

Emergence and Differentiation: Reconceptualising the Digital Object

Conor Angus Spence

Faculty of Arts and Social Sciences – School of Art, Communication and English

The University of Sydney

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Statement of Originality

This is to certify that to the best of my knowledge, the content of this thesis is my own work.

This thesis has not been submitted for any degree or other purposes.

I certify that the intellectual content of this thesis is the product of my own work and that all the assistance received in preparing this thesis and sources have been acknowledged.

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Conor Angus Spence

Authorship Attribution Statement

Chapter 4 of this thesis has been accepted for publication and will appear in the peer-reviewed journal *Techne: Research in Philosophy and Technology* as “*Destiny 2 and Platform Oriented Ontology: An Enquiry into the Existence of Video Game Objects*”. I wrote and planned the paper, and I am listed as the single author.

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Conor Angus Spence

Signature:

Dr. Chris Chesher

Signature:

Abstract

In this thesis I develop an ontology of digital objects. I combine Gilles Deleuze and Felix Guattari's general logic of the assemblage with the concept of emergence. I propose that digital objects such as video game weapons, Non-Fungible-Tokens (NFTs), and wearable biosensors are *emergent objects*. I argue that these objects are ontogenetic entities that emerge as part of a primordial process of machinic production. Beginning with a close reading of Gilles Deleuze, Felix Guattari, Gilbert Simondon, and Charlie Broad, I develop an ontogenetic schematic that traces the origins of these objects from Being to emergence.

Using the conceptual apparatus of the assemblage, I conduct an empirical analysis of the computational, cultural, and subjective elements contributing to the production of each object. This thesis centres on three main case studies: video game weapons, Non-Fungible Tokens (NFTs), and continuous glucose monitors (CGMs). Each of these case studies explores the process of ontogenesis endemic to each object from Being to emergence. In each case study I demonstrate that emergent objects have a set of unique causal powers. This includes the ability to affect transformations in their surrounding milieus, subjectivate actors, and initiate phase-shifts. In undertaking this project, I reconcile the concept of the object with assemblage theory. I show that rescuing the concept of the object from the technical complexity of digital media does not mean subsuming the complex infrastructures underlying each emergent object within an organic unity. On the contrary, I show that the production of a digital object is a privileged moment of individuating-difference, a moment that sees a partial flight from the assemblage in the form of the object.

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Chapter 1: Emergent Objects: An

Introduction

“...matter itself is synthetic and productive. Matter is primary process, and everything that unfolds at the level of conceptual representation is merely secondary and derivative.”

(Brassier, 2010, 09:19)

Introduction

In this thesis I develop an ontology of digital objects. In the tradition of Aristotelian first philosophy, I study the fundamental issues of being and existence as they relate to digital objects and produce an account of their existence (Shields, 2023). In doing so, I take up several questions: what is a digital object? Are video game weapons, Non-Fungible Tokens (NFTs) and wearable biosensors objects or assemblages? What is the ontological difference between a digital object and a non-digital object? Are digital objects material or immaterial? And how do the modes in which these objects are produced, received, circulated, and operated affect their existence?

First and foremost, I use this thesis to develop a new metaphysics and ontology of the digital object. This ontology rescues the concept of the object from a crisis in its identity – a crisis precipitated by the contradiction between objects as organic unities and the distributed, impermanent, and productive networks of objects, flows and actors that constitute new and emerging classes of digital objects. In this thesis I recover the object from the compulsive pursuits of essentialist and reductionist philosophies that seek to bind objects to two different axes: the object as appearance and essence; and the object as that which is merely other to the subject. Both definitions do not accurately describe the existential reality of objects that emerge in, and through, digital infrastructures. This is because these objects are predicated on a much broader system of relations, components, objects, and human actors that extend far beyond the bounds of appearance and the non-human. Despite the disjunction between the ways that objects have been imagined in these reductionist philosophical models, and the empirical reality of digital objects, the term object remains in use both as a metaphor and as a way of describing certain kinds of entities. For example, the term “object” is used

metaphorically in Object-Oriented Programming (OOP) to denote an instance of a class that has its own properties and attributes as well as its own monadic singularity. The term “object” is also (often simultaneously) used by gamers and programmers in reference to the entities that a player interacts with when they play a video game; hence a weapon in game is seen as an object. In recent times creators of cryptocurrencies and NFTs have also sought to replicate and co-opt the characteristics of objects when describing their creations. These “objects” or “tokens” are marketed on the basis that they are as permanent, immutable, transferable and solid as other forms of assets. It is clear then, that the term object remains socially and semiotically in play even as the ontological, metaphysical, and technical realities of digital objects have long since abandoned the old philosophical boundaries of the object.

The concept of the object preceded the genesis of the digital object by some time. The philosopher Aristotle conceived of objects as composites of form, or, property-like substances that govern the appearance of a thing, and matter such as atoms, electrons, and quarks (Shields, 2023). According to Aristotle, the unification of form and matter is an essential condition for all objects because it differentiates otherwise homogeneous lumps of matter from each other (Shields, 2023). Hence, it is necessary that form and matter are spatio-temporally contiguous within the being of an object. Other approaches to the ontology of objects, such as Immanuel Kant’s (2003), state that an object has two distinct dimensions of being; there is the for-itself (phenomena) and the in-itself (noumena). Kant’s (2003) point was that while the properties of an object are available to us in the realm of appearances (i.e. the phenomena), the object also has a noumenal aspect that is both unknowable, and the repository for the object’s essence. Kant argues that the noumena is both inaccessible and essential to objects because it is the essence that makes an object what it is, and not something else.

When it comes to the digital objects I deal with in this thesis, that is, video game objects, NFTs, and the objects produced by wearable sensors, there are several issues that come with adopting either Kant’s or Aristotle’s model. With regards to the hylomorphic model, there is no contiguity between form and matter because the material basis of an NFT, a video game weapon, or a wearable sensor is both multiple (i.e. involves several objects) and distinct (i.e. these other objects are not the digital object itself). For example, this material base might encompass the processor of the computer upon which an NFT or video game weapon is produced, the server banks of the platform upon which the program is stored, and the

pixelated rendering of the object on screen. Despite this, the form of the weapon, NFT, or wearable object remains ontologically, spatially, and possibly, temporally distinct from this base.¹ In contrast to a non-digital object such as a hammer then, a digital object does not satisfy the requirements of the hylomorphic schema.

Kant's model is also limited in its application to digital objects for two reasons. First, the distributed and relational basis of a digital object means that there cannot be but one essence or noumena for a digital object because it is produced by the relations between multiple components. There is no essential aspect of a digital object, therefore, because it is always in motion and always precarious. The productive base of a digital object is one defined by exterior relations rather than interior essences and cannot, therefore, exist as an essence prior to its emergence. Second, adopting Kant's model could also result in ascribing a noumenal existence to one or more of the several objects constituting the material basis of a digital object. For example, we might think of a video game weapon as the "phenomenon" and the software and hardware as the "noumena". For my part though, I find this argument unconvincing because Kant (2003) seems to think that a noumena is necessarily unified and distinct, and therefore, that there cannot be multiple noumenons for a single object because this would contradict the supposed indivisibility of essences. This objection is reinforced by the fact that the software and hardware producing digital objects is not inaccessible, but merely obscured in the form of the digital object. For example, we can access each of these components by taking apart the computer or by opening a programming interface.

In this chapter I provide an overview of the content of this thesis. In the process, I map out an ontology of the digital object that is equal to the theoretical challenges posed by digital infrastructures. These challenges include the multiple instantiations of the object at the level of code, processor, and interface, the difference between NFTs, video game weapons, the *Libre 2* sensor and these infrastructures, and the inadequacy of theory that places the identity of the object prior to the process of becoming object. I begin with an overview of contemporary scholarship that addresses digital objects from Yuk Hui (2012, 2016), David Chalmers (2019), and Bernhard Rieder (2020). I then introduce my own response to these issues — the emergent object, before providing an overview of each chapter and its contents.

¹ When referring to the wearable object I distinguish between the material basis of the object that one might wear and the digital object that one interacts with using their smartphone or smartwatch.

Theories of the Digital Object

In this section I sketch three contemporary attempts to conceptualise digital objects from Yuk Hui (2012, 2016), David Chalmers (2019), and Bernhard Rieder (2020). In it, I challenge these scholars' theories and sketch an alternative approach inspired by the work of Katherine Hayles (2017), Thomas Nail (2021), Gilles Deleuze (2013, 2017), Felix Guattari, (2013, 2017) and Chris Chesher (2023). The reason for their inclusion is that while Chalmers (2019), Hui (2012, 2016), and Rieder (2020) have attempted to produce a new ontology of the digital object, none of them have managed to fully conceptualise the relationship between the digital object and the material infrastructure from which it arises. In contrast to this, the work of Nail (2021), Deleuze (2013, 2017), Guattari (2013, 2017) and Chesher (2023) unveils a set of problems, properties, and ontological states that problematize the accounts offered by Chalmers, Hui and Rieder, indicating a series of ontologically important issues that have been under-researched thus far,

Nonetheless, it is worth engaging with Chalmers, Hui and Rieder as each of their respective reveal certain fundamental facts about the existence of digital objects. Chalmers (2019), for example, posits that data objects and what he calls "virtual objects" (p. 453) are one and the same. For Chalmers (2019), the object that appears on screen in virtual reality is the same as the data object on which it is predicated. The issue with his claim, however, is that it does not account for the fact that several data objects may be required to produce only one virtual object. There is also the risk of a false identification between what Chalmers calls virtual objects and data objects. Whereas a virtual object attempts to perform the qualities of objectivity based upon its non-digital counterparts, i.e. a gun in a video game performs the actions of shooting, resembles its non-digital counterparts to varying degrees, and is confined to a certain set of coordinates in game, data objects are metaphorical interventions used by programmers to organise parts of their code. A data object can represent something decidedly un-object-like such as the weapon's physics, whether it is able to be equipped by the player, and so on. Whilst these property-objects are necessary for securing the integrity of the virtual object, there is a non-identity or difference between data object and virtual object. While I do not deny that both are connected in a significant manner, I do claim that they *are* ontogenetically differentiated from each other in a manner that does not indicate equivalency, but on the contrary, indicates an indeterminacy. This indeterminacy, I argue, extends to other parts of the computational assemblage such as the systems hardware. What this reveals is that while data objects are necessary for the production of virtual objects, they

remain differentiated from them.

Yuk Hui (2012, 2016) has developed an ontology of digital objects using a framework inspired by Bernard Stiegler and Gilbert Simondon. Hui (2012) acknowledges the complexity of digital objects, observing that at “...the level of programming they are text files; further down the operating system they are binary codes; finally, at the level of the circuit boards they are nothing but signals generated by the values of voltages and the operation of logic gates” (p. 387). Hui’s observation is central to my argument for two reasons. First, it shows that there are multiple instantiations of digital objects across several layers of abstraction. Hui (2012, 2016) reveals that a digital object is indebted to a multitude of simultaneous processes. A digital object is thus a text file *and* an electronic pulse and both processes are necessary predicates for its existence. Nevertheless, I argue that each process is not analogous with the other, but that they are related. Second, Hui shows that digital objects are material or at the very least predicated on material processes despite their apparent ephemerality and contingency. As part of an ontology of objects that owe their existence to computational systems then, Hui (2012) shows that the material basis of digital objects must be accounted for. Hui (2016) makes an early departure from the productive base of digital objects to focus on the ways that datafication figures into the frameworks of these objects. In doing so he leaves an open question as to how we might develop a philosophy of the digital object that engages with the ontological differences that permeate their being. This is where the questions addressed by in thesis and Hui’s (2012, 2016) work tend to diverge. At the risk of simplifying his analysis, Hui appears less concerned with the *being* of objects in comparison to the datafication and grammaticisation of digital objects. The question I am interested in, however, is how to develop an ontology that reconciles the differentiations within these objects with the concept of the object itself.

