Indistinguishable Likeness: the impact of the original artwork and its 3D-printed twin on the discipline of art history, conservation, and museum practice

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SUMMARY

The advancement of technology and digitization has made reproductions of art omnipresent. However, 3D printing stands apart from previous and current reproduction methods due to its unique ability to accurately replicate all material characteristics of a painting, such as three-dimensionality, translucency, and glossiness, at a high level of detail. Additionally, its digital nature enables limitless possibilities for adding, modifying, and manipulating new or existing data. *Indistinguishable Likeness* investigates how the original and its 3D-printed twin disrupt the Western emphasis on the materially unique artwork.

Through an interdisciplinary framework applied to several case studies, the research demonstrates how 3D-printed reproductions provide new perspectives on original artworks, deepening our understanding of art history, conservation methods, and public engagement with art.

This thesis comprises seven chapters, with the first three providing the theoretical foundation. Chapter 1, *Double Trouble - Exploring the Realm of 3D Printing*, discusses the development of 3D printing and its current application in art. A brief historical overview of the evolution of 3D printing demonstrates that, while the technology existed for a while, its availability only occurred in the previous decade due to advances in computing power. This well-integrated process from design to physical object allows the efficient fabrication of complex shapes (e.g., hollow spaces), microscopically small elements, or geometries that would be difficult or impossible to create with other methods. This has made the technology indispensable in art for reconstructing damaged or incomplete artworks, supporting research, preservation, and documentation, and enhancing accessibility and engagement with art within and beyond the museum's walls. Since 3D printing is a digital method, meaning its data can be modified unlimitedly, advancements in techniques that enable the development of 3D printing are also discussed. Considering material analysis methods and emerging digital technologies like extended reality (XR) and artificial intelligence (AI), which, combined with 3D printing, facilitate the visualization of past and future states of an artwork, the creation of new pieces, and novel interactions with art. While current challenges like accuracy, quality, and material fidelity exist, improvements in computational power and deep learning will significantly enhance our ability to visualize historical

and future states of artworks with 3D printing, potentially transforming our understanding of art history.

Chapter 2, *Art in the Age of 3D Printing - The Material Relationship between the Original and its 3D-printed Twin*, critically examines art reproduction's historical and theoretical foundations and how 3D printing challenges traditional views on authenticity. The chapter begins by placing 3D printing within the broader historical context of art reproduction. Tracing the evolution of reproduction techniques from traditional methods like engraving and lithography to digital and contemporary techniques, such as artificial reality (AR), skepticism and animosity toward copying art is relatively new. The shift began with mechanical reproduction, such as photography, as Walter Benjamin elaborated in his influential work *Das Kunstwerk im Zeitalter seiner technischen Reproduzierbarkeit* (1936), arguing that an artwork's unique time, location, and context of creation infused its materials with a distinct 'aura' that can only be experienced when face to face with the original artwork. Framing 3D printing within the concept of mechanical reproduction shows that the unique qualities of 3D printing in recreating an artwork include all of the original's visual and material attributes; this means that the dichotomy between the original and the reproduction is increasingly inadequate. The chapter further explores the physical and conceptual relationship between a 3D print and the original artwork, questioning how these entities interact when placed side by side. Defining 3D printing within the closely related yet distinct concepts of 'good' and 'bad' copying, it becomes evident that the value of the original and the 3D print is not solely constructed through its visual and material qualities. It also involves subjective, immaterial aspects, varying between individuals, thus requiring a different approach to understanding 3D printed twins' authenticity.

Chapter 3, *A Goldfinch for Everyone! Reconsidering Authenticity in a World of 3D Reproductions* introduces literary scholar Gérard Genette's work *L'Oeuvre de l'art. Immanence et transcendence* (1994) to establish a new way of considering authenticity in a world of 3D printed reproductions. Genette suggests redefining authenticity beyond materiality, viewing it as an evolving concept influenced by the viewer's experience and the artwork's context. This chapter argues that 3D-printed reproductions can inherit and expand the aura of the original work, enhancing its significance. By incorporating Alois Riegl's concepts of 'age value' and 'memory values,' which are expanded by more contemporary sources, I argue that authenticity can stem from preserving an artwork's context,

historical materials, or conceptual essence for an artwork's value is influenced by external factors such as the observer's perspective, socio-cultural context, and display conditions. Authenticity, therefore, encompasses both material and immaterial elements and remains dynamic. Through this expanded view of authenticity, 3D printing offers a holistic approach to preserving and presenting artworks, combining their material and immaterial aspects while maintaining their integrity.

