligman (2013) states, the pursuit of intrinsic goals, including personal growth, has a greater impact on well-being than the pursuit of external achievements, such as wealth or fame.

OTHER FINDINGS

While the themes discussed above reflect findings consistent with the PERMA framework, the data also revealed additional insights, which are presented under Other Findings. This includes the negative emotions experienced during the wearing period, the process of becoming used to wearing the brooches over the week, and participants' comments that jewellery is rarely worn by men.

During the period of wearing the brooches, participants also experienced negative emotions, including receiving no or unexpected comments, frustration when the brooches did not complement their outfits, and feelings of upset when they forgot to wear them. As an example, S2P11 described feeling sad on days when no one commented on their brooch, as they valued its role in facilitating conversations: "Today, I wore the brooch all day and saw lots of people. However, nobody commented on the brooch which, surprisingly, made me a bit sad. I was getting used to the brooch enabling conversations. I found that very interesting because I clearly like the brooch being a conversation starter." (S2P11, diary – day 4)

Some individuals described feeling excited during the initial days of wearing the brooches, but over time they became used to them and paid less attention to them. For instance, S2P3 observed that although wearing the brooch was initially a novel experience, they gradually got used to it as the week progressed:

"At the beginning I felt like it's a new thing happening in my life for all of sudden I need to wear it and then

especially goes to Thursday like after day 4, I felt like I kind of got used to it." (S2P3, interview transcript lines 137-140)

This aligns with Gilbert's (2006) observation that 'wonderful things are especially wonderful the first time they happen, but their wonderfulness wanes with repetition'. Participants initially expressed excitement when they began wearing the brooches, but this sense of novelty gradually declined over time.

A notable finding from the data is that all male participants (n = 3) reported the perception that men rarely wear jewellery or accessories, especially brooches. For instance, S2P10 stated:

"But men in general I suppose wear less jewellery, especially things like brooches. So I was being asked quite regularly. And as I said it was quite nice." (S2P10, interview transcript lines 58-59)

As jewellery historian Rachel Church observed, 'by the later 20th century most men wore hardly any jewellery' (Fisher, 2023). However, in recent years, there has been a shift, with men in general, not only celebrities, are beginning to appreciate ornamental accessories. Church also noted the intriguing trend of brooches making a comeback in fashion, highlighting their broad accessibility, as they require no sizing, do not need ear piercing, and can be worn with any type of clothing.

CONCLUSION

Findings from the diaries and interviews revealed that all five PERMA dimensions (Positive Emotion, Engagement, Relationships, Meaning, and Accomplishment) were reflected in participants' experiences of wearing the researcher-made jewellery (brooches). Positive Emotion and Relationships emerged most strongly, whereas Engagement and Accomplishment were less highlighted. This may reflect the passive nature of wearing jewellery, in contrast to more active, goal-oriented activities such as jewellery making. Beyond the PERMA, participants also reported negative feelings, such as sadness when receiving no comments or not the comments they expected, frustration when the brooches did not match their outfits, and upset when they forgot to wear them. Over the 7-day period, some individuals became accustomed to wearing the pieces. Notably, all male participants ($n = 3$) highlighted their belief that men rarely wear jewellery or accessories, particularly brooches.

As with any study, several limitations should be acknowledged. Firstly, due to time and budget constraints, the research was conducted over a short intervention period (7 days). Future research could benefit from extending the duration of jewellery-wearing intervention, from two weeks to several months, to better capture potential longitudinal effects. Additionally, social desirability bias (King and Bruner, 2000) may have influenced the findings. This refers to the tendency of participants to answer questions in the way they believe will be viewed

favourably by others. In this study, participants were aware that the focus was on jewellery and well-being, which may have shaped how they interpreted and recorded their experiences, potentially biasing responses towards more positive accounts. It is also important to acknowledge that the findings are specific to the context of this study and the researcher-made jewellery used. These artefacts were intentionally designed as experimental, research-oriented objects rather than a specific category of jewellery. Therefore, the extent to which the findings may transfer to other forms of jewellery (e.g. fashion jewellery or fine jewellery) remains open and requires further investigation.

Overall, the findings suggest that wearing researcher-made jewellery may promote individual well-being, particularly by evoking positive emotions, facilitating social connection, and generating personal meaning. The study highlights the potential of wearing jewellery as a means of supporting individual well-being, while also providing valuable insights into participants' experiences of wearing jewellery in their daily lives. This work encourages ongoing exploration of the relationship between jewellery and well-being, inviting researchers and practitioners to recognise the deeper impact that objects can hold in everyday life.

AI USE DISCLAIMER

The authors used AI-assisted tools solely for language editing (grammar and clarity). All scientific content, interpretations, and conclusions are the sole responsibility of the authors.

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Embodied Jewellery or the Disappearance of the Object

Author: *Zoé Kiner-Wolff*



ABSTRACT

In the late 1960s, a “body jewellery” movement emerged in the world of contemporary jewellery. Some jewellery artists developed a conceptual approach, echoing both “body art” and social practices of body modification. They created “embodied jewellery,” and gradually, the jewellery seemed to disappear, giving way to the body, which raises questions about the status of jewellery, objects, and the adorned body. This paper explores the tension between jewellery as body adornment—part of the human appearance—and its gradual disappearance into the body, as conceptualised by jewellery artists. In this way, this theoretical paper utilises key theories by anthropologists such as Gil Bartholeyns, Enid Schildkrout, and Bruno Rouers, and sociologists such as David Le Breton and Philippe Liotard to propose a new reading method. Through this study of embodied jewellery, several results emerge: jewellery could be a mark on the skin or a wound; a hybrid living thing or made with flesh; an invisible adornment under the skin or in a liquid form dissolved in the body.

Keywords: *Body Jewellery; Embodied Jewellery; Performance; Body Related Object; Body Modification*

INTRODUCTION

Since the second half of the twentieth century, jewellery as an artistic practice has been structured around a community of specialists, schools and institutions. As such, jewellery artists, who are trained and then go on to teach at the jewellery workshops in art schools, are supported by a network of collectors and galleries, museums and fairs¹ (Heinich and Shapiro, 2012). In this field of jewellery as art, I study the specific work of artists who question the way jewellery relates to the body and to wearability.

From the end of the 1960s, artists began to developing spectacular or performative jewellery that was not designed to be worn in everyday life from a Western perspective. This approach shifts the experience of wearing a jewel, which is no longer an ornamental accessory. In this way, these artists move away from the traditional definition of jewellery² by developing a conceptual approach to their medium. However, the body remains at the heart of the thinking of artists. On the one hand, the connection with the body seems to be the ultimate element that defines jewellery.

¹ This state of affairs reflects “all the concrete processes that make—and not just say—something art”, a characteristic of the phenomenon of artification coined by sociologists Nathalie Heinich and Roberta Shapiro.

² By developing new forms of jewellery, some artists are moving away from the traditional definition which considers jewellery to be “decorative objects worn on clothes or on the body, such as rings and necklaces, often made from valuable metals and containing precious stones”. What’s more, the French dictionary *Le Nouveau Petit Robert, dictionnaire de la langue française* (2007) emphasises the preciousness and small size of jewellery as a decorative object, an accessory. This definition reflects a conception of jewellery based on its common use in modern and contemporary Western society. But it

Considering jewellery as a “body related object” may be the only way to describe it in a global perspective³ (Heuzé, 2013, p. 17). On the other hand, the end of the 1960s marked a turning point in jewellery art, when “the new physicalness in the visual arts contributed to jewellery artists beginning their search for a more direct relationship with the body,” as the art historian Liesbeth den Besten (2011, p. 128) wrote. Indeed, a “body jewellery” movement is developing alongside the rise of body art. There seems to be a correlation between the emergence of artistic practices involving the body— such as happenings, performances, actions and events — and those of jewellery artists who create pieces designed to be activated during performances. Furthermore, this phenomenon is also part of a broader trend toward the spread of body modifications in subcultures within contemporary Western societies⁴. In French, an expression such as *bijou incorporé* helps avoid the pitfall of “body jewellery”, which clearly evokes body art while this kind of jewellery goes beyond the art scene. This wording — *bijou incorporé/embodied jewellery/body jewellery* —

effectively excludes a large portion of creations from other socio-cultural contexts, as well as a significant proportion of works by contemporary jewellery artists. My doctoral research therefore involves searching for another, more comprehensive definition of jewellery.

³ For example, according to Michèle Heuzé (2013), an art historian specialising in contemporary jewellery, “defining jewellery without the body is to equate it with any other object and strip it of its identity”.

⁴ Regarding bodily modifications in contemporary Western societies, I refer to, among other sources: the authors of the *Quasimodo Journal*, the research of sociologist David Le Breton, or the essay on the punk movement by Dick Hebdige (1983 [1979]).

enables the body to be incorporated into the definition of jewellery, emphasizing first and foremost that it is an object made for/about the body⁵ (Willcox, 1973, p. 10). By placing the body at the centre of attention, jewellery studies follow an approach to “cultures of appearance” (*les cultures de l'apparence*)⁶ that regard the body as “the primary aesthetic medium” (Belting, 2004; Thévoz, 1984). In this way, this paper echoes the approach of art historian Michel Thévoz, who studied body art as part of the history of body modifications in human societies through an anthropological and sociological lens⁷.

By studying the work of some jewellery artists, it appears that this direct relationship with the body has consequences for the form of jewellery and transforms the status of the object. At this point, a trouble begins between the body and jewellery, visible in the work of various artists who question the place of the body as an empty canvas. Some artists mark the skin so well that the imprint or inscription become the jewellery, or they cross the boundaries of the skin to embed the jewellery, which enters the flesh and gradually disappears into the body. By using the organism as a creative material,

⁵ Donald J. Willcox came to the same conclusions when he mentioned “terms such as ‘body adornment’ or ‘body jewellery’ are directed toward this same end, even though everyone realizes that the body has been a major consideration of jewellery design for thousands of years. The point is that our language is just too limited and too worn to catch exactly the nuances of definition that we are trying to capture.”

⁶ In a fascinating introduction, the anthropologist Gil Bartholeyns explores the epistemological basis of the study of adornment and cultures of appearance (Bartholeyns, 2011).

⁷ In his book *Le Corps peint* (1984), Michel Thévoz outlines the history of body decoration from prehistoric practices to body art and the punk movement of the 1970s.

these jewellery artists overturn the relationship between jewellery and the body and, in doing so, question their limits and common boundaries. What happens then if the jewellery disappears and the body now occupies the main place? This paper explores the tension between jewellery as body adornment — part of the human appearance⁸ — and its gradual disappearance into the body through the conceptual work of jewellery artists.

IN THE SHADOW OF ORGANIC JEWELLERY

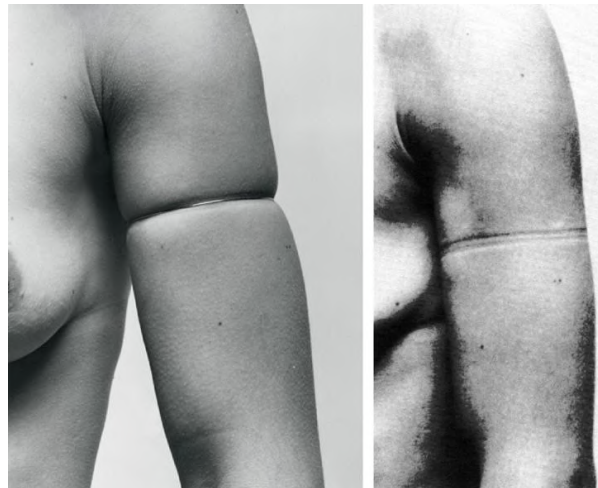
On contact with skin, jewellery is an object linked to the body “directly, crudely, sensually, through purely epidermal communication”, as Michel Thévoz (1984, p. 26) observes regarding body paintings, tattoos and adornments. Among body jewellery artists, this connection is accentuated when the jewellery is inscribed directly into the flesh. This investigation of the epidermis is full of meaning, because “the skin encloses the body, the boundaries of the self, establishing the border between inside and outside in a living, porous way, because it is also an opening to the world, a living memory”⁹ (Le Breton, 2007, p. 157).

⁸ Body adornment and modifications in different cultural areas have been studied by numerous researchers, historians and anthropologists, such as Marcel Mauss, who includes jewellery in the category of adornments, meaning “the addition of ornaments to the body” (Mauss, 1950).

⁹ The French anthropologist and sociologist David Le Breton has focused his research on the body, particularly on body modifications (scarification, tattoos, piercings, and mutilation) and the relationship to pain, both in social contexts—within groups or as an individual practice—and in artistic contexts.

This plastic memory of the body is actually used by Gijs Bakker in his *Shadow Jewellery* (1973). This series of photographs, taken by Ton Baadenhuyzen, shows parts of the body—one arm, one back, two ankles—with the mark of a bracelet or a ring imprinted on the skin by a wire that encircles the body (Fig. 1). The original title, *Organic Jewellery*¹⁰, conveyed the idea that it is the mark left on the body that becomes the jewel itself, while the subsequent title—*Shadow Jewellery*—emphasises the disappearance of the object. It is noteworthy that Bakker chose to change the title when the bracelet was reissued in gold for an exhibition, highlighting the paradox of this piece of jewellery, which is both immaterial and hyper-physical.

Fig. 1 Gijs Bakker, *Shadow Jewellery* (*Organic Jewellery*), 1973. Photo: Ton Baadenhuyzen.



¹⁰ This changing of the title is reported by Liesbeth den Besten in her book *On Jewellery* (2011) (Den Besten, pp. 128, 139). I agree with

This example opens the gate for a whole range of skin-mark jewellery, which are like temporary scarification or tattoos, immortalised by the photograph, thanks to “its intrinsic quality as exposed film, which makes it similar to the retina, the most sensitive tissue in the body” (Thévoz, 1984, p. 8). From this perspective, photography can be seen as a “second skin”, an extension of the body and the jewellery, on which the imprint of the embodied jewellery is now fixed forever. Thus, jewellery artist Tiffany Parbs create stamps to make inscriptions on the body. She plays with words in *Rash Stamps* (2004), from her *Marked* series: when pressed against the skin, the object leaves a red mark like a “rash” or like a bite mark on the arm, which can be seen in the photograph by Greg Harris (Fig. 2).



Fig. 2 Tiffany Parbs, *Rash Stamps*, 2004, *Marked* series, sterling silver, skin, varied dimension. Photo: Greg Harris.

his view that “the original title is much more appropriate to the idea of the work.”

In this case, the jewellery is definitely a mark on the body; the object is no longer an ornament, but rather a tool. However, on the pieces entitled *Inflame*, from the *Bind* series (2009), there are hollow spaces designed for the fingers to hold the movable type (Fig. 3). This detail demonstrates the attention paid to the body and gesture in the design: In order to leave a mark on the skin with the *Inflame* object, the wearer must hold it between their fingers; the object itself bears the imprint of these fingers to show the wearer how to hold it. All of Tiffany Parbs' work "focuses on expanding existing definitions of jewellery using her body as a primary reference point" (Tiffany Parbs website). Throughout this process, she pays attention to the body, indeed, as evidenced by the vocabulary chosen for the titles, drawn from the fields of dermatology and skin irritation (such as "rash", "inflammation", "marked"...). Words matter in Parbs' work, and it's no coincidence that her objects look like stamps or movable type.

Fig. 3 Tiffany Parbs, *Inflame*, 2009, *Bind* series, 40x20x15 mm (each). Photo: Tiffany Parbs.



With *Etched* (2004), from the *Marked* series, words are inscribed directly onto the skin, at specific parts of the body where words embody some violence: "cut" on a finger, "choke" around the neck and "pulse" on the inside of the wrist, evoking blood flowing through the veins and scarification (Fig. 4).

Through skin marks, Parbs evokes on the body's surface the violence and pain studied by David Le Breton (2006, 2003, 1999). The importance of words is reflected in the captions of her works, when Tiffany Parbs uses the terms "Skindigital print" or "skin giclée print"; the artist then plays with the language of printmaking by referring to two printing techniques (digital print and giclée print) which she associates with the skin, emphasising that her jewellery adorns the body directly on the flesh. Just as printing inscribes a message on paper, *Etched* are messages imprinted on the skin – a kind of giclée prints on skin, in the words of Tiffany Parbs.

Faced with these organic jewels, formed by the traces and shadows left on the skin, the boundaries between what is body and what is jewellery become blurred. The question of the status of the object arises: Is the work the ephemeral mark left on the body, the jewellery tool that made the mark, or the photograph that preserves it? Nevertheless, there are exceptions to the ephemeral nature of the body marking in the practice of embodied jewellery. This is the case when French jewellery artist Emmanuel Lacoste uses tattoos or scarification, for example, with the work *Share: When Sharing the Private Space Makes it Larger* (2012). On June 9, 2012, Emmanuel Lacoste got a tattoo on one of his hands during the 44th Zimmerhof



Fig. 4 Tiffany Parbs, *Etched*, 2004, *Marked series*, skin giclee print, 330 x 470 x 40 mm. Photo: Greg Harris.

Symposium (Germany). This event brings the intimate moment shared between the tattoo artist and the client into the public eye and transposes the art of tattooing into the world of contemporary jewellery (Fig. 5). It is also worth noting that the photograph documenting this performance was taken by a key player in French contemporary jewellery, Benjamin Lignel. But in this particular case, the photograph is not the only trace of this embodied jewellery; the indelible tattoo remains visible on the artist's body even after the performance has ended. Given the context in which it was created, the tattoo truly becomes “*un bijou cutané*” — “a skin jewellery” (Le Breton 2016, p. 133). Throughout his body of work, Lacoste uses performance: for example, to remove a strip of skin from his back for the project *O* (2018), a necklace made of human skin gilded with gold leaf; or to implant a PTFE Kalashnikov bullet into a man's arm in collaboration with body-hacker Lukas Zpira for the project *La nature humaine* (Human Nature) (2018). These two examples illustrate two different approaches to embodied jewellery: one is a piece of jewellery made of flesh, where the body serves as the raw material; the other is a piece of jewellery that disappears into the body.

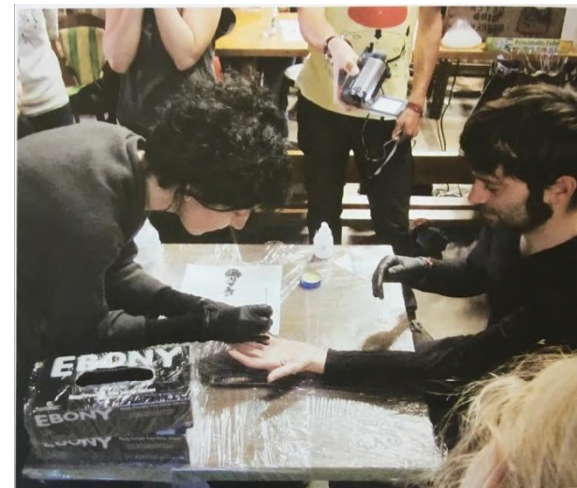


Fig. 5 Emmanuel Lacoste, *Share: When Sharing the Private Space Makes it Larger*, 09/06/2012, performance, 44e Zimmerhof symposium (Bad Rappenau). Photo: Benjamin Lignel.

Here, a parallel can be drawn with social practices involving body modification which “differ from traditional jewellery in that piercings and tattoos require penetration of the skin” (Rouers, 2008, p. 39). Thus, for ethnologist Bruno Rouers¹¹, “body marks are therefore jewellery with added value”. This reflection may apply to embodied jewellery, which is both jewellery becoming body and body becoming jewellery.

INTO THE FLESH

The issue of boundaries is also the one of the body itself: the skin, with its thousands of pores and the orifices that act as the body’s sensory receptors, is the interface between the body and the outside world. As anthropologist Enid Schildkrout (2004, p. 338) remarks, “bodily inscriptions are all about boundaries”. Jewellery artists explore these boundaries by creating embodied jewellery: from the surface, with jewellery imprinted on the skin, they begin to penetrate the body through the orifices, just like piercings do.

With *Ornamental Fauna* (2006–2007), David Roux-Fouillet explores some iconic body piercing sites that have been widespread in Western societies since the 1970s¹²: the pierced nipple (Fig. 6), the stretched

¹¹ Bruno Rouers is a French ethnologist and anthropologist who has studied body modifications practiced by traditional societies as well as those in contemporary societies, particularly among adolescents. He has written numerous papers, such as: Rouers B. (2007) *Les marques du corps*. Soins Psychiatrie. 252; Rouers B. (2006) *Les marques de l’être et du paraître: Piercing, tatouages, des actes individuels et volontaires*. Enfances & Psy.



Fig. 6
David Roux-Fouillet,
Ornamental Fauna:
Brooch, 2006, silver,
silkworm,
3 x 4 x 10 cm.
Photo: David
Roux-Fouillet.

¹² For more on this topic, see the research by sociologist David Le Breton, who traces the history of piercing, tattooing, and body modification in contemporary societies—especially in *L’Adieu au corps* (1999)—beginning with punk culture in the mid-1970s and explaining the role played by fashion and celebrities.



Fig. 7 David Roux-Fouillet, *Ornamental Fauna: Lobe/ear piece*, 2006–2007, silver, silkworm, 3x 10 x 4,5 cm, film 19 min. Photo: David Roux-Fouillet

earlobe (Fig. 7)—whose piercings are replaced by silver shapes in which silkworms weave their cocoons—and the helix, where the *Papillon* (Butterfly) hatches (Fig. 8). *Paradoxically Ornamental Fauna*, is no longer just an ornament. It is a hybrid object created through a collaboration between the artist, who crafts a metal scaffolding, and the silkworm, which spins a silk cocoon around it. It is also the connection between the wearer and the animal as the piece of jewellery also serves as a bridge between the wearer and the insect. The “uneasy cohabitation” (Besten, 2014, pp. 221–222) between the wearers and the worms, as noted by Liesbeth den Besten in the video documenting this performative jewellery, also affects the observer. This is particularly true of the *Nipple Piece*, where *Ornamental Fauna* is placed in a highly intimate spot and in a setting that evokes motherhood. In a way, this discomfort with adorned bodies echoes the reactions provoked by the punk body with its irreverent attitude, studied by Philippe Liotard (2016) and documented by Dick Hebdige (1983). He wrote about the punk movement as early as 1979, saying that “the perverse and the abnormal were valued intrinsically. In particular, the illicit iconography of sexual fetishism was used to predictable effect” (Hebdige, 1983, pp. 107–108). Once again, with *Ornamental Fauna*, the images capture an ephemeral form—such as shadow jewellery—due to the rapid metamorphosis of the insect’s body, which changes the shape of the jewellery as it interacts with the wearer.