Another important contribution to the ontology of digital objects comes from Bernard Rieder (2020), who, in his book *Engines of Order*, sets out to analyse the structures of algorithmic production. Using a conceptual apparatus informed by the work of Gilbert Simondon, Rieder reveals that computation is a sprawling infrastructure or ecosystem of objects and processes. Rieder (2020) argues that this ecosystem encompasses an ensemble of technical objects and interrelations upon which the software of everyday life is predicated. Like Hui (2012, 2016), Rieder (2020) is indebted to Simondon’s (2011) understanding of technical objects. Using Simondon’s ideas of concretisation, individuation, and metastability, he argues that a

computer is “...a theatre of a certain number of reciprocal causal relations that assure its operational functioning, concretisation is the movement towards synergy, toward an optimal state of interaction between elements” (p. 64). For Rieder, this reciprocity extends to software. He states that software is not separate from computing, it is a technical element within an ensemble. What this means, Rieder (2020) claims, is that the technical ensemble of computation is both software *and* hardware. Software is not entirely separate from the hardware of a system because it itself constitutes and directs the functions of these components. Rieder (2020) argues that without software, hardware is nothing but “...pure technical potential” (p. 66) and therefore, that it is part of the machine because it dictates how the system will function. Rieder’s account, however, lacks a properly metaphysical foundation in terms of the flows of matter leading to the hypostatization of matter, and later, digital objects themselves. Without this, the processes enabling the interoperability of each of component of the ensemble, the mechanisms through which these components relate, and the position of the human subject within this ensemble goes unexamined. In this thesis I foreground the metaphysics of the object first, so that we might know why the ensemble of technical components Rieder identifies exists in the first place.

In her book *Unthought*, Katherine Hayles (2017), while not addressing the ontology of digital objects directly, does reveal that nonconscious computational assemblages possess emergent powers to produce affects other than themselves – affects she labels *cognitions*. Hayles (2017) insight here bears a certain, albeit superficial resemblance to my own ontology of digital objects. Like Hayles (2017), I identify that computational assemblages produce affects other than themselves and that these affects originate from sprawling infrastructures of interconnected components, codes, and processes. However, Hayles (2017) work is not concerned with the metaphysical foundations of these processes, preferring to approach nonconscious cognition through a neuro-scientific framework that privileges cognition as an intentional process of unspecified origin. Consonant with my goals of developing an ontology of the digital object, I maintain that the relationship between the object as a productive affect of an assemblage and the assemblage itself is a metaphysical and ontological problem that needs to be resolved. Determining what drives these affects, how they are produced, and where they come from then, is a question left open by Hayles that this work intends to answer. As a part of this, the thanatropic differentiation of Deleuzian (1994) Being is foregrounded as both the origin and the process of the digital object.

Thomas Nail (2021) in his *Theory of the Object* develops an ontogenetic ontology of the object. Although he does not directly address digital objects, Nail's approach to objects as looping, material, and metastable processes does highlight that objects emerge as a part of the primordial movement of matter. For Nail (2021), objects are "...flows of matter that have 'folded' into relatively stable patterns or cycles, such as vortices" (p.31). Nail's (2021) shift from an ontology of the object to an ontogenesis of the object means that objects are metastable processes – they are not static entities or transcendental essences then, but the continuous and repeated movement or "folding" of matter. If for example, the folding maintaining an object was to undergo a dramatic change, cease, or dissipate, then the object would no longer exist. Nail (2021) places the movement of matter prior to the formation of the object. In doing so he reveals that objects emerge from somewhere, and drive towards being-object in a continuous process. In this thesis I take Nail's ontogenetic model and apply it to the study of digital objects. In my view digital objects also "loop" – they are produced by an assemblage of interacting components, software processes, and actors, and they need these processes to repeat to continue existing. Where my approach must differ from his, is that digital objects require the simultaneous folding of matter across multiple objects. The requirement for a distributed, simultaneous folding of matter distinguishes digital objects from non-digital objects. Where this process of folding matter is territorialised to a single object, digital objects require this process to occur across several objects simultaneously, and within themselves as differentiated entities. It is because of this distributed precarity, as well as the difference between digital objects and the infrastructure that they rely upon, that I view this collection of hardware, software, and actors as an assemblage.

Following Rieder (2020) and Hui (2012, 2016) a similar Simondonian thread runs throughout this thesis. I take the ensemble of heterogeneous components and processes that is computing as the basis for what we call digital objects; however, I expand it to include a range of human and non-human actors. This is because simply incorporating the entire system of hardware and software does not serve the purpose of rescuing the object. Adopting Rieder's model in its entirety risks conflating the object with the system, rather than the differentiation of the former from the latter. Two other issues also emerge with Rieder's model in relation to the ontology of digital objects. The first is that a digital object needs to be invoked by some form of actor. Accessing a video game weapon, an NFT, or a wearable device for instance requires that someone or something bring it into being by issuing a command, pressing a button, or opening an application. As Chris Chesher (2023) has claimed, invocation (in its most

primitive form) “...is a technological action that simply calls on an external resource to produce a given action, reducing the labour and uncertainty involved in achieving that goal with a human body” (p. 15). Likewise, digital objects are called into existence by the actions of a user. For the object to appear, the hardware needs to be activated, the software needs to be run, and the object needs to be invoked. Thus, I widen Rieder’s system to include human and non-human actors. Instead of an ensemble then, I adopt Gilles Deleuze and Felix Guattari’s (2013) assemblage to conceptualise this system of differentiated human and non-human actors.

Chesher’s (2023) work on invocational media reveals that digital objects need to be invoked by some form of actor. What I take from his observation is that far from being separate to the object, an actor becomes part of the network that produces the object and therefore, that any ontological framework should account for their position. Although I typically associate this actor with a human person, Actor Network Theory (ANT) shows that we may also include non-human actors such as those that perform technical operations and establish a horizon of possible actions (Law, 1991). Notwithstanding this distinction, I use Deleuze and Guattari’s (2013) general logic of the assemblage to incorporate the insights of Hui, Nail, Rieder, and Chesher without minimising the role of human and non-human actors. In the first instance, there are clear instances of concrete assemblages (material components) within the networks that produce digital objects (Nail, 2017). Digital objects are predicated on several interlocking components – hardware, software, peripheral devices, socio-technical organisations (i.e. platforms), and networked infrastructures. Deleuze and Guattari’s concept of the assemblage reflects the multiplicity of these components without reducing them to a unified system. Indeed, as Colin McFarlane and Ben Anderson note “Assemblages are not organic wholes, where the differences are subsumed into a higher unity” (2011, p. 125), instead, they are flexible arrangements of heterogeneous objects and actors. More to the point, the ontology of the assemblage addresses the fact that each of these elements operates in relation to one and other – whether that be the interactions of software objects, the transition of bits across processor and storage stacks, or the wireless transmission of blood sugar fluctuations from the body to a processor, server, and smartphone. It is these relations that condition the possibilities of this system; in other words, they are the abstract machine of the assemblage.

Digital objects both produce, and are produced by, subjects. The presence of the invocator

as a part of the assemblage is evidence of what Thomas Nail (2017) calls the personae of an assemblage – but what I will call subject positions. These are the individuals, actors and agents who become part of the assemblage and are in turn produced by it. At a conceptual level my incorporation of a person as a part of the digital object assemblage is not simply a matter of description, it also opens another line of analysis ignored by the likes of Hui (2012, 2016), Chalmers (2019), and Rieder – the socio-cultural and subjectivating effects (and affects) of digital objects. We see examples of this in how object effect how one becomes a player by wielding a weapon in game, how one becomes regulated, disciplined and kept healthy by a wearable device, or how one becomes a consumer through a platform. In each of these cases the assemblage and the object produce a subject-position based upon the social and cultural logics embedded within it. In this way digital objects come to shape the individuals that invoke them, forming what Guattari (1992) calls “complexes of subjectivation”.

While breaking down each element of the assemblage goes beyond the purview of this chapter and will be dealt with in more depth in Chapter 2, this foray into contemporary theorisations of digital objects indicates that a bricolage of theoretical, philosophical, and empirical resources will be necessary for forging a new ontology of the digital object. Due to the flexible network of heterogeneous components, actors, and processes and actors constituting the infrastructure of digital objects, I have selected the assemblage as the dominant conceptual apparatus for this work. Adopting this apparatus, however, brings us to an issue that is fundamental to the ontological structure of digital objects. That is, despite this collection of components of hardware, software and subjects having an identifiable structure as an assemblage, there remains an ontological gap or *difference* between the digital object and this assemblage. The video game weapon, NFT, or on-screen sensor is ontologically, aesthetically, functionally, and spatially distinct from the components and relations upon which it is predicated. Thus, the assemblage is not a digital object in the direct sense, it is only the productive base of a digital object. It is this gap that I intend to explore and theorise in this thesis, because, as Thomas Nail (2017) notes, the organic unity of objects is antithetical to the concept of the assemblage. Unlike objects, assemblages can have their components added, subtracted and combined *ad infinitum* without necessarily compromising the integrity of the assemblage itself. In contrast to this, the term object presupposes a unified structure, a weapon in a video game presents as a single, functionally indivisible point, as does an NFT with all its purported immutability. Once again, a disjunction emerges between

the seemingly unified structure of the object and the assemblage it reifies, however, like the concept of difference in Deleuzian philosophy this difference is a productive one, representing an entanglement that does not subsume one or the other.

Emergent Objects

The exploration of this difference between object and assemblage is where the major contribution of this thesis is to be found. It is also where the phrase “rescuing the object” begins to take on its significance. Despite Deleuze and Guattari’s attempts to distance themselves from the concept of the object to avoid the metaphysical baggage that comes with adopting the term, and Nail’s (2017) observation that assemblages are not organic unities, I reimagine the relationship between the two that preserves the alterity of each. Unlike Hui (2012), Chalmers (2019), and Rieder (2020), the ontology I have developed in this thesis acknowledges the entanglement of a digital object with a vast assemblage of different components and actors while avoiding both top-down essentialism and conflating digital objects with these assemblages. It is Deleuze (1994) that provides the foundations for such an intervention. In his work *Difference and Repetition*, Deleuze conceptualises Being as a continuously individuating (becoming) univocal field of existence, he shows that the becoming of an entity is neither an *ex nihilo* creation, nor the instantiation of a transcendental essence. Similar to Nail (2021), he shows that the production of an entity is the result of primary machinic production, a production that does not just precede the formation of the digital object, but all entities.

In response to the ontological differentiation between a digital object and the assemblage upon which it is contingent, I posit that the relationship between the two is productive. It is productive in the sense that the assemblage produces the object as an instance of differentiation, and because this differentiation is an instantiation of Deleuze’s (1994) Being-as-process, or what Nail (2021) calls “generative indeterminacy” (p. 230). I argue that digital objects, as entities that emerge after the instantiation of an assemblage, are secondary outcomes of a primary process of machinic production – one that drives progressive differentiation(s) within Being. Like Simondon (2011) and Deleuze (1994), Manuel DeLanda (2012) conceives of differentiation in terms of a single ontological field, one devoid of hierarchies and composed of interacting particulars and emergent wholes. Differentiation, therefore, is not a contradiction between beings in the plural, but rather, the individuation of a

singular Being. The indication of difference between an assemblage of interacting particulars and a digital object does not therefore indicate that each is unrelated to the other. On the contrary, this difference bears witness to a progressive differentiation, one driven by the interactions of other individuated particulars, but differentiated from them. In this way there is a connection between the object and assemblage, but also a non-identity. I propose that in light of this relationship of individuating-difference, objects like NFTs, the weapons we encounter in video games, and wearable devices like the *Libre 2* sensor be called *emergent objects* to better describe this ontological precarity and existential difference.

The concept of emergence is a useful heuristic for the precarity that haunts digital objects. Emergence has a long philosophical lineage going back to Aristotle but has more recently found popularity in the philosophies of mind, nature and science. I am also not the first to bring it into dialogue with Deleuzian philosophy. Manuel DeLanda (2016) has argued that assemblages themselves are emergent entities given the ontological parallelism between an assemblage and the parts that constitute it. In the context of this thesis an emergent being is not more or greater than the sum of its parts, rather, as the emergentist philosopher Susan Stepney (2019) has argued, it is “...other than the sum of its parts” (p. 329). To further clarify my use of emergence I have adopted Charlie D. Broad’s (2014) distillation of natural emergence in which emergent properties: (1) are neither identical to, nor derivative of, the underlying physical properties of the system; (2) are genuinely causal (i.e. that they have causal powers independent of these underlying physical properties); and (3) emerge only when an appropriate set of physical properties are instantiated. In Broad’s (2014) definition of emergence we see a homology with the empirical experience of encountering an emergent object. When activating the *Libre 2*, for example, I need to insert it into my skin successfully, connect it to my personal computer or smartphone, as well as Abbott’s servers. The object will only emerge once each component of the machine, software, and my body are interacting successfully.