Chapter 4, *A Girl with Many Faces - 3D Printing's Effect on the Perception of Art,* introduces the first case study, Johannes Vermeer's *Girl with a Pearl Earring* (1665), to discuss how 3D printing profoundly alters the perception of art. Traditionally, art history concentrated on visual analysis and iconography, yet misjudgments by connoisseurs and the unveiling of forgeries require a more objective approach to analyzing art. Technical art history blends scientific, historical, and artistic viewpoints to interpret the physical traits that give an artwork its meaning. Introducing 3D printing within this domain, I demonstrate that while differing in materials from the original, perception research reveals that the technology is a valuable tool within this approach. This technology is essential for revealing hidden features, like intricate surface textures, and for visualizing, predicting, and recreating past and future material states when combined with data from technical art historians. While there currently are no examples of the impact of visualizing these findings, debates that emerged within art restoration demonstrate that printing past states of originals can lead to new interpretations and alter our perception of the original works. The chapter delves deeper into the significance of tactile engagement with art via 3D printing, citing Laura Marks' 2002 book *Touch: Sensuous Theory and Multisensory Media*. By enabling physical interaction with precise reproductions, 3D printing offers a novel way to engage with the material qualities of art, enhancing the viewer's comprehension and creating a more immersive experience. Ultimately, this chapter underscores that 3D printing different phases of the artwork in a multisensory manner profoundly affects the concept of the 'true' artwork preserved in its materials.

Chapter 5, *Gold or Blue?* What shall we do? 3D-Printed Reproductions as a Conservation Strategy examines the use of 3D printing as a conservation strategy for addressing the dilemma surrounding the restoration of *The Crucifixion of Christ with Mary and John* by the Master of the Lamentation of Christ in Lindau (circa 1425). Explaining the differences between conservation, preservation, and

restoration based on conservator Salvador Muñoz Viñas' *Contemporary Theory of Conservation* (2012 [2005]) supplemented with Louise Wijnberg and Elisabeth Bracht's conservation of Ellsworth Kelly's (1923-2015) *White Triangle with black curve* (1972) as a practical example shows that conservation encompasses diverse practices and involves many stakeholders. This complicates the field, as it must satisfy the diverse wishes of all individuals involved in the unique material artwork. Due to restoration debates and controversies, conservation has traditionally focused on maintaining the physical aspects of original objects, which automatically dismisses reproductions or 3D prints as insufficient substitutes. However, contemporary art's ephemeral materials, performative nature, and digital forms pressurize traditional material-centered methods, for they automatically compromise an artwork's symbolic, functional, and conceptual values. A conceptual foundation for reconsidering 3D printing in conservation can be found in literary theorist John L. Austin's idea of performative utterances. When considering the original artwork as a dynamic entity influenced by its surroundings and the viewer's perception, 3D printing not only provides a scientific, reversible, and transparent way to maintain the original's materials but embodies the artwork's various values; it also conserves and extends the artwork's significance. Since 3D prints can become authentic versions of the original and unavoidably age, I explore whether a 3D-printed reproduction of *The Crucifixion*, a mechanical replication, could be conserved by producing another 3D print. Examples of authentic reproductions, like the Lascaux caves, demonstrate that 3D prints, much like their originals, are bound to unique moments in time and thus warrant the same conservation care as any other artwork.

Chapter 6, *When Paintings "Speak" to You - The Interaction between the Original Artwork, 3D print, and Visitor in the Museum* uses Theo van Doesburg's *Counter-composition VII* and *Portrait of Pétro* to discuss 3D printing's effects on public engagement with art. Further exploring Austin's theory uncovers that the agency of 3D prints, like originals, is determined by the dynamic interaction between the object, creator, message, and observer. Using Caroline van Eck's concept of 'living presence response,' the experience of objects as if they were alive, supplemented with affect theories, shows that 3D-printed replicas gain agency through constant interaction within a broader network. Because the activation of cognitive systems and sensory stimuli is responsible for the viewer's perception of a 3D print and the original as social agents, the 3D print makes the

universal claim of authenticity and the emphasis on the materials of the original non-sensical. Introducing the 3D print within the museum environment, the concept of *parerga* derived from Johannes Grave et al.'s book *The Agency of Display* further confirms the transformative effects museum's environment on the agency of the original work of art and the 3D print. This highlights that individual artworks and 3D prints cannot be viewed in isolation but only require meaning through constant interaction with each other, their surroundings, and the viewer. Since personal identification and empathetic engagement, rather than material originality, determine the experience of authenticity, the chapter ends by discussing how 3D reproductions allow museums to extend the experience of the original, unite diverse audiences, and promote dialogue in a changing cultural landscape.

Chapter 7, *~~Re~~produced Originals - A Reflection through the Lens of Mark Dion*, synthesizes the discussions from the previous chapters through the lens of contemporary artist Mark Dion and by examining his installation, *The Leiden University Phantom Cabinet* (2019). To understand Dion's use of curiosity cabinets, this chapter begins by tracing their evolution into modern museums. It highlights how this transformation has enabled museums to shape societal values through classification and inclusion systems. The way Dion combines the traditional curiosity cabinet with 3D prints to create a new artwork emphasizes the differences between their historical counterparts. This viewpoint differs from the case studies in this dissertation, offering an exciting perspective to re-evaluate and synthesize the research's key points.

Ultimately, this research discusses that 3D printing redefines the concept of authenticity and can offer the best of both worlds: by facilitating the creation of replicas that retain and even enhance the material qualities of original artworks, 3D printing liberates artworks from their material, cultural, and temporal confines, allowing for multiple interpretations and a broader range of meanings. In this way, the technology is a potent tool for both art creation and redefining cultural values. It has the potential to democratize art, making it more accessible, open to diverse interpretations, and capable of addressing contemporary societal issues. This dissertation illustrates how the significance of artworks changes for different viewers, calling for a more inclusive and thoughtful approach to cultural preservation and presentation.