Keith Brown and meeting the digital halfway: Cartographies of light and sculptural becoming

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ABSTRACT

This article reconsiders British sculptor Keith Brown's practice through new materialist and postdigital perspectives, focusing on *Crest_01* (2012). Centring Brown's concept of *modelling-with*, it argues that light is an active mediator linking analogue and digital domains, shifting authorship from an anthropocentric model towards human-nonhuman collaboration across computational and material processes. Using a cartographic methodology, the article maps non-linear moments across Brown's workflow – analogue material engagement, CAD modelling, and 3D printing – to track changing intra-actions of light, code, and matter. It shows how algorithmic form becomes perceptible through screen illumination and is materialised through light- and heat-driven fabrication, where coded geometries are enacted layer by layer. Close analysis of *Crest_01* demonstrates how light activates translucency, duration, and spatial perception, positioning the sculpture as a performative event rather than a static object. The article proposes digital matter as an agentic force and suggests modelling-with light as a framework for rethinking sculptural practice and creative collaboration under pervasive technological mediation.

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Introduction

Sculptors who have turned to 'the digital' experience an embodied physical-to-virtual blurring of realities.[1] Working 'through-the-screen-space', they encounter an analogue to the digital (and back to analogue) postdigital entanglement, enabled by the ubiquitous and indeterminate qualities associated with binary code (Ihde 2012:146-47). Equally important, yet overlooked, is the sensory and performative role played by the actual and virtual materiality of light. In this infolding human-nonhuman relation, the direct and indirect properties of light initiate a forceful shift that transforms spatial, temporal, and material dimensions. To emphasise the performative co-creating significance of light-matter, we examine a cartography of supporting concepts, practices, and materialities. Our critical analysis reveals how points of tension and connection co-constitute the ever-transforming relation among the sculptor, material, and digital technologies. Adopting a cartographic methodology foregrounds the material-semiotic significance of light-matter, moving beyond the analysis of sculpture as a static object to account for complexity, hybridity, and processual change. Relinquishing rigid interpretation introduces a flexible, relational, and generative framework for understanding the performative, light-infused neomaterial aesthetic prevailing in digital sculpture. Central to clarifying this vital sculptural phenomenon is the call of new materialist philosophy to reconsider the primacy of matter, which advocates the co-constitution of things rooted in a material-discursive entanglement.

It is well established that computational machines can materialise complex forms derived from software-driven algorithms and binary code. In explicit terms, the screen converts electrical voltage into light through transduction, wherein the Light-Emitting-Diode (LED) backlit computer display converts electrical energy into light.[2] At the algorithmic level, the computational instrumentality translates light into data. Parameters such as intensity, wavelength, direction, or time-based variations are encoded as numerical values that the algorithm can process. In the 3D Computer Aided Design (CAD) modelling process, algorithms function as generative and structuring agents that translate abstract parameters – such as mathematical relationships, procedural rules, and iterative transformations – into precise digital geometries. These algorithmically driven forms, often generated by parametric or computational design systems, initially exist as virtual meshes composed of vertices, edges, and faces. When prepared for 3D printing, this data is converted into machine readable G code instructions through a process known as slicing, in which the digital model is divided into successive horizontal layers. The 3D printer then materialises the algorithmic logic layer by layer, depositing or solidifying material according to these encoded pathways. Essentially, CAD and algorithms take on a physical form through a sequence of transductive operations mediated by light: first rendered perceptually through digitally regulated screen illumination during modelling, and subsequently enacted through

light and heat-driven fabrication processes that chemically or thermally transform material layer by layer. In this way, the immaterial operations of the algorithm – its calculations, repetitions, and variations – are directly embodied in the physical object, resulting in a sculpture that not only reflects its digital origin but also preserves the procedural intelligence embedded within its computational formation.

The sculptural object that emerges is therefore not a direct translation of a pre-existing digital model, but the sedimentation of continual light-matter events. Less explicit is how light operates within the digital as an iterative, responsive spatio-temporal system that interconnects body and material. In the digital, the (im)materiality of light is not just an external condition but an active agent, shaping the human-nonhuman entanglement that characterises how the work is seen, felt, and even conceived. In the digital domain, this elusive active material serves as a significant sensory feature, subtly enabling a spatio-temporal virtual exchange between the sculptor and the virtual realm while affecting the shape and surface of the actual sculpted form.