The use of emergence indicates another element of emergent objects – they are preceded by events, components, and forces that are other than themselves. I use emergence here to show that digital objects have a past and present indebted to the individuation of Being and the movements, mobilisations, territorialisations, and deterritorialisations of their milieus. Using emergence within the context of assemblage theory initiates a particular theoretical moment in which the assemblage can be acknowledged as the productive basis for a certain type of

object while also preserving its conceptual integrity. I do this by acknowledging and foregrounding this difference within the broader framework of Deleuze's (1994) individuating Being. In doing so, I challenge the popular conception that digital objects are lesser, unreal or immaterial because they are distributed and precarious. As part of a monadic, univocal Being and a primary process of machinic production, I show that emergent objects are no less physical or real, but they are different and differentiated from their milieus. Adopting this machinic "procession" of individuation brings the history of each object into sharp relief. As Guattari (1992) notes in *Chaosmosis*, technology is a subset of the machine, rather than the inverse. Similarly, emergent objects are secondary products of a primary machinic production. The histories of innovation, mobilisation, and adoption preceding the genesis of an emergent object are, in fact, part of the ontogenesis of that object. While the instantiation of an assemblage is an integral moment in the production of each emergent object then, the assemblage itself is overcoded and organised according to the dominant machines of the socius (Deleuze and Guattari, 2017). As a result, the machines arranging and mobilising video game weapons, NFTs, and wearables, become sites of analysis because they affect the ontogenesis of each object.

The incorporation of the socius into the ontogenetic becoming of emergent objects grounds the socio-cultural analyses I undertake in this thesis. As Being is univocal and machinic, emergent objects are preceded by, and emerge out of, the capitalist machine of modern technoculture (Deleuze and Guattari, 2017). Emergent objects do not emerge out of nowhere; they are produced, distributed, and used within a specific milieu that can include neoliberal policies of self-government, anarcho-capitalist machines, or the capitalist assemblages of platformised gaming. By including the past of these objects as a part of a broader process ontology or ontogenesis, I integrate social assemblages, machines, and other threads of production as matters of ontological relevance (Nail, 2021). As Deleuze (1994) has claimed, "There is cruelty, even monstrosity, on both sides of this struggle against an elusive adversary, in which the distinguished opposes something which cannot distinguish itself from it but continues to espouse that which divorces it" (p. 28). Likewise, an emergent object's drive towards specificity carries within it the underlying assemblage and the machines presupposing it. The precarity and ephemerality of these objects is a testament to the fact that they continue to espouse the infrastructures from which they attempt to escape. An emergent object cannot exist without instantiating an assemblage, yet it will continue to drive towards a privileged moment of individuation in which it becomes discernible.

What follows in this introduction is an overview of this thesis in its entirety. Having now introduced the topic, the relevant theories, and why there is a need to reappraise the object in light of an increasingly complex milieu, it is now time to discuss the methodological approach I take to this work. The following section provides a map of this thesis. It presents an overview of each chapter alongside a rationale for its respective place, subject, inclusions and exclusions. After this, I finish this chapter by reiterating the concerns of this thesis and its potential implications for future studies.

Overview

This thesis will possess explanatory potential beyond the three case studies I have undertaken. As a work of new theory, it builds an ontology of emergent objects through a synthesis of empirical observation and interpretive philosophical reasoning. Informed by three case studies, the philosophical direction of this work has been supplemented with an extensive range of texts relating to computer science, media materialism, and media studies in addition to philosophy itself. From a methodological perspective the ontology I have developed in this thesis is an instance of “Empirical Standardism” in the sense that it is a theoretical position “...attuned to an appreciation of the empirical realities that emerge in the course of our experience” (Rescher, 1994 p.178). The “theory” of emergent objects developed in this thesis is attuned to the empirical study of video game weapons, NFTs, and the *Libre 2* sensor, having been adapted from personal encounters with these objects and an engagement with pertinent scientific literature. Each case study is, therefore, a sustained reflection on the nature of these objects in the mode of Heideggerian (1977) questioning. A questioning that reveals the ontological truth of these objects. These case studies have been selected on the basis of their position within different phylogenetic subsets of digital objects. The video game weapon, NFT, and *Libre 2* each represent common forms of digital objects: those that are mediatised and used in the context of play, those that attempt to capitalize on digital infrastructures to produce new commodities, and those that monitor and regulate subjects through smart devices (wearables). Nonetheless, each of the case studies in this thesis is only a single example amongst many others. The axioms I have uncovered in my analysis of each of these objects remain coherent across multiple fields of analysis. I achieve this by grounding each analysis in Being before analysing the particularities of each emergent object. Through a series of exhaustive empirical analyses and an assembly of appropriate theory, I uncover an ontological structure shared between each of these objects that has, paradoxically, opened the way for divergent forms of individuation.

Before embarking on this summary there are some matters that need to be addressed. What is traditionally referred to as a “literature review” has been dispersed throughout this thesis on the basis of its relevance to the chapter’s subject matter. There are two reasons for this format. The first is practical: there are three different case studies with their own unique debates, analyses, and histories. For the sake of efficiency and to spare the reader revisiting other chapters for context, I have folded a case study-specific literature review into each case study chapter so that the information contained therein stays relevant to the reader. I have also adopted the same approach by devoting separate chapters to the ontological and metaphysical presuppositions of the thesis, and the empirical-technical elements of these objects. The second reason is logical: by adopting this structure I am able to develop a properly systematic approach to the analysis of each object, starting with a set of theoretical presuppositions through which each analysis is conducted, continuing on to an analysis of the shared technical structures of these objects, through to each case study and the particularities of each object before formalizing it in the final chapter as an ontological schematic.

Chapter 2 deals with philosophical texts of a more general nature such as those of Immanuel Kant (2003), Graham Harman (2019), Gilbert Simondon (2011, 2020), Gilles Deleuze (1994, 2017), Felix Guattari (1992, 2017), Manuel DeLanda (2016), and Charlie Broad (2014).

Chapter 3 has more of an empirical focus and refers to literature more aligned with this topic. In this chapter I discuss texts from fields as diverse as media materialism, computer science, engineering, and software studies to establish a set of facts from which to orient my analysis. I have also chosen to refer to works that only discuss one form of emergent object in its appropriate case study chapter. I have done this so that each of these can be used effectively without having to summarise each theorist anew or pre-empt a later analysis. These case study chapters feature diverse analysis from the likes of David Beer (2016), Grant Tavinor (2018), and Deborah Lupton (2016) amongst others.

From a methodological standpoint, this thesis is intended to be an interdisciplinary work of philosophy. It is an analysis that engages seriously with digital cultures research through a philosophical lens. I “rescue the object” by developing an emergentist, ontogenetic ontology of digital objects in dialogue with the metaphysical and ontological commitments shared by both Deleuze and Guattari. As such, this work is embedded in a series of relevant theoretical resources while also providing a high degree of empirical evidence. These considerations have shaped the structure of this thesis. Chapter 2 develops the philosophical and analytical

frameworks informing this thesis, while Chapter 3 outlines the broader technical logics and structures underlying each emergent object. Chapters 4, 5, and 6 deal with video game objects, NFTs, and the Libre 2 respectively. Chapter 7 systemises the work undertaken in this thesis. In the following section, I provide a summary and overview of each chapter and its elements.

Chapter 2: Towards a Philosophy of the Emergent Object

In Chapter 2 I establish the metaphysical and ontological framework for emergent objects. For the most part, the work undertaken in Chapter 2 revolves around two main objectives. The first of these objectives is to make the case for why traditional theories of the object are inappropriate for theorising objects like video game weapons, NFTs, and the *Libre 2* sensor. To this end I examine the work of Kant (2003) and Graham Harman (2019) and show that their insistence on essences and disclosure makes them unsuitable for the present task. I then embark on the second, and most important task of this chapter – building a theoretical framework for emergent objects. I engage in a dialogue with five philosophers whose work has been instrumental to this thesis: Gilbert Simondon, Gilles Deleuze, Felix Guattari, Manuel DeLanda, and Charlie Broad.

I begin building the analytical framework of this thesis with the introduction of this work's central motif: the procession of individuation. This procession, or rhizomatic thread, follows the development of each emergent object from its genesis in Being, to the individuations it affects within its surrounding milieu as a differentiated entity. The procession of individuation is a heuristic that delineates the analytical boundaries of this thesis by organising each analysis of the object across several “strata” of individuation from Being, to milieu, to assemblage and then object. Starting with the work of Deleuze (1994) and the metaphysics he develops in *Difference and Repetition*, I locate the foundation of each emergent object within the differentiations of Being. Situating the origins of objects in Deleuze's Being-as-becoming sets the stage for the object's emergence by locating both the object and the assemblage within different, but interlinked, phases of becoming. Underpinning this claim is Deleuze's development of Being as a univocal set of differentiations, meaning that we do not speak of different beings as such, but merely differences within Being.

After grounding the object in Deleuze's metaphysics of becoming, I continue with the second

phase of the procession: the milieu into which the object emerges. I use the term “milieu” to refer to the immediate environment or field in which an object or entity comes into existence. Inspired by Simondon’s (2011, 2020) work on the milieu, I theorise the milieu as the pre-individual reality into which an object will be individuated. I take it to be the set of material, social, and cultural conditions that shape the object. As Simondon (2011) notes in his *On the Mode of Existence of Technical Objects*, the formation of the first technical object was the moment in which Being was bifurcated (or differentiated) from a previously a unified field into an object and a milieu. Simondon (2011) posits that this first object was differentiated from Being to such an extent that it was then able to affect individuations in its own right. Taking up this idea that there is a pre-individual reality from which, and into which, an object emerges, I use this phase-shift from Being to milieu to address the social, cultural, and material apparatuses that provide the conditions for an object to emerge. By approaching the milieu in this way, I integrate the operative contexts of neoliberal capital, the structures of the body, and the attempted modulations of a wearable blood glucose sensor with the object’s technical structure. I do this on the grounds that each of these codes and their associated machines constitute the pre-individual milieu from which the emergent object emerges.

From the milieu, the procession of individuation shifts to its third stage: the formation of an assemblage that produces the emergent object. In this section I revisit the work of Deleuze and Guattari (2013, 2017) to show that the milieu preceding the emergent object needs to be individuated to the point where an assemblage is formed. I use the “general logic” of the assemblage to conceptualise, and identify, the underlying systems of objects, relations, and individuals that precipitate the production of an emergent object. From an analytical perspective, I use the assemblage as a conceptual tool to identify the group of components, actors, and relations that need to be instantiated for the object to emerge. When I examine a gun from the video game *Destiny 2* in Chapter 4 for example, I show that it requires the conjugation of several elements including the player’s own computer, the servers of the platform, the players themselves and the proprietary software of the game, operating system, and platform. Employing the assemblage in this way, I identify and classify each of these elements and the relations between them while also preserving their exteriority to one another. What emerges here, is a productive assemblage of components, and the individuated and differentiated emergent object.

I trace the instantiation of an assemblage through to the emergence of the object. I examine

the ontological difference that emerges between the assemblage on the one hand, and the emergent object on the other. This section sees the introduction of Broad (2014) and the concept of emergence to explain that an emergent object drives towards its own individuation even though it remains contingent on the underlying assemblage. I also consider Broad's (2014) claim that emergent properties (in this case objects) possess unique causal effects (and affects) endemic to themselves. This point becomes crucial in Chapters 4, 5, and 6 when I explain how socio-cultural logics and significations intersect with the object's ability to initiate individuations in its surrounding milieu after it has emerged. The benefit of my ontogenetic intervention is that it does not differentiate between the essence of the object and the ways that it changes over time, is perceived by others, or how it is used. On the contrary, I show that fetishisation, modulation, and even how it is used in-game are instances of becoming-object predicated on this point of initial emergence.

The procession of individuation is a form of conceptual bricolage. Whilst this procession is grounded in a Deleuzian understanding of Being, it is informed by concepts from Simondon including individuation, the milieu, ontogenesis, and the technical object. In conjunction with Simondon, I invoke Guattari (1992) to argue that the social and technical machines operating in the milieu surrounding an emergent object also influence the form, use, and meaning of these objects. The encounter between Broad's emergence (2014) and Deleuze's (2013) difference on the other hand, explains the bi-directional relation of difference and dependence within the emergent object. I show that the arrival of an emergent object signifies a privileged moment of difference underpinned by a system of actors and objects. In the NFT chapter, for example, this structure embeds the history of cryptocurrency and its mobilisation at the hands of anarcho-capitalists and speculators in the series of individuations leading up to the emergence of NFTs. Here, the capitalist axiomatic to both commodify and redefine its limits is unveiled in the genesis of multiple forms of decentralised cryptocurrency before eventually coalescing in the form of an NFT.

