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Do *Sleeping Shepherds* Dream of 3D-Printed Sheep: John Gibson, Oliver Laric, and Digital Neoclassicism

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This article discusses John Gibson's (1790–1866) sculpture *The Sleeping Shepherd Boy* (designed 1818; this version carved 1824) in the Walker Art Gallery (fig. 1). It positions Gibson's 1824 marble sculpture—itself a nineteenth-century work responding to a Roman relief—alongside a series of twenty-first-century 3D scanned and printed sculptures modelled after it by the artist Oliver Laric for the Liverpool Biennial in 2016, under the title *Sleeping Boy* (fig. 2). Laric produced this series using an open-access 3D scan of the 1824 sculpture, which provided the foundational data for these new works, which do not simply replicate Gibson's *Sleeping Shepherd Boy*, but add forms, modify, and restore earlier damage, or suggest past and future restorations. I argue that Laric's project might best be described as a kind of digital neoclassicism and, as such, this article positions his digital practice and physical sculptures within the intellectual history of neoclassical imitation, the accretive legacies of antique models such as the Endymion relief of the Capitoline Museums, and the challenge of discussing "originals", "imitations", and "copies" within historic practices where multiple versions of a single design were expected and making small modifications to recognisable models was standard practice. I describe Laric's practice as "digital" despite the production of physical sculptures because the digital elements—the 3D models, open-access platforms, and transformative processes—are the foundation of the physical objects, and are certainly the wider-reaching aspect of the practice.

My analysis focuses on sculptures that occupy multiple temporalities and imaginative spaces: Liverpool 2016, Rome 1818, and Rome about 130 ce, as well as the internet (in both the ongoing present, and the future). I became interested in the potentials of these related objects, the practice of 3D scanning in art historical research, and the use of art historical objects in contemporary art practice when searching for a prop for a talk in which Gibson's *Shepherd* was a key point of comparison. This straightforward use of an accurate 3D print led to a wider enquiry around the relationships between "original" art historical objects and the intellectual, creative overlaps between imitative practices in the nineteenth century and contemporary projects such as Laric's open-access scans and sculptures. While Laric has used other Gibson sculptures in his contemporary practice, the *Sleeping Shepherd Boy/Sleeping Boy* and the Liverpool Biennial in particular offer the most direct connections between multiple pasts and the present. This article addresses the processes of 3D scanning and printing and CNC (computer number control) milling as part of the material

histories of these works, and the intellectual relationship between twenty-first-century imitations and nineteenth-century practices. Gibson's *Shepherd* is itself imitative of a Roman sculpture and was produced in conversation with leading European sculptors Antonio Canova and Bertel Thorvaldsen. Laric's works play with questions of originality and materials through bootlegging, replication, and accessibility.[1] I argue that scanning and printing technologies do not displace the "original". Instead, they offer new potentially disruptive—but not destructive—opportunities within the legacy of neoclassical practices. Together, these two bodies of work allow us to think about the similarities in attitude towards imitation, the significance of the "neoclassical" across different historic moments, and cultures of copying or reproduction.
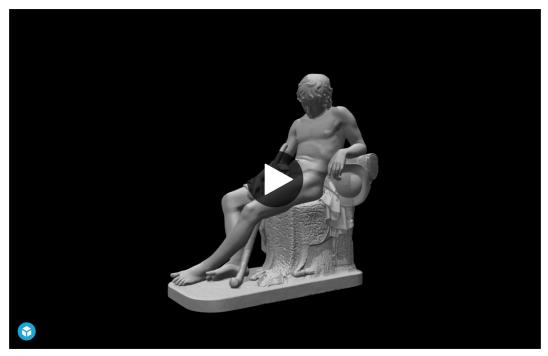

Figure 2.
Oliver Laric, *The Sleeping Shepherd Boy at The Walker Art Gallery*, 2016, 3D printable sculpture.
Oliver Laric and Scan the World / MyMiniFactory (CC BY–NC–SA 4.0)