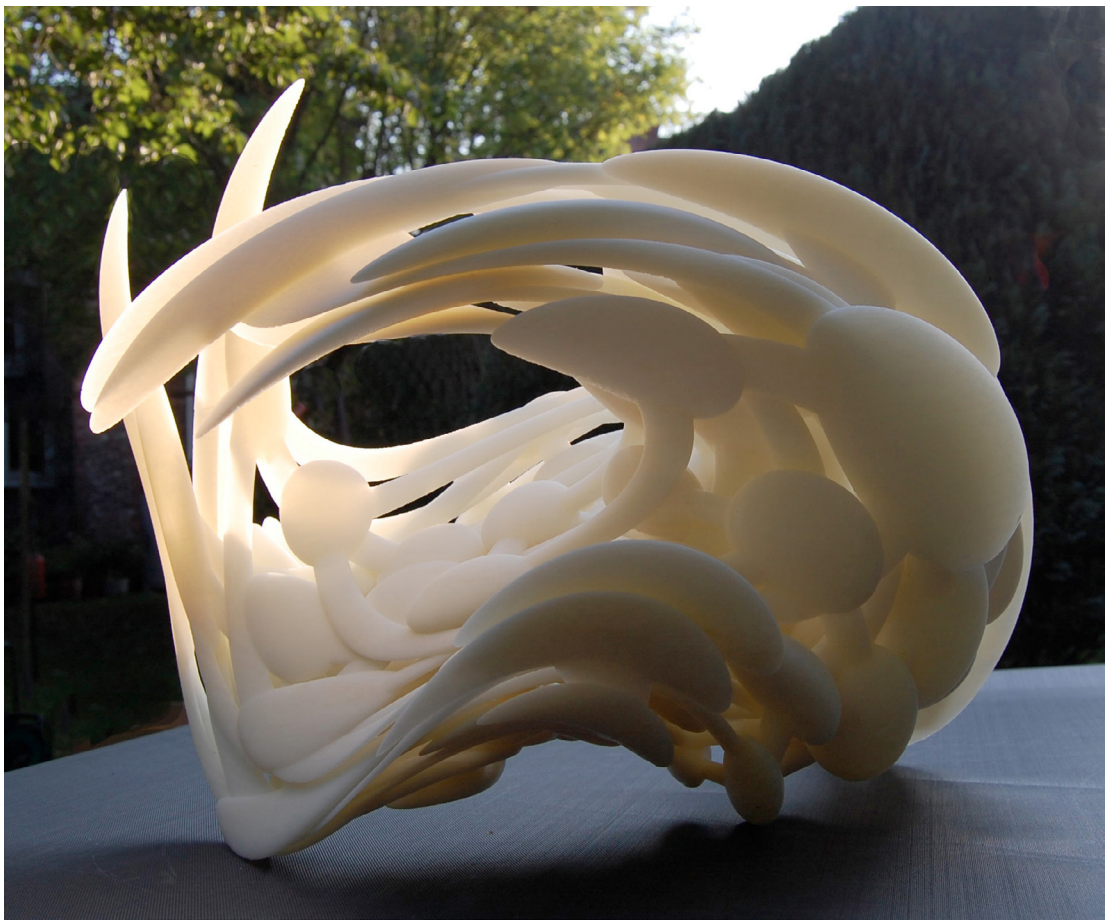

FIGURE **Nº 1**

Keith Brown, *Crest_01*, 2012. Fused deposition modelling 3D-printed acrylonitrile butadiene styrene, 22 x 30 x 24 cm. Part of the exhibition *Future and Reality*, 2012, Beijing, China. Courtesy of Keith Brown.

Whether created in the virtual or actual space, the concept of materiality in space constitutes an endless yet enveloping medium that, when interspersed with light, activates the visual, tactile, and kinesthetic senses. The light-forming, ethereal aesthetic emanating from British artist Keith Brown's *Crest_01* (2012) accentuates translucency as agential, generative matter, which constantly redefines both the work's inner volume and the enfolding space (Figure 1).[3] 'Modelling-with light,' as Brown (2019a) names his praxis, we argue, illuminates *Crest_01*'s human-nonhuman collaborative coupling as a revolutionary promise for contemporary digital sculpting, rethinking agency and possibilities for their creative collaboration. Brown's convoluted, sinuous 3D-printed sculpture weaves a complex yet seemingly familiar organic form that would be difficult to achieve through traditional sculpting methods. To the naked eye, prompted by the title, *Crest_01* represents a surging wave-like form about to reach its threshold. Shaped by light, the form's overall thrust is harnessed by a spatio-temporal network of interconnected nodes, giving rise to an oscillation of implied yet denied motion. The artwork's structural integrity marks not only the force of light but also Brown's response to algorithmic stimuli that evolve from within, that is, shaped by an indeterminate coded logic rather than an anthropocentrically imposed geometry.

In *Crest_01*'s sinuous curves, light assumes form. Translucent folds materialise, illuminating the languid yet dynamic motion of molten matter, frozen in successive registers of chiaroscuro. As light oscillates between presence and absence, it saturates the contours of the form. In each sinuous wave, light-matter entwine becoming-form, form becoming-light. Interrupted by the intermittent absence of its channelling partner, wavelengths punctuate and extend beyond the visible spectrum into the realm of (im)materiality. An unbounded, digitally coded algorithm materialised in a finite 3D-printed off-white Acrylonitrile Butadiene Styrene (ABS) thermoplastic, *Crest_01*, renders light visible as a transformative agent.[4] Confronting established perceptions of human-nonhuman creativity, *Crest_01*'s transformative potential lies in its demonstration that binary code and plastic alone do not adequately convey the sum of its parts; there is more than meets the eye – a vitality beyond the tangible – a 'minor gesture,' as Erin Manning (2016:1) phrases it. Minor gestures are nuanced; they open experience to new modes of expression, emphasising not the expression's eventual becoming but disrupting the process to introduce a 'becoming of continuity,' from within the event, before it's becoming (Manning 2016:3). Recognising that code is no longer a novel trajectory of contemporary sculpture raises the question of why light-matter matters.

Light, imperceptible and overlooked, does not merely render the world visible. Instead, light in sculpture shapes perception, evokes effect, models form, and alters our aesthetic experiences through its ethereality. Kathryn Vasseleu (1998:44-45) concurs, noting that light is 'taken for granted as a transparent "lighting" or background setting of things' but,

extending beyond its marginal role, is essential to the perception and experience of objects. The entanglement of light, colour, and the spatial relationships among objects within a perceptual field cannot be dissected into discrete components (Vasseleu 1998:45). Instead, it manifests through intentionality, in which the perceiving subject coexists with this sensory phenomenon (Vasseleu 1998:45). Nevertheless, in most artistic analyses, discourse concerning this enigmatic literal, yet metaphorical phenomenon is subordinate (or entirely omitted) to the work's materials, processes and meaning.

In our mapping of *Crest_01*, light is considered fundamental to understanding the material and processual dimensions entwined in the artwork, thereby facilitating a performative view of how the artist and the artwork intra-act. Light, specifically its translucent expression in *Crest_01*, expedites the entanglement of dualities as transformative working relations within the digital domain. Avoiding a representationalist interpretation, we regard the digital as engaging 'with the vexing sites where figures, narratives, concepts, and histories bear the traces of their worldly entanglements,' interpreting 'storied matter' as it articulates the human and nonhuman actors' relations (Alaimo 2015:300).[5] From this perspective, we engage Brown's modelling-with by mapping the processes and materials from their analogue to the digital (and back to analogue) interactions. Throughout, the subtle gestures of the light illuminate posthumanist and postanthropocentric engagement with the digital realm, thereby critiquing anthropocentric perspectives to unveil human-nonhuman couplings as a creative prospect.[6] While cartography is sometimes understood as a methodological sequence, it does not operate here as a linear, step by step procedure. Rather, following new materialist approaches, cartography is employed as a non linear, relational method that traces connections, movements, and transformations as they emerge across practice, theory, and material processes. Instead of advancing through discrete stages, the analysis maps moments of intensity in which analogue and digital practices, light, materiality, and code interact within Brown's sculptural praxis. These mapped moments function as analytical waypoints rather than sequential steps, allowing relations and processes to remain open, dynamic, and responsive to material conditions as they unfold. Rather than functioning as an abstract theoretical exposition, the conceptual framework developed here is mobilised as a set of analytical tools activated through the close reading of *Crest_01*, enabling a situated examination of how light, code, and material intra act within Keith Brown's sculptural practice.