Chapter 3: The Technical Constitution of Emergent Objects

Chapter 3 focuses on the empirical aspects of emergent objects. Having established a procession of individuation from Being, to the milieu, to an assemblage, and then to the object, I look at the constitution of computational infrastructures as they exist. In this chapter I engage with the work of media materialism, software studies, and computer science to ascertain each of the different elements making up emergent objects. Like Rieder (2020) and Hui (2012), I examine the layers of computing from the pulses of bits across hardware stacks to the abstractions of software. I show that computing is not only material in terms of its technical components, but that it is also relational. I argue that unlike a technical ensemble or object within which each element is bound to one another, emergent objects are produced by an assemblage of relations between discrete entities. In turn, these relations drive the continued individuations of emergent objects. This chapter verifies the foundations of emergent objects in very real physical infrastructures, it also reveals a gap or difference between the assemblage and the object itself.

In this chapter I address the work of media materialist Jean-Francois Blanchette (2011). For his part, Blanchette's argument foregrounds the materiality of computing in terms of the operations undertaken by hardware and the relationship of this hardware to software. I use Blanchette's work to map the assemblages within which emergent objects are produced. Using his materialist account of computation, I link the distributed base of hardware with the abstractions of code. I claim that emergent objects emerge out of this productive base of hardware, and therefore, that the interrelations of hardware components are a necessity for the existence of these objects. I argue that both hardware and software, although different, function as concrete assemblages or the "...existing embodiment of the assemblage" (Nail, 2017, p. 26). An emergent object is therefore neither immaterial nor unreal, it requires a very real, and very necessary basis of material components to be established. This point also supports my later emergentist intervention because it reveals a lack of identity and spatial contiguity between this underlying system of objects, processes, and components and the emergent object itself.

Following the trajectory from the concrete basis of hardware to the abstractions of software, I turn my attention to the programming languages with which emergent objects are written. I centre this discussion on a dominant programming paradigm – Object-Oriented Programming

(OOP). I demonstrate that the so-called objects in OOP are neither equivalent to emergent objects (such as NFTs and video game objects), nor are they objects. On the contrary, my analysis of OOP shows that the objects it invokes are self-contained blocks of data that have adopted the term “object” as an organisational metaphor for the benefit of the engineers, programmers, and designers that use them. Thus, OOP objects possess a variable ontology and are evocative of what Susan Leigh Star calls a “boundary object” (Star, 2010). The reason for this foray into the minutiae of programming is to port Deleuze and Guattari’s (2013) assemblage into the study of software itself. By doing this I show that an emergent object is not instantiated as a totality or essence at the level of code. Rather, an emergent object is produced from the relations between several or more data objects.

The final part of Chapter 3 addresses the socio-technical foundations of emergent objects. Emergent objects, like video game weapons and NFTs, are typically accessed, distributed, bought, traded, and occasionally built using the technical resources of platformised infrastructures. The ubiquity of these platforms has led to the recent theorisation of platform-based commodities such as NFTs and video game weapons as contingent cultural commodities (Poell et al., 2019). I address the importance of platforms in terms of how they shape the structure of emergent objects, including the ways that these objects are produced and encountered. Since the advent of Web 2.0, platforms have become increasingly ubiquitous aspects of computing. They encompass an arrangement of both hardware and software as well as a set of social practices, identities, and actors (De Reuver et al., 2018). Platforms provide a useful case study for the ontogenesis of emergent objects because they showcase the spatio-temporal discontinuity between the emergent object as an object, and the assemblage through which it is produced. When playing a video game on the Steam or Xbox platforms for example, I may be using my own machine to control my character, however the server hosting the game space may be located in another state or country, and my access to it is dependent on an ongoing connection with this server and the routines that it is running. What this indicates is the contingency of emergent objects on pre-existing infrastructures that have their own sets of actors, routines, and histories. The platform is thus both a part of the milieu into which emergent objects will arise, and the material basis upon which it is predicated.

Chapter 4: Video Game Weapons

Chapter 4 is the first of three case studies constituting the body of this thesis. In this chapter I analyse a weapon from the popular video game *Destiny 2* (that is played on Steam) using the frameworks developed in Chapters 2 and 3. Where forms of cartridge or disc-based gaming relied upon a self-contained repository for the games' information and a console, the platformised gaming of *Destiny 2* relies upon a “launcher”, a personal computer of some kind, and access to Steam's transnational array of servers, software, and players. I address the ontological consequence of this shift from the enclosed forms of console gaming to the distributed assemblage of platformised gaming. Using the framework of the emergent object, I show that this pivot to a more dispersed “assemblage-based” structure warrants a re-examination of how these objects exist and the processes, components, and actions that lead to their emergence. I show that these objects are differentiated from the infrastructures of Steam and can take on subjectivating, affective, and intensive powers across several territories once they have emerged into the ludological space of the game.

I begin this chapter with a brief background on platformised gaming and how it differs from older mediums such as disc or cartridge-based games. I demonstrate that the information, hardware, playerbase, and software required to run the game are distributed across a trans-territorial network or assemblage. I then review a selection of existing literature on digital objects from the likes of David Chalmers (2019), Yuk Hui (2016), and Grant Tavinor (2018). I suggest that these alternative ontologies lack explanatory powers when it comes to processual ontology of video game objects. In the middle parts of this chapter, I examine Steam as an assemblage. Deploying Deleuze and Guattari's (2013) “general logic” of the assemblage, I read Steam's arrangement of hardware, software, and subjects, along with the shifting relations between them, as forms of concrete assemblages, mobile actors, and abstract machines. I then trace the emergence of a weapon in game from the pulses of bits across hardware devices to the becoming(s) of code that eventuate in the emergence of a gun. Contrary to other frameworks that take the video game objects as enclosed and “other” to human subjects, I foreground the need for an agent to first invoke Steam and then the object by entering the game world. My analysis reveals that the subject is a part of the platform assemblage and affected by the object. First, I show that the subject is part of the underlying assemblage of Steam as an invocator. Second, I examine how the weapon can affect the player's actions, emotions, and identity in unique ways.

In the final part of this chapter, I foreground the emergence of the gun as a privileged individuation in which a minimal threshold of difference is established between the assemblage and the emergent object. The gun is theorised here as an emergent object that, through the productive relations of an assemblage, is individuated out from the platform's infrastructure to become an entity in its own right, even as it remains contingent on the system. I then explore unique causal powers that, as per Broad's (2014) definition, are conferred upon the weapon once it has emerged. I analyse these causal powers from the perspective of a player and show that the gun is able to affect intensive becoming(s) or what Deleuze and Guattari (2013) term as "haecceities". These haecceities are shown to occur both within the ludological space of the game and outside of it in the milieu of the players.

Chapter 5: Non-Fungible Tokens as Emergent Objects

Chapter 5 analyses Non-Fungible Tokens (NFTs) as emergent objects. In contrast to Chapter 4's focus on the relationship between the assemblage of Steam and the emergence of the gun in *Destiny 2*, Chapter 5's analysis is far more wide-ranging. I begin this study of NFTs with an account of their historical and social development using Deleuze (1994) and Guattari's (1992) frameworks of the machine and the milieu. Situating the development of NFTs within a rhizomatic thread that stretches from Being to milieu, I expand my analysis beyond the technical parameters of the emergent object to study the milieu and the events that have preceded the development and emergence of NFTs. By taking this approach, I show the effect that the capitalist machine and its axiomatic of organising flows and codes has had upon the development of NFTs and their mobilisation as commodities.

In this chapter I situate NFTs as part of a long line of attempts to mobilise cryptography in the service of producing new commodity forms. Tracing the development of NFTs from Bit Gold and Bitcoin to Ethereum and then NFTs, I show that each of these stages and each of these cryptocurrencies conformed to an axiomatic of commoditisation (Deleuze and Guattari, 2017). I use the procession of individuation from Being to milieu, to assemblage, and then to the emergent object to locate NFTs within this broader movement of commoditisation. I show that the history of the emergent object, and by extension the process of becoming an object, does not begin with the instantiation of an assemblage but rather, extends back to other processes of production and development. Here, I conceptualise the history of the as not only a matter of context, but rather, as an ontogenetic thread extending into the past and the future.

In the middle sections of this chapter, I transition from this rhizomatic analysis to analysis of the technical antecedents of an NFT. This section focuses primarily on a triumvirate of software processes driving the emergence of an NFT – blockchain, smart contract, and token standard (Park et al., 2022). While I acknowledge the materiality of the hardware components constituting the underlying assemblage, I focus on these software elements or processes. As with other emergent objects, NFTs are not unique in that they require processor, network, and storage stacks to exist. However, the structure of the blockchain, token standard, and smart contract is both integral and endemic to the NFT. My analysis of the assemblage underlying NFTs here reveals a similar ontogenetic structure to the video game weapon, and later, the *Libre 2*. I show that like the other emergent objects studied in this thesis, an NFT is differentiated from the hardware, software, and actors upon which it is contingent. Whilst these elements are certainly the productive base of an NFT, the NFT is itself not reducible to the sum of these parts because it is ontogenetically differentiated. I show that the NFT is made “other” to this assemblage because it is a productive outcome of the interrelations between them.

Using this ontogenetic lens, I study the reception of NFTs in culture following their popularisation in 2022. I use the notion of individuation to explore their cultural reception and mobilisation. I argue that because the process of progressive differentiation (i.e. ontogenesis), does not cease following the emergence of an NFT, the volatility of NFTs in cultural, artistic and economic discourses is a by-product of this continuous individuation. I show that as newly emerged objects, NFTs become an object to which something can happen, rather than a component of a computer, or a derivative of software. In these terms, I argue that the precarity of NFTs is both socio-cultural and ontological (indeed they are one and the same), given that each is deeply intertwined with the individuations of univocal Being.

Chapter 6: Emergence and Wearables: The Freestyle Libre 2 as an emergent object

Chapter 6 continues the exploratory and analytical work of Chapters 4 and 5 with an examination of the continuous glucose monitor (CGM) the Freestyle *Libre 2*. Following Chapter 5 and its inclusion of the socio-cultural investments of desiring machines in the individuation and subsequent emergence of these objects, I focus on the relationship between the technics of the *Libre 2* and the micro-politics of control embedded within it. The *Libre 2*, as a device that I both wear every day and rely upon for homeostatic maintenance, bears

some notable differences to video game weapons and NFTs. First and foremost, the concrete assemblages of the *Libre 2* are not as easily obscured as those of an NFT or video game weapon. Unlike these other two emergent objects, I have direct sensory access to parts of the *Libre 2* in that I can both touch it, and I can see where it has been inserted into my skin. This makes it tempting to conflate the concrete component with the object itself, given that they are much closer together.

In this chapter I show that the structure of the *Libre 2*, however, is more complex than that of an object or technical object. Even though I am able to touch the sensor embedded in my arm, the *Libre 2* as an emergent object still requires several relations beyond the boundaries of the sensor in order to exist. These relations include those with the body, another device such as a smartphone or smartwatch, and a set of servers. I show that the *Libre 2*'s entire function is not localised to my arm; rather, I encounter the emergent through a smart devices interface. If the connection between sensor and device is interrupted, or it is inserted in the wrong place, the emergent object does not emerge and the sensor-object mounted on my arm becomes functionally useless

In the first part of this chapter, I analyse the history of wearable devices through a Guattarian (1992) framework of machinic investment. I take the attempted mobilisation of technology by socio-cultural machines as a series of individuations preceding the genesis of the emergent object. I integrate the influence of neoliberal discourses of self-government, individual responsibility, and control with the ontological, or rather, ontogenetic structure of emergent objects. Invoking the work of David Beer (2016) and his notion of “metric power”, I link the *Libre 2*'s production of metrics with the neoliberal project of discipline, self-control, competition, and self-optimisation. Here the technical structure of the device is shown to be influenced by a broad range of social movements, such as what Deborah Lupton (2016) has called the “Quantified Self”, and as previously mentioned, David Beer's (2016) “Metric Power”. Drawing on this body of work, I argue that the *Libre 2* as an emergent object is an apparatus of control that modulates individuals. It is an extension of the territorialised structures of institutional power, i.e. the hospital or the clinic, and under the auspices of the *Libre 2*, the clinic is deterritorialised and reterritorialised as part of a cyborgian, optimised diabetic subject.