In the same way, Lauren Kalman uses photographic staging to create jewellery in interaction with the body. On the photographs and videos, she creates, body fluids such as saliva, tears or blood blend with the iconic

Fig. 8 David Roux-Fouillet, Ornamental Fauna: Papillon, 2006, silver, silkworm, 3 x 14 x 9 cm. Photo: David Roux-Fouillet.



Fig. 9-10 Lauren Kalman, Hard Wear (Gold Bracelet) and (Bracelet), 2006, inkjet print, 23 x 51 inches. Photo: Lauren Kalman.



Fig. 10 Lauren Kalman, *Hard Wear (Tongue Gilding)*, 2005, gold, saliva, jar, 2 x 2 x 3 inches. Photo: Lauren Kalman.



materials of jewellery such as metal, gold leaf and pearls. With two of her photographs—*Gold Bracelet* (2006) and *Bracelet* (2006)—she creates a fictional narrative by juxtaposing two images of hands taken with the same framing. On the wrist of the first one there is a gold bracelet deeply embedded in the flesh (Fig. 9), on the second one, in the same place, there is a bracelet made of blood beads (Fig. 10). Thinking about Bakker's *Shadow Jewellery*, it looks like “the wire appears painfully thin and tight and looks as if it could sever the bound skin” (Kalman, 2006, p. 1).

But it is actually with the help of a razor blade, which is not shown, that Lauren Kalman brings forth these beads of blood around her wrist. Even if the pain is less severe than it appears, this piece of jewellery has a strong visual impact, because “shedding blood is a [...] taboo that is being broken, while for many of our contemporaries, just seeing it causes fainting or fear” (Le Breton, 2007, p. 163). With the use of blood and razor blade, the punk body mentioned earlier is back. In fact, Kalman uses the body and its secretions as the



subject and raw material for her jewellery and performances.

In the series *Devices for Filling a Void* (2014–2024), her jewellery depicts drool, snot and vomit in the form of metal, ceramic or glass bubble, showing the body in all its awkwardness as punk aesthetics do with “piss, semen, blood from wounds and menstrual blood, shit, sweat, vomit—all the bodily fluids that repel the bourgeoisie and disgust well-educated people” (Liotard, 2016, p. 130). Furthermore, Kalman wears her jewellery during performative moments captured through photography and video. Unlike a still image,

video shows how the jewellery impacts the body. For example, the *Tongue Gilding* (2006) video shows involuntary movements of a tongue covered with gold leaf, drool running due to the inability to swallow and the gold leaf that is gradually disintegrating (Fig. 11). The work also exists in the form of its remains, preserved in a jar as a relic of the performance: fragments of gold leaf are muddled up with saliva, playing on the inherent preciousness of gold (Fig. 12).

Because the body is full of meaning, just as jewellery is a cultural and symbolic artefact, this embodied jewellery can carry a message. In this way, Åsa Skoberg explores feminist issues in her work by playing with the symbolism of jewellery. *I Want Pearls* (1998) is a portrait of a young woman wearing a necklace of love bites.

These bloody pearls appear as the stigmata of male domination over women's bodies, by subverting a sexual act and the pearl necklace that symbolises the wife's attachment to her husband. The title—*I want Pearls*—contrasts with the chilling effect of the image and screams out the violence of patriarchal social norms. No tools other than the mouth are needed to make this necklace, yet it is the history of the jewellery that gives meaning to this artwork.

Whether it takes the form of a mark on the skin, a scar, or a tattoo, or even if it's a necklace made of human skin, in the embodied jewellery movement, the body is now adorned with its own substance. The object seems to give way to the body, with the emergence of "an art whose material is the body"¹³ in contemporary jewellery.

SCHMUCK UNTER DER HAUT (JEWELLERY UNDER THE SKIN)

Having transgressed the boundaries of the skin, jewellery artists continue their investigation into the body, using the means provided by surgery and

¹³ I borrow this expression from the French physician and anthropologist Claude Chippaux (1982, p. 258). His research is shaped by the colonial context in which it was conducted—a context that cannot be ignored—yet it provides important insights for the study of body modifications.

medicine to reach the innermost depths of the body, where the jewellery dissolves.

Norman Cherry's *Angiogenetic Body Adornment* (2004) are only visible as subcutaneous growths.

Similar to the transdermal implants used in Bodmods¹⁴,

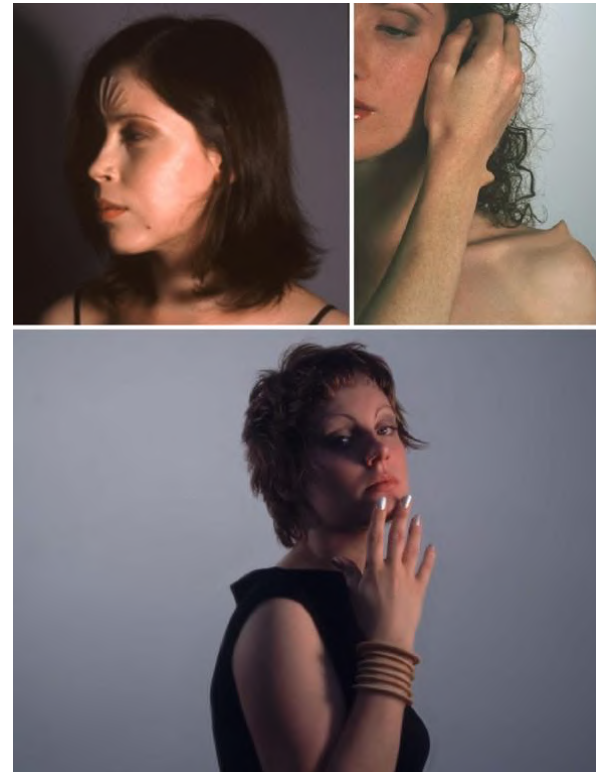


Fig. 13 Norman Cherry, *Angiogenetic Body Adornment*, 2004. Photo: Norman Cherry.

¹⁴ BodMods" is a neologism formed by combining "Body" and "Modifications", a single term used to describe all deliberate changes made to the body.

the jewellery piece blends under the skin, transforming the shape of the human body (Fig. 13). Norman Cherry refers to medical research in his title: by “taking its name from ‘angiogenesis’, the natural process by which tissue is made, the ‘jewellery’ is constructed from the substance of the body itself” (Cheng and Indigo, 2007, p. 70). Furthermore, this subcutaneous jewellery can be likened to scarification practices, as it causes a swelling on the skin’s surface similar to the marks left by scarification, such as “cutting” or “peeling”¹⁵. This project was initiated through discussions and in partnership with the Engineering Department at the University of Liverpool and documented by the artist in a research paper published in the *Journal of Media Arts and Culture* (2006) with visual proposals.



Fig. 11 Tiffany Parbs, *Blister-ring*, 2005, skin digital print, 330 x 470 x 40 mm. Photo: Terence Bogue.

¹⁵ Scarification refers to superficial incisions that are deep enough to leave a lasting mark on the body, creating a pattern whose shape can vary depending on how the skin is cut and how the scar is treated. In the case of “cutting”, the skin is incised with a scalpel to create a mark, engraved or embossed, on the skin’s surface. Peeling involves

However, it is difficult to know whether these photographs are actual experiments or mere hypotheses, a question raised by the artist himself (Cherry, 2006). He describes the photos shown in Fig. 13 as “examples of what might be created for and by adults applying the principles I have described. Are these just flights of fancy? The products of the fevered imagination of a deluded academic? Just science fiction? Or might I just be predicting a real future?” Whether these experiments are real or are fictional creations produced by manipulating images using software (such as Adobe Photoshop), these embodied jewellery pieces do actually exist even if only virtually, through a concept depicted in an image. Here again, images are used to construct a narrative in which the jewel is created with the material of the body. These photographs show jewellery under the skin, but still visible in relief. Furthermore, jewellery is increasingly being incorporated into the body, entering beneath the skin and becoming less and less visible. Another embodied jewellery formed by a bump under the skin is Tiffany Parbs’ *Blister Rings* (2005). For this ring, she burned her skin with wax, and it is the skin reaction—the blister—that becomes the jewellery (Fig. 14). In this case, the jewellery is actually made with the skin itself, it’s no longer just a fiction or a virtual item, and the pain also is real.

raising the skin so that the scar forms a swelling. For more information, see Manni F. and D’errico F. (2026). *The Oxford Handbook of the Archaeology and Anthropology of Body Modification*. Oxford University Press.

Fig. 15 Peter Skubic, Schmuck unter der Haut, 1975/1982, photographs of the surgical operation on 4 November 1975: insertion of the implant; X-ray of the implant in the arm of the artist. Photo: Peter Skubic.

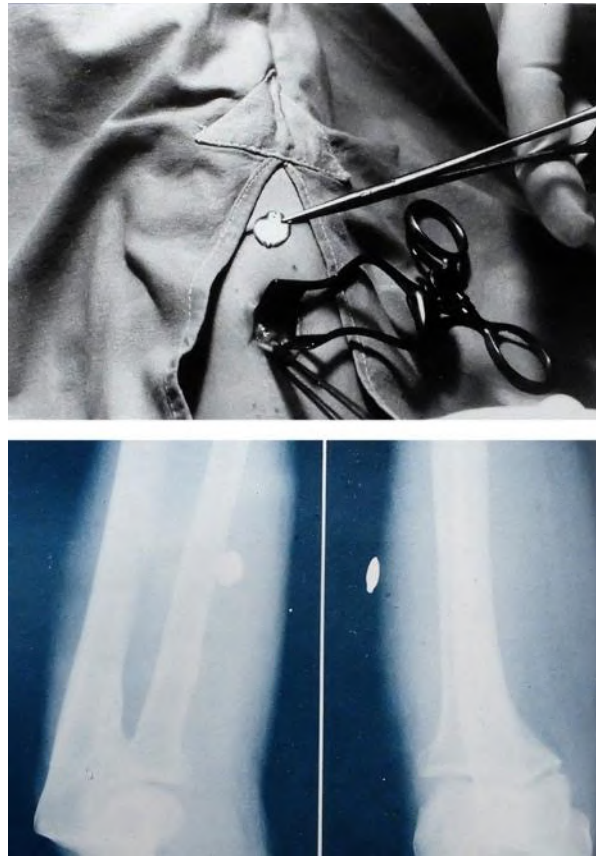


Fig. 16 Peter Skubic, Schmuck unter der Haut, 1982, ring. Photo: Peter Skubic.



The choice of finger—the right ring finger—is significant; in a Western context, that is the wedding ring finger. In the artistic work of a female artist, the painful Blister Ring symbolizes the status of women, just as Skoberg's *I want Pearls* did. Furthermore, Parbs' work extends the ideas developed by Donald Willcox in 1973, when he observed a reversal in the power dynamics between the body and jewellery: "Forms began to grow onto and into the human body as if they belonged there. The body was being rediscovered, and jewellery was being redefined. Yes, we had always considered the body, but we had too often defined it in terms of confining our forms" (Willcox, 1973, p. 12).

With embodied jewellery, the body is now constrained by jewellery artists and the boundaries of the skin are altered according to the artist's vision. In *Schmuck unter der Haut* (1975–1982), by Peter Skubic, the implant entirely disappears into the body, placed under the skin of his forearm during surgery on 4 November 1975. The photographs of the surgical operation and the X-ray images of the implant in the artist's arm document the performance (Fig. 15), comparable to the use of images in the work of the artist Orlan¹⁶, for whom "the operating theatre becomes a studio and the surgical procedure becomes a performance, but also part of the work presented" (Le Breton 1999, p. 49). On 27 May 1982 a second operation was performed to remove the piece of metal from the artist's arm and seal it in a coffin-shaped ring.

¹⁶ Orlan is a French performing artist who during the 1990s developed "the Carnal Act" (*"l'Art Charnel"*): some transformations of her body and appearance through surgical-operation performances,

Between the two operations, the artist wore the implant inside his arm as an invisible adornment; by contrast the ring is a highly material object whose shape evokes the recognizable form of a coffin, with all the symbolism it carries (Fig. 16). While there is a return to the material and visual form of jewellery, photographs, X-ray images and performance remain at the heart of the artist's approach¹⁷.

If the implant that Skubic wore for seven years is a simple metal pellet, the materiality of *Inner Beauty* (2000–2011), by Frédéric Braham, is even more tenuous. The jewellery artist borrows from the world of medicine 72 ingestible homeopathic dilutions of gold, silver, copper, ruby, diamond, etc., transforming them into jewellery with references to iconic materials (metal and precious or semi-precious stones). These drinkable solutions contain a tiny amount of gold granules or diamond drops, but when transferred to the world of jewellery, they acquire a symbolic value: an "inner beauty" (Fig. 17). It is also an inner beauty that adorns the person who drinks the solution. *Inner Beauty* jewellery then becomes something imperceptible, a transparent liquid, an inner and undetectable ornament that remains during digestion until it is naturally eliminated by the body. Or perhaps jewellery becomes something more symbolic: a magic potion that reveals the inner beauty of the person wearing it. Even more than the implant in Skubic's arm, each *Inner Beauty* is a piece of jewellery that disappears into the body. Neither photography nor X-rays are now capable of

filmed and live-streamed in galleries and museums in New York, Paris and Toronto. <https://www.orlan.eu/bibliography/carnal-art/>

¹⁷ See the 3.28-minute-long movie *Extraction*, by Wilhelm Graube, made during the surgical operation on 27 May 1982.

revealing the embodied jewellery. Maybe Inner Beauty is the best example to illustrate Ursula Ilse-Neuman's declaration (2014, p. 16): "wearing jewellery increases our consciousness of the body's physical and temporal nature and gives tangible reality to our existence as biological organisms".

*Fig. 12
Frédéric Braham,
Inner Beauty, 2000,
ingestible
homeopathic dilution
of gold, silver,
copper, glass flask
polyester thermolac,
silicone, polyester
thermolac coated 925
silver. Photo:
Frédéric Braham.*



CONCLUSION

In my attempt to survey embodied jewellery, several themes emerge. First, this paper outlines a typology of embodied jewellery: as a mark on the skin or a wound; as a hybrid living thing or made with flesh; as an invisible adornment under the skin; or in a liquid form dissolved in the body.

Through this gradual disappearance of the object and of the adorned body, it is the symbolic power and intrinsic values of jewellery in relation to the body that remain. Secondly, embodied jewellery differs radically from the traditional definition of jewellery: it is no longer an ornamental accessory; sometimes it is not even an object anymore, but a conceptual approach through which jewellery artists explore the meaning of jewellery through its relationship to the body. In this way, jewellery artists borrow forms of expression from other artists, such as photography and video, performance, tattooing and Bodmods. Thirdly, this approach highlights the connections between embodied jewellery and social practices of body modifications, from cosmetic surgery to punk aesthetics, in order to study jewellery in a broader context and as an element of the culture of appearance (Bartholeyns, 2011). If jewellery disappears as an ornament, it provides traces for researchers and artists to rethink it, in all its facets.

AI USE DISCLAIMER

The author used AI-assisted tools solely for translation and spelling. AI-assisted tools were not used to draft or generate any part of the manuscript. All scientific content, analyses, interpretations, and conclusions are the sole responsibility of the author.

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Medically Prescribed Jewellery: An Artistic Research Project on the Aestheticisation of Medical Repair

Authors: *Olga Noronha, José Simões*



ABSTRACT

This paper explores the intersection of medical practice and jewellery, proposing to extend the role of adornment beyond status, pride, or personal expression to encompass body modification, enhancement, and medical repair. It considers how jewellery can intersect with the medical profession and the repaired body through both aesthetic and integrative functions. Medical jewellery operates in two key ways: first, as an aesthetic enhancement—“it becomes you”—that prompts reflection on its psycho-social impact; and second, as an integrated, naturalised element of the body, engaging with repair or prosthetic intervention while raising questions about the psycho-physical experience of incorporating a foreign object within oneself. By situating jewellery in surgical and clinical contexts, the research tests the boundaries of what jewellery is and what it can do, foregrounding its performative, epistemic, and discursive potential. The study proposes an alternative role for jewellery, reframing medical repair, from wound stitching to fracture repair, as a site of aesthetic, symbolic, and experiential engagement. Examined across multiple bodily layers, orthotic, subdermal, exodermal, exo-corporeal, and intracorporeal, “medically prescribed jewellery” speculates on how science, technology, and jewellery converge to enhance and aestheticise the self, positioning jewellery as both integrative and transformative.

Keywords: *Medical Jewellery; Medically Prescribed Jewellery; Body Repair; Prosthetics; Aesthetic Enhancement; Embodiment*

INTRODUCTION

From prehistory to the present, the human body has served as a canvas for inscribing meaning through acts of modification, repair, and adornment. Archaeological and ethnographic evidence attests to the diversity of body art practices, ranging from scarification, elongation, and tattooing to piercings and body painting. These practices have fulfilled ritual, social, and aesthetic functions, while also providing avenues for resistance, identity formation, and self-expression (Mascia-Lees, 1992; DeMello, 2007; Thévoz, 1984; Jeffreys, 2007). Contemporary forms of body modification extend these traditions, reflecting both culturally embedded norms and individual acts of differentiation. Understanding such practices provides a critical framework for reconsidering the possibilities of medical devices when approached through the lens of jewellery.

This paper introduces the concept of “medically prescribed jewellery”, a field situated at the intersection of art, medicine, and technology. The term “prescribed” signals that these are not objects freely chosen as accessories, but interventions positioned by clinical need—much as a course of treatment, or an orthotic device, would be. Jewellery, historically associated with adornment, ritual, and personal identity, is here reimaged as a medium capable of aestheticising medical repair, supporting therapeutic processes, and transforming perceptions of the medicalised body (Noronha, 2018). Inspired by Norman Cherry’s predictions regarding the integration of jewellery with science and technology (Cherry, 2006), this artistic research project explores jewellery not merely as ornament but as an epistemic and potential therapeutic

object—one capable of mediating perception, bodily experience, and emotional response in contexts of medical intervention.

This lineage runs through Orlan’s surgical performances, which interrogate aesthetics and identity by transforming the body into a living canvas (Pearl, 2017; O’Bryan, 2005), and Peter Skubic’s *Schmuck unter der Haut* (1975), which brought jewellery beneath the skin (Kietzmann, 2014). Conceptual jewellers such as Gijs Bakker, Naomi Filmer, and Gerd Rothmann pushed this territory further still, foregrounding corporeality and prosthetic intervention in their own work (Zijl, 2005; Baumer, 2003; Filmer, 2013).

By engaging with surgical, biomedical, and engineering knowledge, our design research develops objects that retain the aesthetic and symbolic qualities traditionally associated with jewellery while also addressing therapeutic and prosthetic functions. Unlike conventional medical devices—which often prioritise utility, neutrality, and invisibility—medical jewellery emphasises emotional resonance, personalisation, and the potential to transform patients’ relationships with their bodies and treatments (Noronha, 2018).

This paper also situates medical jewellery within broader debates surrounding body modification, prosthetic design, and aesthetic enhancement. It examines how such objects can operate across multiple layers of the body, from exo-corporeal to intra-corporeal interventions. Through this exploration, this artistic research project seeks to reimagine medical repair not merely as functional restoration but as a site for aesthetic, emotional, and cultural expression.

Accordingly, the research questions guiding this study are:

- How can jewellery principles be applied to medical repair and prosthetic design?
- In what ways can medical jewellery become integrated into, or naturalised by, the body?

By addressing these speculative questions, this paper proposes medical jewellery as an interface between art and science, offering both a speculative and practical reimagining of how the body may be adorned and repaired.

MEDICAL JEWELLERY AND THE AESTHETICISED REPAIRED BODY

Since antiquity, medicine has been concerned with the care of those unable to care for themselves (Porter, 2002). Beyond determining what intervention is required, the manner of care—how patients are treated and perceived—remains central. In contemporary healthcare systems, patients are increasingly positioned as “consumers” of clinical experiences, often rendered vulnerable by pain, anxiety, or feelings of disempowerment when meaningful choices are limited (Maxwell, 1992). Evidence suggests that fear and psychological distress can delay healing (Cole-King & Harding, 2001; Norman, 2003), but large-scale healthcare systems are frequently criticised as impersonal and mechanistic “medical factories” (Porter, 2002).

The concept of becoming the body is central to this argument. As Bouraoui (2014) suggests, the body extends beyond its physical boundaries, and jewellery can aestheticise this extension by transforming repair

into symbolic enhancement. The Japanese practice of kintsugi offers a useful parallel: rather than concealing breakage, repair is emphasised and celebrated through visible restoration. Similarly, medically prescribed jewellery does not seek to hide wounds or prostheses but instead reframes them as enriched, aesthetically meaningful sites of bodily repair.

Psychological research indicates that prosthesis users frequently experience stress, depression, and disturbances in body image even after functional recovery (Breakey, 1997; Cansever et al., 2003; Williamson et al., 1994; Sjö Dahl et al., 2004). While prosthetic devices may restore mobility and autonomy (Pohjolainen et al., 1990; Murray, 2005), their visual and aesthetic qualities significantly influence patient acceptance and overall wellbeing (Horgan & MacLachlan, 2004; Price & Fisher, 2007). Pillet and Didierjean-Pillet (2001) argue that aesthetic considerations support psychological integrity, while Bhuvaneshwar et al. (2007) highlight that cosmetic appearance can affect recovery outcomes as strongly as functional performance. As Norman (2004) and Coates (2003) emphasise, emotionally motivated design enhances user acceptance and attachment by engaging feelings as well as functionality. Medically prescribed jewellery pursues precisely this transformation, converting the clinical, antiseptic, and seemingly alien into objects that are intimate, meaningful, and desirable. It proposes a shift from rejection to attraction, encouraging patients to perceive implants and devices as extensions of selfhood rather than intrusions. In this reframing, the prosthesis becomes an intracorporeal jewel—simultaneously medical and aesthetic.

This approach opens a layered taxonomy of intervention, ranging from exo-corporeal adornment to intra-articular implants, informed by collaborations among clinicians, psychologists, bioengineers, and jewellers. Each artefact is conceived not only in terms of biocompatibility and mechanical performance but also through its symbolic, emotional, and aesthetic significance. Although some designs remain speculative, they demonstrate how medicine, technology, and jewellery may converge to produce objects that are both therapeutic and epistemic—they could potentially help patients understand and reconcile with altered bodies while prompting broader cultural reflection on fragility, repair, and embodiment.