New material topologies: Mapping oscillating gestures

This moment in the cartography maps *Crest_01*, presented as part of the *Future and Reality* exhibition at the 5th Beijing International Art Biennale, hosted at the National Art Museum of China through the lens of new materialist thought, foregrounding how Brown's

sculptural practice emerges through oscillations between analogue material engagement, digital modelling, and light mediated intra action. Shifting, as Brown does, from analogue to digital and back to analogue, modelling-with light emphasises the significance of integrating traditional sculpting techniques into the virtual domain, working intuitively and collaboratively, to revert to a tangible state. To facilitate our discussion, we consider the subtle gestures of light imminent to *Crest_01*'s intra-active entanglements as a gesture that suspends its neomaterial aesthetic. Our cartographic methodology facilitates an 'absolute deterritorialising' that avoids 'representation, signification, and disciplinarity' (Dolphijn & Van der Tuin 2012:113). Under the framework of new materialism, this genealogy centres our discussion on how matter acquires agency within realism and how its materialisation 'unfolds' (Dolphijn & Van der Tuin 2012:113). Our interdisciplinary framework enables us to plot a comprehensive review of (digital) matter as inherently relational and imbued with agency. It emphasises a material-discursive entanglement and posits a vitalist understanding of the roles and actions of both the artist and the artwork. Rick Dolphijn and Iris van der Tuin (2012:121, emphasis in the original) describe new materialism as 'a monist philosophy of difference, or more precisely, *immanence*,' whereby we reconceptualise (post)modern thought. Consequently, we engage in 'diffraction', drawing on disciplines ranging from physics to the arts, to foster constructive engagements across (and a reworking of) disciplinary boundaries,' challenging the dualist views (Barad 2007:25).

Light, an electromagnetic phenomenon characterised by both wave and particle-like properties, propagates through space with a specific frequency and wavelength, with its energy exchanged in discrete amounts known as quanta or photons (Simondon 2020 [1964]:82.). Its capacity for movement, relationality, and agency is most evident through its ability for translucency, making it visible to human perception. As an analogy, translucency illustrates the process-oriented nature of modelling-with, as articulated in *Crest_01*'s neomaterialist imprimatur.[7] The procedural reassembly of analogue and digital elements in sculpture manifests as an expression of the postdigital. The hybridisation of digital and analogue media signifies a notable transition from symbolic representation to indexicality in media practices (Cramer 2014:13).[8] As a 'messy state of media, arts, and design *after* their digitisation,' the postdigital signifies a period following the disruption of digital information technology, emphasising physical traces or a neomaterial imprimatur and content (Cramer 2014:17, emphasis in the original). In this postdigital reality of rapidly expanding and pervasive technological advancements, a review of human relations with digital matter requires reappraisal. In contemporary sculpture practice, we regard postdigital reality as an agentic system, in line with scholars who argue that postmodernism has reached an end.[9] Shifting between the past and the future of artmaking contextualises our research within the framework of 'metamodernism,' defined by Vermeulen and Van

den Akker (2010) as a 'structure of feeling.'[10] Metamodernism is an indeterminate sensibility comprising a 'series of linked observations' in which the prefix *meta* frames connotations that are 'situated epistemologically *with* (post)modernism, ontologically *between* (post) modernism and historically *beyond* (post)modernism' (Vermeulen & Van den Akker 2010:6-12, emphasis in the original). These open-ended metamodern views position modelling-with participatory artistic practice in experiences; a postdigital entanglement infolded in a structure of fluctuating events. In Brown's praxis of modelling-with, we propose that light 'moves through the [art] event, creating a pulse, opening the way for new tendencies to emerge' (Manning 2016:8). Light resonating across analogue-digital spectra, we argue, signifies these transpiring affinities, thereby actualising the potential for divergence from the 'predetermined definitions of value [of the] major' (Manning 2016:8). Light '[c]ourses through it, unmooring its structural integrity, problemati[s]ing its normative standards'; its speculative, pragmatic nature reveals the agency of digital matter, a 'value as ephemeral as it is mobile' (Manning 2016:1-2).

Drawing upon decades of traditional sculpting practice focused on materiality, pattern, processes, and form, his early-career sculptural iterations influence Brown's current modelling-with process. This moment in the cartography traces Brown's analogue engagement with material processes, in which light and matter inter-act before digital mediation, and marks the artist's transition from analogue to digital methods as the initial phase of his creative process. Brown's praxis of modelling-with light in CAD offers an insight/opportunity to inform this reappraisal. His work merges, distorts, twists, and duplicates geometric forms, digitally altering the algorithms that describe form. His work occupies an analogue-digital space, which enables engagement with form not possible when sculpting with tangible matter. His last phase culminates in a transition back to an analogue state by 3D-printing the digital form, materialising its coded structure in thermoplastic layer by layer. Following post-processing, *Crest_01* now offers a transient glimpse, momentarily solidified in analogue form, of the expansive, open-ended possibilities inherent in the digital that underpin it. In the manifestation of its oscillating analogue-digital-analogue continua, *Crest_01*'s neomaterial imprimatur, which reveals its postdigital nature, reiterates modelling-with as a co-creative practice in which human-nonhuman entities entwine.

Through its immersive and (im)material gestures, light remains a collaborative partner throughout the making process. Highlighting the performativity of the sculpture's material-processual entanglements, we plot light's illuminating companionship throughout our discussion as we shift conventional hierarchical, human-centred paradigms of making, diminishing the role of the sculptor as the sole creator, to a praxis of making-with that resonates with a postanthropocentric episteme wherein all matter constitutes vital, intelligent, and self-organising assemblages (Barad 2003, 2007; Braidotti 2018; Deleuze

& Guattari 2004). A postanthropocentric, nonlinear infolding of human and nonhuman matter manifests, equalising the ontological status of humans and nonhumans and reshaping our current and prospective engagement with the digital environment.[11]

The vitality of light: Analogue-digital entanglements

In *Crest_01*, the vitality of light becomes materially perceptible through the sculpture's translucent surfaces, where analogue and digital processes converge and are activated through modelling with. Materials acquire agency through their technological associations; a fusion palpable in *Crest_01*, where light manifests at the 'confluence and convergence of digital technologies' (Paul & Levy 2015:27). Here, light not only 'activates the work' but also invites a lived, 'felt' experience of time that dissolves conventional distinctions between entities (Manning 2016:65). Light as a metaphor for the dynamic unfolding of reality, illuminating the interconnectedness of temporal moments and resisting static representations; light itself becomes 'time as duration' (Manning 2016:65). For Brown, the spatio-temporal materiality and affective bodies converge to forge a unique analogue-digital intra-action, wherein the virtual is experienced as a perceptual field. Here, the cartography maps the translation of material intuition into computational modelling, foregrounding CAD as a site of human-nonhuman intra-action mediated by light.