After establishing the socio-cultural background of the *Libre 2* I turn to the allopoietic and

autopoietic nodes of the emergent object. I trace the influence of the human body and neoliberal logics of competition and control on both the assemblage and the emergent object. Following the wider procession of becoming permeating the genesis of each emergent object, this part of the chapter focuses on the assemblage underlying the production of the emergent object. Here, I examine the relations between the body and the sensor and how this affects the being of the emergent object. I analyse the way that the sensor interprets the body and how the *Libre 2* signifies fluctuations of data according to a regime and an ethic of self-optimisation. For example, the metrification of the body is achieved by the *Libre 2*'s conversion of the sensor's electrochemical reactions into glucose ranges, colours, and warnings. I show that the *Libre 2*, like all emergent objects, is not only different to the assemblage underlying it, but that it is able to initiate further individuations as an object unto itself that are beyond the capabilities of the underlying assemblage.

In the final part of this chapter, I focus on the relationship between the emergent object and its surrounding milieu. I examine how the *Libre 2* affects its surroundings through its own individuation, and I abolish the difference between the socio-cultural and the technical by situating these individuations within the object's ontogenesis. I reveal that the function of the *Libre 2* as an apparatus of discipline as Beer (2016) would say, or control as Deleuze (1992) would say, occurs because of the interaction between the object and its milieu. For example, the *Libre 2* becomes connected across devices, to my smartphone, my wife's, my endocrinologist's, etc. It calls on each of us to act and it situates my behaviours in a scale ranging from the optimal to suboptimal. Without the emergence of the *Libre 2*, this individuation could not occur because the object could not be encountered. I read these actions through Deleuze's (1992) notion of the society of control, because, unlike Michel Foucault's (1995) disciplinary society, the *Libre 2*'s actions are about modulations that shift in accordance with movement, rather than the stark walls of the institution. The *Libre 2*, while certainly useful (I should know!), proves an interesting case of how emergence and individuation may not always be free of the neoliberal axiomatic.

Chapter 7: Towards a Schematic for Emergent Objects

In the final chapter of this thesis, I shift my focus away from the theory construction that was undertaken in Chapters 2 and 3, and the analytic work conducted throughout Chapters 4, 5, and 6. In contrast to these chapters, Chapter 7 focuses on consolidating and systematising the work that has been done so far, while also looking forward to the future of emergent objects.

This is the most systematic chapter of this thesis in the sense that it abstracts itself from the minutiae of each case study to focus on the broader strokes of the theory itself. In adopting this systematic approach my intention is to leave the reader with a map, or framework, that can be applied to future case studies. Specifically, to cases in which there is a similar interplay between primary machinic production, i.e. the individuations of Being and an assemblage, and the production of secondary objects, i.e. our emergent objects.

From a structural perspective, Chapter 7 adheres to the categories of Being, milieu, assemblages, and objects as outlined in the procession of individuation. I begin by revisiting Deleuze's (1994) univocal metaphysics of Being-as-becoming and use it as a lens through which to read Broad's (2014) conception of emergence. I posit that the moment in which an emergent object emerges is not distinct from individuation. On the contrary, I show that emergence is a privileged point of differentiation that sees a minimal difference established between the milieu, the assemblage, and the emergent object. I reveal here that emergence is a form of individuation consistent with Deleuze's metaphysics. While the object cannot be differentiated entirely from the assemblage, it nevertheless becomes differentiated from it through a process of becoming. This is a significant move philosophically because it reinforces both the materiality and the reality of the object against the common refrain of immateriality. It also acknowledges the ever-present threat of being re-integrated back into the assemblage from which it arises. This is the fulcrum upon which the argument rests – that the individuation of the emergent object is not finished once it has emerged; rather, it remains in a continual process of individuation that is inherently precarious. Indeed, there is always the threat of non-emergence, or, in other words, of returning to Being.

I follow up this discussion of emergence by showing that emergent objects are contingent upon an assemblage. This is a key axiom of this thesis: emergent objects cannot exist without the instantiation of an underlying assemblage. Thus far, I would venture to say that the presence of digital infrastructures is a predicate for an emergent object, and therefore, that they are endemic to digital infrastructures as least as far as the objects discussed in this thesis are concerned. While emergence does occur at the level of consciousness and across other complex systems, digital objects transcend the pure “qualitativity” of images to possess what Thomas Nail (2021) calls “quantitative properties”. For example, the weapon's ability to cause damage in game, its magnitude relative other weapons, and its ability to emerge at the behest of an invocator while taking on a magnitude relative to other emergent objects, is

evidence of a conjugation between both qualitative and quantitative properties. This is what makes an emergent object an object rather than an image. In turn, these properties are derived from the interrelations of an assemblage. Thus, the pull between the assemblage and the differentiation of the object continues: the emergent object is never free from the assemblage and always espouses that which it divorces (Deleuze, 1994).

In the final parts of this chapter, I speculate on the possible individuations that can occur as a result of an emergent object's genesis. Each of these parts in this procession are intended to be heuristics to explore the possibilities and rhizomatic threads permeating the becoming of each object. As we have seen in each of the chapter overviews, there is no one determined course leading to emergence. Granted, there are conditions for an object to exist (hence the procession), but these individuations are not in themselves fixed to any one course. On the contrary, the individuation of the object from the field of difference may entertain a multitude of potential becomings. This is perhaps wherein the value of the emergent object as a theory lies: it does not correspond to just three objects, but rather, describes a much broader relationship between computational assemblages and the beings that they produce. As such, the theory of emergent objects has an analytic capacity in excess of the examples that I have provided. In the final stanzas of this chapter, I suggest that emergence will continue as virtual reality and generative intelligences become more commonplace. It is my hope that the present work may be able to contribute to future discussions of these technologies and the objects that emerge from the assemblages constituting them.

Conclusion

In this chapter I have introduced the topic, content, and direction of this thesis. At its core, I use this work to develop a new process-ontology of digital objects that will rescue the concept of the object from its current philosophical peril. By addressing the ontology of the object directly, I reappraise what an object is and can be in an era of increasing socio-technical complexity. Using a combination of theoretical and empirical analysis, I facilitate an encounter between a diverse range of theory and three empirical analyses. Invoking the philosophy of technology, media studies, and digital cultures, I centre this work on the study of three different objects: video game objects, NFTs, and the *Libre 2* sensor.

Echoing the procession of individuation, this thesis begins by addressing Being itself in the second chapter before driving further and further towards individuating itself with each case

study. Each chapter, therefore, can be read as a stage of becoming corresponding to the development of the object, one that ends with the open-ended-question of further individuations and becoming(s) once a minimum threshold of difference has been reached.

Chapter 2: The Philosophy of Emergent Objects

Introduction

Despite what the title of this chapter may seem to suggest, the following foray into different “philosophical” conceptions of the object is limited in scope. Conceptions of what “objects” are, what constitutes them, what they do, and what defines them differ according to factors such as historical context, sub-discipline, the prejudices of the philosopher, and the intentions of the theories in which they are situated. Even the dichotomous arrangement of the subject-as-agent and the object-as-passivity has been problematised by the likes of Graham Harman (2019), Bruno Latour (1993), and Gilbert Simondon (2011). I have, therefore, confined the material covered in this chapter to a select number of philosophers whose work represents an instrumental contribution to the aims of this thesis. My choice of what to include and exclude has been dictated by the task at hand, that is, determining the nature and existential-ontological modality of emergent objects.

Throughout this thesis I argue that emergent objects are unlike natural and technical objects for several reasons. First, they are contingent on an underlying system or assemblage of components and actors. Second, they are ontologically dynamic or ontogenetic, since they are in a process of production, and third, they are existentially precarious because they require that an assemblage be instantiated to continue existing. Following Manuel DeLanda (2016), Broad (2014) and the emergentist tradition more broadly, I contend that objects like video game weapons, NFTs, and wearables (specifically the *Libre 2*), are “emergent” in the sense that they are reliant on a set of relations separate to themselves, yet differentiated from them (DeLanda, 2016). In this chapter I develop an ontological framework for these emergent objects, one that is informed by the work of Simondon, Deleuze, Guattari, Nail, Broad, and DeLanda. This framework has been tasked with tackling the tension between the object as an emergent entity and the underlying system upon which it is contingent.

I embark upon this chapter with two aims in mind. First, I want to provide an overview of the concepts germane to this ontological model. These concepts will come to form the analytic

frameworks used in the case studies undertaken in Chapters 4, 5, and 6. As such, each concept presents a set of claims about the world and the structure of things that will inform the rest of this thesis. Second, I aim to establish the primacy of the emergentist model over traditional conceptions of the object such as those of Immanuel Kant and to a lesser extent Graham Harman. To reflect these aims I have divided this chapter into two parts. The first part is a critical appraisal of Immanuel Kant and Harman's work on objects that is intended to set the stage for my own intervention. The second is a full accounting of my own framework that follows the unfolding of the emergent object or what I call the "procession of individuation". This procession is a four-phase account of an emergent object's emergence that begins in Being and ends in the aftermath of emergence. It tracks the "becoming" of an emergent object from its roots in Being, to its milieu, to the establishment of an assemblage, and finally, to its emergence. This procession begins with a general metaphysics of Being before delving further into concepts like milieus, individuations, machines, assemblages and emergence.

I begin this chapter by presenting an overview of Immanuel Kant's and Graham Harman's philosophies of the object. My reason for selecting these two philosophers (and for addressing them first) is that each of their ontologies represents a set of essentialist approaches to the philosophy of the object. It is my belief that interrogating each of their respective understandings of objects can help to unveil the theoretical presuppositions informing these positions, and then, sharpen my case for why a new philosophy of the object is required given the empirical realities of emergent objects. It also provides an opportunity to identify some homologies or shared characteristics such as Harman's (2019) work on flat ontology and how this might apply to emergent objects. Having done this, I then proceed to developing an understanding of Being inspired by Deleuze's univocal Being outlined in *Difference and Repetition*. This section can be thought of as the "ground" of emergence and it focuses on situating the production of an emergent object in an ongoing process of individuation. I have written this section in dialogue with Gilbert Simondon (2011, 2021) and his work on individuation and becoming. I then delve into the structure of the milieu. I focus on Felix Guattari's (1992) concepts of machines, milieus, allopoiesis and autopoiesis to show that emergent objects do not emerge *ex nihilo*, but are instead strategically mobilised by pre-existing social arrangements and machines, while also being produced according to the codes and logics of their immediate environments. I trace the influence of machinic individuation

upon the technical, aesthetic, utilitarian, and operational aspects of emergent objects, and argue that these can be grounded in the allopoietic and machinic origins of emergent objects.

In the middle sections of this chapter, I reconstruct Deleuze and Guattari's (2013) "general logic" of the assemblage. I show that the underlying systems producing emergent objects adhere to a tripartite structure of abstract machines, concrete assemblages, and personae. This section proves crucial for my overall argument not only because it informs the general logic of the following case studies in terms of the ontology of platforms, wearables, and NFTs, but also because it is where I effect a key synthesis between what is commonly categorised as the "continental" philosophy of Deleuze and Guattari (2013) with the "analytic" philosophy closely associated with the concept of emergence. Here I provide the groundwork for my later identifications of computational networks and assemblages with the conditions required for an object's emergence. This also provides the necessary groundwork for the following discussions of emergence and how this process will be defined going forward. This penultimate section sees a discussion of emergence informed by works from Broad (2014), Manuel DeLanda (2016), Susan Stepney (2019), and Peter Fazekas (2014). Emergence is defined here as the production of an ontologically separate entity that can (and does), include objects like the ones studied in this thesis. The final part of this work, entitled "Towards an Ontology of the Emergent Object", functions as a summary of the proposed theoretical framework. It brings together the key ideas, concepts, and processes from each section and provides a map of the analytic process undertaken in this thesis. This structure is then reflected in the format of each of the case studies undertaken this thesis.