Recent publications by the authors contribute to this interdisciplinary dialogue, spanning biomedical engineering and design studies. These include the development of the Biofiligree® concept for bone-fracture healing, the proposal of a novel biofiligree fixation plate for cubital fractures, and theoretical analyses addressing the cultural meanings and conceptual limits of prosthetic and bodily enhancement technologies (Noronha et al., 2026; Noronha et al., 2025; Simões & Noronha, 2026; Noronha et al., 2023; Ramos et al., 2026). Ultimately, medical jewellery challenges the sterile conventions of traditional prosthetics, proposing instead that repair may be personalised, meaningful, and aesthetically expressive—transforming medical intervention into a practice not merely endured but embraced as part of bodily identity.

METHODOLOGY: CRITICAL REVIEW AND REFLEXIVE ACCOUNT

The methodology underpinning this doctoral research was rooted in critical design practice, combining object-making with reflexive inquiry. The central aim was to explore how aesthetic and material qualities associated with jewellery could be transferred into medical and surgical devices, reconfiguring their cultural, emotional, and bodily meanings. This approach aimed to address both patients who directly encounter medical interventions and wider publics who engage with medical artefacts within social and cultural spheres.

This artistic research project was practice-led: objects were conceived and developed across different bodily layers—on the surface, exo-corporeally, sub-dermally, and intra-corporeally. These artefacts, described here as medical jewellery, were designed to retain the conceptual and aesthetic qualities of adornment while also addressing functional and biocompatible considerations. Although speculative in origin, the artefacts were grounded in existing scientific research and explored viable rather than purely imaginary propositions.

REFLEXIVE ORIENTATION

This study does not attempt to prescribe definitive uses for medical jewellery. Instead, it investigates how objects acquire meaning across different interpretive contexts, encouraging publics to reflect on the intersection of aesthetics, medicine, and embodiment. The work is positioned as a provocation, inviting questions rather than offering prescriptive solutions. As

epistemic objects, the artefacts resist such stable classification as purely artistic, fashionable, or medical. Their significance lies in their polysemous quality—the capacity to shift across disciplinary frames and generate multiple meanings. Three intersecting functions were identified during the reflexive process:

Palliative: Reframing prosthetic and implantable devices as valuable and meaningful rather than alien intrusions;

Epistemic: Engaging publics with medical science and practice through design interventions;

Aesthetic: Offering visual and psychological reassurance, enhancing embodiment through beauty and symbolic value.

DISSEMINATION

The work was presented in curated exhibitions (e.g., Biofiligree at Faculty of Medicine of the University of Porto Bicentenary Exhibition [2025], MUDE-Museum of Design permanent exhibition, Portugal; How Come, at The Rag Factory, London UK [2013]; Museo Del Gioiello, Italy [2014–2021]; Body Control, Netherlands [2019]), invited lectures (e.g., Politecnico Milano IT [2013–2025]; Royal College of Art, UK [2019]; Winthrop University, US [2013]), international conferences (e.g., The Healing Arts – Forging Alliances of Arts & Medicine, Berlin [2026]; Design Futures: E-stitches - V&A Museum, London, UK, [2016]; TECHNE (Un)Conference – Stasis & Kinesis. Barbican Centre, London, UK [2015]), and professional meetings, including presentations to the Portuguese Society of Orthopaedics and Traumatology.

DATA COLLECTION

Exhibitions, lectures, and facilitated discussions created spaces where participants could interpret, question, and respond to the work. Additional data came from short written questionnaires and informal conversations with consenting members of the public and professional communities of practice who engaged with the work at these venues. In keeping with the study's reflexive, practice-led character, these exchanges were treated as exploratory and qualitative, not as a formal empirical survey.

Responses were coded thematically, revealing the ways in which medical jewellery operates across disciplinary contexts: art contexts (the artefacts were interpreted as symbols of corporeal fragility and impermanence); fashion contexts (the artefacts were read as markers of identity, taste, and selfhood in social environments); and medical and scientific contexts (the artefacts were understood as prosthetic devices in which beauty could support therapeutic and psychological outcomes) (Noronha, 2018).

Across these contexts, a recurring theme emerged: some participants recognised the potential for medical jewellery to support patients' emotional reconciliation with medical repair. Personalisation was frequently identified as a key opportunity for fostering attachment to prosthetic or implantable devices.

LIMITATIONS AND CONSTRAINTS

This artistic research project was shaped by significant ethical constraints. While the work was widely disseminated in cultural and academic forums, it was not possible to present medically prescribed jewellery directly within clinical settings or to gather patient

narratives. Access to lived experiences of medical intervention would have enriched the empirical and reflexive dimensions of the project. The absence of direct patient participation represents both a methodological limitation and an opportunity for future inquiry, pending appropriate ethical approval (Noronha, 2018).

KNOWLEDGE CONTRIBUTION

This methodological framework contributes to both design research and medical humanities by demonstrating how speculative artefacts can operate as epistemic tools. Medically prescribed jewellery might serve simultaneously as an aesthetic object and a therapeutic proposition, provoking discussion about the imperfect and repaired body.

By functioning as an interface between inner identity and external embodiment, the artefacts encourage reflection on medical intervention, prosthetics, and self-expression. They might challenge disciplinary boundaries, opening dialogue about how aesthetics and technology might converge in ways that support bodily repair and psychological resilience. In doing so, this artistic research project advances a form of critical design practice discourse that does not merely produce objects but generates discourse, reframing biomedical artefacts as sites where cultural, emotional, and bodily meanings can be renegotiated.

MEDICALLY PRESCRIBED JEWELLERY

Contemporary medicine routinely incorporates artificial components such as joint replacements, bone fixation plates, dental implants, vascular stents, and neural

prostheses, demonstrating the growing convergence between biological tissue and engineered materials (Ratner et al., 2013; Park & Lakes, 2007). These developments make it possible to reconsider the relationship between the body, medical devices, and aesthetic artefacts. Rather than viewing implants, prostheses, and surgical components solely as functional interventions intended to restore physiological capacity, this artistic research project proposes that such elements may also be approached through the conceptual and material language of jewellery.

Within this context, this paper introduces the concept of medically prescribed jewellery, proposing a speculative taxonomy of jewellery forms organised according to their degree of visibility and bodily integration (Noronha, 2018). Five hypothetical levels of intervention are considered, ranging from external orthotic devices to intracorporeal implants. These levels include orthotic, exodermal, exo-corporeal, subdermal, and intracorporeal forms of jewellery, each corresponding to a different spatial relationship between the artefact and the body. This layered framework allows jewellery to be examined not only as an object worn on the body's surface but also as a potential component embedded within, or structurally integrated with, the body itself.

The emerging of such possibilities is closely linked to contemporary biomedical practices that already involve the insertion of screws, plates, sutures, prosthetic joints, and other medical devices into the body. These interventions reshape the physical body and introduce foreign materials that may remain permanently within

it. Biomedical implants are typically designed according to strict functional criteria such as durability, mechanical performance, and biocompatibility (Ratner et al., 2013). However, their presence within the body inevitably influences the subjective experience of embodiment. Scholars working in medical humanities and prosthetic studies have highlighted how prosthetic and implantable technologies alter the boundaries between body and artefact, producing hybrid forms of corporeality in which biological and technological elements coexist (Sobchack, 2004; Ihde, 2002).

This perspective resonates with design approaches that emphasise emotional engagement with objects and the capacity of aesthetic qualities to shape users' experiences and attachments (Norman, 2004; Coates, 2003). In this sense, the medical intervention itself becomes an act of adornment, where the repaired site of the body may acquire new forms of aesthetic value and personal meaning.

This proposal also challenges conventional assumptions about jewellery as an object intended primarily for public display. Traditionally, jewellery functions as a visible signifier of identity, status, or personal expression (Turner, 2010). In many of the speculative forms described here, however, particularly subdermal and intracorporeal jewellery, the artefact may remain invisible to external observers.

Research on prosthetic acceptance has shown that aesthetic and symbolic qualities can significantly influence psychological adaptation to medical devices (Horgan & MacLachlan, 2004; Murray, 2009). Similarly, studies in patient-centred design show that

personalisation, aesthetics, and symbolic meaning in medical devices or environments can positively influence patient satisfaction, perceived well-being, and adherence to treatment (Farley & Weinstein, 2006; Rehn-Groenendijk et al., 2023). In this way, medically prescribed jewellery proposes a convergence between medical technology and aesthetic practice, where repair, transformation, and adornment coexist within the living body.

The following sections examine these hypothetical levels of intervention in greater detail, exploring how jewellery might operate across different layers of the body, from orthotic supports worn externally to implants integrated within the musculoskeletal system.

ORTHOTICS

Orthoses generally fall into two main categories: prefabricated (off-the-shelf) devices and custom-made orthotic devices. Prefabricated orthoses are manufactured in standardised sizes and materials and are typically available through medical supply providers or pharmacies. These devices are often adjustable and secured to the body using straps, elastic supports, or fastening systems such as Velcro. Because of their accessibility and adaptability, prefabricated orthoses are frequently prescribed for short-term therapeutic use or for conditions that require relatively simple mechanical support. Although standardised, they may still be modified or adjusted by clinicians to better suit the patient's needs.

By introducing principles from jewellery design, such as material refinement, personalisation, craftsmanship, and aesthetic consideration, orthotic devices may be reimagined as objects that combine therapeutic function

with visual and emotional resonance. In this context, orthotics may be understood not only as medical supports but also as wearable artefacts that communicate identity, resilience, and personal meaning. Materials, surface treatments, and forms could be reconsidered to transform the device from a purely clinical apparatus into an object that the wearer might feel proud to display rather than compelled to conceal.

This perspective suggests a shift from the conventional perception of orthotic devices as temporary corrective tools toward a more integrated understanding of them as aestheticised extensions of the body. When approached through the lens of jewellery, orthotic design may foster a more positive relationship between patients and their medical devices, contributing to improved emotional acceptance and potentially enhancing adherence to treatment.

In this way, orthotics represents the most externally visible level of medically prescribed jewellery within the taxonomy proposed in this project. Positioned at the interface between body and environment, they provide a compelling site in which medical functionality and aesthetic expression may converge, demonstrating how therapeutic technologies can also participate in the cultural and symbolic dimensions of bodily repair. In fact, assistive devices (Fig. 1 and 2) may have a purpose apart from functionality. That function, beyond the merely structural/mechanical, may be joined with aesthetics to extend to thoughts and feelings, by transitioning “robustness” to “beautiffulness”. In figure 1, a model wears a series of sculptural jewellery-body interfaces that blur the boundary between adornment and prosthetic extension. The pieces were manufactured with skin-toned resin on cotton mesh,

shaped into rigid yet fluid contours that encircle the neck/shoulders and forearm. Their matte surface and warm hue evoke an ambiguous corporeality, simultaneously resonating with and distancing themselves from the wearer’s body.



Fig. 1 Cervical collar and wrist orthoses - laminate resin (prosthetics technique), silicon breast implant, Plastazote®, gold plated silver and leather (Noronha, 2018).

Photo: Daniel Pires.

Gold-plated silver fasteners and angle regulators punctuate the elements, introducing a mechanical accent that underscores their hybrid character as both jewellery and supportive apparatus.

The positioning of the neck piece fulfils both protective and restrictive functions, while the wrist form frames the underlying skin through a deliberate aperture, emphasising the interplay between exposure and enclosure. Overall, the composition foregrounds jewellery as an expanded practice: one that engages the body not merely as a site for ornamentation, but as a terrain where intimacy, constraint, material agency, and embodied emotion converge.

Figure 2 shows an expansive collar and neck structure crafted from intricately handmade gold/silver filigree. The golden structure extends from the base of the neck into a wide, mantle-like form that encircles the shoulders. Its surface is composed of repeating filigree spirals that evoke both historical craftsmanship and armour. By enlarging the proportions beyond those of traditional adornment, the work challenges expectations of jewellery as intimate or small-scale. Instead, it asserts jewellery as a spatial and performative medium capable of reshaping the silhouette and redefining the wearer's presence. The result is an exploration of ornament as an extension of the body, identity, and gesture, operating simultaneously as artefact, medical cervical collar, and expressive surface.

In Figure 3, the model wears a medical scoliosis corset, resembling a sculptural torso form, that extends from the ribcage to the hips, composed of a smooth white surface yet embedded with circular golden filigree elements. These filigree inserts act as luminous points of ornamentation, creating a dialogue between the

organic curvature of the body and the precision of traditional metalworking techniques.

The piece reads simultaneously as protective shell, prosthetic extension, and ceremonial garment, exploring how jewellery can operate at a scale that mediates between intimate embellishment and medical intervention. This staging foregrounds jewellery as a critical practice capable of shaping bodily perception, emotional resonance, and spatial presence.

Figure 4 shows close-ups of a hand wearing two delicate finger adornments that operate at the threshold between jewellery and micro-prosthetics. Each splint wraps around a phalanx with a thin, pale-toned band punctuated by small gemstones. The stones introduce points of colour and luminosity, transforming the otherwise minimal structure into a site of concentrated ornamentation. Their placement suggests both embellishment and functional articulation, hinting at an imagined relationship between movement, structure, and healing through support.



*Fig. 2
Filigree cervical
collar – gold plated
silver hand-made
Portuguese filigree
(Noronha, 2018).
Photo: Artur Cabral.*

Fig. 3
Lombostat
(scoliosis corset) –
polypropylene, gold
plated silver hand-
made Portuguese
filigree and elastic
(Noronha, 2018).
Photo: Artur Cabral.



Fig. 4
Top: Pianist finger
splint – gold and
brilliant cut black
white diamonds;
Bottom: Mallet finger
splint – sterling
silver, brilliant cut
rubellite and citrine
(Noronha, 2018).



SUBDERMAL AND EXODERMAL

When a wound occurs as a result of trauma, surgical intervention, or other medical procedures, the closure of the cutaneous surface becomes essential to facilitate healing and minimise the risk of infection. Techniques for wound closure have evolved over thousands of years, reflecting both advances in medical knowledge and the development of new materials and technologies. Historically, methods ranged from cauterisation and the application of heated oils to more controlled techniques such as suturing, bandaging, and wound dressing. In contemporary medical practice, a variety of closure methods are used, including sutures, surgical staples, adhesive strips such as steri-strips (commonly known as butterfly stitches), and tissue adhesives. The specific technique applied depends on the nature, location, and severity of the wound. Clinicians must carefully select the most appropriate combination of suture materials, needle types, and closure methods according to the characteristics of the tissue involved. A superficial laceration on the foot, for example, may require a different approach from a complex surgical incision on the face or a deeper wound involving multiple tissue layers. In many clinical situations, more than one suturing technique is used simultaneously to ensure optimal closure and promote effective healing.

Within the conceptual framework of medically prescribed jewellery, the moment of suturing presents an opportunity to consider how wound repair might also incorporate aesthetic and symbolic dimensions. Rather than relying exclusively on conventional absorbable or non-absorbable suture threads, it is proposed that patients could be offered the option of

alternative materials capable of performing both medical and aesthetic functions. In this speculative scenario, suturing elements could be designed not only to close and stabilise the wound during healing but also to contribute to the visual transformation of the repaired site.

Such materials might include finely engineered chains or filaments made from biocompatible precious metals such as gold, platinum, or sterling silver, or the use of specially designed decorative staples with gold or metallic finishes. These elements would function medically by securing tissue and facilitating healing while simultaneously acting as a form of adornment that reframes the wound as a site of transformation rather than simply a mark of injury. In this sense, the suturing process itself becomes a form of aesthetic intervention.

The concept draws inspiration from cultural practices in which repair and ornamentation intersect, most notably, as referred to previously, the Japanese technique of kintsugi, where broken ceramics are repaired with lacquer mixed with powdered gold, emphasising rather than concealing the fracture. Similarly, medical jewellery in a subdermal or exodermal context would not aim to hide surgical repair but instead acknowledge and aestheticise it. The resulting scar, rather than being perceived solely as damage or imperfection, may become a visible trace of resilience and recovery. From a design perspective, such interventions would require careful consideration of biocompatibility, sterility, mechanical flexibility, and long-term interaction with human tissue. Any implementation would necessarily involve collaboration with surgeons, biomedical

*Fig. 5
Silver chain surgical
staples. Running-X
stitch in central
wound and Skin
embroidery around
with silver chain
suture (Noronha,
2018).
Photo:
Olga Noronha.*



engineers, and materials scientists to ensure that aesthetic qualities do not compromise clinical safety or therapeutic effectiveness. The introduction of jewellery principles into wound closure practices suggests an alternative relationship between the patient and the repaired body. Instead of perceiving sutures as temporary medical necessities to be removed and forgotten, they may become meaningful artefacts embedded in the narrative of healing. In this way, subdermal and exodermal medical jewellery proposes a reconfiguration of surgical repair in which healing, aesthetics, and personal meaning converge.

*Fig. 6
Running-X (centred)
stitch gold plated
silver chain suture,
with a J shaped
suture needle
(gold plated)
(Noronha, 2018)
Photo:
Olga Noronha.*



The proposals presented in figures 5 and 6 result from research into the techniques and procedures related to medical sutures. With particular emphasis on the study of materials and their properties; in the analysis of stitches and sutures (applied according to the condition of the laceration); and in the cosmetic aspect resulting from the cicatrisation process, influenced by the suture material, technique, and post-operative treatment, the subdermal and exodermal proposals intend to re-contextualise the procedure, questioning the possibility of transforming the ephemeral to the permanent, from the merely “functional” to the “aesthetic”. The figures

present a series of interventions on skin, onto which delicate metallic structures have been inscribed, embedded, or partially attached. Across the works, fine linear elements composed of gold wire, chains, or filigree-like components interact with the organic surface, creating a visual and conceptual dialogue between jewellery, incision, and bodily matter. These interventions evoke the language of suturing, repair, and ornamentation simultaneously, situating the pieces within an ambiguous territory between adornment and corporeal modification.

In several instances, geometric motifs reminiscent of traditional filigree patterns appear delicately traced across the surface. Diamond-shaped outlines, zig-zag lattices, and star-like structures composed of fine metallic lines create intricate configurations that rest flush against the substrate, suggesting both decorative surface drawing and surgical marking (Fig. 5). These motifs recall the precision of wirework jewellery techniques while also resonating with contemporary digital line drawing or biomedical diagramming. The rigid geometry contrasts with the softness of the flesh ground, emphasising the tension between ornamental control and organic vulnerability.

Other pieces introduce gold chains that appear partially embedded into the surface, following irregular seams that evoke the visual logic of sutures or stitched wounds. The chain links catch the light as they trace subtle lines of connection across the substrate, oscillating between jewellery and surgical intervention. In some compositions, the chain extends downward beyond the site of contact, terminating in a pointed or weighted element that hangs freely (Fig. 6). This suspended segment introduces a vertical gesture of release, contrasting with the intimate scale of the

embedded intervention and suggesting a dynamic relationship between attachment and detachment. In another variation, a sequence of delicate gold elements forms a branching structure reminiscent of anatomical stitching or grafting. The repeating segments produce a rhythmic pattern that evokes organic growth or botanical branching while simultaneously recalling embroidery techniques. Small contrasting components punctuate the composition, interrupting the otherwise continuous line and introducing moments of visual weight and tension. These elements emphasise the dual character of the intervention: both restorative and decorative. Taken together, the works foreground the body, or its surrogate material, as a site for experimental dialogue between decoration, repair, and technological intervention. The juxtaposition of metallic precision with a skin surface invites reflection on how jewellery may operate not only as an external adornment but also as a material interface with the body. These pieces blur distinctions between jewellery, prosthetic design, and biomedical intervention, proposing forms that function simultaneously as embedded ornament, speculative prosthetic interface, and conceptual gesture. Presented in isolation against neutral backgrounds, the works reimagine adornment not merely as surface decoration but as a poetic and speculative form of embodied care.

EXO-CORPOREAL

Exo-corporeal jewellery refers to objects attached to the exterior of the body that remain directly linked to medical intervention or bodily repair. Unlike orthotic devices, which primarily provide biomechanical support, this category occupies an intermediate position between clinical apparatus and personal adornment. These artefacts remain visible and may simultaneously fulfil protective, therapeutic, or communicative functions while also operating as aesthetic expressions.

In this framework, the medical device becomes a site where function and adornment converge. A stabilisation frame could integrate modular decorative components or sculptural elements that reinterpret its geometry as wearable architecture. Connectors, rods, or joints might be redesigned as articulated jewellery components, reframing the assembly as an object of design rather than solely a marker of injury. Such interventions may significantly influence the psychological experience of treatment. The conspicuousness of external medical structures often heightens feelings of vulnerability or stigma. We propose that by integrating aesthetic and symbolic considerations could instead communicate resilience, individuality, or artistic intent, encouraging patients to reinterpret the device as a meaningful extension of the body.

Exo-corporeal medical jewellery thus operates at the intersection of medicine, design, and identity. Positioned on the body's surface, these objects remain socially perceptible while functioning as integral components of care. Their visibility enables them to participate in the communicative roles of jewellery,

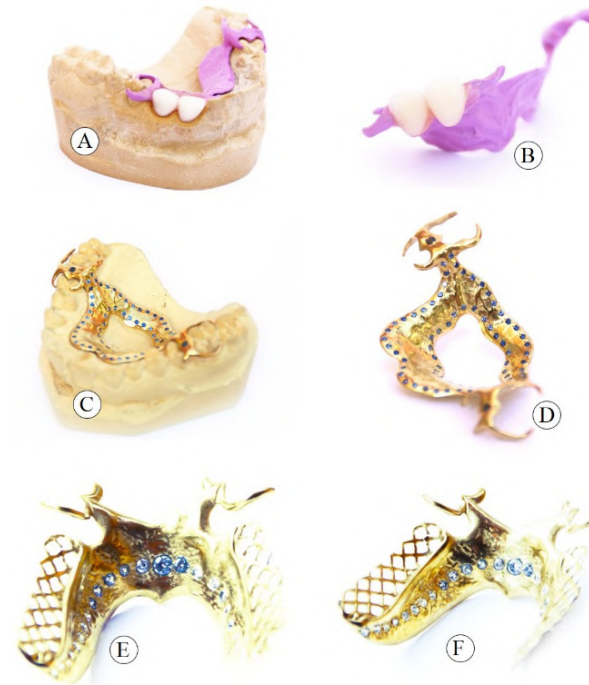


Fig. 7

A - Pink enamelled denture framework with two teeth (lower maxilla) on mould; B - Pink enamelled denture framework with two teeth (lower maxilla); C - Gold denture framework set with brilliant cut sapphires (upper maxilla) on mould; D - Gold denture framework set with brilliant cut sapphires (upper maxilla) on mould; E - Gold-plated silver denture framework set with cubic zirconia (upper maxilla); and F - Gold-plated silver denture framework set with cubic zirconia (upper maxilla) (Noronha, 2018).