This field is dynamic and ever-shifting, forming a postdigital assemblage where past, present, and future coexist (Dolphijn & Van der Tuin 2012:66). Drawing on Bergson's (2013:154-191, 183-185) theory of *durée*, which prioritises lived, subjective experiences over measured time, modelling-with celebrates the ongoing force of becoming as matter and time coalesce. Brown's sculpting with physical materials and tools is translated into the digital domain, where he continues to explore the innate self-ordering tendencies of matter, as initially examined throughout his artistic *oeuvre*. To elucidate what engaging with the digital entails in Brown's transition from analogue to digital domains, it is necessary to investigate how his early engagement with matter and form informs our understanding of the coexistence and potential expansion of these methods through the integration of digital technologies.

FIGURE **Nº 2**

Keith Brown, *Sawdust installations*, 1977. Sawdust. Serpentine Gallery, London, Summer, 1977. Courtesy of Keith Brown.

Beginning sculpture in the 1960s, Brown (2019a) was influenced by the 'truth to material' principle, which he interprets as 'truth to form and process.' Engaging with everyday objects such as bricks, cardboard, sawdust, wall tiles, and wood, these early entanglements with materials allowed matter to dictate form rather than control it, establishing a relational approach that collaborates with entities' inner logic. *Sawdust installations* (1977) (Figure 2) highlights the vitality of materials, specifically the self-organising structure, as the sawdust's repose angle is deformed by glass. Brown's emphasis on intuition, exploration, and experimentation sparked an engagement with the intrinsic logic of matter as a self-determining relation, a microscale view of an entity's essence and a becoming through vital materialism (Bennett 2010). Barad's (2003; 2007) agential realism affirms matter as an ongoing process characterised by agency, accentuating a materialist perspective of performativity: intra-action, contrasted with the implicit binarism of *inter*action. Barad (2003:823) defines it as a process that 'causally constrains … nondeterministic enactments through which matter-in-the-process-of-becoming is sedimented and enfolded in further materialisations'. Within this relational framework, the sieve dispersing sawdust and the glass template deforming its angle of repose function as apparatuses. Matter (sawdust) actively intra-acts with the apparatus (sieve and glass), blurring limits between human and nonhuman actions by revealing the potentialities of all entities through their entanglement. Grounded in Niels Bohr's principle of complementarity, which asserts that wave-like and particle-like behaviours are fundamental and interconnected, Barad (2003:825) underlines the context-dependent nature of matter, suggesting that notions

such as matter are intimately embroiled with meaning. A pivotal concept herein is multistability – the idea that digital technology's effects are context-dependent and manifest as a situated field of awareness.

Bergson's writings employ light metaphors to illustrate perception, intuition, and reality. Emphasising dynamic, fluid experiences, we approximate light to duration and intuition, reflecting Brown's postdigital remediation. Dynamic vitalism, as evident in *Sawdust installations*, describes an *élan vital*, or vital impetus, shaping a 'cosmic flow' of life and matter with a 'tendency toward spatialisation' (Bennett 2010:76-77). Bergson (2001:197) disassembles static notions of space-time, noting that all entities are interconnected through time while remaining distinct in space. This qualitative multiplicity is heterogeneous, continuous, dualistic, and, most critically, an irretrievable temporal flow that invites reconsidering matter not as inert but as temporal processes (Bergson 2013:85-120). In *Sawdust installations*, the materials and methods, immersed in natural and/or artificial light, suspend form within its modulations of light and shade. Similarly, *Crest_01* is punctuated by light (extended into the digital), framing Brown's praxis as a process of sense-making (Manning 2016:15). Light, in all its forms across the artist's durational analogue-digital interconnection, functions as a filter among diverse entities. This concept is rooted in the practice of modelling-with, which is based on affective and extended perception (Wegenstein 2010:21). In the Bergsonian framework, perception is associated with movement and transformation, implying that Brown's intuitive experiences and active responses originate from a dynamic unity of actual past experiences and current virtual images.

Brown's early sculptural spontaneity is evident in his *Tree series* (1980-1990). The slicing and reassembling of tree trunks into hybrid forms reveal a self-organising geometry analogous to CAD functions such as copy, twist, and bend. Brown (2019a) likens the broken edges in *Pixelog* (1980) to digital pixelation characteristic of two-dimensional computer graphics, where 'the object has been pushed through itself.' Similarly, the stacking technique used to create the artwork's form is comparable to the layered process of 3D printing. While Brown's relational framework governs the internal logic of entities, his methodology extends beyond the artist's focus on materials. Modelling-with digital technology also influences the development of digital media, continually improving its capabilities through software updates from the late 1980s to the present, including tools for digital sculpting. Early on, Brown experimented with pre-visualising segmented tree formations using Apple Macintosh's first version of the 2D CAD software MacDraw®. Later, the release of Aldus Super 3D™ enabled Brown to achieve convincing 3D pre-visualisations of his physical sculptures. Notably, using this early form of CAD as a design tool introduced a sense of pre-planning, which conflicted with Brown's desire for an intuitive approach to modelling-with matter, where it is more about "making something"

rather than “making as a process” (Ingold 2013:20). Unavoidably, the baseline choice of tools in the 2D CAD MacDraw® software influenced Brown’s decision-making, reducing the direct engagement found in wielding a chainsaw or chisel. Brown’s transition to digital took place over two years, evolving through the release of Autodesk 3D Studio DOS®, the first version of Autodesk 3ds Max®. Brown’s real-world self-ordering mind-matter intra-action with matter, combined with his co-evolution with digital software, served as a precursor to the algorithmic manipulations shaping his contemporary digital sculptures. The artist’s use of CAD and 3D printing in the late 1990s once again broadened his intuitive exploration of the self-ordering object in the physical world, now rooted in a deeper engagement with the algorithmic internal structure of computation.

Brown (2019a) asserts that CAD facilitates the flexible, open-ended exploration of converging geometries exemplified by the continual intra-action between mind and matter. This process fosters intellectual fluidity towards a becoming-with the digital. Ongoing advancements in software, particularly in virtual reality, continue to enhance the capabilities of digital co-creation, making it increasingly dynamic, immersive, and adaptable as computational ‘think-tool[s]’ (Grau 2003:255). Instead of positioning humans in opposition to technology, Zylinska (2020:27, 54-55) advocates for viewing human activity as intrinsically connected to technical assemblages, demonstrating ‘how humans can operate within the constraints of the apparatus’ that co-constitutes them. Such performative intra-active entanglements signify that sculptors evolve in tandem with digital processes. By capitalising on continuous technological advancements and emerging opportunities for creativity, the practice of modelling-with remains open-ended, thereby broadening the scope of collaborative human-nonhuman relationships.