Immanuel Kant and Graham Harman

In this section I discuss Immanuel Kant's (2003) and Graham's (2002, 2019) respective approaches to the ontology of objects. I begin by reconstructing Kant's famous phenomena-noumena distinction alongside Harman's Heideggerian reinterpretation of this schema. From a structural standpoint, engaging with these two philosophers in the early stages of this chapter helps to situate my own intervention in relation to their work as well as my case for including the likes of Broad (2014), Guattari (1992), Simondon (2011, 2021), and Deleuze (1992, 2013). While Kant and Harman both make strong cases for their respective ontologies, each fall short when they are applied to the empirical and ontological realities of digital objects. However, I want to stress that the inclusion of these two theories is not simply a case

of choosing a “straw man” to highlight the necessity of my own intervention, but that both Kant and Harman make essential contributions to the philosophy of objects that are still very much relevant to present debates around objects and their ontology. Therefore, engaging with them critically is necessary in the context of a “philosophy of the object”.

I begin this section with a reconstruction of Kant’s ontology before doing the same for Harman’s. As unitary approaches to objects, Kant and Harman’s models share several homologies relating to essence and existence, although they diverge from each other along the lines of the former’s idealism and the latter’s speculative realism. These differences are important from a philosophical and technical standpoint because they make differing claims about the essential nature of objects and therefore, lead to very different conclusions about what objects are. I start by introducing the contextual and epistemic assumptions of Kant’s work, most notably his famous dictum regarding synthetic *a priori* judgements. I follow this up with a discussion of the categories and judgements involved in the cognition of objects and how this factors into the delineation between the object “for-itself” (phenomena) and the object “in-itself” (noumena). I then engage with Harman’s work on Object-Oriented Ontology (OOO). I point out that while Harman (2019) has a unitarian approach to object ontology, he differs with respect to his realist sympathies and materialist metaphysics. Throughout this section I also refer to certain aspects of video game weapons, NFTs, and wearables to provide an empirical justification for my claim that both approaches are unsuitable.

Kant’s approach to objects is informed by the epistemic and metaphysical grounds of his Transcendental Idealism. For its part, Transcendental Idealism places heavy emphasis on the relationship between objects and subjects and their opposition to one another, and much of Kant’s work centred not on the object as a thing-in-itself, but as an object of cognition. Although it is certainly not the case that Kant’s (2003) epistemology wishes to deny the existence of a mind-independent world, he did want to emphasise that our cognitive processes were first and foremost the mechanism through which we have access to it. Kant (2003) presents a synthetic argument, positing that judgements about objects are made via a transcendental epistemology (Kant, 2003). Simply put, Kant (2003) argues that one has a pre-constituted (i.e. *a priori* or prior to experience) knowledge of both time and space. In this way time and space are abstractions that both ground an individual’s judgements about objects as well as provide the possibility for these judgements in the first place. The

knowledge of empirical objects, therefore, is predicated on this primordial knowledge. This idealist position privileges the application of logic, critique, and phenomena to constitute objects (Kant, 2003). For Kant the object is not a self-contained unit that carries within itself the qualities that make it discernible; rather, the object is constituted by the subject through the application of categories (Kant, 2003). Hence, the object is an outcome of the unification, or synthesis between the intuition, the understanding, and the associated categories and concepts. As Kant argues, this means that "...space is a necessary representation, *a priori*, which underlies all outer intuitions" (Kant, 2003, A 23/B 38).

Kant's theorisation of objects has several aspects requiring further consideration. The first is that the object of outer experience (i.e. the object we encounter, perceive, intuit, etc.) is necessarily spatial insofar as we cannot conceive of an object without it existing in some kind of space. Kant argues that this is what makes space an epistemic condition for our knowledge of objects because although we can quite comfortably imagine a space absent of an object, we cannot conceive of an object that is absent of a space (Kant, 2003). Kant also follows Aristotle by adopting a hylomorphic perspective with regards to the object of experience, arguing that all empirical objects are constituted by two key elements, that is, form and matter (Kant, 2003). His argument here is that matter without form would not be spatially or temporally ordered in the same way that objects are, with formless matter becoming an amorphous blob, and matterless form becoming an immaterial idea. Kant maintains then that objects are given to us as objects through the act of cognition, with this act involving the application of the category and the act of intuition where the object is given (Kant, 2003). Kant further differentiates between two types of categories based on quantity (unity, plurality and totality) and quality (reality, negation and limitation). These categories govern the meaning-making process inherent in an encounter with an object, both as an idea and as a synthetic object (idea and object). Categories thus define the things that we can know about an object through our cognition of them. What is noteworthy, however, is the absence of the object's structure and its materiality, given that these cannot be experienced directly and therefore remain part of the noumenal domain.

This approach to objects, and, to a lesser extent, objectality, necessitates that the object of empirical intuition is known through its being-for-itself (phenomena) rather than its noumenal being (Harman, 2019). This means that the perceiving subject is able to intuit and unify the empirical object with its concept on the basis of that which is perceived, but they

are not able to know the object as it exists for itself (Kant, 2003). This leads Kant (2003) to his famous distinction between the object's phenomenal being (for-itself) and its noumenal being (in-itself). This split decouples the object from its qualities, meaning that the object is not reducible to the sensorial inputs available to the subject, but rather remains as an essence-in-itself beyond both space and time (Kant, 2003). The noumena is therefore not just the internal structure of a thing but its essence, an essence that exceeds the faculties of cognition. This tenet of the Kantian object will come to form the basis of Harman's OOO. Like Kant, he argues that an ontology of the object should account for its noumena as a definitive part of it (Harman, 2019). In this respect Harman's work can be considered a neo-Kantian revival of the object because it maintains and defends this aspect of the for-itself and in-itself model of being.

From this brief reconstruction it should be clear that Kant's emphasis on using the subject's experience and the categories of understanding to explain the existence of objects is not without issue. Emphasising the subject's experience and, by extension, the object as an object of experience has limited explanatory potential in terms of analysing the being of objects. This is because this ontology privileges the experience of the object through the act of cognition – Kant thus situates objectivity in the realm of ideas one derives from the unity of perception and the categories of understanding rather than the thing-in-itself, which for Kant remains inaccessible. Here, he is effectively relegating the matter of an object's existence to the realm of ideas whilst ignoring the mode of its existence. This approach proves to be orthogonal to the aims of this thesis. This is because an ontology of emergence in relation to entities like video game weapons, NFTs, and wearables must account for the concrete matters of being and existence inherent to these objects. It is therefore not a question of my experience of the object or the conditions that make my knowledge of it possible. It is about uncovering the general logics common to all emergent objects as entities in themselves. The idealist approach taken by Kant here fails in this respect because of the underlying assumptions motivating his approach to objects. Contrary to Kant, I argue that a materialist metaphysics coupled with a rigorous empirical analysis *can* provide the requisite tools to engage with the underlying structures of objects beyond our experience of them. This is perhaps where Harman's approach might be found to be better suited to the task at hand.

Graham Harman's Object-Oriented Ontology (OOO) is one of the more contemporaneous additions to this discussion of the philosophy of the object. Nevertheless, Harman's OOO is

both theoretically and methodologically closer to Immanuel Kant than any other philosopher mentioned in this chapter due to his emphasis on the noumenal region of the object. Despite this proximity to Kant, Harman was inspired by the notion of *aletheia* (revealing) in Heidegger's work to affect a reversal of Kant's emphasis on experience, phenomena, and understanding. Unlike Kant who argues that the appearance of an object is the grounds of our knowledge of it, Harman argues that it is the noumena which is *the* defining characteristic of the object (Harman, 2019). Hence, because knowledge comes *from* the object, the theory is object-oriented. Harman (2002) argues that we have access to the noumena as the essence of an object on the condition that it can disclose itself, however this disclosure is conditional on the subject's proximity to the object in question. For this reason, he objects to both "overmining" and "undermining", opposing all attempts to reduce an object to what it is made of (overmining) and what it does (undermining) (2019). Harman's attempt to construct an entirely new theory of the object provides insights across a diverse range of topics such as essence, realism, anti-realism, and flat ontology (2019). With this in mind, I will deal with his treatment of each of these issues in kind.

Tackling Harman's Object-Oriented Ontology (OOO) necessitates descending from the theory's most general philosophical precepts to its most particular. From the outset OOO borrows from Manuel DeLanda's (2016) notion of "flat ontology". For both Harman and DeLanda flat ontology signifies that all things in existence, regardless of whether they are a subject or an object (Harman, 2019) have the same ontological status. Instead of distinguishing between entities based on dogmatic hierarchies like form and matter, flat ontology begins by casting the widest net conceivable over everything in existence (Harman, 2019). Everything in existence, whether a complex multivalent entity or a simple atom, is said to possess a common structure and status as part of the universe. From the outset this already places Harman's metaphysics of OOO at odds with the likes of Kant who insisted upon a primordial division between human thought on one side, and everything else on the other (Harman, 2019). In his book *Object-Oriented Philosophy: A New Theory of Everything*, Harman is quick to point out that the chief benefit of such an approach is "...to prevent any premature taxonomies from being smuggled into philosophy from the outside" (Harman, 2019, n.p.). Using flat ontology in this way provides Harman with a set of presuppositions that will be necessary for his departure from the rational subject as the arbitrator of objectality. By removing the hierarchical arrangements of entities Harman returns to the

noumenal object as something in-itself, something that was previously distinguished *a priori* from humans.

Harman's pivot from Kant's privileging of the idea as the arbiter of objectality towards the object-in-itself sets the stage for what can be considered the key development of OOO – the reversal of Kant's phenomena-noumena distinction. By effecting this reversal Harman is claiming that objects are not phenomena mediated by the categories of understanding, but that they are, in fact, noumenal, that is, fundamentally inaccessible or withheld from us (Harman, 2019). As I discussed in my overview of Kant's conception of the object, the noumena is the inaccessible, unknowable "in-itself" of an object that exists beyond the individual's sensory (phenomenal) faculties and the categories of knowledge (Kant, 2003). However, Harman (2019) diverges from Kant by stating that one's knowledge of an object cannot be given solely in experience, or the anthropomorphisms of phenomena, idea and form. On the contrary, the essence of the object is withheld from us while the qualitative aspects that come to us through experience do not have any essential truth (Harman, 2019).

Harman's abandonment of the idea-category model has two notable consequences. The first is that the object one encounters phenomenologically is a "fiction" because it is not strictly the object itself. This is because the qualities that one perceives in their encounter with an object do not exhaust the full existential content of the object or even provide an adequate representation of its being. Instead, these qualities are said to produce a fiction about the object that is then attached to it (Harman, 2019). From an epistemic perspective the qualities of an object such as the way it looks, feels, etc. are neither representative nor indicative of the object's actual being. The second consequence of this reversal is what Harman terms "the fracture in things", which refers to the fact that an object "...precedes its qualities despite not being able to exist without them" (Harman, 2019, n.p.). There is thus a division between the "real" noumenal object on the one hand, and the sensory object on the other, because what is accessible to us as humans and through our experience is not really the object. On the contrary, the content of our experience only serves to constitute a fictional object as it appears in our experience (Harman, 2019). The real object though precedes both the qualities of experience and experience itself, with the noumenal being of the object existing beyond the spatio-temporal confines of qualities despite being contingent upon them (Harman, 2019). From the perspective of constructing the object then, Harman's ontology of the object

necessitates that it is not reducible to its qualities, but rather, retains the privileged status of a being-in-itself.

This “fracture in things” imposes a division between the sensual and the real for Harman (Harman, 2019). This division organises the object into a tetradic matrix in which there are sensual qualities, sensual objects, real qualities, and real objects (Harman, 2019). To begin breaking this matrix down, the sensual qualities of the object are those that are perceptible and available to the individual, they are qualities that one perceives when encountering an object such as colour, position, tactility, etc. According to Harman (2019), the availability of these qualities is enabled by a common spatial position shared between the object and the individual. Unlike the real object, or the object in itself, these sensual qualities are accessible to the senses because they are coextensive with the observer (Harman, 2019). The sensual object is also spatialised, but where qualities are likely to change with the passing of time, the sensual object is the unified referent to which the various experiences of the object are ascribed (Harman, 2019).

The third part of this tetrad corresponds to what Harman (2002) terms the “real qualities” of an object. Real qualities are those qualities essential to the identity of the object. While sensual qualities may vary over time and between individuals, and are inessential to the object, real qualities do not vary between experiences (Harman, 2019). Real qualities are a predicate for the experience of the object itself, and without them, one could not actually be said to have experienced the object. Harman goes on to claim that the destruction of these essential qualities would surely spell the end of the object itself (Harman, 2019). For example, Harman claims that if the White House was burnt down entirely during the war of 1812, its immolation would spell the end of its qualities, and, by extension, the object itself (Harman, 2019).