Photo: Olga Noronha.

while their clinical purpose maintains their connection to bodily repair.

Within the broader taxonomy of medically prescribed jewellery proposed in this project, exo-corporeal artefacts represent a transitional category between external orthotic technologies and more invasive forms such as subdermal or intracorporeal jewellery. They illustrate how the boundaries between adornment, prosthetic technology, and medical intervention can be reconsidered through design, opening possibilities for devices that support both healing and aesthetic articulation.

Figure 7 presents a sequence of six dental jewellery hybrids that explore the transformation of prosthetic structures into ornamental artefacts. Images A and B, a dental model and corresponding plaster impression, reveal the initial clinical geometry from which the subsequent pieces are derived. These foundational forms establish the anatomical context, highlighting the intimate spatial relationship between prosthetic design and the mouth as a site of both function and expression. Images C and D show intermediate prototypes in which the functional armature of a partial denture is reimagined through intricate openwork structures and the integration of jewel-like elements. The metallic frameworks begin to depart from clinical neutrality, adopting a more expressive, sculptural character while still referencing the morphology of the oral cavity and serving its medical purpose. In images E and F, the transformation reaches its fullest articulation: the orthodontic framework becomes a highly ornamented object featuring lattice-like gold structures set with sapphires. These final pieces operate simultaneously as speculative prosthetics and jewellery,

foregrounding questions of value, intimacy, and the aesthetic potential of medical devices. The progression across the images illustrates a design-led inquiry into how functional biomedical forms can evolve into emotionally resonant artefacts.

SUBDERMAL

Positioned between the exterior and interior layers of the body, these artefacts occupy an intermediate space where medical intervention, body modification, and aesthetic expression converge. In contemporary medical and body modification practices, subdermal implants already exist in various forms, ranging from medical ports and implants to decorative modifications that alter the contour of the skin.

As this framework progresses inward through the body's layers, the conceptual and anatomical shift from subdermal to skeletal or intracorporeal jewellery becomes increasingly significant. While subdermal implants interact primarily with soft tissue and the surface of the skin, intracorporeal jewellery engages directly with the body's structural core—the skeleton. Here, ornamentation is no longer mediated by the dermal layer but is instead mapped onto bone itself, transforming the internal architecture of the body into a potential site for aesthetic, symbolic, and functional intervention. This deeper level of integration expands the notion of jewellery beyond surface adornment, positioning it as a structural participant in bodily repair and identity formation.

Bone fixation plates exemplify this deeper form of internal intervention. These devices are designed to stabilise fractures by mechanically supporting the bone during healing. Typically fabricated from

biocompatible metals such as titanium or stainless steel, fixation plates are contoured to follow the anatomical geometry of the affected bone and secured with screws that bridge the fracture site. Although concealed beneath the skin, they become part of the patient's internal architecture, often for extended periods or permanently. Their presence is known primarily through radiographic imaging, yet they play a decisive role in shaping the repaired body. When viewed through the lens of design, their elongated geometries, patterned perforations, and close adherence to the bone's surface reveal formal affinities with jewellery and metalwork, suggesting an unexpected potential for aesthetic and conceptual reinterpretation.

By situating ornament along the bones themselves, these works foreground a conceptual shift from jewellery as surface adornment to jewellery as an integrated extension of anatomical form. The metallic elements echo the proportions and geometry of the skeletal structures they accompany, producing a hybrid visual language that moves fluidly between prosthetic device, bone fixation plate, ceremonial ornament, and speculative biomedical implant. In some instances, the pieces appear almost prosthetic in character, suggesting biomechanical supports or protective exoskeletal elements; in others, their intricate detailing and gemstone embellishments emphasise their identity as crafted objects within the traditions of fine jewellery. Conventional osteosynthesis plates ensure reliable fracture fixation but often reduce recovery to a purely clinical process.



*Fig. 8 (above)
Gold Biofiligree®
osteosynthesis and
arthrodesis bone
plates, (one with
protruding
tourmaline-set
“piercing”, another
with pavé-set
tourmalines, and two
with no gems), set
with gold-plated
surgical screws to a
hand anatomical
model (Noronha,
2018). Photo:
Olga Noronha.*

Within the framework of medically prescribed jewellery, Biofiligree® (Fig. 8 and 9) is proposed as a novel fixation concept that integrates Biomedical function with artistic design inspired by traditional Portuguese filigree. The system allows the patient personalisation through selectable motifs, geometries, and engravings, introducing an aesthetic and symbolic dimension to the healing process.

*Fig. 9
(right) - Silver
Biofiligree® filigree
bone plates set with
gold-plated surgical
screws to foot
anatomical model
(Noronha, 2018).
Photo:
Olga Noronha.*



The proposed concept involves the design, development, and scientific evaluation of bone fixation plates based on filigree structures, exploring Biofiligree® bone fixation plates (Fig. 10 and 11) as reliable and effective biomedical devices for fracture stabilisation. In addition to fulfilling their mechanical role during bone healing, these plates are conceived with a secondary life beyond the clinical setting. Once the bone has healed and the plate is removed, the implant can be transformed into wearable jewellery—such as a bracelet, ring, or pendant—depending on its



original size, thereby becoming a personal artefact that symbolises recovery.

To explore this concept, silver and stainless-steel filigree bone plates were designed and evaluated as fixation elements for fracture healing, demonstrating how osteosynthesis devices may evolve from purely functional hardware into objects that unite medical treatment, personal identity, and artistic design (Noronha et al., 2023; Noronha et al., 2025).

Fig. 10
Illustration showing the concept of the Biofiligree® bone fracture healing concept; Top: finger phalanx plate; Bottom: calcaneus plate. Miranda, 2023)
Illustration: Catarina Miranda.

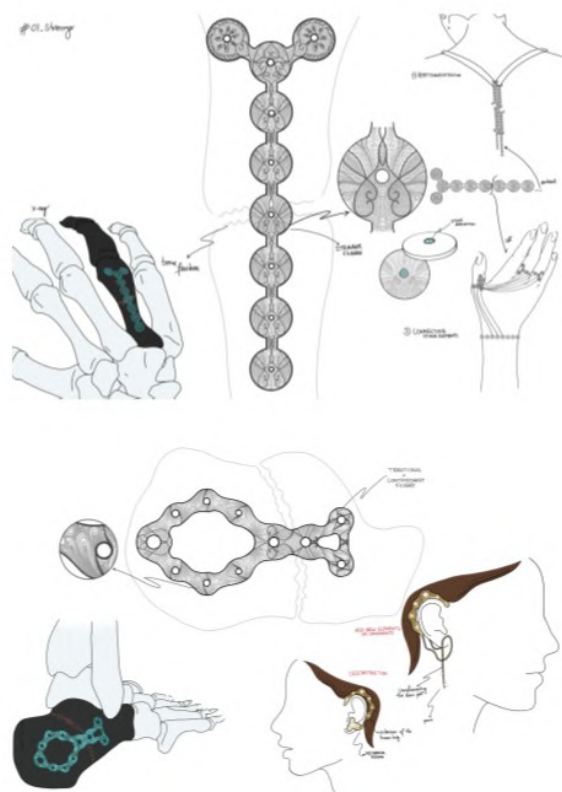


Fig. 11
Biofiligree® ulna plates (Noronha, 2023).
Photo: Joel Ribeiro.



INTRACORPOREAL PROSTHESIS

Intracorporeal prostheses represent the deepest level of intervention within the system of medically prescribed jewellery proposed in this project.

In contemporary medicine, intracorporeal prostheses include a wide range of biomedical implants such as artificial joints, dental implants, bone fixation plates and screws, cardiac pacemakers, cochlear implants, and other devices designed to support or substitute physiological functions. These objects are engineered primarily for durability, biocompatibility, and functional performance. Materials such as titanium alloys, medical-grade stainless steel, ceramics, and advanced polymers are commonly used to ensure structural stability and long-term integration with biological tissues.

Within the framework of medical jewellery, intracorporeal prostheses invite a reconsideration of the aesthetic and symbolic dimensions of such implants. Although these devices are not visible to others, their presence within the body may profoundly affect the individual's sense of embodiment. Prosthesis users often describe their devices along a spectrum, from an unfamiliar, foreign presence to a fully incorporated extension of the self (Murray, 2004)—a complex psycho-physical relationship that echoes broader accounts of hybrid corporeality, in which biological and technological elements coexist within a single embodied experience (Sobchack, 2004; Ihde, 2002). This reconceptualisation also resonates with broader philosophical and cultural discussions surrounding the technologically augmented body (Haraway, 1991). Within the broader scope of this project, intracorporeal prostheses represent the most integrated form of

Fig. 12
Filigree gold-plated
silver hip prosthesis
(femoral component)
(Noronha, 2018).
Photo: Olga
Noronha.



medical jewellery, where the boundary between body and object becomes almost indistinguishable. Figure 12 displays a hip prosthesis revealing sculptural complexity and meticulous surface detailing. Each piece culminates in a rounded, bulb-like head adorned with vertical fluting, while the tapering shaft features intricate filigree-inspired patterns that combine linear engraving with ornamental motifs. The transition between the spherical top and the narrowing stem is accentuated by subtle curvature and layered decorative elements, suggesting both structural continuity and ceremonial refinement. This shape is the mechanical conversion/substitute of the top of a human femur. In this case, however, the proposal was not developed with functional or clinical feasibility as a primary concern. Rather than aiming to produce a medically

viable implant, the design operates as a speculative and conceptual exploration of how prosthetic devices might be reimaged through the language of jewellery. Consequently, the object should be understood as an artistic provocation rather than a functional biomedical device, intended to question how medical prostheses could incorporate aesthetic, symbolic, and cultural dimensions. Although reminiscent of tools, implants, or anatomical extensions, these types of objects resist singular categorisation. The visual and conceptual language of this piece knowingly engages with an established lineage of jewellery practice that has already explored the surgical implant as an aesthetic object, most notably Christoph Zellweger's *Foreign Bodies* series (Zellweger, 2007). Working in mirror-polished medical-grade steel, Zellweger's pieces adopt the material vocabulary of implants to fashion objects worn externally as jewellery, deliberately confusing organ and ornament and asking what future viewers might make of an implant recovered from tomorrow's graves. Where *Foreign Bodies* borrows the material and formal language of implants to unsettle jewellery's status as external adornment, the *Biofiligree®* hip prosthesis proposed here inverts that gesture: rather than bringing implant materiality to the surface of the body, it takes the ornamental vocabulary of traditional Portuguese filigree and embeds it within an actual intracorporeal device, so that the jewellery becomes the implant rather than referencing it from outside. Whereas Zellweger's practice operates critically through simulation and surface, the proposal explored here operates through a literal, functional identity between ornament and prosthesis.

Fig. 13
3D CAD real
simulation – Poem
engraved/indented
hip prosthesis
(femoral component)
(Noronha, 2018).
Photo: Olga
Noronha.



Figure 13 presents a hip prosthesis whose spherical head features a reflective surface inscribed with lines of text, partially legible and subtly embedded within the curvature of the metal. This inscription introduces a layer of meaning that exceeds the object's biomedical function, transforming it from a purely technical implant into a vessel capable of holding information, memory, or instruction. The presence of text suggests that an internal device—typically silent and unseen—might also serve as a carrier of personal narrative or even as a form of internalised identification, a message held within the body rather than displayed upon it. The elongated, tool like silhouette of the prosthesis echoes the morphology of the gilded forms in the preceding series, yet here the aesthetic shifts toward restraint and precision rather than ornate embellishment. The engraved surface operates as a conceptual interface, merging material presence with linguistic content in a manner that evokes, speculatively, an “internal tattoo”—an inscription held within, rather than upon, the body. By embedding language into a structure designed to inhabit the body, the piece proposes that prosthetic devices could one day communicate, authenticate, or memorialise—quietly transmitting meaning from within.

FUTURE DIRECTIONS

This challenge provokes fundamental questions about the very nature of jewellery. Is visibility a necessary condition for appreciation? Within this project, speculative forms of validation were considered, including medical imaging to visualise the object, photographic documentation at the time of surgery, or affidavits certifying its placement. These possibilities remain open, inviting a reimagining of the jewellery object as an intimate, technologically mediated interface with the body.

As Smith (2007, p. 55) observes, this artistic research project navigates “a dialectic between invisibility and visibility, concealing and revealing, denial and disclosure, loss and enhancement.” Future work will continue to engage with this dialectic by synthesising scientific knowledge, technological practice, and an embodied understanding of the body as both medium and lived experience. Collaboration with surgeons, biomedical scientists, and bioengineers will be essential to address these questions and to advance the application of jewellery principles within medical design.

CONCLUSIONS

This paper has examined the concept of medically prescribed jewellery as a speculative and interdisciplinary framework that seeks to challenge conventional distinctions between adornment, prosthetics, and medical devices. By positioning jewellery within surgical and biomedical contexts, this artistic research project explores the possibility of extending the traditional role of jewellery beyond

ornamentation toward a medium that might engage with bodily repair, embodiment, and emotional experience.

The study explores how jewellery principles—materiality, symbolism, intimacy, and personalisation—might offer alternative perspectives on the design of prosthetics and medical interventions. Rather than concealing medical repair or striving for imperfect imitation of the natural body, medical jewellery is proposed as a way of reframing prosthetic and surgical components as meaningful artefacts that might contribute to the individual's relationship with their altered body. In doing so, this artistic research project proposes that aesthetic and symbolic qualities could potentially play a role in psychological adaptation, and invites consideration of how medical devices might be reimagined as objects that could be experienced as extensions of identity.

Through the development of speculative artefacts across multiple bodily layers—orthotic, exodermal, subdermal, and intracorporeal—the project explores how jewellery might operate simultaneously as an aesthetic, epistemic, and palliative practice. As aesthetic objects, these artefacts propose possibilities for introducing beauty and symbolic value into medical contexts. As epistemic objects, they may stimulate dialogue between art, science, and medicine, and invite broader reflection on fragility, repair, and the technologically mediated body. As palliative propositions, they speculate on ways in which design might support emotional reconciliation with prosthetics, implants, and surgical interventions. The methodological framework, combining practice-led design research with reflexive inquiry and public dissemination, explores the capacity of speculative

artefacts to function as critical tools within medical humanities and design research. The responses gathered through exhibitions, discussions, and community engagement suggest that some audiences recognised the potential of medical jewellery to humanise medical technologies and to open possible new ways of thinking about embodiment and bodily repair.

At a broader level, this artistic research project offers a speculative contribution to ongoing discussions about the cultural and emotional dimensions of prosthetics and biomedical technologies. It proposes that medical design might be imagined beyond an exclusive emphasis on functionality or invisibility, and might also incorporate aesthetic meaning, personal expression, and symbolic resonance. In this sense, medical jewellery is presented as a speculative proposition that invites further consideration of how medical objects might engage with identity, embodiment, and personal meaning.

While the project remains largely speculative, it identifies promising directions for future collaboration between jewellers, designers, surgeons, biomedical engineers, and psychologists, and further work will be required to investigate biocompatibility, clinical feasibility, and patient-centred outcomes.

Ultimately, medical jewellery speculates on the possibility that repair may be not only functional but also beautiful, meaningful, and intimately connected to identity—inviting consideration of how bodies, technologies, and aesthetic practices might coexist in alternative ways.

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The authors used AI-assisted tools solely for language editing (grammar and clarity). All scientific content, interpretations, and conclusions are the sole responsibility of the authors.

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Exploring the Traditional Tools and Jewellery of the Kumaun Himalayas of Uttarakhand

Authors: *Reetesh Sah, Rohit Kumar Singh Bhakuni*



ABSTRACT

This research paper explores the traditional jewellery-making techniques of the Kumaun Himalayas region in Uttarakhand, a geographically unique and culturally rich part of northern India. Jewellery in this region transcends mere ornamentation; it holds profound religious, cultural, social, and economic significance. Crafted primarily from gold and silver, these ornaments symbolise purity, prosperity, authority, social hierarchy, and marital status. While traditionally associated with married women, ornaments are also worn by men, children, and unmarried women across different castes and communities. In Kumaun, certain ornaments are culturally mandatory, reflecting deep-rooted social customs and regional identity. The paper examines a wide range of traditional ornaments, their symbolic meanings, and the jewellery-making processes rooted in indigenous knowledge systems. It delves into the tools, locally available materials, and techniques employed by artisans, highlighting how traditional practices fostered a self-sustaining eco-socioeconomic ecosystem in the hill regions. However, with increasing urbanisation, improved connectivity, and the influx of factory-made, mass-produced jewellery, traditional practices face gradual erosion. Modernity has influenced design preferences, especially in urban and plains areas, leading to the adoption of branded commercial jewellery over handcrafted heritage pieces. Through ethnographic insights and historical references, this study documents the transitions in jewellery-making and emphasises the urgency of preserving this intangible cultural heritage. The paper contributes to broader academic discussions on heritage

conservation, traditional craft economies, and the impact of modernisation on hill societies. It underscores the importance of passing on this cultural knowledge to future generations to ensure continuity and respect for the region's artisanal legacy.

Keywords: *Artisan; Cultural Heritage; Jewellery; Body Ornaments; Goldsmithing Tool; Traditional Goldsmith Techniques*

INTRODUCTION

Dress is a vital aspect of any society, serving as a cultural marker that distinguishes one community from another. Jewellery, as an integral part of dress, plays a similar role in reflecting cultural identity. Jewellery-making has been classified as a traditional craft that conveys cultural elements and symbolism through its designs (Fobiri et al., 2024). Every culture has its own distinct set of ornaments that not only add aesthetic value but also signify the social and economic standing of the wearer.

In Uttarakhand, ornaments hold a prominent place in society. Men, women, and children wear various forms of jewellery. The state is home to numerous castes and tribes residing from the high Himalayan regions to the foothills and plains, each with distinct food habits, lifestyles, dress codes, and jewellery traditions. At present, traditional jewellery has undergone considerable change due to modernity. These changes are more evident in the plains because of their proximity to cities, while the hilly regions have preserved much of their traditional heritage. Among the ornaments worn in Uttarakhand, *Pajeb*, *Payal*, *Paire*, *Pauji*, *Nath*, *Bulakh*, *Pachlad*, *Champakali*, *Guloband*, *Teep*, *Jaumala*, *Kangan*, *Tagdi*, *Hansuli*, and *Soota* are prominent. A ninth-century idol of the goddess Parvati recovered from Almora was found adorned with ornaments such as *Kundal*, *Hasuli*, *Ekavali*, *Bhujband*, and *Katisutra* (Joshi, 2021). In earlier times, the lack of transportation and communication made access to the remote hilly regions of Uttarakhand difficult. However, with improved connectivity, commercially-manufactured jewellery from urban centres has reached these areas, creating strong competition for traditional handmade ornaments. Factory-made jewellery is

produced more quickly, requires less labour, and is available at lower cost, making it more attractive to consumers (Verma, R., 2024, Interview).

Traditionally, jewellery-making in the Kumaun Himalayas relied on indigenous craftsmanship and locally made tools. Although gold and silver were often imported, tools such as hammers, *ghadiya*, *baram*, and *reza* were prepared by local artisans using locally available materials. This system supported cultural sustainability as well as the livelihoods of artisans engaged in related traditional occupations (Joshi, 2021). There are primarily two jewellery-making techniques prevalent in the region. Traditional ornaments were handcrafted using simple tools such as chisels and hammers, whereas modern jewellery is generally lightweight and produced with machines and moulds, reducing both time and labour requirements (Joshi, 2021).

This research paper analyses the evolution of jewellery-making techniques in Uttarakhand by examining both traditional methods and contemporary adaptations. It also explores the socio-economic factors influencing jewellery preferences and the cultural significance of ornaments across different regions of the state. By documenting these transformations, the study highlights the importance of preserving traditional craftsmanship while acknowledging the influence of modernisation on jewellery-making practices.

RESEARCH GAP

Over time, researchers have conducted sociological and economic studies on the significance of jewellery in the region (Bhatt et al., 2018). However, these studies have given limited attention to the technologies, tools, and

techniques involved in traditional jewellery-making. This highlights the need for a comprehensive study of the technological and artisanal aspects of jewellery-making in the Kumaun Himalayas of Uttarakhand.

OBJECTIVES

This paper addresses these unexplored aspects by examining the tools and techniques used in traditional jewellery-making and documenting the process from raw material to finished ornament. It also investigates the socio-economic and cultural context of jewellery production, the impact of modernisation on traditional practices, and the importance of preserving and documenting indigenous craftsmanship.

MATERIALS AND METHODS

This study adopts a qualitative approach and focuses on selected towns and villages of the Kumaun division of Uttarakhand, including Someshwar, Dwarahat, Chaukhutiya, Almora, Bageshwar, Nainital, Pithoragarh, Berinag, Nanakmatta, Khatima, and Champawat. Field visits and interviews were conducted with local communities, particularly generational goldsmiths, to collect first-hand information.

Historical and ethnographic methods were employed, including semi-structured and in-depth interviews with traditional jewellers and local elders. A review of existing literature, historical texts, and documents related to Kumaun's jewellery-making traditions was also undertaken.

Participant observation in jewellery-making workshops was used to document traditional crafting techniques, supported by visual documentation from artisans' collections and local jewellery shops. Photographs and

traditional tools were analysed to trace the evolution of jewellery-making techniques.

The oral history method provided insights into changes in jewellery-making practices over time, while content analysis of historical texts, images, and artefacts helped identify recurring themes and cultural transformations. The study aims to provide a comprehensive understanding of traditional jewellery-making and its cultural significance in Kumaun, Uttarakhand.

ETHICAL CONSIDERATIONS AND METHODOLOGY

Ethics in social research refers to standards of appropriate conduct shaped by established norms within the research community. Researchers are therefore expected to follow ethical principles to ensure responsible and respectful engagement with participants (Babbie, 2013). In this study, conducted under the academic affiliation of Kumaun University, Nainital, Uttarakhand, voluntary participation, informed consent, confidentiality, and non-maleficence were strictly maintained.