Some Notes on the Work of Art as Mechanically Reproduced

In this article I refer to copies, replicas, and imitations to describe the relationship between "original" objects and later artworks that engage with them. These terms, for my purpose, are developed through discussions of neoclassical art and "imitation", as laid out by Johann Joachim Winckelmann and the scholarship that followed. Winckelmann's *Reflections on the Imitation of Greek Works in Painting and Sculpture* declared that "The only way for us to become great, or if this be possible, inimitable, is to imitate the ancients".[2] It was through the *imitation* of Greek art that artists could "become knowledgeable more quickly […] Imitation will teach the artist to think and to draw with confidence, since he finds established in it the highest limits of that which is both humanly and divinely beautiful".[3] Imitation—conceived not only as an artistic practice of drawing after the antique, but an intellectual practice intended to shape the pathways of taste in artists and viewers—was necessary to "abandon marble", to "follow nature alone". Hugh Honour clarified: "Imitation […] involved the artist's higher faculties, especially his inventive powers. So far from having anything of the 'servility' of the copy, the practice of imitation was, according to Reynolds, 'a perpetual exercise of the mind, a continual invention'".[4] An imitation, therefore, is a work which may incorporate

quotations, elements, or motifs from an older model—often intended to be recognisable to an audience—but which reflects the intellectual processes of artistic selection and revision to create a new work.

Successive imitative works, derived from earlier imitations, could then introduce further changes and modifications, consciously or unconsciously by artists and artisans, until the "imitation" is wholly distinct from the original "original"—that is, when the first source or prototype object or artwork is no longer recognisable as a direct source for the latest. In George Kubler's construction of prime objects and replica series, this original, often lost, is the "prime" object:

> *Prime objects and replications denote principal inventions, and the entire system of replicas, reproductions, copies, reductions, transfers, and derivations, floating in the wake of an important work of art.*[5]

For neoclassicism—and digital neoclassicism—these prime objects are often the mythic lost Greek original, the hypothetical bronze from which a marble version or versions were taken. Some of these replicas and derivations, Kubler notes, "reproduce the prime object so completely that the most sensitive historical method cannot separate them".[6] However, he contrasts, "in another kind of seriation, each replica differs slightly from all the preceding ones".[6] For the neoclassical and digital neoclassical imitation, we are concerned with the latter: that which differs, not through boredom, but in pursuit of a moderated originality, a new way of doing an old thing.[8] Kubler's origination, seriation, and replication are perhaps among the most productive ways of understanding the relationships between imitative art practices, to which Laric makes oblique reference (discussed in the section "2016"). Gibson's imitation of antique models followed practices established by his contemporaries and teachers, and his sculptures used similar prototypes. These variations on the central object became part of a growing and overlapping chain or network of imitations, which as it expanded eventually occluded the central original or originals to later observers.

A copy, by comparison, is the direct reproduction of an "original" by someone else, without the creative and generative input of a new artistic mind. This could be in reduced scale or in new media, such as small bronze copies of antique marbles. Copying in the nineteenth century was often a training exercise, the method by which artists learned their technical skills and acquired a visual vocabulary, a mental repository of formal solutions and subjects. Imitation was the practice of taking that vocabulary and creating new forms that reflected careful study and thought. Other than for training, copying antiquities and other artists' work was looked down upon, a practice which could make the copyist money, but which did not require the intellectual, generative processes of imitation and creation. However, selling replicas or copies of one's own design to multiple parties was simply good business practice. Replicas could be also licensed out to be reproduced in Parian or plaster which made the image more accessible to wider audiences with smaller budgets or smaller houses, or even reproduced as etchings, or later photographs. These less direct reproductive methods—that is, not produced by the artist's studio but licensed out or even bootlegged—allowed for the dissemination of the artist's design to a wider audience.