This brings us to the final aspect of the object - the real, or “noumenal” object. Due to the inaccessible and inexhaustible nature of this object, little can be said in the way of specifics. By virtue of its position in the tetrad it has neither qualities nor sensual aspects. Harman resorts to claiming that “...real objects exist whether or not they currently affect anything else” (2019, n.p.). Real objects cannot relate to one another directly but do so by means of the sensual object, and they always withdraw from direct access (Harman, 2019).

Ontologically, the real object bears the closest resemblance to the noumena of Kant, but it

differs in respect to its relationship with real qualities because it cannot exist without them. The imposition of the sensual-real fracture leads to the emergence of four categories that place the key characteristics of the object in a tense set of relations between necessity and contingency. What remains, however, is that the real object is something beyond its qualities yet is nevertheless contingent on their existence.

Before I develop my own theory of emergent objects, I want to finish by assessing both Kant and Harman's approach to objects. Neither Harman's nor Kant's approach is well-suited to defining an ontology of video game weapons, NFTs, and wearables like the *Libre 2* sensor. Both approaches are incapable of dealing with the ontological contingency or ongoing precarity characterising the existence of these objects because they place the essence of the object prior to its production. This criticism can be extended further to the production of ontological difference in the context of flat ontology as, if the object arises once a certain system of relations has been instantiated (as is the case with each of the objects studied in this thesis), it must then exist at the same time with this system. The other issue with Kant (2003) and Harman's (2019) approaches is that both marginalise the processes driving the production of objects in favour of postulating an immutable essence. From a logical perspective this seems counterintuitive because it places the essence of the object prior to its existence, or in the case of Kant, reduces the object to my experience of it.

Both Kant and Harman's approaches, therefore, seem reductive and counterproductive to the task of developing an ontology based upon a series of empirical analyses. Over the course of this thesis, I demonstrate that each emergent object is continually produced from a series of interactions occurring between existing technical objects, software, and human subjects. Determining the ontology of digital objects necessitates that technical objects like codebases, processors, and databases, network infrastructures, and other hardware and software components, not to mention embedded human subjects, are all accounted for. The contradictions inherent in using an essence-based approach can be demonstrated quite well if we apply this system-object problem to Harman's model of an emergent object. In OOO an emergent object is defined as the aggregate result of a combination of objects, which from Harman's perspective could include social objects such as the band The Beatles, a marriage or a vehicle (2019). The problem here, is that it cannot explain how there is a noumenal being that encapsulates the essence of each object, but that the emergent object has a new essence produced in combination with other objects, yet, that this emergent object is also somehow

able to survive permutations in its contents such as the removal of a band member (Harman, 2019). In a Kantian sense, the essence of an object is supposed to be unchangeable, and, whilst essences in OOO might be able to change this contravenes the very concept of the essence as something immutable, inaccessible and separate from the fluxes of the world.

The problem with the emergent object as it is defined in OOO is that the marriage of two or more objects to create a third, different object, contravenes the immutability of essences. It is illogical to claim that the macro-entity can maintain the diachrony of its essence despite the changes in its being. For example, how can an emergent object be formed by the combination of two or more objects, yet remain the same emergent object even as one of these parts has perished or been replaced? If I was to ask Harman to apply his schema to an emergent object such as a video game weapon, he would likely agree with me that it is an aggregate of several objects (e.g. material components such as circuitry, servers, chipsets and software components), however, he would maintain that this object is not an emergent entity contingent on the relations between each of these parts, although distinct from them, but a real object existing outside of the qualitative access we have to it. Despite the contingency of the weapon upon multiple components, it would still have to remain an object with a unique essence that we are nonetheless unable to have access to. I find this to be an unconvincing and altogether untenable argument given the processual nature of the weapon's existence. Harman's fracture between essence on the one hand, and qualities on the other, does not account for the individuations and continual becoming(s) that are constantly undergone by objects.

As an interdisciplinary work, my own ontology bridges the gap between the social and cultural being of the object and the existence of the object itself. As such I am wary of using essence at a conceptual level because it underplays the evolutionary and constructive factors that lead to the existence of an object in the first place. If there are no hammers without arms and the need to build or make something, how is it that the essence of a hammer could exist independently of the socio-cultural factors governing the form of a tool? Or, even if qualities like form are irrelevant, how does one differentiate between essences without the differences produced by the relations between object and milieu? This would suggest that essence is either shared or ontologically irrelevant. On the contrary, I venture that both emergent and regular objects do not have an essence that transcends their being-in-the-world. Like Simondon (2020), I claim that objects are continually individuating and becoming through

their interactions with the world. Therefore, a fixed essence is not only an impossible limit for an object but also an ontological impossibility.

Deleuze and Simondon on Being, individuation and the origins of objects

A purely object-oriented or idealist conception of the object has limited explanatory potential when it comes to creating an ontology for objects such as video game weapons, NFTs, and wearable biosensors. To develop an alternative approach that can avoid these pitfalls and be applicable across the breadth of each case study, it is now incumbent upon me to begin constructing the foundations for my own intervention. This necessitates a project of theory building that lays out the rudiments of this ontology while showing where and why it applies to these objects. I begin building this framework for the “philosophy of the object” starting with Being itself, and then proceed from Being to the milieu in which objects emerge. I centre this transition from Being to milieu, and, eventually, the emergent object using Deleuze’s (1994) notion of difference. Deleuze’s difference plays a crucial role in the ontology of emergent objects because it encapsulates the relationships of difference and dependence residing at the heart of emergent objects. Using Deleuze’s (1994) concept of difference I approach the relationship between emergent objects and the systems on which they are contingent from the perspective of becoming. I argue that difference is produced within Being as part of what Ray Brassier (2010) and Nick Land (2011) in their readings of Deleuze have called primary machinic production. That is, that there is a primary machinic process of individuation driving the production of difference. It is this difference that becomes the basis for the system-object distinction because it accounts for the distinct causal and subjectivating powers possessed by these objects. In doing so I return to the origins of the concept of individuation in the work of Gilbert Simondon (2020) before linking it to the progressive differentiation of being of which the emergence of the object is part. My rationale for the arrangement of theory in this chapter over a traditional “literature review” is that it brings together a body of literature relevant to the study of objects while incorporating it into the analytic context in which it will be used.

My analysis of Kant and Harman demonstrated that neither a hierarchical subject-object relation nor an insistence on the noumenal permanence of an object is applicable to the analysis of objects predicated on socio-technical systems. Bifurcating substances in terms of

the idea and the object, the phenomena and noumena, or appearance and essence underplays the empirical, social, and technical realities of objects. These realities are important because they inform and structure the existence of emergent objects in ways that are both concrete and observable. If an object has no essence or relation to an essential category of knowledge though, how then does it become an object? If possessing the essence of an object is no longer the arbiter of objectality, then the object must be formed according to productive forces that will both precede and succeed its coming into existence. What are these forces then? And how do they facilitate an emergentist model of game weapons, NFTs and wearables? To answer these questions, I will be turning back to the earlier work of Deleuze and his book *Difference and Repetition*. For its part, *Difference and Repetition* is a radical departure from the dominant tendencies of occidental philosophy. Contrary to what was (and still is) an established practice of looking at differences between beings, Deleuze (1994) claims that difference emerges within Being, hence its univocality.

Where Harman (2019) claims that each object possesses a unique essence as a metaphysical and ontological necessity, and objects are therefore *different* from each other because of this metaphysical and ontological distinction, Deleuze takes the opposing view that difference is produced not between beings, but *within Being*. For Deleuze (1994) “...the essence of being is to include individuating differences, whilst these differences do not have the same essence and do not change the essence of being” (p. 36). This means that differences are produced from the continual individuation of Being, because of this, Being is not static or fixed but is becoming. Being is not an essence as such, but a series of events resulting in the becoming of everything from the smallest atomic structures to the most complex of systems. In direct contrast to Harman (2019) and Kant (2013), where there were multiple essences inimical to change, the essence of Being to Deleuze is becoming. Being, therefore, remains impervious to the contradiction between essence and process, they are for Deleuze one and the same “above all...individuation properly precedes matter and form, species and parts, and every other element of the constituted individual” (Deleuze, 2013, p. 38). In this view the production of an object is a moment of differentiation, or more accurately, the production of difference. It is the unfolding of a complex entity out from an already individuating Being.

Deleuze’s metaphysics of Being evokes Thomas Nail’s (2021) work on quantum indeterminacy and the ontology of the object-as-process. Nail (2021) claims that “The kinetic operator is not an empty void but a seething generative indeterminacy” (p. 230) and,

therefore, that “...the movement of matter/energy is not reducible to objects but is their immanent and non-totalisable condition” (p. 231). Similar to Deleuze’s (1994) idea that differentiation is the repetition of individuation i.e. Being is a process, Nail is claiming that the fundamental substrate of space-time is a process of generative, “seething” individuation in which objects are produced as loops in space-time. Here, the object is immanent to Being in the sense that it is not divorced from the minute movement of matter, but rather, is a hypostasized bundle of looping processes. For the emergent object this reveals that it is not separate from Being or any of the other individuated processes upon which it is contingent such as the computational assemblage or the routines of software. On the contrary it is qualitatively differentiated from these loops as an individuated object. The indeterminate nature of this substrate means that the object is not the totality of these processes, but rather, is entangled with them. This is what is known as a nomological relation in which the object emerges alongside a system, but is not directly equivalent to them.

Adopting Nail (2021) and Deleuze’s (1994) metaphysics has two consequences for the ontology of emergent objects. The first is that all objects and entities (whether digital or not), are temporary structures produced by individuations or movements in Being (Nail, 2021). Similar how waves are temporary structures emerging out of a larger body, objects are structures brought into existence by pre-existing flows of machinic production (Deleuze and Guattari, 2017). This view holds that objects are only ever partially individuated from their surroundings and are always under threat of reintegration. The benefit of taking such a view is that we can account for how emergent objects are differentiated from the systems that produce them yet remain contingent upon them because of this relationship between Being, difference, and repetition. For example, Deleuze (1994) asks us to “... imagine something which distinguishes itself – and yet that from which it distinguishes itself does not distinguish itself from it” (p. 28). Similarly, the emergence of an NFT or the *Libre 2* represents the moment where a new form of difference in Being is established; whether momentary or ongoing the object’s arrival is a signifier of some degree of difference being established. This is seen, for example, in the simple observation that where there was once an absence of an object on-screen, or in our immediate milieu, the instantiation of some underlying system has led to there being one.

Other scholars have taken up this idea of Being-as-differentiation or Being-as process in their own ontologies. Manuel DeLanda (2002) touches on this idea that difference is produced from a flat field on interactions. His inclusion here is meant to clarify the difference between the hierarchical (vertical) arrangements of categories that characterise traditional ontologies (like Kant's) and the productive differentiations of a flat ontology:

...while an ontology based on relations between general types and particular instances is hierarchical, each level representing a different ontological category (organism, species, genera), an approach in terms of interacting parts and emergent wholes leads to a flat ontology, one made exclusively of unique, singular individuals, differing in spatio-temporal scale but not in ontological status (DeLanda, 2002, p. 52).

DeLanda (2002) defines flat ontology as a monadic plane of existence composed of individuating entities. These entities, while qualitatively distinct from one another, are not hierarchically distinct. Difference is defined in terms of spatio-temporal scale and coordination, which by itself, does not produce ontologically distinct essences, but rather sees difference expressed qualitatively² (DeLanda, 2002). There is no hierarchical relation between subject and object here, only differences in qualities. In his work, DeLanda (2002) goes further to discuss how this flat ontology privileges relations, individuation, topographies of intensification, and landscapes of segmented space (2002).

In explaining Deleuze's concept of Being and difference I have made use of the concept of individuation to signify an event of becoming. While Deleuze (1994) makes extensive use of individuation, notably, to describe continual interplays between becoming, events, differences, and repetitions, his own work was heavily influenced by another philosopher – Gilbert Simondon. Simondon and Deleuze's shared understanding of individuation is a lynchpin for the present analysis because it encapsulates the flow of becoming-events leading to the emergence of an object. I use the term individuation to describe the event, or procession of events eventuating in the formation of an object (Simondon, 2020) .

² DeLanda expresses this in terms of 'intensity'.