Participants were informed about the objectives and nature of the study, the intended use of the information collected, and their right to withdraw from the research at any stage without any consequences. Prior informed consent was obtained before conducting interviews (Babbie, 2013).

The ethical approach adopted in this study follows qualitative research practices described by Kvale and Brinkmann (2009). Interviews were conducted sensitively and respectfully to avoid psychological, emotional, or social discomfort. To protect participants' identities, confidentiality and anonymity were maintained throughout the research process, and any identifying information was omitted or anonymised.

The study therefore adhered to accepted ethical standards in social science research, ensuring voluntary participation, informed consent, confidentiality, and the principle of doing no harm.

INTERVIEW METHOD AND DATA ANALYSIS

The present study employed qualitative interviews as the primary method of data collection. Semi-structured interviews within an oral history framework were conducted to document traditional goldsmithing practices, including ornament design, tools, and production processes. Semi-structured interviews were selected because they allow flexibility in exploring participants' experiences while maintaining a consistent structure of inquiry. The interview design was informed by the qualitative interview methods described by Kvale and Brinkmann (2009).

Participants were selected through purposive sampling and consisted of practising goldsmith artisans possessing traditional knowledge of ornament-making techniques. Interviews were conducted in Hindi and the local Kumauni dialect, recorded with participants' consent, and later transcribed for analysis.

The analytical process followed an iterative approach in which interview transcripts, field notes, photographs, and observations of tools, materials, and ornament-making processes were reviewed repeatedly to identify recurring themes and patterns. These findings were interpreted in relation to broader discussions on craft heritage and technological change. Following Kvale and Brinkmann (2009), the analysis emphasised understanding participants' experiences and meanings through an interpretive and reflective approach.

MATERIALS AND TOOLS IN KUMAUN JEWELLERY MAKING

Historically, most materials used in traditional jewellery-making in Kumaun were sourced locally. Gold was relatively accessible and was obtained from local mines and riverbeds. Edwin T. Atkinson, in *The Himalayan Gazetteer*, notes that the Salmali hills near Bageshwar contained mines rich in iron, copper, and gold (Atkinson, 1884).

Atkinson also refers to the ancient accounts of gold-digging ants described by Herodotus. According to Herodotus, people living north of Kaspatyrus and Paktyika procured gold that was collected from earth dredged up by large ants (Herodotus, cited in Atkinson, 1884). A similar reference appears in the *Mahābhārata*, where the Khasa tribes presented *Pipīlika Swarna* (ant-collected gold) to King Yudhishtira during the Rājāsūya Yajña (Vyas, 1933–1966):

तद् वै पिपीलिकं नाम उद्धृतं यत् पिपीलिकैः।

जातरूपं द्रोणमेयमहार्षुः पुञ्जशो नृपाः॥ 2.52.4 (Vyas, 1933–1966)

Translation: “That which is called Pipīlika, gold extracted by ants, heaps of this gold measured in droṇas were brought by the noble kings.”

Atkinson further records that the Bhuksas (Buxa/Buxa) traditionally practised gold-washing and extracted gold dust from the auriferous sands of the Sona Nadi (Atkinson, 1884). Today, however, most materials used in jewellery-making are imported. Due to the declining availability and rising cost of gold, silver has become the primary metal, while some ornaments are also made from copper. The widespread occurrence of copper belts in Kumaun further supports its use. Patti Kharahi, north of Almora, has long been recognised as a centre of metallurgy, and several other

locations in the district also show evidence of ancient metallurgical activity (Sah, 2019). Traditionally, most tools used in jewellery-making were produced locally by skilled artisans, while only a few specialised tools were obtained from outside the region. The tools and materials used in traditional jewellery-making in Kumaun are described below.

BHATTI (FURNACE)

The furnace (Fig. 1) is used for smelting metals such as gold, silver, and copper. Traditionally, furnaces were made of clay and operated with a manually rotated fan that supplied airflow to keep the coals burning. Such furnaces are now rarely found. A traditional-style furnace documented in Bageshwar represents a hybrid system, retaining the conventional design while using an electric motor instead of manual operation to provide continuous airflow. Traditionally, furnaces were constructed from locally available materials such as clay and stone, making them economical for artisans. Modern furnaces, however, are generally built with

bricks and cement, increasing construction costs and creating additional economic challenges for traditional jewellery artisans (Kodak, 2023, Interview).

KOYLA (COAL)

Traditionally, jewellery-making in Kumaun used coal prepared from oak (*Quercus leucotrichophora*) and kafal (*Myrica esculenta*) trees, which were locally abundant. The wood was burned into embers, extinguished with water, dried, and stored for later use. Stone coal (Fig. 2) was also used, though less frequently, due to its higher cost and the need for importation. Compared to wooden coal, stone coal burned longer, produced higher temperatures, and generated less ash. The use of oak and kafal coal reflects the close relationship between traditional jewellery-making and the local ecological environment, as artisans depended on nearby forest resources for low-cost production. In recent years, however, the use of traditional wooden coal has declined due to reduced forest availability, environmental regulations, and

Fig. 1 A traditional furnace (bhatti) is used for melting metals in jewellery-making.

Location: workshop of Mr Arjun Kodak, Bageshwar, Uttarakhand, 2023. Photo: Sah and Singh Bhakuni under the ICHR Research Project.



Fig. 2 Stone coal used as furnace fuel in traditional jewellery-making workshops.

Location: workshop of Mr Arjun Kodak, Bageshwar, Uttarakhand, 2023. Photo: Sah and Singh Bhakuni under the ICHR Research Project.

restrictions on cutting oak and kafal trees. As a result, many artisans have adopted stone coal, gas burners, and electric furnaces, which provide more consistent heat, require less preparation, and improve efficiency. While these alternatives have enhanced productivity, they have also contributed to the gradual loss of traditional knowledge associated with fuel preparation and furnace management (Kodak, 2023, Interview).

GHADIYA (CRUCIBLE)

The crucible (Figs. 3 and 4), locally known as *ghadiya*, is a small vessel used for melting metals during the jewellery-making process. Although crucibles can be made from various heat-resistant materials, goldsmiths in Kumaun have traditionally used clay crucibles because of their local availability and suitability for melting precious metals such as gold and silver. They are inexpensive, readily available, and effective for small-scale metalworking.

The size of the crucible varies according to the quantity of metal being processed, with smaller crucibles used for jewellery fabrication and larger ones for melting

greater quantities of metal (Verma, S., 2024, Interview). During the melting process, the crucible is placed inside the furnace until the metal reaches a molten state. Traditional clay crucibles were often handmade and prone to cracking after repeated heating and cooling. In contrast, modern crucibles, particularly graphite crucibles, are more durable, resistant to thermal shock, and capable of withstanding higher temperatures. Various graphite crucibles used by artisans are shown in figure 3, while a traditional clay crucible is presented in figure 4. Despite these developments, clay crucibles remain an important component of traditional jewellery-making technology in the Kumaun region.

Fig. 3 Various sizes of graphite crucibles are prepared for use in the melting furnace, used to contain and heat metal during the smelting process. Location: workshop of Mr Arjun Kodak, Bageshwar, Uttarakhand, 2023. Photo: Sah and Singh Bhakuni under the ICHR Research Project.



Fig. 4 Clay crucible (ghadiya) used for melting gold, silver, and copper during the jewellery-making process. Location: workshop of Mr Arjun Kodak, Bageshwar, Uttarakhand, 2023. Photo: Sah and Singh Bhakuni under the ICHR Research Project.

BANKNAL (SOLDERING PIPE)

The *banknal* (Fig. 5 and 6) is a small pipe-shaped tool, traditionally made of brass, used by goldsmiths to direct and control the flame during heating. One end is placed in the artisan's mouth to blow air and intensify the flame, while the slightly bent opposite end directs heat precisely onto gold or silver. This enables controlled heating during processes such as soldering and melting. The banknal remains an important tool in traditional jewellery-making, particularly in small-scale workshops where manual techniques are still practised. Its length and shape vary according to the artisan's



Fig. 5 (left) Banknal, a brass pipe-shaped tool used by goldsmiths to control and direct the flame during the heating and soldering of metals.

Fig. 6 (right) A goldsmith using a banknal to direct airflow and intensify the flame during the heating and soldering of gold components in the jewellery making process. Location: workshop of Mr Sudhir Verma, Nainital, Uttarakhand, 2024. Photo: Sah and Singh Bhakuni under the ICHR Research Project.

preference and working style (Joshi, 2021). Examples of banknal used by artisans (Fig. 5, 6) depict a goldsmith using the tool to direct airflow and intensify the flame during jewellery production.

KUPPA (LAMP)

Before the widespread availability of gas facilities, goldsmiths used traditional oil lamps, known as *kuppa* (Fig. 7), along with a banknal (Fig. 5) to melt gold and silver. These lamps were typically fuelled by kerosene or mustard oil and were made from materials such as tin or brass. A kuppa generally consisted of an oil



Fig.7 Traditional oil lamp (kuppa) used by goldsmiths to generate flame for melting and heating metals with the help of a banknal.) A goldsmith using a banknal to direct airflow and intensify the flame during the heating and soldering of gold components in the jewellery making process.

Location: Photograph taken at the workshop of Mr Ajay Verma, Shop No. 96, Talli Market, Tallital, Nainital, Uttarakhand, 2023. Photo: Sah and Singh Bhakuni under the ICHR Research Project.

reservoir, a front section with a thick wick, and an upper section with a smaller wick. The thick wick produced a stronger flame for melting larger quantities of metal, while the smaller wick was used for finer work and relighting the larger wick when required (Verma, A., 2023, Interviews). The lamp was fitted with a handle for easy movement and a hinged lid for refilling oil and adjusting the wick. During operation, air was directed through the banknal toward the flame to increase heat and enable controlled melting or soldering of metal. Although modern gas torches have largely replaced these lamps, the kuppa remains an important part of the traditional jewellery-making technology of the Kumaun region.

DABKANI (PRESS)

The *dabkani* is a traditional clay tool used by goldsmiths to press small pieces of gold or silver into thin sheets (Figs. 8 and 9). It consists of two parts: a



Figs. 8 and 9 Upper and lower components of the clay dabkani, featuring a raised central knob used to apply pressure while flattening gold or silver into thin sheets.

Location: workshop of Mr Sudhir Verma, Nainital, Uttarakhand, 2024. Photo: Sah and Singh Bhakuni under the ICHR Research Project.

base with a shallow concave cavity and an upper pressing piece that is slightly curved and often fitted with a small central knob. When pressed together, the metal is compressed between the two surfaces, producing a thin and uniform sheet for jewellery-making processes. The concave base and curved upper section help distribute pressure evenly, ensuring uniform thickness. Clay is traditionally used because it provides a firm surface suitable for shaping metal without excessive deformation. The sheets produced with the *dabkani* are subsequently cut, shaped, or engraved to create jewellery components (Verma, S., 2024, Interview).

KAATI (CUTTER)

The *kaati*, locally known as a cutter, is an important hand tool used by traditional goldsmiths for cutting thin sheets of gold and silver during the initial stages of jewellery production. Usually made of iron, it consists

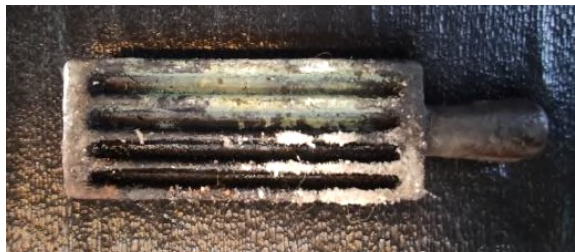


Fig. 10 (left) Kaati, a metal cutting tool used by goldsmiths to trim and cut thin sheets or wires of gold and silver.

Fig. 11 (right) Suwadi, a metal cutting tool used by goldsmiths for trimming and shaping thin sheets or components of gold and silver.

Location (both): workshop of Mr Sudhir Verma, Nainital, Uttarakhand, 2024. Photo: Sah and Singh Bhakuni under the ICHR Research Project.

of two metal arms, joined by a pivot, with sharpened cutting edges that allow precise trimming of metal sheets (Figs. 10 and 11). Traditionally, kaati were manufactured by local blacksmiths and customised according to the needs of individual artisans. Their cutting edges were manually sharpened using grinding stones to ensure accuracy and reduce wastage of precious metals. Goldsmiths also use a similar tool known as the *suwadi*, which is larger and more robust in construction. Resembling heavy metal shears, it is used for cutting thicker or larger sheets of gold, silver, and copper. While the kaati is preferred for delicate cutting work, the suwadi is used for tasks requiring greater force. Although modern steel cutters, mechanical sharpening devices, and electrically



Figs. 12 and 13 Reza, a mould used by goldsmiths for casting gold or silver rods; they allow the formation of rods of varying thicknesses for further processing in jewellery making. Location: workshop of Mr Ram Bharose Lal Verma and Mr Rajesh Kumar Verma, Bada Bazar, Nainital, Uttarakhand, 2024. Photo: Sah and Singh Bhakuni, 2024, under the ICHR Research Project.

powered cutting tools are now available, many artisans continue to rely on traditional kaati and suwadi tools, particularly in small-scale handcrafted jewellery production, where manual control remains important (Verma, A., 2025, Interview).

REZA (ROD MAKER)

The *reza* is a traditional mould used by goldsmiths to produce rods of gold or silver that are later drawn into wire or shaped into jewellery components (Figs. 12 and 13). Molten metal is poured into the mould, where it solidifies into rod-like forms. The reza typically contains two elongated casting grooves of different sizes, allowing the production of rods of varying thicknesses for different stages of jewellery making. Traditionally made from cast iron or *degchun* (an iron alloy used for tool making), the reza is durable and resistant to repeated heating. It is also fitted with a small handle for safe handling during the casting process. The rods produced using the reza serve as raw material for subsequent processes such as wire drawing, hammering, and shaping (Verma, S., 2024, Interview).

JANTAR (WIRE-DRAWING PLATE) AND GAUA (WIRE-PULLING TOOL)

The *jantar* is a specialised tool used by goldsmiths to produce fine gold and silver wires for jewellery making (Fig. 14). It consists of a flat metal plate with a series of graded holes arranged from larger to smaller diameters. A metal rod or thick wire is drawn through these holes successively, gradually reducing its thickness and producing uniform wires without breakage. The wires produced are used for chains, filigree work, and other intricate jewellery components (Verma, R., 2024,

Interview). The *gaua* (Fig. 15) is used in conjunction with the *jantar* during the wire-drawing process. Resembling a pair of long metal pliers, it is used to grip the protruding end of the metal rod or wire and pull it through the holes of the *jantar*. Its grooved gripping head prevents slipping, while the long handles provide leverage and control. Together, the *jantar* and *gaua* (Figs. 14 and 15) enable goldsmiths to produce wires of varying thicknesses required for different stages of jewellery production (Verma, R., 2024, Interview).



Fig. 14 (top) *Jantar*, a perforated metal plate used by goldsmiths to draw gold or silver into fine wires of varying thicknesses during the jewellery-making process. Location: workshop of Mr Ram Bharose Lal Verma and Mr Rajesh Kumar Verma, Bada Bazar, Nainital, Uttarakhand, 2024. Photo: Sah and Singh Bhakuni, 2024, under the ICHR Research Project.

Fig. 15 (bottom) *Gaua*, a metal gripping tool used in conjunction with the *jantar* to pull gold or silver through the perforated plate during the wire-drawing process. Location: workshop of Mr Ram Bharose Lal Verma and Mr Rajesh Kumar Verma, Bada Bazar, Nainital, Uttarakhand, 2024. Photo: Sah and Singh Bhakuni, 2024, under the ICHR Research Project.

BARAM (DRILL)

The *baram* is a traditional hand-operated drilling tool used by jewellers to create fine holes in gold and silver ornaments (Fig. 16). It consists of a metal spindle fitted with a drill chuck, a circular metal disc, a wooden handle, and a cord mechanism. During operation, the cord is wound around the spindle, and the wooden handle is moved up and down, causing the spindle and drill bit to rotate and gradually create holes in the metal



Fig. 16 (left) Traditional *baram* (hand-operated drill) used in jewellery making for creating fine holes in gold and silver ornaments. Location: workshop of Mr Ram Bharose Lal Verma and Mr Rajesh Kumar Verma, Bada Bazar, Nainital, Uttarakhand, 2024. Photo: Sah and Singh Bhakuni, 2024, under the ICHR Research Project.

Fig. 17 (right) Modern hand-cranked drill used in jewellery workshops, operated by rotating the side handle manually to create holes in metal pieces.

Location: workshop of Mr Ram Bharose Lal Verma and Mr Rajesh Kumar Verma, Bada Bazar, Nainital, Uttarakhand, 2024. Photo: Sah and Singh Bhakuni, 2024, under the ICHR Research Project.

surface. The circular disc helps maintain stability and smooth rotation during drilling. Although labour-intensive and requiring considerable skill, the baram has traditionally been used to create precise perforations for stone settings, chains, and decorative patterns. With technological advancements, it has largely been replaced by mechanical hand drills and electric rotary tools, which allow faster, more efficient drilling. A modern hand-cranked drill used in jewellery workshops is shown in figure 17. Despite this shift, the baram remains an important symbol of traditional jewellery-making technology and craftsmanship (Verma, R., 2024, Interview).



Fig. 18 Traditional hammer and airan used in jewellery-making. The hammer is used to shape and flatten gold or silver, while the iron airan, fixed into a wooden base, provides a stable surface for controlled hammering. Location: workshop of Mr Sudhir Verma, Nainital, Uttarakhand, 2024. Photo: Sah and Singh Bhakuni, 2024, under the ICHR Research Project.

HAMMER AND *AIRAN* (METAL BLOCK)

The hammer and *airan* (Fig. 18) are essential tools used in traditional jewellery-making for shaping and refining gold and silver. The *airan* serves as a stable working base, consisting of a solid iron block fixed into a wooden stump that absorbs vibration and provides support during hammering. The hammer is typically small and lightweight, with a metal head and a wooden handle that allows controlled striking. During the process, the metal is placed on the *airan* and shaped through repeated hammering to flatten sheets, adjust thickness, refine edges, and form jewellery components. Although modern equipment such as rolling mills, hydraulic presses, and motorised forming machines now assist in metal shaping, the traditional hammer and *airan* remain indispensable for the detailed hand-finishing and fine adjustments that require precision and craftsmanship (Verma, S., 2024, Interview).

MOULDS

In Kumaun, silver jewellery was traditionally crafted entirely by hand without the use of moulds. Over time, however, moulds were introduced to create more intricate and consistent decorative patterns on gold and silver ornaments. Usually made from durable metals such as iron, bronze, or brass, these moulds contain engraved floral, geometric, and traditional ornamental designs. In the traditional process, a thin sheet of gold or silver was placed over the mould and carefully hammered so that the engraved pattern emerged in relief on the metal surface. This technique required considerable skill to achieve clear and precise impressions while avoiding damage to the metal. The use of moulds enabled artisans



Fig. 19, 20 (top) Traditional metal moulds used in jewellery-making to imprint decorative motifs on gold and silver ornaments. The moulds contain engraved patterns that are transferred onto thin metal sheets through controlled hammering. Location: workshop of Mr Rajendra Verma, Shop no. 211, New Market, Tallital, Nainital, Uttarakhand, 2024. Photo: Sah and Singh Bhakuni, 2024, under the ICHR Research Project.

Fig. 21 (bottom) Set of small metal moulds displaying floral and ornamental motifs used by artisans to reproduce repeated decorative designs on jewellery components. Location: workshop of Mr Rajendra Verma, Shop no. 211, New Market, Tallital, Nainital, Uttarakhand, 2024. Photo: Sah and Singh Bhakuni, 2024, under the ICHR Research Project.

to reproduce detailed designs with greater consistency across multiple jewellery pieces. With technological advancements, traditional hammer-based moulding has increasingly been supplemented by die-press machines, hydraulic stamping tools, and other modern techniques that allow faster production and greater uniformity. Nevertheless, traditional moulds continue to play an important role in handcrafted jewellery, where artisans value manual techniques for preserving the aesthetic character and authenticity of regional jewellery traditions (Verma, S., 2024, Interview). Different types of moulds are shown in figures 19, 20, and 21.

KANSALA AND THUKANNA (DAPPING BLOCK AND PUNCHES)

The *kansala* and *thukanna* are traditional tools used for shaping gold and silver jewellery (Fig. 22, 23). The *kansala* serves as a base containing semi-rounded cavities that help form thin metal sheets into curved or dome-like shapes. It is usually made of wood or bronze and is available in different sizes for producing various jewellery components. The *thukanna* is an iron tool with rounded ends that fit into the cavities of the *kansala*. During the shaping process, a thin sheet of gold or silver is placed over a cavity in the *kansala*, and the *thukanna* is positioned on top and struck gently with a hammer. This allows the metal to gradually take the desired shape and is commonly used to produce domes, beads, and other decorative jewellery elements. Although modern hydraulic presses, die-forming machines, and stamping equipment have increased production speed and uniformity, the *kansala* and *thukanna* remain important tools in handcrafted jewellery, where manual techniques help preserve the authenticity of regional traditions (Verma, A., 2023, Interview).



Fig. 22, 23 Wooden and bronze kansala used with iron thukanna of various sizes to shape thin sheets of gold and silver into semi-rounded and domed jewellery components through controlled hammering. Location: workshop of Mr Rajendra Verma, Nainital, Uttarakhand, 2024. Photo: Sah and Singh Bhakuni, 2024, under the ICHR Research Project.

RING ROD

The ring rod is an iron tool used by jewellers to shape and adjust rings according to finger size (Figs. 24 and 25). It consists of a long-tapered rod marked with standard ring sizes. During the ring-making process, a partially formed ring is placed on the rod and gently hammered to achieve a uniform circular shape and the required size. By moving the ring along the tapered surface, artisans can make precise adjustments to ensure a proper fit. Although traditional ring-sizing methods have increasingly been supplemented by mechanical ring stretchers and digital measuring tools, the ring rod remains an important tool in handcrafted jewellery production (Verma, A., 2025, Interview). The engraved numerical markings on the rod enable artisans to measure and adjust ring sizes accurately (Fig. 25).



Fig. 24, 25 Ring rod used by jewellers to shape and adjust rings to the required finger size. The tapered rod with size markings helps artisans accurately form and measure rings during the final stages of ring-making. Location: workshop of Mr Rajendra Verma, Nainital, Uttarakhand, 2024. Photo: Sah and Singh Bhakuni, 2024, under the ICHR Research Project.