Laric's sculptures are not straightforward copies of their models; instead, his *Sleeping Boys* are modular, with potentially interchangeable parts. This element of these works raises questions: What happens when an artist plans for future replacements, stand-ins, and alterations, on their own behalf and that of their prototype? Laric's *Sleeping Boys* (and his other replicative, modular pieces) are produced with their own future decay in mind; the models he produces as part of his scanning practice are wholly open access and not only document the object for posterity but are offered to anyone to modify and replicate ad infinitum, producing not only editions and possible replacements of his work/the original, but also spawning new variations on the type, either digitally or in physical media. This includes the work of contemporary British sculptor Zachary Eastwood-Bloom, whose *Divine Principles* series used, among others, Laric's open-access models as the basis for further

derivations, produced using 3D modelling and printing technologies and CNC milling to create new marble sculptures.[9] These add new links to the chains of seriation and replication described by Kubler, the digital version of neoclassical works on the same model or theme.

Patrizia Di Bello has noted that "In the twenty-first century, we might be seeing a revival of 'art manufacture,' as in the nineteenth century fuelled by new technologies, now electronic devices rather than engines".[10] Di Bello remarks that following a 2016 event at the Royal Academy, London:

> *in contrast with the mesmerizing magic of the process [of 3D printing or CNC milling] witnessed in action, the resulting sculptures seemed bland and underwhelming—if acutely precise—compared to the plaster casts and statuettes that were exhibited alongside them to explain and give cultural legitimacy to the new technology.[11]*

In contrast to the "underwhelming" sculptures resulting from 3D printing processes, Barry X Ball's *Purity* (2008–2009), a white Iranian onyx bust replicating Antonio Corradini's *Purità* in a naturally polychromatic stone is described as embodying:

> *both sculpture and photography as arts of mechanical reproduction, where the act of copying— starting the work by reproducing something already there in the world … is demonstrated as not "slavish," but as endowed with a rich potential to rethink the original at every stage of the re/production.[12]*

However, *Purity* was produced using CNC milling technology. The technical method of production must therefore be less important than the appearance of being *sculpture* rather than a mere reproduction. Both the 3D-printed and stone sculptures were made with robotic methods, but only the resin works lacked—to some audiences—the aesthetic value of traditional fine art sculpture. Robotically produced (whether in marble or resin) and manually finished works from 3D models are only technically new, rather than conceptually: a CNC milling machine is, functionally, a computer-driven robotic version of a pointing machine and studio assistants.[13] That is not to say that they operate by the same mechanical actions, but that they both outsource the manual labour of removing material from the block from the artist to others. 3D printing is much the same: it uses computer-guided, but human-input, lasers or spigots to fuse or deposit layers of material to create (rather than subtract) a new object from a previously unshaped medium. Where the robotic "hand" is not part of the finished object's formal conditions, it simply saves time and human energy, while still requiring human input, monitoring, and finishing.[14] This digitises and mechanises the production sculpture studio of the nineteenth century, where the manual labour of sculpture making was done by artisans and the artist's "hand" was seen in the model (once clay or plaster, now composites and polymer) and in the final surface finishing.[15]

Laric has made remarks that refer to historical cases of replacement and repair that challenge the authenticity or aura of an ancient work—the Ship of Theseus, the Forbidden City of Beijing, a Shinto shrine, and others—which further complicate questions of originality, aura, and restoration in his large-scale modular works.[16] How much of an original object can be replaced with new material and it still retain its original identity or character? How many additions and modifications can be included before a work is wholly new, rather than an imitation or productive derivation? This is a central question for Laric's sculptural practice, and for the increasing use of data-driven, mechanically produced fine art sculptures and sculptural objects. These questions, especially combined with the robotic or mechanical processes of production offered by CNC milling and various forms of 3D printing, challenge the historical privileging of the artist's hand and the singular art object. For the *Sleeping Boy* sculptures, for example, any replacement modular parts come from Laric's own studio but, in the future, as the segments degrade at different rates or the objects are damaged, museums

or collectors might have their own replacements made. The data from Laric's scans may also be used to provide restorations for other objects, either the original objects he scanned, or the works produced by other artists. The Ship of Theseus paradox operates on the assumption, too, that the replacement parts are indistinguishable from the old parts: what happens if slight changes are introduced, either through error or deliberate action?