Light written in code: Modelling-with the digital

In *Crest_01*, light written in code operates as a mediating condition through which algorithmic form is perceived, adjusted, and ultimately materialised, situating computational processes within a performative sculptural event. Brown’s immersion in natural light during his analogue interaction with matter, coupled with the illumination from artificial light sources in his studio, permeates the computer screen. In a tangible sense, the materiality of light functions as an external factor that shapes perception, sensation, and affect. However, less apparent is how light functions within the digital domain as an iterative, responsive spatio-temporal system that links bodies and materials. This moment foregrounds light’s reconfiguration within the digital domain, where illumination is no longer environmental but algorithmically modulated and written in code. According to Brown (2001:209), the processes involved in light-driven CAD modelling and 3D image

rendering are comparable to manipulating a 'fluid substance such as gas', where the materiality of space forms an endless yet enveloping medium, a flexible shell that, when interspersed with light, stimulates the visual, tactile, and kinaesthetic senses. The shift from analogue to digital occurs when light is encoded as data, turning a purely physical phenomenon into a computational one. The luminosity of Brown's screen is 'controlled by modulations of light in a spatially mapped array of bits or pixels' (Paul 2015:180). Memory plays a vital role in discussions of digital light, as it supports the processes of storing, manipulating, and displaying visual digital data (Jones 2015:89). When binary numbers act as 'digital control' mechanisms, light is activated similarly to data management within the logical framework of digital circuits in computers. Specifically, it is possible to digitally regulate the locations within memory, enabling the storage of images for later display. Central to this process is light – described as a 'digitally current flow' – which occurs when sources are switched on under digital control, producing heat that emits human-visible and infrared light (Jones 2015:89-90).

The role of light in what Brown observes on the screen mainly relates to memory, aligning with Bergsonian duration; it maintains switch states within digital devices, keeps records of current statuses, and determines which lights – often arranged in high-resolution arrays – should be activated to create images, such as lamps, Cathode Ray Tube (CRT) electron beams, or Liquid Crystal Display (LCD) pixels.[12] Digital light then refers to the electronic regulation of light emission. It thus does not behave differently from natural light (Jones 2015:90). The image displayed on the screen can be understood 'as a kind of program, a process expressed as, with, in or through software', a processual intra-action offering an open-ended inquiry into the transformative properties of light, emanating from code (Rubinstein & Sluis 2013:29, emphasis in the original). Digital light is then encoded as discrete data algorithms, constituting a 'pattern of illumination' that manifests as 'a string of digits' (Palmer 2015:151).

In examining the shifting role of screens as intermediaries for illumination and information, Paul (2015:179, 184) asserts that screens serve as 'membranes' that enable novel modalities of collaboration and perception. Distinguished by a move away from ocularcentrism, digital media integrates 'a combination of vision and enacted embodiment,' frequently relying on 'light and shadow as enabling principles.' (Paul 2015:179).[13] Brown's immersion in digital light is thus a critical element in mediating relational agency or 'embodied action,' as Paul (2015) terms it. This collaboration broadens the aesthetic scope of contemporary sculpture towards a 'new order of object,' embedded in Brown's deliberate integration of CAD and 3D printing technologies, which represents a shift that influences the decisions and practices of sculptors by leveraging the innovative spatiotemporal and material potentials afforded by digital media (Brown 2001, 2019a). In the digital domain, light further elucidates its function in worldly interactions, functioning

not merely as a 'basic principle of vision' but also as an 'essential element in mediating embodied action' (Paul 2015:191).

Real-time screens enable immediate output modifications, generating dynamic images experienced without delay and often driven by some form of user intra-activity (Palmer 2015:158). They alternate between windows and control panels, oscillating between 'representation' and 'control' dimensions, where the subject transitions between the roles of viewer and user – inviting us to act as both witnesses and participants (Manovich 2001:207). In this context, images generated in real-time transform the computer screen into a space of performativity, characterised by a 'performative calculation, where temporality is recursive' (Palmer 2015:158). In CAD, simulated translucency is achieved by transmitting light via momentum-transfer optics rather than by direct traversal of the image. This process is a fundamental component of the underlying photon-mapping technique known as subsurface scattering.[14] This computer modelling procedure simulates the physics of matter interacting with light, culminating in the opaque-transparent glow of translucency. Algorithmic light rendering techniques that produce computer-simulated translucency evoke a sensory experience rather than an optically defined spatiality. Unlike viewing the 3D-printed object, the realism of simulated translucency in a digitally rendered CAD image is, in fact, 'not written in light' but 'written in code' (Vasseleu 2015:164).

To illustrate the performativity of code, we revisit Barad's (2007:73) agential realism, specifically diffraction – a methodology and conceptual tool for understanding patterns of difference and relationalities. Relying on light, Barad (2007:75) exemplifies the phenomenon of diffraction by elucidating how 'waves combine when they overlap … bending and spreading' upon encountering an obstacle. Light 'appears to bend when it passes by an edge or through a slit' under specific conditions, resulting in a 'pattern of alternating light and dark lines' (Barad 2007:75). The relational bending and spreading of waves generate interference patterns that, akin to Manning's (2016) minor gesture, reveal their entangled intra-action. Serving as a metaphor for intra-action, diffraction emphasises the relational entanglements between human-nonhuman entities within *Crest_01*'s intricate network of contours and converging volumes. These phenomena arise from an underlying numerical sequence that becomes apparent as Brown adjusts the rhythm and gestures that delineate the sculpture's sinuous form. To facilitate this process, he employs Non-Uniform Rational B-Spline (NURBS) freeform modelling software, which allows the topology of solid geometry to be dynamically modified by altering the numerical values that define its vectorised lines, curves, and shapes.[15] In this dynamic computational process, digital data is embodied in code, exemplifying an indeterminate process rich in potential.

The digital creation of sculptures facilitates the development of a symbiotic relationship between the physical and virtual neomaterial realms, emerging from the assembly of an indeterminate collection of objects. As with most digital art practices, the process of digital sculpture involves digitisation, in which continuous data is transformed into a numerical representation. In this nuanced context, the computer's concealed inner black box (hardware and software) alters indivisible binary code to produce recognisable digital images. Brown's CAD-driven digital sculpting process involves the continuous modification of the parametric digital model, thereby challenging the traditional view that sculpture is an isolated, physical endeavour focused on a static, predefined object.