KANGAN SHAIL (BRACELET MANDREL)

The *kangan shail* is a metal tool used by jewellers to shape and adjust bangles during the jewellery-making process (Fig. 26). It consists of a thick, tapered cylindrical rod on which a partially formed bangle is placed and gently hammered to achieve a smooth, circular shape. By moving the bangle along the tapered surface, artisans can adjust its size and ensure uniformity and symmetry. Although traditional shaping methods have increasingly been supplemented by mechanical bangle-shaping machines and hydraulic presses, the *kangan shail* remains an important tool in workshops where handcrafted jewellery-making techniques continue to be practised (Verma, A., 2025, Interview).

CHAINI (CHISEL)

The *chaini* is used to cut thick pieces of gold and silver (Fig. 27). It consists of a sharp lower end that cuts the metal and a flattened upper end that is struck with a hammer. During use, the chisel is positioned on the metal surface and hammered to produce a precise cut (Verma, S., 2024, Interview).



Fig. 26 (top) Kangan shail is used by jewellers to shape and adjust bangles into a uniform circular form during the bangle-making process. Location: workshop of Mr Ram Bharose Lal Verma and Mr Rajesh Kumar Verma, Bada Bazar, Nainital, Uttarakhand, 2024. Photo: Sah and Singh Bhakuni, 2024, under the ICHR Research Project.

Fig. 27 (bottom) A chisel or chaini used in jewellery-making to cut, shape, and refine metal components during the crafting process. Location: workshop of Mr Narendra Lal Verma, Johri Bazar, Almora, Uttarakhand, 2023. Photo: Sah and Singh Bhakuni, 2024, under the ICHR Research Project.

CHIMPTI (PLIERS/CLIP)

The *chimti* is an important hand tool used by jewellers for gripping and handling small jewellery components during the crafting process. It consists of two narrow metal arms joined at one end, allowing artisans to securely hold delicate materials. Available in different sizes, the tool is commonly used for handling gemstones, thin wires, small pieces of gold or silver, and other decorative elements, particularly during stone-setting. Its fine tips enable precise manipulation while reducing the risk of damage (Verma, N., 2023, Interview).

TARAJU (SCALE)

Traditional weighing methods in jewellery-making have undergone significant changes. While digital scales are now widely used, earlier goldsmiths measured gold and silver using traditional balances and silver coins. A silver coin equivalent to 16 *annas* was considered equal to 1 *tola*, with 1 tola weighing approximately 11.664 grams. The historical weight standards used in jewellery-making are presented in Table 1.

Unit	Quantity
1 Ratti	0.1215 Grams
1 Aana	6 Ratti (0.729 Grams)
1 Tola	16 Aana (11.664 Grams)

Table 1: Conversion of Traditional Gold and Silver Measurement Units (Ratti, Aana and Tola) into Grams. Source: Mr. Rajendra Verma, Goldsmith, Naya Bazar, Tallital, Nainital, Uttarakhand (Interview).

KUMAUN JEWELLERY-MAKING PROCESS

Using the tools and techniques described above, jewellery in Kumaun is crafted through a series of stages, beginning with the procurement of raw materials and ending with the assembly of finished ornaments. Owing to the limited availability and high cost of gold, silver has traditionally been the primary material used in jewellery-making. Gold was generally supplied to goldsmiths in the form of biscuits, while silver was procured as bricks. According to Shri Rajendra Verma, a standard gold biscuit weighs approximately 10 tolas (116.64 grams) (Verma, N., 2023, Interview).

After procurement, the metal is melted in a furnace using a crucible and coal, and then cooled with water (Kodak, 2023, Interview). The molten metal is subsequently shaped into sheets, wires, or rods according to design requirements. Tools such as the hammer, jantar, and gaua are used to produce wires, reza is used to make rods, and dabkani is employed for preparing sheets (Verma, R., 2024, Interview). The shaped metal is then placed on moulds and carefully hammered to create the desired designs. Different moulds are used for different ornaments, improving efficiency and consistency in production. During this process, gold and silver are heated with a banknal to prevent breakage caused by hammering (Verma, S., 2024, Interview). Certain hollow ornaments are reinforced with lakh (*Laccifer lacca* or *Kerria lacca*) to provide structural support (Verma, G., 2023, Interview). Finally, the individual components are assembled into finished ornaments. In Kumaun, artisans who specialise in threading jewellery components into garlands are known as *patuas* (Verma, G., 2023, Interview).

TRADITIONAL ORNAMENTS OF THE PEOPLE OF KUMAUN, UTTARAKHAND: A CULTURAL OVERVIEW

The traditional ornaments of Kumaun, Uttarakhand, reflect the region's rich cultural heritage, regional aesthetics, and socio-religious traditions. Beyond their decorative function, these ornaments convey meanings related to gender, marital status, ethnicity, social status, and ritual practices. Kumauni ornaments may be classified by their sociocultural function into gender-specific, ethnic, social, and anatomical categories. They are also categorised based on the part of the body they are worn on, including ornaments for the feet, waist, hands, neck, nose, ears, and head. While women are the primary wearers of most ornaments, certain pieces, such as the *Mangalsutra*, serve as important symbols of marital status and social identity.

ORNAMENTS WORN ON THE FEET

Among the most common foot ornaments in Kumaun are *Bichua* or *Bichiya* (Fig. 28), toe rings made from white metal locally known as *gillet*. Traditionally worn by married women, these rings often feature floral designs and symbolise marital status. Their open design allows flexibility in sizing and comfortable wear. Anklets, locally known as *Payal* or *Pajeb* (Fig. 29), are another important category. They vary in size and design and may be adorned with small bells. Traditionally, anklets with bells were worn by daughters-in-law so that their movement could be respectfully heard by elders, reflecting local domestic customs. *Pajeb* are generally heavier and are often worn on ceremonial occasions.

Fig. 28 A pair of Bichua or Bichiya.
Location: Champawat, Uttarakhand. Photo: Sah and Singh Bhakuni, 2025, under the ICHR Research Project.



Fig. 29 A pair of Payal or Pajeb.
Location: Someshwar, Uttarakhand. Photo: Sah and Singh Bhakuni, 2025, under the ICHR Research Project.



Fig. 30 A Paijniya.
Location: workshop of Mr Narendra Lal Verma, Johri Bazar, Almora, Uttarakhand, 2023. Photo: Sah and Singh Bhakuni, 2023, under the ICHR Research Project.



Other varieties include Imarti, made from twisted gillet wires with attached bells, and Jhawar (also known as *Paijniya* or *Pajina*), thick hollow anklets containing metal or stone pellets that produce sound while walking (Fig. 30). A single Jhawar can weigh up to 242 grams (Joshi, 2021).

ORNAMENTS WORN AROUND THE WAIST

The *Tagdi* or *Kamarbandh* is the principal waist ornament in Kumaun. Made from intricately woven cloth or solid silver, it serves both decorative and functional purposes by accentuating the waistline and helping secure traditional attire during rituals and festivals (Verma, S.L., 2023, Interview).

ORNAMENTS WORN ON THE HANDS

Hand ornaments in Kumaun are diverse and include rings (Figs. 31 and 32) and *Challa* (multi-looped rings or bangles), which may be made of gold, silver, copper, or iron. These ornaments can be plain or embellished with stones, depending on personal preference and economic status (Joshi, 2021). The *Pauji* or *Pahunchi* is an important traditional wrist ornament, particularly among Shoka women. The silver variety is stitched onto red or black velvet, while the gold version, generally worn during festivals and marriages, is hollow and filled with lakh to provide strength and lightness (Verma, G., 2023, Interview). Depending on the type, it contains 20–30 gold beads or 40–60 silver beads and is secured with a thread and hook mechanism (Joshi, 2021). Two pairs of gold *Pauji* is shown in figure 33. *Dhagulas* are thick silver bangles traditionally worn by both men and women in Kumaun (Fig. 34). They are often gifted by a maternal uncle to a newborn during the naming ceremony as a symbol of

Fig. 31, 32. Rings.
Location: Krishna
Jewellers, Bada Bazar,
Nainital, Uttarakhand.
Photo: Sah and Singh
Bhakuni, 2024, under
the ICHR Research
Project.



Fig. 33 Two pairs of
pauji.
Location: workshop of
Mr Govind Lal Suresh
Chand Jewellers, Sunar
Gali, Pithoragarh,
Uttarakhand, 2024.
Photo: Sah and Singh
Bhakuni, 2024, under
the ICHR Research
Project.



Fig. 34 A pair of
Dhagula. Location:
workshop of Mr
Narendra Lal Verma,
Johri Bazar, Almora,
Uttarakhand, 2023.
Photo: Sah and Singh
Bhakuni, 2023, under
the ICHR Research
Project.



protection and blessing. These ornaments are generally heavy, often weighing more than 200 grams, and feature decorative engravings created through hand craftsmanship. Adult *Dhagulas* are thick and solid, while children's versions are lighter and may include small bells. They continue to be valued as traditional ornaments and family heirlooms in Kumauni households (Verma, G., 2023, Interview). *Thoka* or *Thvak* (Fig. 35) are large silver bracelets that were traditionally worn in Kumaun. Usually weighing between 400 and 500 grams, they symbolised wealth and status. These bracelets feature engraved geometric patterns and an opening mechanism secured by a screw or pin. Owing to their size and weight, they were primarily worn during special occasions and ceremonies (Verma, N., 2023, Interview). Bangles are another common hand ornament made of gold or silver and are often hollow with a lakh filling to maintain their shape.

ORNAMENTS WORN AROUND THE NECK

Neck ornaments are among the most valued ornaments in Kumauni culture (Jain, 2021). The *Soota* (*Sutiya*, *Sutwa*, or *Hansuli*) (Fig. 36) is a silver necklace worn by women and children; lighter versions are gifted during naming ceremonies, while women's versions may weigh up to 1 kg. The *Galobandh* or *Gulbandh* (Fig. 37) consists of gold or silver pieces stitched onto a velvet base, traditionally red for married women and black for widows or elderly women (Joshi, 2021). Other important neck ornaments include the *Chandrarhar*, (Fig. 38) a long silver garland symbolising prestige and status (Verma, S.L., 2023, Interview), *Gagri Mala* (Fig. 39), *Elaichi Mala*, and the *Moonga Mala* (Fig. 40), which is traditionally worn by

the bridegroom and his brothers during Sah community marriage ceremonies (Sah, C., 2024, Interview).

Fig. 35 A Thoka.
Location: workshop of Mr Narendra Lal Verma, Johri Bazar, Almora, Uttarakhand, 2023. Photo: Sah and Singh Bhakuni, 2023, under the ICHR Research Project.



Fig. 36 A Hansuli.
Location: workshop of Mr Narendra Lal Verma, Johri Bazar, Almora, Uttarakhand, 2023. Photo: Sah and Singh Bhakuni, 2023, under the ICHR Research Project.



Fig. 37
A Galobandh.
Location: Krishna Jewellers, Bada Bazar, Nainital, Uttarakhand. Photo: Sah and Singh Bhakuni, 2024, under the ICHR Research Project.

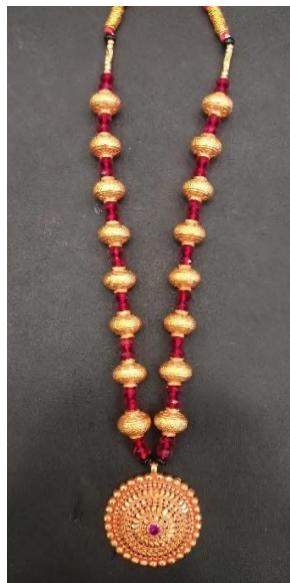


Fig. 38 (bottom, left)
A Chandrahar.
Location: Krishna Jewellers, Bada Bazar, Nainital, Uttarakhand. Photo: Sah and Singh Bhakuni, 2024, under the ICHR Research Project.

Fig. 39
A Gagrimala.
Location: Krishna Jewellers, Bada Bazar, Nainital, Uttarakhand. Photo: Sah and Singh Bhakuni, 2024, under the ICHR Research Project.

Fig. 40
A Gagrimala, Moonga Mala, Galoband, Mangalsutra Nath (rounded nose ring) and other ornaments can be seen in traditional attire.
Location: Bhimtal, Uttarakhand.
Photo: Sah and Singh Bhakuni, 2024, under the ICHR Research Project.



Fig. 41
A traditional Kumauni Nath.
Location: Krishna Jewellers, Bada Bazar, Nainital, Uttarakhand.
Photo: Sah and Singh Bhakuni, 2024, under the ICHR Research Project.

ORNAMENTS WORN ON THE NOSE

Nose ornaments hold special significance in Kumauni culture. The *Phulli* (*Longphali* or *Keel*) is worn by women irrespective of marital status, although married women generally wear larger versions, often decorated with coloured stones. The *Jadaudar* or *Navratna Phulli* is distinguished by its nine gemstone settings, while Shoka women commonly wear the large *Beera* (Joshi, 2021). The *Nath* (Fig. 41) is the most important nose ornament and symbolises marriage and auspiciousness. Traditionally circular in shape, it is often decorated with *Chandak* and *Meenakari* floral motifs and supported by a chain or pearl string attached to the hair. Its weight may range from 1–10 tolas, while a smaller version is known as *Nathniyan* (Kodak, A., 2023, Interview).

Fig. 42
A pair of *Munade*.
Location: the workshop of Govind Lal Suresh Chand Jewellers, Sunar Gali, Pithoragarh, Uttarakhand, 2024.
Photo: Sah and Singh Bhakuni, 2024, under the ICHR Research Project.



Fig. 43
A pair of *Jhumkas*.
Location: Krishna Jewellers, Bada Bazar, Nainital, Uttarakhand
Photo: Sah and Singh Bhakuni, 2024, under the ICHR Research Project.



Fig. 44
A pair of *Jhumkas*.
Location: Krishna Jewellers, Bada Bazar, Nainital, Uttarakhand
Photo: Sah and Singh Bhakuni, 2024, under the ICHR Research Project.

Another nose ornament is the *Besar*, worn on the septum. Its principal forms include *Bulaq*, *Aarh* (Fig. 43), and *Bisar*, and in some regions it is also known as *Bulaq* (Verma, K., 2023, Interview).

ORNAMENTS WORN ON THE EARS

Ear ornaments in Kumaun are diverse and artistically significant. *Munade* are solid gold earrings that taper downward (Fig. 42), while *Murke* (also known as *Utraula* or *Murkiya*) are small, rounded earrings worn on the ear's edge (Joshi, 2021).

Kanphool or *Karnaphool* (Fig. 43), meaning “flower of the ear,” are floral earrings commonly worn during festivals and weddings (Jain, 2021). Other popular ornaments include *Tops*, which are secured with a screw at the back, and *Jhumkas*, dome-shaped earrings with hanging elements. Owing to their weight, *Jhumkas* (Fig. 44) are often supported by chains, pearl strings, or, in rural areas, colourful woollen threads (Verma, P., 2023, Interview).

ORNAMENTS WORN ON THE HEAD

Head ornaments such as *Mangtika* or *Sheeshphool* are worn on the forehead during weddings and religious ceremonies. Usually weighing between 0.5 and 3 tolas, they consist of a central pendant suspended from a gold or silver chain attached to the hair.

Other important head ornaments include *Beniphool*, a silver ornament attached to the braid with a chain extending down the back, and *Mathbedu*, a traditional headpiece worn during rituals and ceremonial occasions (Verma, I., 2023, Interview).

DISCUSSION AND CONCLUSION

This study is situated within the broader discourse on craft heritage, material culture, and indigenous technological knowledge. Traditional goldsmithing in Kumaun represents a form of artisanal knowledge in which skills, techniques, and design traditions are transmitted across generations. The findings demonstrate that jewellery-making is not merely a material practice but also a cultural process shaped by social, economic, and technological change. Jewellery has long held an important place in the socio-cultural life of Kumaun. Traditionally crafted from silver and occasionally gold, ornaments functioned not only as adornments but also as markers of marital status, identity, social position, and ritual observance. Although many traditional customs continue to survive, changing lifestyles and modern influences have altered both the forms and meanings of jewellery. Field data reveal that the Verma community occupies a central position in Kumaun's traditional jewellery-making tradition. Interviews with artisans showed that the

community has historically preserved indigenous knowledge, traditional motifs, and specialised techniques associated with ornament production. Traditional ornaments such as *galobandh*, *soota*, and *nath* continue to be produced by Verma artisans in districts including Almora, Pithoragarh, Bageshwar, Champawat, Udham Singh Nagar, and Nainital. The findings, therefore, identify the Verma community as a key custodian of the region's jewellery heritage and intangible cultural knowledge. At the same time, the study indicates that traditional jewellery-making is experiencing a gradual decline. Artisans reported that the expansion of branded jewellery outlets and the growing preference for established national brands such as Tanishq, Kalyan Jewellers, Malabar Gold & Diamonds, Joyalukkas, and PC Jeweller have reduced demand for locally crafted ornaments (Business Outreach, 2024). Participants also identified declining interest among younger generations, due to rural-to-urban migration, rising gold prices, limited market access, and the increasing popularity of lightweight, artificial, and rental jewellery as major challenges. These factors reflect broader socio-economic transformations that are affecting both the livelihood of artisans and the continuity of traditional knowledge. The findings support observations that goldsmithing has historically functioned as a caste-based occupation in which knowledge is transmitted through family networks (Kanungo and Chakrabarti, 2021). Traditional ornaments continue to carry cultural meanings related to identity, social status, and protection (Maïga and Harouna, 2024), underscoring the enduring relevance of artisanal jewellery despite shifting consumer preferences. To ensure the continuity of this heritage,

targeted interventions are required, including training programmes for younger artisans, digital promotion of local designs, collaborations with contemporary designers, and greater public awareness through museums, exhibitions, and academic research. Such initiatives may help traditional jewellery-making adapt to contemporary markets while preserving its cultural distinctiveness. The study concludes that the jewellery-making traditions of Kumaun represent a valuable intersection of craftsmanship, cultural identity, and indigenous knowledge. While modernisation has transformed production techniques and consumer preferences, the continued participation of artisan communities, particularly the Verma community, remains essential for safeguarding this important element of Kumaun's cultural heritage.

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AI USE DISCLAIMER

The authors used AI-assisted tools solely for language editing (grammar and clarity). All scientific content, interpretations, and conclusions are the sole responsibility of the authors.

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Perspectives on Sustainable Development in the Jewellery Industry

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ABSTRACT

This exploratory paper presents the perspectives of industry professionals on sustainable development in the jewellery industry from 2015 to 2024 (inclusive). This is achieved through thematically collating and analysing discussions which took place at the Fair Luxury conference, The State of Sustainability in the Jewellery Industry, held in June 2025 at The Goldsmiths' Centre, London. The material presented during the conference was further developed through the integration of industry sources, providing a stronger academic grounding.

First, the impact of sustainable development is established, to map out the scale and scope of supply chains related to gold, diamond and coloured gemstones in a global context over the last decade. Second, current attitudes and industry practices are thematically analysed to present current approaches engaging in sustainable development. Lastly, emergent aspirations for further sustainable development in the jewellery industry are outlined to identify where future efforts may be invested for sustainable development.

I posit that while global progress remains limited in scale, industry infrastructure for sustainable development is now more greatly established for stakeholders across the supply chain: offering tested pathways to scale impact through increased participation. Findings include seven attitudes to frame industry practice, demonstrating adaptation for local and global contexts. Practice-informed insights demonstrate UK businesses adopting strategies such as

carbon reduction, traceable sourcing and more transparent consumer communication. The paper forms a reference point: to help track the complexity of sustainable development discourse within the jewellery industry over time and offer insights in how to respond to geopolitical inequality in supply chains.

Keywords: *Sustainable Development; Ethical Practice; Radical Craft; Supply Chain; Neocolonialism; Extractive Industries*

INTRODUCTION

Historically, there has been disconnect between miners, refiners, trade specialists, manufacturers, designers, craftspeople, educators, retailers and consumers in the global jewellery industry. The issues associated with this division subverted public knowledge until the term ‘blood diamonds’ reached the consumer lexicon in the 1990s. Since then, the industry has been openly criticised for ‘dirty’ practices including social injustices, economic exploitation of mining communities, environmental degradation and unregulated toxic chemical practices, compounded by a lack of transparency on, and accountability for, these issues (Archuleta, 2016; Oakley, 2019).

In response, international interventions emerged. In the wake of the Global Witness (1998) report, *A Rough Trade*, the Kimberley Process (2025) was established in 2003, to certify the conflict-free origin of diamonds, intended to ensure that diamond sales in war zones do not fund armed conflicts. The ‘No Dirty Gold’ campaign in 2004, led by NGO Earthworks and Oxfam America, sought to raise awareness of the issues to the consumer and retailer as a catalyst for change in gold mining practices (Earthworks, 2004). In 2011, the Fairtrade and Fairmined accreditation systems launched in 2011, to certify the traceability of gold and silver from licensed mining operations in Bolivia, Colombia, Ecuador and Peru (ARM, 2013). Extractive industries related to jewellery manufacturing are typically not considered sustainable, given resources are non-renewable and irreversibly impact the environment. External to the sector, the United Nations (2025) adopted the now commonly recognised Sustainable

Development Goals in 2015, to support social, economic and environmental stability across borders and industries, acknowledging extractive industries’ vital role in creating long-term value for mining communities.

Further development has occurred over the last decade (2015–2024 inclusive) to address divides that persist between stakeholders in the global jewellery industry. To further academic discourse, this paper aims to capture changes in industry perspectives over the last decade.

RESEARCH RATIONALE AND METHODOLOGY

This paper responds directly to the discussions which took place at the Fair Luxury conference, *The State of Sustainability in the Jewellery Industry* (2025), held on the 9th June 2025, 1–8pm, at The Goldsmiths’ Centre, London. Invited industry professionals delivered four presentations, followed by four panel discussions, with audience Q&A, to represent sustainable developments within micro- to large-scale organisations. This exploratory paper mirrors the conference’s 10-year framework to assess change in the industry and will represent the industry’s internal debate and offer perspectives of both pioneering and ongoing sustainable developments that have occurred since the groundbreaking establishment of certification systems. Industry reports and community networks typically address sustainable developments individually and on an annual timeframe, whereas the intention of this

paper is to build a broader understanding of the thematic issues connecting industry practices. The methodological approach adopted in this paper involves the collection of data directly from conference presentations and their critical examination through engagement with relevant industry publications. Conference data was collected through notetaking and then thematically analysed (Braun and Clarke, 2006) to present non-identifiable views. The material derived from the presentations and panel discussions at the conference (Fair Luxury, 2025) will feature abbreviated referencing “(c.)” throughout this paper. The collected data is supported by sources to provide broader contextual information and examples. Additionally, a critical review of the attitudes toward sustainable development within the industry, the existing supply chain systems and how businesses align with sustainable development is offered, to evaluate the nature and rate of sustainable development. These aspects are analysed in relation to industry reports and the Sustainable Development Goal framework (United Nations, 2025).