Digital neoclassicism offers new media in which to experiment with these questions, in sculpture and in art historical practice. As the wood of the Ship of Theseus rotted away, planks were restored to maintain the ship as a complete object—but once the last "original" plank was removed, the paradox emerges: can this ship, which has no material remaining from the original ship, still be the

Ship of Theseus, or is it merely a replica? If the weight of historicity and aura are placed solely on the materials themselves, then it cannot be the Ship; if the form and collective agreement are what convey the aura of historicity, then the material age of the individual planks has no relevance. The modular construction of Laric's work visually suggests that the pieces could be swapped, including different details, or different colours, or the same to replace damaged portions (fig. 3). Which, then, would be the original? How many modular pieces can be mixed and matched before the ontological original is obliterated? Which piece carries the historical/art historical aura?

If the unaltered (but processed) 3D model offers the unlimited potential for reproduction and modification, the open access 3D model of Laric's scanning project could be compared to Walter Benjamin's photographic plate, where "the work reproduced becomes the reproduction of a work designed for reproducibility".[17] However, I suggest that the artist's conscious (or algorithmically driven) intervention, which is then reproduced by mechanical means, creates a *new* artwork, a sculpture, rather than a sculptural object. Laric's additions, the importance of the work's modularity, and his critical acknowledgement of the tension between originality, copy, and replacement, demonstrate an artistic intention and an intellectual engagement rather than rote copying. For his robotically carved *Venus Celestis* (discussed in this article's penultimate section), Eastwood-Bloom used the digital 3D model as the neoclassical artist would have used a clay one; making changes to the model and then printing it as an intermediary stage to assess the success of the figure—much like making a plaster cast. The model is then fed into the milling machine, thus substituting the pointing machine for the point cloud.

Critical studies of classical reception argue that objects accrue meaning over centuries of rediscovery and reworking. I would argue that modern works such as Laric's, based on ancient and neoclassical models, have *yet to accrue* the temporal distance that feeds a perceived "aura" of art historical or cultural value,[18] while simultaneously pointing to that very aura in their prototypes. Although Laric did not specifically mention George Kubler's writing as a source for his ideas around classical receptions (as, indeed, he did not name Nagel and Wood earlier), Laric's own words about his sculptures also point to Kubler's discussion of formal sequences and solutions:

> *What draws me to the generic form is that it is reinterpreted for different purposes. From early on, that's what fascinated me about neoclassical sculptures, too. They were already the second birth of a type of form, and in that sense, not really final.[19]*

In *The Shape of Time*, Kubler argued that:

> *When problems cease to command active attention as deserving of new solutions, the sequence of solutions is stable during the period of inaction. But any past problem is capable of reactivation under new conditions.[20]*

To use Kubler's framework, neoclassical sculpture—the formal sequence in which Gibson worked, and to which Laric and Eastwood-Bloom were responding—might be dated to approximately the 1780s, but this sequence was itself a reactivation of "classical" problems in sculpture, which in turn had experienced various other reactivations. The most famous, of course, the renaissance, or literal rebirth of "classicism", had long since stabilised by the late eighteenth century but was ever-present as a visual database in Rome, where Gibson worked. Furthermore, previously forgotten antique material, such as the Endymion relief, was still being excavated during Gibson's time in Rome and would have populated public and private galleries, offering new prototypes from which the late-eighteenth- and nineteenth-century sculptors working in an imitative mode could draw inspiration. While the neoclassical's sequence of solutions to classicism's problems began to stabilise within Gibson's lifetime—and could certainly be said to have done so by the end of the following generation—new technologies, media, and audiences have since reactivated these past problems

as digital neoclassical works. The following sections outline the relationships between Gibson, his contemporaries, and the antique as part of the process of nineteenth-century sculpture and imitation, and then Laric's engagement with Gibson's *Sleeping Shepherd Boy* as a form of digital neoclassicism.