Shifting the emphasis to the processual relationship, Brown engages directly with the parameters (algorithms and rules) in the same way that he engaged directly with the tangible matter of his earlier sculptural explorations, which script the formation of *Crest_01*'s flowing contours. In this reciprocal creation process, the work eschews rigid, monumental formalities, with its algorithmically infused variations serving as manifestations of nuanced human-nonhuman gestures, whereby modelling with light constitutes a performative, intra-active system composed of co-occurring entities. Within this system, the concealed algorithmic logic of the digital realm facilitates distinctive sculptural effects that indicate Brown's engagement with digital technology. Culminating in *Crest_01*, this processual entanglement of becoming inaugurates a site of potential, characterised by visual tension that indicates an unpredictable oscillation between motion and immobility, outward propulsion, and fleeting implosion. By assigning recognition to the digital as Brown's co-creator and acknowledging its indeterminate, ubiquitous materiality as a medium, code constitutes a genuine creative force. This realisation liberates *Crest_01* from its traditional representational three-dimensional function, positioning it within the performative realm of digitality.

Expanding this computational data conversion process to the digital fabrication of sculpture extends the discontinuity between the 3D image and its physical form. Accordingly, the 3D printing process exhibits both continuous and discontinuous states of matter. Homogeneous, continuous properties of the extruded molten plastic characterise the initial state. In contrast, the final state is achieved when the surface of the 3D print is formed through numerical translation, slicing the digital file into discrete layers of printable plastic. Despite these procedural distinctions, virtual (CAD) and digitally fabricated (3D printing) forms originate from indeterminate continuous matter. The transition of matter from a fluid, continuous state to a rigid, discontinuous state exemplifies the performativity of matter. This subtle shift in spatio-temporal materiality creates a shared production space, where numerous minor gestures – both direct and indirect – influence modelling-with light and, consequently, the physical sculpture.

The agentic dialogue between cognition and affect is driven by intra-acting relations among hardware, software, and wetware that mutually influence each other in multiple recursive feedback loops. Brown's complex 3D-printed sculptures originate from a cyclic analogue-to-digital-to-analogue processual intra-action, extending the act of making beyond the immersive awe of the digital. Steven E. Jones (2014:191-197) identifies this eversion as a transforming reflexive phenomenon. This workflow traverses the 'physical (object, artefact, archive, place) to digital (code, data, connection, network) and back again,' demonstrating that digital code as data always manifests in tangible form. In Brown's analogue-digital remediation, the 3D printer is regarded as a portal of power for everting digital objects into the physical realm. 3D printing enables Brown to reify his ideas across diverse materials, sizes, and configurations, producing geometries that challenge conventional sculptural methods, where 'modelling-with light, with pure form' broadens the imagination and enhances the digital aesthetic (Brown 2019b). Through digital techniques, Brown adopts new methodologies for creating physical objects, engaging in thinking-through-making, in which ubiquity, transduction, haptics, prototyping, and chance intersect reflexively in the digital-to-physical transfer of an object's neomateriality. *Crest_01*'s translucency – an entanglement of natural light, digital light, and code – illustrates the unfolding of virtuality as it continually approaches encoded potential. This proposition underscores the subtleties of the notions of what the artist is and does, as well as what the artwork is and does, when viewed through the digital realm.

The user's intra-action with this computational system is of paramount importance in shaping digital aesthetics and in understanding its determinants. This shift moves the focus from merely defining the essences of objects to adopting a vitalist systems perspective; a material engagement that delineates modes of execution (Bennett 2010; Malafouris 2013, 2019, 2020; Shanken 2015). Modelling-with digital technologies demonstrates that unique and intricate sculptures arise from a computational, performative system that facilitates embodied relations through virtual environments and digital fabrication. Collaboratively, Brown's serendipitous methodology promotes engagement with digital media, where code operates through its pervasive influence and predictive algorithms. Making-with digital tools liberates the sculptor from physical material constraints; consequently, a feedback loop is established, forming a machinic habitual relationship between human cognition and computational media as a cognitive assemblage (Hayles 2017:115). Drawing upon Deleuze and Guattari's (2004) concept of an unbounded assemblage, this 'cognitive nonconscious' system of 'actuators' comprises multiple elements, including humans, algorithms, and devices (Hayles 2017:84). The behavioural state of nonconscious cognition emphasises the flow of information through a system of material agents and forces (Hayles 2017:116). Each entity demonstrates the intra-active capacity to influence the others and to reconfigure spatial, temporal, and material dimensions.

On matter that matter: A minor gesture towards an optimistic conclusion

Returning explicitly to *Crest_01*, this final moment maps the sculpture's affective and perceptual intra-action with viewers, in which light activates a durational, relational experience rather than a fixed meaning. Modelling-with light unveils an entangled field of becoming, where light constitutes merely one among numerous affective gestures shaping sculptural intra-action. Returning to the physical realm, *Crest_01*'s machine aesthetic opens a system of possibilities by blending the flexibility of digital technology with the tangible qualities of 3D printing. This hybrid methodology yields forms characterised by elasticity and ductility, exemplified by seamless, nested geometries – shapes unachievable through traditional sculpting techniques – thereby extending contemporary sculpture beyond the constraints of conventional practices. The biomorphic forms, illuminated by light, interlace analogue-digital entanglements – an emblem of the postdigital – suspending light in time. The surface of the everted form exhibits a cartography of layered patterns originating from the 3D-printed thermoplastic. This neomaterial imprint signifies *Crest_01*'s postdigital aesthetic as a human-nonhuman collaboration within a broader performative system. The digital realm, encompassing both material aspects (hardware and code) and semiotic components (data and algorithms), functions as a collaborative site where material-discursive forces intra-act, generating outcomes through iterative 'mattering' – the active shaping of meaning via its generative potential (Barad 2007:137). The digital is thus not merely a co-creator involved in materiality and process but also serves to elucidate knowledge production, diffracting the complexity inherent in disciplinary boundaries. By both reifying and challenging dualisms, the concept of modelling-with concentrates on specific actions and material consequences as they unfold performatively. Acting as a mediating praxis across various scales – from the cosmic to the molecular – it enables relational exchanges that highlight difference and relationality, recasting causality as the process through which reality is constructed (Simondon 2020 [1964]:384, 163). The intra-action between thermoplastic material and (im)material light (among other subtle gestures within these entanglements) invites an inquiry into their mattering, rather than attempting to mirror reality.