SCOPE

There are forms of sustainable development or practices which can operate in jewellery supply chains: mining can offer economic, cultural and other social benefits. In this paper, the term sustainability aligns with the United Nation’s definition—“meeting the needs of the present without compromising the ability of future generations to meet their own needs.” (United Nations, 2026)—and is intended to reflect the journey toward more sustainable development, rather than

defining any aspect of extractive mining as inherently sustainable.

This paper intends to capture perspectives on sustainable development within the industry over the last decade. To achieve this, the investigation reviews the socio-cultural perspectives based on their grounding in the past, present and future. First, sustainable developments from 2015 to 2024 (inclusive) will be mapped out to review the scale of innovation in a global context. Secondly, current industry perspectives presented at the conference will be thematically analysed. This will encompass changes in attitudes which have led to sustainable development. Industry practices will also be discussed to present current approaches responding to the attitudes. Lastly, emergent industry aspirations will be outlined to explore where future efforts may be invested.

The paper will not provide comprehensive research on each specific topic raised; its value lies in capturing an overview of sustainable developments from the perspective of industry professionals. The perspectives shared are from professionals in the Global North, and whilst some of the contributors have direct engagement with mining communities in the Global South, the findings are inherently limited by their representation. This exploratory study offers a useful resource for researchers, educators and industry to engage with these sociocultural perspectives which are scarcely captured in academic research.

INDUSTRY REVIEW: 2015–2024

This section reviews the past decade of activity discussed at the conference. Broadly, the conference emphasised the need for responsible mining strategy sector-wide, to promote traceable supply chains: considering the local environment and social dimensions (c.). Following this, a change in business models was noted: frameworks that embed economic, social and ecological equity are replacing solely economic frameworks (c.). A call for greater governance through industry regulation was made, given that global jewellery markets are not significantly affected by sustainability credentials (c.). The information shared below provides a sense of the scale of sustainable development made over the last decade. This focuses on Artisanal and Small-scale Mining (ASM) communities and emphasises the liminal nature of sustainable development issues faced by the jewellery industry.

ASM (ARTISANAL AND SMALL-SCALE MINING)

The jewellery industry circulates precious metal, diamonds and coloured gemstones from newly-mined, pre-mined and synthetic (often labelled ‘lab-grown’) materials. Mining practices vary from artisanal to small-scale, medium and large scales. ASM is characterised by workers utilising basic tooling to extract their desired metal or mineral from the earth. This typically informal manual labour activity is coupled with a lack of economic infrastructure, which leads to risk of exploitation and illicit activity (Pact, 2025; Yansura, 2025). For example, an industry insider suggested that the mines of the Ituri province in the

Democratic Republic of Congo extract 5–6 tonnes of gold per year, yet only 18kg was legitimately exported out of the country in 2023 (c.). Most of the gold extracted was thought to reach the international market in Dubai and China through the African Gold Refinery in Entebbe, Uganda (c.); the African Gold Refinery has faced US sanctions since 2022 for the illicit movement of gold (Open Sanctions, 2025).

Most recent statistics from 2017 indicate that ASM (in gold, gemstones and other metals unrelated to jewellery) provides a vital livelihood for nearly 40 million people around the world, with a further 150 million depending on ASM across 80 countries in the Global South. It is estimated that the ASM sector contributes 20% of the gold, 80% of the sapphire and 20% of the diamond supply globally (c.; IGF, 2017). ASM is paradoxical for sustainable development: it is a vital source of income for remote and impoverished communities, yet can contribute to illegal activity and unregulated practices, risking lives and the environment (c.; Human Rights Watch, 2018). For example, mercury is used to extract gold from mined ore, forming an amalgam. This amalgam needs to be heated to vaporise the mercury, leaving the pure gold behind. The open burning of mercury is commonplace: despite the risk, it’s estimated that 10–19 million gold miners release approximately 410–1400 tonnes of mercury into the air, water and soil annually (Esdaile and Chalker, 2018).

ASMs are considered key to contributing toward sustainable development within the extractive industries for precious metals, diamonds and gemstones

(c.; Pact, 2025). Yet the challenge lies in the scale: engaging with individuals and communities at a local level in a meaningful and sustained way, across global mining sites (c.). The economic viability of mining is tied to the ASM community livelihoods: as the price of gold has increased over the last decade, it suggests ASM extraction is on the increase (c.). However, there is major risk of displacement, in times when the global gold price crashes, or as seen in the diamond industry over the last decade. Synthetic diamond alternatives have become popularised and are up to 90% cheaper than their mined counterpart, which has negatively impacted the demand for mined diamonds (Forbes, 2025). Beyond their desirability within the jewellery context, these precious materials are entangled with other industries and currency, which further influence value, extraction rate and operational methods, making it a volatile landscape for mining communities (c.).

GOLD AND COLOURED GEMSTONE INITIATIVES

By 2015, gold mining reform had already been proven possible (c.). Since then, smaller-scale initiatives for traceable precious metal supply chains have emerged. These include: Single Mine Origin gold, which was launched in 2017 as a joint venture between the Betts Group and Hummingbird Resources, and the AgAIN silver product (recovered from X-ray film) launched in 2022 by Betts Group (Betts Metal Sales, 2025a; Betts Metal Sales, 2025b). The CRAFT (Code of Risk-mitigation for ASM engaging in Formal Trade) code was developed, in 2018 to “convert the due diligence process into a tool for development” for ASM communities looking to formalise (LBMA, 2020). Furthermore, PeaceGold fosters long-term partnerships

to source gold from mining communities as a mechanism for peace in areas of conflict (c.; PeaceGold, 2025). Radical change has occurred for coloured gemstones. A contributor considered the coloured gemstone sector ‘still asleep’ in 2015: responsibility focused on scientific disclosures, such as the 4 Cs (i.e., the cut, colour, clarity and carat of a gemstone), rather than the origin and related social, economic and environmental impacts in mining the material (c.). Miners’ lack of knowledge was weaponised against them in some instances due to their being in rural geographies, and often women (c.). From early 2017 the Gemological Institute of America (GIA) acted, offering free gemmological education to artisanal miners, who were shown how to sort and value their own gemstones, enabling a transition from sale by weight to sale by material value (c.; GIA, 2017; Shor 2019). Furthermore, 2018 saw the establishment of Moyo Gems, a miner-to market collaboration for coloured gemstones. The pilot project in 2019 had 91 miners involved, and as of 2024 the program had approximately 900 miners enrolled (Anzagems, 2022; Moyo Gems, 2021), which is a testament to the success of the project. Miners were said to earn ~95% of the export value where the industry average is a meagre 35% (c.). The small-scale collaboration encourages legal mining where it was previously impossible; miners become creditworthy as they have a bank account and receipts for the sales they make (c.). Now there are gemstone suppliers who are driven to represent miners and cutters through their product range and to share their stories through social media and client conversations (c.; Ethical Gem Suppliers, 2024).

SCALE OF IMPACT

However, the scale of initiative impacts has been incredibly small in a global context. In 2023, 133kg of Fairmined gold was mined, equating to 0.0036% of the total gold mined globally that same year (c.; Fairmined, 2025; World Gold Council, 2023). Virtu Gem, established in 2021, has up to 100 miners involved in sustainable development activities, yet again is a minute fraction of the global ASM community (Virtu Gem, 2025: c.). Whilst most mining communities remain unsupported, a major change in the last decade is that the industry now has greater infrastructure to support more responsible mining operations (c.). There are now numerous examples of traceable supply chains at differing scales and risk levels, and traceable ASM supply chains in coloured gemstones have now been proven possible on a small scale (c.). Increased miner representation through official media and informal social media platforms means that consumers and stakeholders further down the supply chain are increasingly aware of the need for sustainable development (c.). Accounts were shared at the conference, expressing how proud miners are of their skills and what they create, yet how external stakeholders often take advantage of their skills and resources (c.). Contributors who had visited mines recounted poor health and safety conditions, gender-based violence, and an acceptance of the deplorable environmental conditions caused as a direct result of mining activity (c.).

The impact that initiatives have had in the last decade is significant, yet it is essential that the industry avoids disillusionment with the scale of change in a global

context. Most miners are yet to experience the positive narratives the jewellery industry often celebrates: “Our friends on the ground [mining communities] have more wealth [natural resources] than we will ever have, but have no means to realise it.” (conference contributor 1, 2025).

This statement suggests that existing neocolonial systems prevent many mining communities from gaining geopolitical power, despite their rich resources. Sustainable development remains a contentious issue within the industry, with resistance to acknowledging involvement in extractive mining issues and to taking a proactive approach (c.).

TRACEABILITY AND ACCOUNTABILITY

One contributor noted that the world “woke up” in 2020, with a 50% increase in Positive Luxury licensees (2025; c.). Interest is gaining for accreditation for responsible practices within the industry, such as B-Corp and memberships through the UK National Association of Jewellers and the Responsible Jewellery Council (RJC), where members adhere to codes of conduct, assisting businesses in benchmarking their sustainable practices (c.; B-Lab, 2015; NAJ, 2025; RJC, 2025). Again, the uptake in these memberships for jewellery brands remains minimal in the UK and international context.

The RJC was established in 2005 and has been heavily criticised for its governance, standards, and certification systems. Critics posit that the RJC contributes toward greenwashing as, “RJC certification does not provide assurance that companies meet international standards for responsible sourcing.”

(Human Rights Watch, 2018). Many other accreditation-oriented initiatives face scrutiny over their effectiveness: for example, the standards set for miners to obtain accreditation can marginalise artisanal miners, who cannot access support to progress with or finance the requirements for formalisation, or the standards themselves are self-regulated, or lax in their auditing of license holders (c.). The Kimberley Process Civil Society Coalition, for example, was established as an observer of the Kimberley Process and a human rights activist to encourage good governance within the diamond sector, beyond conflict (Kimberley Process Civil Society Coalition, 2025). This indicates that the Kimberley Process falls short in both ensuring that all certified diamonds are conflict-free and in considering broader social issues affecting diamond mining communities within their criteria.

This section indicates that new sustainable development initiatives in the jewellery industry seek to empower mining communities and address systemic geopolitical and socioeconomic issues. The increased uptake in certification schemes for jewellery manufacturers and retailers evidences further action being taken toward supply chain traceability. However, the scale of impact remains minimal, and some certification systems are falling short in holding their members accountable.

INDUSTRY PERSPECTIVES

The previous section provided a sense of scale for the extractive industry challenges and the impact initiatives have had over the last decade. The complex geopolitical factors affecting ASM and limited research mean that there is no comprehensive understanding of the issues from a variety of stakeholder perspectives. As a result, sustainable development knowledge is developed through practice by stakeholders within the industry.

ATTITUDES

This section contributes to the sociocultural research gap by presenting attitudes shared by industry professionals during the conference (Fair Luxury, 2025), organised into seven groups.

Identify Opportunities for Sustainable Development

Connecting jewellers to miners for socioeconomic benefit can occur through access to an international market: there is a need to transition away from illicit trade—where the value of ASM materials moves out of their originating country—toward more formalised economies, ensuring miners have a genuine stake in the supply chain (c.). Given that millions of people rely on the extractive industries related to the jewellery industry, one contributor stated that stakeholders need to find a way to enable responsible mining and support sustainable development through celebrating geology and gemmology (c.). The industry needs to build the economic value of precious metals, diamonds and coloured gemstones to account for the cost of fair trade (c.). Jewellery is uniquely positioned to advocate for sustainable development through communicating the

sustainability “story” as a value factor of interest to the consumer (c.).

Reimagine Supply-Chain Dynamics

Risk mitigation, including preventing conflict minerals from entering the supply chain, has historically been implemented to protect and benefit large companies. This has marginalised mining communities who do not have the means to align to frameworks (c.). The aforementioned point emphasises the need to change the power dynamic within supply chains to ensure symmetry between the interests of miners and all other stakeholders (c.). It was proposed that a generational transformation was needed. For example, to pursue gold mining that is not only free from the hazardous use of mercury and conflict, but also where the practices build formalised economies where the environment and community is respected, healthy and empowered (c.). This may include incentivising nationally owned mining operations, to make it more likely for wealth creation to stay within the country, promoting sustainable development and entrepreneurial projects, which lower long-term economic reliance on mining (c.). Currently, the jewellery industry is setting the standards. There is no NGO specifically dedicated to the jewellery industry (Human Rights Watch is considered the closest) to conduct impartial research and hold the industry to account (c.).

Imperfect Actions are Encouraged

Sustainable development in mining and wider industry is an extensive undertaking; an iterative approach is necessary as mistakes will be made (c.). Another challenge is balancing all the different aspects of business—often with limited capacity—while acting toward sustainable development simultaneously (c.). A conference contributor stated that, “It’s a journey: you are never going to get there.” (conference contributor 2, 2025) emphasising the cyclical nature of sustainable practice.

Collaboration is Essential

Stakeholders were encouraged to build empathy and find common ground to move beyond polarised narratives (e.g. mined vs. recycled vs. synthetic) and recognise that all precious materials in the supply chain have the potential to support sustainable development (c.). For example, exploring methods to account for the carbon cost of mining fairly, across mineral products, both newly mined and pre-mined. Building sustained and trusting relationships—particularly with mining communities that have historically been exploited by foreign traders—across the supply chain are needed. This was considered achievable through understanding the complex issues in greater detail and humanising the narratives of miners (who are often portrayed in the binary: as ‘criminal’ or ‘hero’) (c.). Lastly, industry collaboration with academia was advocated for, to offer legitimacy to sustainable development issues, with a greater possibility of innovation for the jewellery industry (c.).

Corporate Shift

Larger companies are shifting from Corporate Social Responsibility to Environmental Social Governance (ESG) (c.). Carbon strategy has also emerged in the last decade, due to businesses needing to comply with net-zero carbon emission targets (c.). The shift to ESG indicates a transition from meeting regulations and improving efficiency to incorporating sustainable development frameworks for holistic decision-making in all aspects of the business, thereby making a more meaningful impact. Governance serves a dual purpose: ensuring regulatory compliance—e.g., to climate-related law—and in enabling a company to articulate its own distinct values across social, economic and environmental dimensions (c.). Some business models have also undergone progressive change, to avoid undermining their impact: the Hockley Mint, for example, established an Employee Ownership Trust in 2023, to ensure the power was no longer a ‘top-down’ model (c.; Hockley Mint, 2025).

Industry Change is not (Currently) Consumer Driven

It was identified by contributors in the room that sustainable development was self-initiated, whether as an independent jeweller, a medium or large manufacturer or retailer (c.). Price was the first concern for clients (based on confidential surveys and direct conversations conducted by retailers) when making a jewellery purchase, with questions on ethics second, or not considered at all (c.). A general industry attitude that consumer demand for sustainable development is necessary to validate the pursuit of this activity was posited (c.). The contributors noted that taking sustainable development actions pays dividends

through focusing on genuine sales, enabled through informing clients about their values or ESG (c.).

Good Intentions are not Enough

Having good intentions or developing frameworks and policies is not enough without evidenced implementation (c.). From a carbon perspective, the best thing to do is to sell less, which is a conundrum businesses need to resolve to justify their level of production (c.). It was warned that carbon accounting can further risk clarity of the overall business impact: investing in good projects rather than removing slivers from a footprint may lead to greater impact (c.). Lastly, the loose use of terms such as ‘recycled’ and ‘lab-grown’ (Davidson, 2022) implies greater sustainability credentials for ‘non-mined’ products—avoiding the nuanced reality of material acquisition and overall impact. Greenwashing tactics like this have become a greater issue over the last decade, and it is preventing industry change (c.).

All seven attitude-oriented groupings presented above hinge on taking responsibility: in evaluating current thinking and practice to identify areas for actionable sustainable development. I suggest these themes are significant as they align with post-imperialist theory: current practices are being questioned from more diverse geopolitical and socioeconomic perspectives. Conference contributors stated that the jewellery industry from the Global North needs to engage and take meaningful action across the supply chain, particularly with mining communities in the Global South, which reflect trends over the last decade, outlined in the ‘impact’ section above. These attitudes indicate that stakeholders in the jewellery industry are

acknowledging sustainable disparities between the Global North and South. By extension, I suggest that stakeholders frame issues to avoid divisive rhetoric. These perspectives represent activist attitudes within the supply chain; these principles guide those willing to make a proactive contribution. I also note that an issue not raised here is how to “activate” dormant or resistant stakeholders in the jewellery industry to participate in sustainable development.

PRACTICE

This section outlines the trend toward more sustainable practices that have emerged in UK-based businesses, mainly within manufacturing, but also design and retail spaces, based on the perspectives shared during the conference (Fair Luxury, 2025). The internal and external changes and challenges experienced by designers, manufacturers and retailers are presented below.

Strategic

As presented in the ‘Corporate Shift’ grouping in the previous section, businesses are establishing new or formalising existing values through sustainability policy and/or environmental and social governance (ESG). It was made clear that there is no blueprint; instead, businesses shared their approaches, whether holistic or with a specific agenda to champion (c.). Material sourcing was being evaluated in both quantifiable aspects (such as carbon emissions) and qualitative (social and environmental) impacts, while acknowledging that no matter the sourcing choice, there will likely be shortcomings (c.). For example, recycled gold has a lower carbon footprint than newly mined gold, yet it does not directly engage with mining

(E.C.One, 2025) to lift communities out of poverty. Transitioning to renewable energy sources was a common strategy across the business changes shared (c.).

Organisational

Product materials were noted to account for most of a small business’s carbon footprint. Designing for longevity was encouraged, as the longer the design lasts, the less carbon is emitted: typically, 2–3 times (c.). To raise awareness for the differing source options, small jewellery brand Alex Monroe showcases a bracelet to share the varied diamond origin stories and impacts with clients at their London boutiques (c.; Alex Monroe, 2025). Boodles (a medium-sized British luxury jewellery brand) developed their *Peace of Mined* collection, which captures their story of traceable diamonds (c.; Boodles, 2022). These examples indicate a shift to empower the public in the material sourcing process.

To follow through on the renewable energy transition, businesses had invested in heat pumps and solar panels, alongside rainwater harvesting systems for use in bathrooms (c.). The Weston Beamor Creative Group (comprised of Domino Jewellery, Gecko Jewellery and Weston Beamor) has a business model to enable better pooling of resources across the independent operations, which was considered supportive of minimising the overall carbon footprint (Domino Jewellery, 2023).

Regulations

The OECD Due Diligence Guidance for Responsible Business Conduct (2018) was considered a valuable resource informing how businesses developed both

their strategy and organisational practices. Regulatory barriers included the difficulty for non-specialists to understand the jargon and keep up to date with regulations that inadvertently affect the jewellery supply chain (c.). An example of this is the European Union Deforestation Regulation—in effect since 30 December 2025—which requires companies to perform due diligence on their natural rubber sourcing. This material is commonly used for mould-making in the jewellery industry (Li et al., 2025), but it is likely many jewellery businesses will be unaware of the new regulation. Scope 3 carbon emissions (indirect greenhouse gas emissions: e.g., from overseas manufacturers) were also considered the main challenge to achieving carbon net-zero targets, given there is no direct control over making these carbon reductions (c.).

Industry Standards

Discussions during the conference comprised of methods to promote internal and external change for businesses. Internal change included working toward third-party accreditation for sustainable credentials from an industry-recognised provider, e.g., B-Corp or Positive Luxury (c.). Whilst businesses usually fail to meet standards initially, accreditation systems offer a clear framework to develop organisational and operational change. More informally, an ‘accountability buddy’—on a one-to-one basis, or through the Fair Luxury Pledge (2025) for example—was noted to continually prompt action (c.). Conducting independent audits to verify sustainability claims and digital passports for products to evidence traceability and transparency in the supply chain were becoming more common (c.).

Externally, demanding carbon receipts from suppliers or conducting a supplier survey are a means to gather accurate information and to prompt sustainable development through purchase power (c.). Suppliers are starting to act in this area, such as Cooksongold collaborating with the Institute of Advanced Manufacturing and Engineering at Coventry University to accurately calculate and report on their scope 1-3 carbon emissions (Cooksongold, 2022).

Market Forces

Communicating both philosophy and sustainable practices were considered central to defining brand values and offering transparency of the business’s supply chain(s) and wider impacts to the public (c.). Defining sustainability using language clients will understand helps clearly express the business rationale. Furthermore, making evidence accessible, transparent and relevant to the consumer contemplating a purchase not only adheres to regulations such as the Green Claims Code (CMA, 2025), but builds confidence and can define a distinct brand identity. Humanising the terminology, particularly when referring to people in the supply chain, can help acknowledge distant realities and build empathy with them. Fear of ‘cancel culture’ was encouraged not to outweigh the value in sharing genuine positive impacts: a contributor encouraged staying calm and confident in plans once established. The press were considered to be much more aware of industry issues now and ask about traceability details. The practices shared demonstrate the quantity and value of clear sustainable development frameworks to follow. Whilst there are some examples of original practices, many of these examples relate to existing energy and carbon reduction strategies or are aspiring

to align with standardised certifications. This indicates that many businesses in the UK seek a prescribed, industry-recognised route toward sustainable development. Given the complex nature of global supply chains, equity will be difficult to achieve if more diverse supply chain and business models are not sought after in the Global North.

EMERGENT ASPIRATIONS

This section extends from the attitudes and practice-based findings to outline emergent aspirations for the future of the jewellery industry recorded during the conference discussion. These include global trends and areas identified as pertinent for sustainable development that have not been prevalent over the last decade.

EQUITY, DIVERSITY AND INCLUSION

By 2030, 42% of the world's young people will be African (PRB, 2019); it was considered time to acknowledge the new power centres (c.). There are miners and gemstone cutters keen to be entrepreneurial and it's an opportunity to make direct links with those in resource-rich countries such as Africa (c.). A contributor asked the audience to consider where the power 'sits' and to make sure the methods don't undermine the intended impact: for example, working to eradicate racist and nationalist ideologies embedded through the supply chain. An attendee expressed that it was great to have big brands represented in the room, which was not the case at the 2016 Fair Luxury conference (c.). They advocated for diversity in the journey toward sustainable development by including

people who work in the industry as well as activists and outsiders who ask difficult questions.