2016

With these already complicated and interwoven temporalities, originals, copies, and imitations, we arrive at Oliver Laric's 3D-printed imitations of Gibson's *Sleeping Shepherd*. There are two facets to this work: the printed and displayed sculptures, and the base scan data, both of which are of interest to us here. We will see how Laric's sculptural works are a logical twenty-first-century extension of the practice and philosophy of nineteenth-century neoclassicism, exemplified by Gibson's *Sleeping Shepherd* and training as described in this article. Laric's interest in neoclassical sculpture as a model derives from the non-finality of the forms; as noted, Laric explicitly cites the "second birth of a type of form" in neoclassicism.[38] Without directly citing either Kubler's *Shape of Time* or Nagel and Wood's *Anachronic Renaissance*,[39] Laric points to the idea of the sequential emergence of the form or idea, not decontextualised from its original period but rather bringing with it the cultural weight of its origin as well as the implications of any intervening emergences. The re-emergence of a classical vocabulary in the nineteenth century is its second birth, in Laric's words, and the contemporary remakings are its third, or the second birth of the neoclassical; the generations are not straightforward linear inheritances but cyclical and regenerating. At the time of writing, Laric's intervention with the Gibson work is part of the most recent cycle, shaped by not only new reproductive and distributive technologies, but also contemporary debates around ownership of both antiquities and The Antique.

At the 2016 Liverpool Biennial, Laric showed three *Shepherds* across different venues, in different arrangements of printed material and with varying interventions to the digital model. The first, for us, with the fewest kinds of printed resin, was the ABC Cinema version, made entirely in modular sections of clear resin with highly visible seams, with three additional copies of the Walker *Shepherd* that decrease in scale at the main figure's feet (fig. 7). The second, shown in the Oratory venue, used a substantial amount of clear resin printing with some opaque sections around the tree stump and ground, but in place of the recursive *Shepherds* had a horned starfish from Laric's scan database

(fig. 8). The third, shown in the Cains Brewery, used multiple stereolithographic materials including white sections visually similar to a marble or plaster surface, two grey sections with a speckled appearance not dissimilar to a granite, and one that appears to glitter in photographs (fig. 9). Versions from other exhibitions also include iridescent, pink, and even open mesh sections. All three sculptures include a restoration: the lizard, whose head is missing on the Liverpool marble and on the available 3D model, has been recapitated.

The Liverpool scans and sculptures sit within a larger project of scanning three-dimensional objects in collections and then making that scan data available on Laric's website threedscans.com and other scan repositories.[40] These scans include a version of the *Spinario* from the Institut für Klassische Archäologie, Vienna, also scanned in 2016, and numerous Gibson sculptures.[41] These scans have generally been produced with the permission of the museums (including the Liverpool scans), using handheld scanners such as the Artec Space Spider used for the *Shepherd*, but occasionally Laric has resorted to what may be described as pirate photogrammetry, in the case of his scan and sculptures after Max Klinger's portrait of Beethoven (1902, Leipzig).[42] Laric was denied permission to make a scan of the Klinger Beethoven by the museum, and in the legal grey area between the museum's right to set rules for behaviours on their premises, and the fact that the Klinger work is long out of copyright, Laric used tourist photographs taken by others to construct a photogrammetric model of the sculpture. The average tourist is allowed to take photographs in the space, meaning these legitimate images of the sculpture became the basis for the illicit model. This pirate photogrammetry is in contrast to high-end scanning, which uses lasers or light-emitting diodes to capture minute details from surfaces and produce the 3D model that way; this can be with or without colour or textured surface finishes on the digital model.[43]