The sculpture's high-micron, smooth, 3D-printed shell demonstrates how light interacts with its form, with translucency varying along its flowing, nested curves. Thanks to advanced printing technology, ultra-thin yet robust geometries permit light to diffuse from within, revealing the work's generative interior: a 'game of play' (Manovich 2007:6) stemming from sequences of agential effects that structure sensory experiences and facilitate perceptual individuation (Simondon 1964:287). Technology functions as a mode of being – a mediating event that influences our perception and organisation of the world.

Crest_01's affective intra-action with viewers, in its analogue-digital spectrum, most prominently imparts a material-discursive experience through light. Translucency facilitates a material interaction with the sculpture's surfaces, adding further depth to its neomaterial imprimatur, where translucency is understood as a 'texture' (Vasseleu 1998:11). Vasseleu (1998) elaborates, describing texture as

> anything which is woven into a fabric, and comprises a combination of parts or qualities which is neither simply veiled nor made up. Texture is at once the cloth, threads, knots, weave, detailed surface, material, matrix and frame.

Blurring the boundaries between vision and touch (haptic perception), the texture of translucency enriches and complicates the sensory experience, not only in its modality as a completed artwork, but throughout its postdigital paradigm.[16] Fundamentally, the constructed phenomenon of translucency is a surface of depth that 'spills over' and permeates through the 'interstices of the fabric' (Vasseleu 1998:12). Or, put differently, a minor gesture, blurring the distinction between the visible and invisible framing frames photology, to endow light with texture (Vasseleu 1998:12). Inseparable from its historical and embodied context, light is not purely metaphorical or metaphysical; rather, it serves as both the medium and substance of visual practice, revealing the subtle interplay of differences that constitute our perception (Vasseleu 1998:12). The experience of these minor gestures in *Crest_01* is contingent upon the properties of the thermoplastic, the spatiotemporal analogue-digital environment it inhabits, the lighting conditions, and the cultural context of perception. In this way, matter and meaning are co-constructed, embodying the notion that '[m]attering is simultaneously a matter of substance and significance' (Barad 2007:3). Neither materiality nor discourse holds ontological priority; instead, knowledge and meaning emerge as a dynamic, performative entanglement with the world, a modelling-with light that develops within relational networks rather than in isolation, embodying material-discursive entanglements.

Signifying meaning and producing knowledge, translucency is then intricately tied to ethics, reminding us that what is visible and what remains concealed are influenced by these frameworks. Knowledge is invariably partial, shaped by the context of its production and tied to materiality. This way of thinking ontology, epistemology, and ethics together makes for a world that is always already an ethical matter' (Barad in Dolphijn & Van der Tuin 2012:69). Barad's perspective advocates for ethical responsibility in recognising the exclusions that structure phenomena. 'Ethics is about mattering, about taking account of the entangled materiali[s]ations of which we are part, including new configurations, new subjectivities, new possibilities … Responsibility, then, is a matter of the ability to respond. Listening for the response of the other and an obligation to be responsive to the other, who is not entirely separate from what we call the self.' Our cartographic unfolding of *Crest_01*'s and Brown's practice of modelling-with extends beyond artistic

discourse to social, historical, and philosophical contexts, inviting reflection on the complexities of perception, identity, and relations, offering a nuanced lens through which to understand experience and meaning within our extended worldliness. As its vitalism vibrates across art-historical and theoretical discourse, it engages multiple systems of power that operate in partially visible ways, appearing transparent while obscuring their inner workings. From its historical associations with stained-glass windows, to its role in embodying a sense of divine or mystical presence, to its resonance with the postdigital, post-truth era, the intra-action of light and material aligns with the notion that entanglement with the world is always incomplete, ongoing, and shaped by selective visibility.

Crest_01's delicate, wave-like forms manifest as light renders its contours, shapes, and flowing lines through tone and rhythm. Embracing its velvety off-white material and resisting its stratified digital imprint, it suspends viewers in its graded translucency, offering a partial understanding of the world. The (im)materiality of light oscillates between presence and absence, igniting the sculpture and affecting our perception. Light's subtle dynamics are 'immanent to the in-act', entangling us too in *Crest_01*'s unfolding performance, involving our movements and intra-actions, thereby extending a co-creating field in real-time and inviting participation in its relational and emergent becoming (Manning 2016:2). Despite its elusive nature, light engages us in its emergent collectivity. It creates opportunities for new forms of life, thought, and artistic expression while fostering collective expression, emphasising collaboration and shared agency, and amplifying transindividual dynamics. Attuned to and responsive to complexity, light makes the intricacies of being in the world visible, sustains the precarity of unfolding processes, and enables the emergence of new possibilities. Maybe, by embracing a spirit of collaboration with the world and its intertwined human-nonhuman entanglements in the postdigital era, we may consider meeting the digital halfway.[17]

Notes

1. In *Critical theory and the digital* (2014), David M. Berry outlines the digital as not merely a set of technologies or tools but as a complex social, economic and cultural phenomenon that shapes how individuals communicate, produce, and consume information.

2. LED refers to a semiconductor light source that emits light through electroluminescence when electrically activated. Within the context of this article, LED technology operates as a site of transduction, where electrical energy and digital information materialise perceptually and affectively as light, mediating analogue-digital assemblages and spatio temporal experience.

3. Brown is regarded as one of the pioneers in the field of digital sculpture and remains actively engaged in advancing the convergence of sculpture and digital technology. A retired Sculptor and Professor of Digital Technologies at Manchester Metropolitan University, Brown earned his master's degree from The Royal College of Art, London, in 1975. He is the founder and president of FAST-uk (Fine Art Sculptors and Technology in the United Kingdom),

established in 1998 to facilitate the integration of art with digital technology. Brown oversaw the activities of The Future Technologies Research Group at the Manchester School of Art, which initiated interdisciplinary collaborative research across art, science, engineering, humanities, and healthcare sectors. Additionally, he was a member of the University's Art and Performance Research Hub, which advocates for diverse analogue-digital research models within creative practice (Brown 2019).

4. ABS is a petroleum based thermoplastic polymer commonly used in fused deposition modelling (FDM) 3D printing due to its strength, durability, and capacity for controlled translucency at reduced wall thicknesses. In the context of this article, ABS is understood not as a passive substrate but as an active material participant whose thermal behaviour, layering, and light diffusing properties intra act with code, light, and fabrication processes to produce the sculpture's neomaterial aesthetic.