PARTICIPATORY PRACTICE

Sustainable development was posed as a collective responsibility (c.). Opting into steering groups and contributing toward public consultations such as "The Blue List – The Responsible Jewellery Supply Chain Lexicon," launched by CIBJO, the World Jewellery Confederation (2025), was encouraged (c.). Widening engagement through training and/or creating a sustainability factsheet was thought to help brand storytelling relating to traceability, transparency, and responsibility across the workforce (c.). These points relate back to Section 1, where there is recognition that the impact needs to be scaled up through increased participation now that traceable supply chains and sustainable development within the jewellery industry have been proven possible.

KNOWLEDGE SHARING

The consistency of terminology (as "The Blue List" sets out to achieve) relies on most stakeholders within the industry adopting these agreed definitions, which has not been the case to date. In the last decade, amid an increasing trend in sustainability claims, the term 'recycled' has become commonplace but faces strong criticism due to no internationally recognised definition (c.; Karib, 2023). Compounding this issue is the fact that the industry sets its own standards. This calls for impartial input and scientific data to help resolve the insular and often biased thinking to identify ways to establish coherence across the industry. Access to information to enable learning about sustainable

development and representation of stakeholder journeys toward sustainable development would help educate and clarify the options for change available (c.). The Ethical Making Resource had been an online platform with this aim, but has not been updated since early 2024 (Incorporation of Goldsmiths, 2025). Conversations and questioning each other at events like the conference or Open House sessions (Fair Luxury Open House Recordings, 2025) were also noted as key to supporting change through connection and respectful debate (c.).

ACCOUNTABILITY

Lastly, accountability for misconduct within the industry was outlined as key to progress (c.). A contributor advocated for methods to be like ‘an iron fist with velvet glove’ (conference contributor 3, 2025): taking a step-by-step approach to educate and bring attention to issues, then have recourse if the issue remains unresolved, e.g. disciplinary procedures through associations, memberships and accrediting bodies, to ensure adherence to the code of practice. It was recognised that more work is to be done to whistle-blow and identify who needs to raise their sustainability standards within the jewellery industry (c.). The severity of non-compliance was emphasised: people can go to jail for breaching regulations, and reputational damage can occur if claims are falsified (c.).

The themes here and in previous sections relate to the recent Copenhagen Commitment (a collective, now disbanded) *Solutions Workshop*, also hosted by The

Goldsmiths’ Centre (Copenhagen Commitment, 2023). This workshop identified four key areas for action: Communication: to develop a universally understood language for responsible sourcing. Lobby power: uniting with key stakeholders to address issues and engage in industry decision-making as a collective. Reliable data: to nurture supply chain transparency through academic research. Empowering communities: Advocacy work for marginalised communities in the supply chain.

There is a range of disciplinary expertise required to enable the sustainable development changes outlined across both the insights from the conference and the workshop. This further emphasises the need for collaboration to diversify and bolster the current approaches for sustainable development for the jewellery industry in the future.

CONCLUSION

This exploratory paper identified sustainable developments that have occurred over the last decade (2015–2024, inclusive), based on the contributions made during the 2025 Fair Luxury conference and broader industry sources. At the forefront of sustainable development in the jewellery industry, attitudes are gradually shifting from focusing on risk mitigation to seeking opportunities in sustainable development activity. Making connection across stakeholders in the supply chain is enabling a human-centred approach: through greater awareness of, and connection to, stakeholders experiencing social and economic inequity. This has raised questions on how to

decolonise systemic supply chain hierarchies to ensure historically marginalised groups are empowered and included in industry change. Findings indicate the relational challenges faced both vertically and horizontally within supply chains (miners, refiners, trade specialists, manufacturers, designers, craftspeople and retailers) prompted frameworks that rely on internal and external collaboration to action sustainable developments. This demonstrates the need for impartial viewpoints and wider participation to challenge geopolitical power dynamics within the global supply chain. I hypothesise that the combination of complex supply chains and global systems create a layering of ‘wicked problems’ (Buchanan, 1992). For example, as gold is tied to currency and other industries, the jewellery industry has little control over the material value: this systemic issue makes it difficult to address many supply chain issues (e.g. fair pay and illegal mining) as a result. The properties of ‘wicked problems’ can prove difficult to manage risk and make an improvement at scale without unintended consequences (Buchanan, 1992).

Given there is little consumer demand for industry reform, contributors were tentative in sharing industry-driven changes made, as it was not perceived as being externally valuable. This signifies the disparity between the belief that businesses meet customer demand, and the reality in the conference room, where businesses were autonomously grounding their strategy on their own social, economic and environmental values. Effective communication of evidence-based sustainable development credentials also appeared stunted through a disconnect with marketing teams and concerns about making ‘green claims’ in a culture of greenwashing.

Over the last decade, traceable supply chains have continued to expand and diversify, reflecting the specific needs of miners and communities. It has now been proven possible to have legitimate ASM businesses trading in coloured gemstones by providing marginalised miners with education and access to global marketplaces. Engaging with carbon emissions remains an emergent theme, demonstrating that businesses are responding to carbon regulation in the UK. I suggest greater policy and industry-specific regulations may further ‘activate’ stakeholders toward legitimate operations. However, regulations need to reflect the complex procurement landscape: respecting ‘our friends on the ground’ through collaboration with key stakeholders and national governments.

The sustainable development progress made over the last decade has advanced the jewellery landscape, yet the scale of these impacts is minute in a global context. Since 2015, a small but growing number of people have continued to pioneer different theories and practices toward more equitable supply chains and proactive business models. This paper’s findings suggest that the next steps are to raise the bar of industry standards and accountability, and to expand adoption of the tried and tested ‘imperfect’ models. Collective disinvestment in activity that doesn’t support sustainable development—through transitioning to work with stakeholders in the supply chain who have evidenced credentials—is, for example, an option available to every UK stakeholder. Ensuring there is capacity for diverse sustainable development activities and linking business (financial) sustainability to sustainable development may incentivise industry change. An outstanding component of sustainable development is both identifying funding

for sustainable development and developing economically viable routes for businesses to adopt more sustainable practices. As previously noted, jewellery is uniquely positioned to promote supply chain narratives, driving fair (currently considered ‘premium’) product pricing that reflects fair trade and sustainable development compared to other industries engaged in gold, diamonds and gemstones.

The research shared in this paper distils the liminality of complex issues the industry faces and the conflicting nature of addressing one aspect of sustainability to the detriment of others. Despite this, the compiled resources in this paper evidence leadership and stakeholder capacity for embracing these complex problems. Finally, the findings suggest that further collaboration and academic input are needed to develop diverse methodologies to contribute toward data transparency and policy for sustainable development.

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AI USE DISCLAIMER

The authors used AI-assisted tools solely for language editing (grammar and clarity). All scientific content, interpretations, and conclusions are the sole responsibility of the authors.

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Review of the Federica Sala's Open Studio 2025

Author: *Josefine Spjeldnaes*



INTRODUCTION

Federica Sala's Open Studio, presented during Milan Jewellery Week on 16 and 17 October 2025, offered a rare insight into an artistic process where material and emotion evolve together through the act of making. The space unfolded as a living environment for observation and dialogue, allowing the viewer to witness the rhythm of work rather than its result.

On the work surfaces, small groupings of glass samples, sorted by size and shape, sat on paper alongside handwritten notes, while larger, resolved pieces were placed nearby rather than separated. This encounter invited attention to the time spent and the precision embedded in Sala's method, where craftsmanship and research are not parallel processes but different expressions of the same gesture.

Trained at Alchimia, in Florence, under Jorge Manilla and later collaborating with Giorgio Vigna, Sala has developed a language in which glass, metal, and stone coexist. The complexity of her process arises not from aesthetic ambition but from the intrinsic nature of the materials she engages with. Glass, in particular, demands exceptional control and patience. It requires a physical and mental discipline that borders on devotion. Sala approaches this process as a form of meditation, where repetition and emotional endurance lead to technical refinement. The result is not a demonstration of skill but a trace of persistence, a record of time spent in dialogue with matter.

Her work with glass, however, exceeds technique. Sala considers the material as an analogue to the human body: luminous, mutable, and capable of transformation.

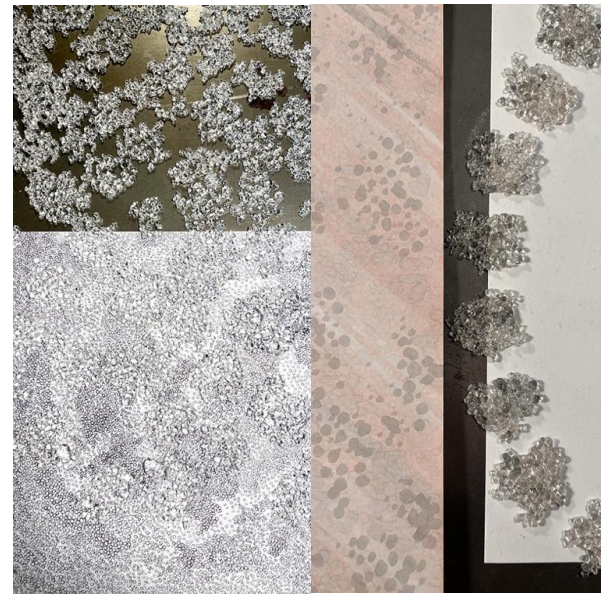
While often perceived as fragile, glass possesses an inherent strength; it can endure for centuries, outlasting metal and even stone. This tension between vulnerability and permanence lies at the heart of Sala's philosophy. In her combinations of materials, hard and soft, opaque and translucent, function not as opposites but as reflections of one another. Through these relationships, she reveals that endurance may emerge from delicacy, and that what appears to be soft or perishable can, in fact, embody resilience.

At the same time, Sala's practice unfolds through a dialogue between beauty and ugliness. She has described being moved by what she finds dark, sad, or difficult, yet she transforms this emotional gravity into something luminous. Beauty, for her, becomes a veil, a means of containing what might otherwise remain unbearable. The Open Studio allowed this duality to surface visibly: the polished and the broken, the resolved and the uncertain, existed side by side. Through this openness, the space itself became part of the work, transforming exhibition into reflection and process into a shared experience.

What emerged from Sala's Open Studio was not merely a presentation of jewellery, but an unfolding of thought through material. It proposed an understanding of making as both knowledge and attention, where mastery is not control but focus, and where the act of working becomes a way of thinking.



*Fig. 2 Entrance of Federica Sala's Studio during the open studio with the printed event image stuck on the front door.
Photo: Federica Sala.*



*Fig. 1 Pieces of glass displayed in combination with drawings and sketches on the studio benches as objects and jewellery to be.
Photo: Huang Xiaozhe.*

MATERIAL RESEARCH AND THE INTELLIGENCE OF PROCESS

Sala's work with glass grows from a long engagement with material practice. Her research has also been shaped by her residency at the Corning Museum of Glass, an institution central to the study and development of glass as both material and artistic medium. Her research is not defined by a fixed outcome but by an ongoing dialogue between making, observing, and adjusting. She approaches glass as a living substance that carries its own logic. Each stage of the process—heating, cooling, and polishing—demands precision and concentration, but also patience and dedication. Through this sustained attention, understanding emerges from the making itself.

Sala explains that ideas often appear to her during the act of making. She sketches or writes notes, recording what arises through the rhythm of work. This rhythm of reflection through doing gives her process a cumulative intelligence. Repetition allows for subtle change, and through small variations she observes how form, colour, and surface evolve. When working in series, she can follow how one piece grows out of another, each containing traces of the previous gesture. She often starts with elements that already exist, a piece of glass, a stone, a metal form, or a found shape that carries its own logic. Rather than forcing a new design, she follows what the material shows her. The dialogue between glass, metal, and stone becomes a means of studying tension. Hard and soft coexist not as opposites but as interdependent states that reflect her view of the body as both fragile and strong.

Glass, often considered delicate, reveals in her hands its true endurance. It can outlast metal, resist time, and change without disappearing. Sala relates this quality to the human condition: transformation rather than permanence is what allows survival. With patience and repetition, her work reveals how apparent fragility can hold lasting strength.

Sala approaches glass as an active material that responds to her gestures and defines its own limits. Working with it requires attention and dedication rather than precision, and craft. Within contemporary jewellery, glass has been explored by a number of artists who challenge traditional hierarchies between precious and non-precious materials.



Fig. 3 Cambiamenti, necklace (2024), glass, marble, silver. On display during the open studio in Milan. Photo: Federico Cavicchioli.

Practitioners such as Linda MacNeil, Paolo Marcolongo, and Agustina Ros have engaged with glass not only for its optical and structural properties, but also for its conceptual potential within the field. MacNeil's work, for instance, emphasises the narrative and symbolic capacity of glass, while Marcolongo and Ros explore its tension between fragility and resistance through process-led approaches. In this context, Sala's practice aligns with a broader movement that reconsiders glass as a primary material within contemporary jewellery, while distinguishing itself through a sustained focus on repetition, bodily analogy, and the experiential dimension of making, rather than control. Her Open Studio allowed this relationship to be seen clearly: knowledge built from persistence,

THE POETICS OF BEAUTY AND UGLINESS

Sala's reflections on beauty reveal a central tension in her practice. She speaks of being drawn to what she calls the horrible, the sad, or the difficult. Emotions that arise from experiences of loss and fragility. Rather than turning away from these feelings, she works with them. Beauty, in her understanding, is not the opposite of ugliness but a way of embracing it. It becomes a structure that allows the unbearable to be seen and transformed. This perspective lends a quiet intensity to her work. The clarity and balance of her pieces do not conceal emotion; they contain it. The surfaces that appear calm carry traces of struggle. Up close, the glass reveals small distortions, bubbles, unevenness, that interrupt its otherwise smooth surface.

The precision of the joins, the delicacy of the forms, and the luminous clarity of the glass all speak to an underlying awareness of instability.



Fig. 4 Pieces in progress in Federica Sala studio made out of carved marble and glass. Photo: Huang Xiaozhe.

Sala's beauty is not decorative. It is a form of discipline, a way of giving shape to what might otherwise remain unformed. In the Open Studio, this duality was visible everywhere. On the worktables, unworked fragments and polished elements rested side by side.

Marks from grinding and cutting remained visible next to smooth, finished surfaces. Amid these contrasts, process became meaning.

Fig. 5 Federica Sala explaining her research in her studio to the visitors. Photo: Huang Xiaozhe.



The combination of glass, metal, and stone becomes the physical expression of balance. Glass, luminous and mutable, meets the solidity of metal and the gravity of stone. The encounter of these materials produces a quiet tension that mirrors the emotional balance her work seeks to achieve. Sala describes this not as opposition but as coexistence, a way of recognising that beauty and sadness, strength and delicacy, can inhabit the same form.

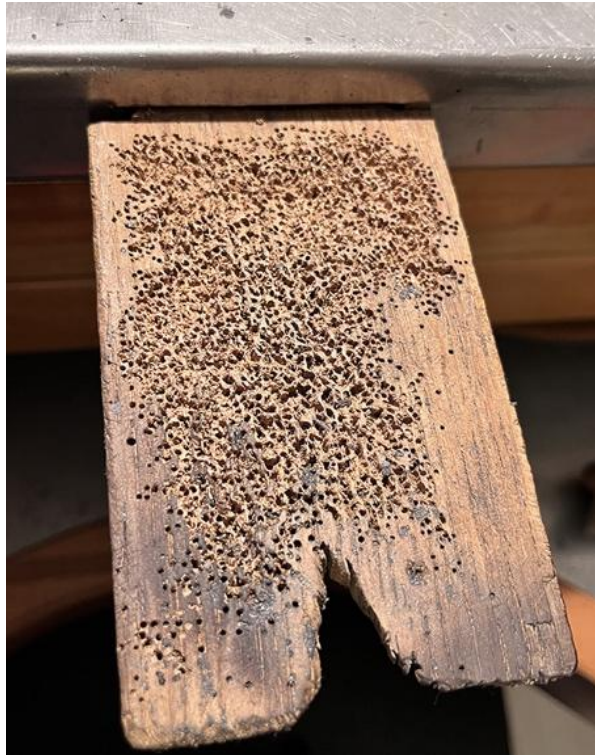
From this understanding, Sala's work proposes beauty as an act of endurance. The surface attracts the eye, but what it reveals is time, persistence, and the traces of difficulty transformed through making. In this sense, her jewellery does not idealise emotion; it gives it form, allowing it to remain present without collapse or denial.

OPEN STUDIO AS METHOD AND EXHIBITION

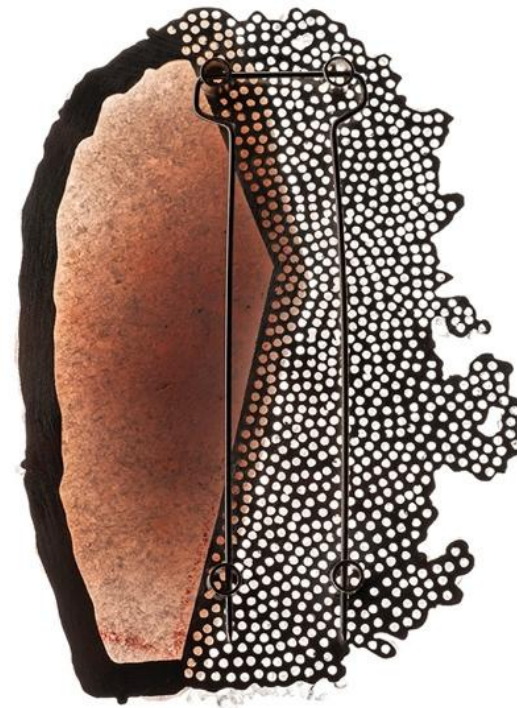
During Milan Jewellery Week on 16 and 17 October 2025, Federica Sala's studio was open to the public, offering access to a functioning workspace instead of a conventional exhibition setting. A kiln stood in the centre of the room, surrounded by tools, raw materials, and fragments of glass, metal, and stone. Unfinished pieces rested beside completed ones, revealing the process behind the finished work. The studio appeared as a living record of ongoing work, where each gesture left a visible trace.

Sala described the event as a presentation of the current state of her research. Some works had returned from earlier exhibitions and were now placed beside recent experiments. The proximity of different stages revealed continuity rather than contrast. A fragment marked by

grinding could be followed by a more resolved form, and finally by a finished piece. The passage of time and the dedication invested in each stage became part of the very objects. The equipment contributed to the atmosphere of the space. Together with the scattered test elements, it spoke of precision and endurance. Working with glass requires rhythm and attention; heating, cooling, and polishing depend on timing that must be learned through practice. Seen together, the tools and test elements offered a clear sense of how



physical process and artistic intention are inseparable. After more than a decade of working with glass, Sala continues to refine the organisation of her studio to support the techniques that have become central to her research. This gradual adjustment reflects accumulated knowledge and a growing harmony between the workspace and the language of her materials. Solitude remains essential. Sala describes the studio as a place of safety and contemplation, where continuity can be sustained through repetition.



*Fig. 6
Benchpeg in Sala's
studio showing the
effect of the
continuous drilling
process to create the
back of some pieces
with stones.
The holes were made
to reach a lighter
metal structure as
shown in the back of
the brooch of the
right image.
Photo: Huang
Xiaozhe and Federico
Cavicchioli.*

Between projects she often revisits earlier pieces, reading them as notes from previous stages. Small experiments and material tests open new directions. During the Open Studio, this quiet questioning became visible. Explaining choices aloud made the structure of her decisions clearer, turning conversation into part of the creative act. Artistic openness is integral to Sala's approach. Showing fragments, tools, and completed works together makes the relation between idea and execution visible. The dialogue between the materials, glass, metal, and stone, could be followed from initial encounter to finished work. Marks of risk and perseverance were left as part of the final expression. In this setting, technical discipline and reflection worked in tandem, each informing the other. The Open Studio was more than a presentation of jewellery. It revealed a research practice articulated through rhythm, time, and material encounter. By exposing the conditions of making, it affirmed the studio as a site of both production and learning.

CONCLUSION

Sala's Open Studio made visible a practice where material, emotion, and thought are inseparable. Through her work with glass, she explores what it means to endure change and to hold together qualities that seem opposed yet depend on each other. Glass, metal, and stone act as extensions of this inquiry. Each material embodies a distinct register of strength and resistance. Their encounter gives form to the balance between delicacy and force that defines both the body and the act of making.

The Open Studio format clarified this philosophy. By presenting her workspace as it is, with fragments, tools, and works in progress, Sala exemplified how knowledge develops through repetition and attention. The event also questioned what an exhibition can be: not a place for finished results but a space for observation, dialogue, and process. The distinction between work and research, between object and method, dissolved into one continuous field of attention.



Fig. 7 The casting metals corner inside Sala's studio used to display her most recent on going work on jewellery, glass and human bodies. Photo: Francesca Urcioli.

Sala's practice contributes to a wider discourse in contemporary jewellery that challenges inherited notions of value and material hierarchy. Glass has historically occupied a more ambiguous position within jewellery, often associated with ornament or imitation rather than primary value (Jargstorf, 1991; Cappello and Panini, 2021). In Sala's work, it becomes the primary carrier of meaning and endurance. It demonstrates that softness can sustain, that fragility can protect, and that transformation can be the truest expression of persistence. In this light, Sala's contribution reaches beyond her own studio.

Her work proposes an understanding of materials that respects their autonomy and complexity. The Open Studio stands as both a gesture of generosity and a form of research. It invites viewers to see not only the finished objects but also the process that allows them to exist.

AI USE DISCLAIMER

The authors used AI-assisted tools solely for editing grammar and spelling. AI-assisted tools were not used to draft or generate any part of the manuscript. All scientific content, analyses, interpretations, and conclusions are the sole responsibility of the authors.



*Fig. 8
Federica Sala
sharing her latest
research
developments with
glass, showing the
pieces she made
during her Artist in
Residence in Corning
Museum Studio
(USA). On the right,
one of the neckpieces
made in Corning
combining glass and
stones carved
together.
Photo: Francesca
Urcioli and Federica
Sala.*

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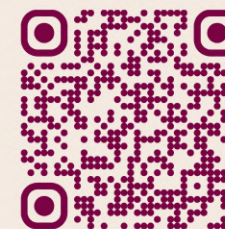
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