At the printing end of the process are two main forms of 3D printing, both of which incorporate a wide range of materials and specific technical processes. The most accessible and inexpensive printers use fused deposition modelling, or FDM. FDM printing uses a heated extruder on computer-driven, mechanised arms to deposit fine layers of filament, most commonly polylactic acid or PLA, from the bottom up—essentially the robotic, plastic version of the ancient ceramic technique of coil pots, or like a glue gun that makes sculpture. Small-scale FDM prints are regularly used to produce moulds for casting sculpture, further introducing layers of replication and new materialities into a single object's network of replications, imitations, and reworkings. Larger objects can be made even on small printers by making modular pieces and fixing them together, not dissimilar to casting individual sculpture parts and affixing them in bronze or plaster.[44] These prints may seem highly accurate when based on high-resolution scans, but the process can easily fail or introduce defects into the finished object; the 3D print I had made using the Scan The World model of Thorvaldsen's *Shepherd* has a serious printing failure where the right arm was printed without sufficient support and the elbow is missing and partially off-centre, with visible stringing even though the scan is exacting (fig. 10). Stereolithography, the primary method of production used for Laric's sculptures, uses a laser or multiple lasers to cure a liquid resin in layers from below. Sintering processes use lasers again, but rather than using the liquid resin, these lasers partially melt and fuse very fine layers of powdered material, which can include plastics, ceramic, resin, or metal alloys.[45] Home stereolithographic and sintering printers are now available, although these cost more than FDM printers and require more health and safety precautions.

Both small-scale printing and specialist professional printing are implicated in Laric's Liverpool Biennial sculpture project, as well as the expansive afterlives of the scan data. My instantiation of the *Sleeping Shepherd*, in grey PLA, is a straightforward print of the STL file taken from Laric's threedscans.com website, with a relatively high layer height to emphasise its production method (fig. 11). My print of the Endymion relief similarly reveals strong traces of its making (fig. 12). Because the scan is freely available, the reach of Laric's imitations after Gibson's *Shepherd* is extended outside the three venues of the Biennial. The model can be further modified by anyone with basic digital skills; even I can run the model through opensource software such as Blender to add extra forms, expand or contract it, or render the whole object in fun colours and low-poly (low-polygon, or geometrically faceted) (figs. 13 and 14). Examples of artists' reworkings of the file are available on Laric's own website, and printed versions are shown along with the file on the MyMiniFactory site.[46] Indeed, we will return to contemporary fine art sculpture which uses these models toward the end of this article. The largely unmodified prints, though not necessarily produced *by* Laric, are essentially editions of his first (digital) version of the Walker *Shepherd*, distinct from the large-scale imitations that function as individual works of art. These prints are analogous to the reproductive, reduced casts sold on the streets of European capitals in the nineteenth century by *i figurinai*,[47] licensed Parian ware or bronze reductions after modern sculpture,[48] and various forms of "photosculpture" using projected photographs or light to take volume or trace contours.[49] The modified digital works displayed on the website are imitations after the Laric original, rather than editions or copies, and are in that case a technologically updated version of Gibson, Canova, and Thorvaldsen's imitations after the antique.

The use of digital scans *suggests* a data-driven fidelity to the original object that in turn offers a degree of authority and "accuracy" to Laric's primary figure and additions. The downloadable STL file of the *Shepherd* maintains the absent lizard head, remaining faithful to the signs of age and damage on the Gibson *Shepherd* in the Walker Art Gallery. However, along with adding recursive shepherds, new colours, and the occasional sea creature, Laric also repaired the lizard head or replaced it entirely with a larger, more prominent lizard on the full-scale resin prints. The inclusion of such damaged parts on the model, rather than a repair, points to a continuing fascination with the cult of the fragment and the visible signs of age on an antique sculpture, as much as a protection of Laric's imitations as new artworks—the data is faithful to the prototype, but his artistic intervention takes it a step beyond (and these new versions cannot be downloaded). In his new works, Laric repaired the lizard heads, and the additions of starfish or recursive *Shepherds* along with the selection of the modules' various media act together to create a meaningful change to the underlying model, sufficient to call each piece a new work of art, an imitation rather than a copy. Starfish can regenerate new limbs and even new bodies when damaged or fragmented; these additions reinforce the parallels with restoration and modularity created by Laric's replications after Gibson, especially as the lizard can regenerate some parts of its body and is already included on the sculpture.