5. The new materialist methodology we adopt considers the material and discursive dimensions of artworks as co-constitutive and inseparable, recognising the artwork as an active participant in the process of meaning-making.

6. The field of posthuman studies emerges from the intersection of posthumanism and postanthropocentrism. Posthumanism challenges traditional humanist notions of "Man" as the universal symbol of humanity, whereas postanthropocentrism opposes hierarchical separation among species and advocates for a bio-centred form of egalitarianism (Braidotti & Hlavajova 2018:1). This scholarly approach employs comprehensive, multidisciplinary qualitative analysis rooted in a neomaterialist framework based on monistic process ontologies within contemporary critical theory (Braidotti & Hlavajova 2018:1). Additionally, it highlights ethical considerations related to the application of new concepts to real-world contexts (Braidotti & Hlavajova 2018:1).

7. The digital imprimatur or 'techno-look,' emerges when CAD is utilised to generate or digitise form, which is subsequently realised through advanced fabrication technologies (Paul 2020:2.04, emphasis in the original). The automated nature of this process is evident in the final artefact, characterised by a high level of technological complexity that surpasses traditional sculpting methods. Furthermore, a notable technological feature is the step-like surface of the 3D-printed object, which reflects the microscopic thickness of the layered mechanical process. The imprimatur, signifying a transition from analogue to digital matter, is regarded as a form of post-digital neomateriality.

8. The postdigital refers to a transforming hybrid (analogue-digital) reality of technological production, wherein the hybridisation of older analogue and newer digital media defines the process of digital re-mediation.

9. Philosopher Fredric Jameson's (1991) essay *Postmodernism, or the cultural logic of late capitalism*, implies that postmodernism in art had arrived at a critical juncture in need of new theories to explain contemporary aesthetic phenomena. By highlighting humanity's ever-evolving capitalist society, Jameson (1991) aligns art-historical discourse with socio-economic phenomena to reveal the futility of retaining any dominant chronological context for debating developments within postmodern art. Subsequently, various scholars and critics have contributed to postmodernism's transformation into something beyond the mere trajectory of History, a mix of styles or blurring boundaries. Some scholars offered proposals such as 'hypermodern', 'digimodernism', 'pseudomodernism' and 'automodernism' (Hutcheon 2002; Kirby 2009; Lipovetsky 2005; Samuels 2008); others such as Timotheus Vermeulen and Robin Van den Akker, Linda Hutcheon, Gilles Lipovetsky, Nicholas Bourriaud and Alan Kirby champion the idea that postmodern discourses have lost their critical value.

10. Roland Barthes' (1977[1967]) assertions in "The Death of the Author" engendered the notion of active readership, subsequently inspiring numerous artists during the 1960s to diverge from conventional genres and the imposition of ideas onto materials. This shift was further reinforced by many embracing collaborative and participatory practices, thereby facilitating novel modes of expression, such as co-creating with nonhuman entities. Metamodernism builds upon this collaborative ethos by proposing a fluctuating structure of feeling that fosters open-ended critical debate across diverse cultural domains (Vermeulen & Van den Akker 2010).

11. See Barad (2003), Jane Bennett (2010), Braidotti (2013), Estelle Barrett & Barbara Bolt (2013), Brian Massumi (2015), and Katve-Kaisa Kontturi (2018) for further elaboration on posthuman and new materialist entanglements.

12. CRT refers to an early display technology in which images are produced by directing an electron beam onto a phosphorescent screen, causing it to emit light. In the context of this article, CRT screens exemplify an analogue-digital interface in which electrical signals are transduced into luminous images, foregrounding light as a performative mediator between code, perception, and embodied engagement with digital form. LCD denotes a flat panel display technology that modulates light transmission through liquid crystal layers under electronic control. Within this article, LCD screens are understood as computational membranes through which digitally regulated light renders form, depth, and translucency, participating in the intra active conditions that shape perception, modelling with, and spatio temporal experience in digital sculptural practice.

13. Ocularcentrism, or the centrality of vision in Western culture, is widely criticised, most notably by notable French philosophers, for its allegedly superior capacity to provide access to the world. Discounting the centrality of vision, in our article, we value all sensory and affective entangled relations to offer an understanding of human-nonhuman relations that extends beyond over-emphasised notions of vision in a metamodern framework. For an elaboration on occularcentrism, consult Martin Jay (1994) and Vasseleu (1998).

14. An algorithm-generated appearance model is a computer software term associated with rendering various synthetic materials within images. Henrik Wann Jensen *et al* (2001) developed an appearance model that simulates translucent materials by enhancing the bidirectional surface scattering distribution function that transports light between any two rays that encounter a surface. The resultant technique offers an enhanced subsurface scattering of light from translucent materials by blending surface features such as colour bleeding within the material and light diffusion across shadow boundaries (Jensen *et al* 2001:511). Surface blending diminishes the distinctly computer-generated appearance. Instead, CAD renderings capture the true appearance of translucent materials such as water, fruits, milk, marble, and skin.

15. NURBS refer to a mathematical modelling system used in CAD environments to generate and manipulate smooth, continuous curves and surfaces through weighted control points and parametric relationships. In the context of this article, NURBS function as a computational apparatus through which form emerges relationally, enabling iterative, light mediated intra action between numerical parameters, perceptual feedback, and sculptural becoming.

16. Haptic perception denotes a sensory modality that accentuates tactile and bodily engagement over visual dominance (Marks 2000:183-184). It describes a mode of perception characterised by closeness and intimacy, in contrast to the objectivity associated with optical vision. Haptic perception is inherently connected to embodied experience, in which the observer interacts with the materiality of objects, as exemplified by *Crest_01*, thereby facilitating a multisensory and affective experience (Marks 2000:183).

17. Our reference to "meeting the digital halfway" here, and in the title of the article, references Barad's seminal work, *Meeting the universe halfway: Quantum physics and the entanglement of matter and meaning* (2007). A phrase borrowed from Alice Fulton's "Cascade Experiment" from *Powers of congress* (1990), which is cited in full as an appendix to her book, is noteworthy. Barad (2007:396) observes that 'meeting the universe halfway' does not imply settling for a middle ground but is instead presented as an ethical summons 'written into the very matter of all being and becoming'; a call to 'take responsibility for the role that we play in the world's differential becoming.' In the context of our article, our reinterpretation of the phrase acts as an invitation to reevaluate human-nonhuman interactions, especially our involvement with the digital domain amid the swift technological progress of our contemporary society.

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