Beyond issues of imitation and replication, the modularity and apparent interchangeability of the Biennial sculptures offer a transhistoric analogy to the culture of restoration in the eighteenth and nineteenth centuries. Restoration trends during this period allowed not only for new limbs and details to be produced as infill, but also for a mix-and-match approach.[50] Laric's modular, recombinatory sculpture echoes the restorer's practice of blending disparate fragments in one figure and the recarving of faces, coiffures, and accessories to fit contemporary market tastes for specific "types".[51] The modularity and complex temporalities of these restorations have parallels in the afterlife of the Aegina pediments, which were purchased by Crown Prince Ludwig I of Bavaria in 1813 and sent to Rome for Thorvaldsen to restore. These restorations have since been removed, but were dramatic interventions to complete the highly fragmented works.[52] The re-intervention of twentieth-century restorers on the Aegina sculptures is no more authentic or authoritative than Thorvaldsen's early nineteenth-century ones, but rather a cyclical development in the life history of the works. As Diebold notes, the metal support rods holding the sculptures in place "in tandem with the perfect circles of the restored shields give the installation an abstract, modernist look that corresponds closely in appearance to the stripped-down modernism" of the museum.[53] The display of the derestored works still relies on Thorvaldsen's earlier restorations to provide visual clarity, a layering of temporalities, and stylistic emergences on top of the historical forms.

Materiality and Seriality

A question asked of these technological replicas is whether readily available duplications might diminish the importance or aura of important works of art, particularly those in expensive, heavy, and difficult to manipulate materials like marble—the Parthenon sculptures, for example. There are really two parts to that question. One is answered by Laric himself: his scanning project is aimed at making "the collection available to an audience outside of its geographic proximity", while also treating "the objects as starting points for new works".[54] Large-scale marble and bronze sculptures are difficult to move and display, and require expensive, environmentally damaging travel for tourists and scholars to visit. The availability of 3D models from Laric and other scanners allows artists and scholars to digitally manipulate and rearrange sculptures from far-flung collections. Small-scale prints allow people to feel a sense of ownership and investment in works that they may otherwise never be able to access, and to customise their ownership from curation to colour. There are practical drawbacks to using these prints or scans as study objects; the models and home prints erase differences of scale and materiality, but so do digital or print reproductions of paintings and photographs. Issues of reproduction, scale, and materiality are not new; in ancient Greece and Rome small bronze copies were made of famous sculptures, as they were in the renaissance and baroque periods, and the nineteenth century saw the introduction of even more materials for copies—plaster, Parian, and prints.[55] The opportunity to purchase these in exhibition shops or online, or to make these replicas at home without a great deal of technical artistic expertise has only changed in materials and methods.

Sufficiently high-quality prints also allow, even in reduced form, the kinds of compositional and formal comparisons that Canova utilised in his studios, or were undertaken in art schools, with plaster casts of sculpture.[56] As Christina Ferando has noted, the comparison of sculptures of similar scale but in different media—in Canova's case, his marble *Perseus* compared to the plaster *Apollo Belvedere*—will give marble an edge, because "plaster lacked the luminosity, warmth, and vibrant surface of the marble".[57] Comparing like to like provides a better opportunity to compare the works' qualities and contour. Furthermore, 3D scans can be used to carve full marble sculptures; a robotically carved marble version of Canova's *Cupid and Psyche* was fabricated for the *Canova. Eterna Bellezza* exhibition in Rome, and Barry X Ball has used 3D scans and robotic carving machines to produce his *Sleeping Hermaphrodite*.[58] Of particular interest are sculptor Zachary Eastwood-Bloom's sculptures for the *Divine Principles* series, which include works after Gibson using Laric's scans. Laric's open-access data of Gibson's *Venus Kissing Cupid* (1832, Usher Art Gallery, Lincoln, scanned as part of the Lincoln 3D Scans project)[59] became the underlying matrix for Eastwood-Bloom's *Venus Celestis*, with the figure of Cupid deformed and distorted using data from satellite images of Venus the planetary body (figs. 15 and 16). This reworked model was 3D printed, refined, and ultimately carved in an edition of three marble sculptures using CNC milling, or in the vernacular, carved by a robot (fig. 17).[60]

The materiality question is more fraught. White marble in the long nineteenth century was heavily freighted with cultural notions of beauty, morality, and artistic superiority, despite a widespread understanding of ancient polychromy in artistic and cultural elite circles during the same period.[61] Gibson in particular was a proponent of the polychromy revival; in the same room as the *Sleeping Shepherd* at the Walker Art Gallery in Liverpool his *Tinted Venus* is displayed in a glass-walled temple.[62] Marble, because of its material properties, can be carved extremely finely and becomes translucent. Among white marbles, Carrara, especially *statuario* or pure white, flawless marble, was

skilled hands and with the right kind of marble this allows for demonstrations of virtuoso carving and lighting effects. It can be polished to an extreme shine as with Canova's *Endymion* or imitate the softness of skin; it can be tinted gently, gilded, or left unadorned apart from the veins and sugary sparkle of its natural chemical and geological makeup.[63] There is no inherent aesthetic or intellectual superiority to the material itself, nor to the production of the sculptures. Most marble "masterpieces" were not the product of the lone hand of a singular artistic genius, but were workshop productions—a fact true of work from antiquity to the present day. Artistic training from the renaissance onwards often took place in ateliers and studios, copying or finishing the master's drawings, canvases, and sculptures, while teams of artists who had completed their training could work under their teacher and specialise in parts of the whole. Canova, Gibson, Thorvaldsen, and their followers used mechanical means to develop replicas in marble, including pointing machines, and teams of assistants.

Critically, however, Laric's works, or the small-scale replicas printed at home, are not intended to be total replacements of works with the aura and materiality of marble sculpture, and do not pretend to be. Even when printed in imitation marble or granite plastic or resin, the material is obviously not actual marble, and any addition of colour, figures, or deformations emphasise that the new work is an imitation or a response, not a replacement or replica. Most of the objects Laric has scanned are still extant, displayed or stored in museums, and his data and objects are not taking their place permanently in their historic galleries—adding new versions, replications, and potentials rather than replacing. However, as a thought experiment, it would be possible to imagine a world where the Liverpool sculpture was, perhaps, lost at sea during shipment to an exhibition. Laric's scan data could be fed into a CNC milling machine to carve a replacement, taking the space of the lost original, either with damage repaired or not. 3D-printed objects, in new materials, are not universally a replacement for marble, bronze, or other traditional fine art sculpture or research: for Eastwood-Bloom, they are an intermediary medium in the process of production, while for my own research, the small scale and inexpensive price tags (and fun colours) make models more economical for study. Laric, however, uses the ever-developing technology as part of the finished work for its aesthetic and critical properties.

The materials of Laric's sculptures and home printers do not replace or undermine the "original" model (a fuzzy concept when the "original" is antique or one of several versions), but point to the continuing interest in viewing, studying, handling, and playing with the material remains of antiquity and the nineteenth century. By using digital software and contemporary materials to produce his imitations of the nineteenth century (which in turn are imitations of the antique), Laric's sculptures point to the futurity of classical and neoclassical models. Scanning projects like his democratise access to the forms of the sculptures themselves, meaning that an art class could make drawings or clay models after a 3D print, rather than the two-dimensional photograph, while historians and art historians could essentially curate exhibitions in the digital or in replica as didactic exercises. These are not devaluing or replacing the originals as materially important; they simply offer new avenues of engagement. In time, Laric's sculptures may gain their own patina of age and aura, gain credit as originals in themselves, while the scans and prints become the material artistic culture of a data-driven age. Laric's scanning projects are by no means limited to the classical or neoclassical sculptures in various collections; he has scanned starfish and crabs, architectural fragments and antiquities, bones and bodies. The edits and remixes he produces of antique and neoclassical sculpture are additive, rather than challenging, deleterious, or even parodic, to the nature of the original(s); they sit within the legacy of neoclassical responses to earlier works rather than undermining it.