Individuation describes the procession of becoming in which an emergent object is immersed – from its beginnings in univocal Being, to a milieu populated by multiple investing machines (social, biological, technical, geological etc.), to a socio-technical assemblage, and finally, to the emergent object. Individuation denotes a becoming-event that initiates in a phase-shift in a milieu (Bardin, 2015). It signifies a transition from one state to another and in relation to emergent objects it refers to the dynamic of emergence and becoming, both before an object emerges into a milieu, and after when it changes or affects its surroundings. Individuation does not have an end or a teleological structure because it does not end when an object is created or emerges.

Simondon mobilises the concept of individuation to argue that the structure of an object is not hylomorphic but dynamic (Bardin, 2015). Rather than there being a transcendental schema that governs the structure of an object, what we would consider the “form” of an object, is, for Simondon (2020), the result of a procession of micro-becomings initiated by the object’s interaction with its immediate environment, and the metastable unfolding’s triggered by these interactions. According to Simondon, the hylomorphic delineation between what is form and what is matter does not apply to the world in which we live (Bardin, 2015). Instead, he claims that an individual, whether subject or object, does not begin as a completed, fixed entity with a discernible (but nevertheless artificial) structure of form and matter, but rather, that a process of individuation precedes the entity, and that this entity is produced as part of this unfolding (Simondon, 2020). This process can be seen at work in Chapter 6’s analysis of the *Libre 2*, where the sensor not only emerged through its interactions with the manufacturer (the labour of the creator being that which gives the sensor shape), but also alongside its interactions with its surroundings, notably, the fluctuations of the wearer’s bloodstream and the electrochemical reactions of the sensor tip.

As was the case with Deleuze’s understanding of individuation, Simondon’s approach presupposes an ontogenetic metaphysics where the genesis of an entity is the result of a continuous process of becoming. Simondon (2011) claimed that all entities emerge from an un-individuated, or rather pre-individual reality for which Simondon scholar Andrea Bardin claims “...is both the reality preceding the genesis of the individual and, at the same time, the milieu full of potentials ‘associated’ to the individual, once the latter has been generated” (Bardin, 2015). This theorisation of the pre-individual represents both the foundation for Simondon’s central thesis of ‘individuation’ and a crossover with Deleuze’s Being-as-

becoming, as like Deleuze, Simondon claims that there is indeed a reality that precedes the individual. Further to this, he argues that this pre-individuated reality is the very ground of a being's conception, on the basis that the potentials within the surrounding milieu also will provide the conditions for the successive phases involved in individuation (Bardin, 2015).

The process of individuation can be broken into two key aspects – structure and operation. For Simondon (2020), structure represents the manifold processes that take place within a system, such as the physical, chemical, and biological interactions or reactions that contribute to the “physical” being of an individual (Bardin, 2015). Structures are the determinable, quantifiable and knowable aspects of an individuating phase-shift because they are governed by discernible patterns and laws. For example, it is possible to predict that exposing my skin to sub-zero temperatures will result in my blood vessels contracting. Here, my body's reaction to this external stimulus is governed by the biochemical feedback structures of my body. Structures are more determinable and knowable than operations given that they present themselves as objects of study. In terms of emergent objects, we can observe two registers in which structures are in play. There are the electromagnetic, electrochemical, and standardised operations in play, and there are structures like game mechanics, token standards, and feedback mechanisms structuring how each object operates and discloses itself.

Simondon does not couch individuation in terms of a scientific determinism in which objects, individuals, and the relations between them are reducible to a set of deterministic structures or pre-set outcomes. Although structures form an integral part in the wider unfolding of individuation, they are only one half of a twofold structure. The operational parts of individuation do not have the same causal strictures as the structural aspects (Simondon, 2020). The operations of a being refer to a series of aleatory relations between an entity, its milieu, and internal structure. Operations reference the indeterminate relations of a being to its milieu, they describe an entity's (such as a technical object) ability to produce unforeseen transformations within itself, and within its own spatio-temporal milieu (Bardin, 2015). Operations are transductive, they are the undeterminable, relational, and processual unfolding of the individual as it is immersed in, and interacts with, its milieu. Adopting Simondon's conception of individuation for the study of emergent objects describes how complex, and ontologically differentiated, beings are produced within a milieu, and how these objects will affect their surroundings and be affected by them in turn. This applies to how an emergent object such as a weapon in a video game may affect players' emotional states and the

gameplay dynamics of the ludus in interesting or emergent ways. The individuation that prompts an emotional outburst in a player is not solely determinable from the structural aspects of the entity and may be affected by factors like chance, the character of its milieu, and the person who is encountering it

Individuation becomes a defining aspect of the ontological structure of emergent objects for the fact it accounts for the continual interplay between technics that are structured by laws, standards, and causality, and the fact that emergent objects operate in ways that are undetermined, and irreducible to, or indeed entirely other than, what is presupposed in this structure. Each object requires the individuation of an assemblage of components and actors, these individuations are governed by structures such as coding practices, biological practices, and gameplay mechanics. They are also potentially undetermined. At the most basic level individuation is the conceptualisation of a being and Being itself in terms of its becoming, it holds that the fixed, stable category of the static individual is “...the impossible limit case of a perfectly static system, the fictive name for a completely accomplished process of individuation, while in actual fact one is always simply witnessing processes which deprive individuals of any fixed identity” (Bardin, 2015, p. 5). Individuation, therefore, is the overall term for referring to the perpetual becoming of an entity. It encompasses a being’s relationship to Being and its surrounding milieu, and the metastable processes that maintain existence against entropic forces (Simondon, 2020). As I have established, Being is a continually individuating field of becoming(s) eventuating in the production of difference and the formation of various entities. The pre-individual phase-shifts prior the genesis of an emergent object, therefore, influence the object’s structure and character. Approaching emergent objects in this way provides an ontogenetic explanation for how the social, economic, productive, and technical realities of a milieu can become embedded in objects like NFTs, video game weapons, and wearable devices, because these objects were literally individuated out from these settings. In the thought of Deleuze (1994) and Simondon (2011) the term “milieu” is used to describe this pre-individual environment. Both philosophers claim that a milieu precedes the genesis of an entity and then becomes a set of environmental conditions surrounding and shaping it. The milieu has a privileged position in this ontology of emergent objects because it is not only the environment that shapes and structures emergent objects but is also the site of an all-important bi-directional relation: On the one hand, milieus are individuated by emergent objects, and on the other, emergent objects are individuated by their milieus.

Milieus, Technical Objects, Allopoiesis, and Machines

In this section I interrogate the relationship between entities and their milieu. Invoking Simondon (2011, 2020), Deleuze (1994) and Guattari (1992, 2013), I discuss the key characteristics of milieu, the relationships between milieu, machines, and objects, and finally, how the individuation of an emergent object out from this environment is indicative of an allopoietic structure. That is, that emergent objects are produced by machinic investments other than themselves and according to the codes, criteria, and requirements of their surrounding environments. This reconstruction of the milieu sets the stage for the historical and cultural analyses that will precede each of the case studies. As part of the objects' milieu, the history of innovations, attempted mobilisations, and contestations that have, for example, characterised the development of NFTs is conceptualised as a series of individuations in Being leading to the eventual emergence of these objects. In this way I account for the factors governing the operative context of emergent objects as a part of their ontological structure. What follows is a reconstruction of the concept of the milieu and its relationship to the ontogenesis of objects. Whilst I follow Simondon (2011) and Deleuze's (2013) broader understanding of the milieu as a perpetually individuating environment that precedes the formation of an emergent object, I supplement my account with a close reading of Guattari's (1992) concept of the machine. Following Guattari (1992), I conceptualise the social, technical, and economic structures constituting the milieu of an emergent object as a form of machine.

The procession from Deleuze's univocal Being-as-becoming to the milieu surrounding an emergent object is a lengthy and complex series of unfoldings. In Deleuze's (1994) thought Being "is", in the sense that it is a unified field of intensive relations differentiating through individuation. This is a necessary consideration when theorising the milieu because the milieu, as the environment from which emergent objects are individuated, is a localised field of Being. I contend that a milieu is a specific field of intensities with a unique character that has (partially) been determined by the events that have taken place within it. Examples of these individuations include physical processes such as the entropic forces of thermodynamics, the cyclical patterns of nature, and the gravitational pulls of celestial bodies, in addition to the social and cultural histories of the setting. These individuations vary in terms of their relevance to the eventuation of emergent objects, and part of doing each case study has been to determine what is ontogenetically relevant to the object. For example, the

advent of platformised gaming has had more of an effect on the ontogenesis of video game weapons than the work habits of one of the developers. Where the former is inscribed in the technical structure of an emergent object, the latter is not. Notwithstanding the requirement to be discerning in my analysis, the milieu is a crucial site for this ontology because it constitutes the field of Being in which emergent objects arise, and the field that they will come to affect. In Chapter 4, this is exemplified in how the pre-existing logics, the transnational infrastructures of the Steam platform, the ludological space of *Destiny 2*, and the domestic spaces of the player form part of an associated milieu from which the weapon emerges, and which it will then affect.

The term milieu surfaces in Simondon's analysis of technical objects. Tracing the origins of technical objects, Simondon (2011) identifies the origins of these objects with an individuation that severs the object from the primordial unity of the natural world which, in Simondon's thought, is designated as a milieu. The origin of a technical object is an individuation that establishes the alterity of the object against the milieu from which it originated. The defining aspect of technical objects, therefore, is that they are differentiated from the milieu to the point where they are distinguished from it. Like Deleuze's (1994) concept of Being, Simondon (2011) understands the natural world to be a unified field or more accurately a milieu, claiming that the creation of an object is an act of division resulting in a fissure between the object and the world. Simondon claims:

The technical object is distinguishable from the natural being in the sense that it is not part of the world. It intervenes as mediator between man and the world; it is, therefore, the first detached object, for the world is a unity, a milieu rather than an ensemble of objects; there are in fact three types of reality: the world, the subject and the object, which is an intermediary between the world and the subject, the primary form of which is the technical object (Simondon, 2011, p. 417).

Positioning the technical object between the subject and the milieu as both an individuated entity and an intermediary, Simondon conceptualises the detachment of the object as an effect of labour (Simondon, 2011). The status of labour as a driver of individuation unveils an underlying ontogenesis within the structure of the object and its relationship to the milieu. The investment of the labourer in the process of detachment shows that objects are not self-engendering but rather, that they originate from individuations, causes and investments

distinct from themselves. In other words, that they emerge from a milieu. We see this in both the requirement for a subject's labour, and, in the positioning of the milieu as the ground from which an object is differentiated. The crystallisation of the subject's labour produces a semi-definitive object by initiating a phase-shift away from a unified world to a world that now has mobile objects within it (Simondon, 2011). This "primary alienation," as Andrea Bardin claims, is not just the alienation of the object from the world, but also the object from its producer (Bardin, 2015). In this respect emergent objects are no different from Simondon's technical objects. Like technical objects, emergent objects must be individuated away from their milieus to emerge, and they must be produced through processes external to themselves. They are thus allopoietic in the literal sense (allo – other) (poiesis – production). My use of allopoiesis here includes both labour and ancillary processes like the interplays of hardware, software, and subjects.

The alienation of the object from the world also opens another ontogenetic thread – the now detached, functionally independent object contains within itself the potential for individuation (Bardin, 2015). This potential results from the object's independence. If a technical object emerges into the surrounding milieu, it becomes party to the same aleatory relations as any individuated being. What this means is that the object can produce changes within itself and the surrounding milieu through its interactions with the world. Hence, the technical object has the potential to effect changes and "become". This has the consequence of making the technical object complicit in a broader thread of individuation, necessitating that it will change over time given the plethora of possible outcomes, positions, and modifications to its being brought about by the aleatory relations between it, and the milieu. This phenomenon is exemplified in the paradox of Theseus' Ship, where the ship's identity is called into question once each repair, modification and replacement has been undertaken. In turn, this raises the question as to whether this is the same ship or not. My Simondonian (2011) reading however, suggests that this line of reasoning is a mistake, and that rather than locate the identity of the ship materially or ideally, we might simply argue that it is undergoing its own process of individuation.

The ability to individuate does not mean that technical objects are analogous to subjects. Simondon takes pains to differentiate between the two with respect to their agency, their metastability, and the individuations available to them (Simondon, 2011). Simondon claims that because technical objects do not have an internal sense of time, and they lack the

reflexive consciousness of subjects, they cannot anticipate and modify their behaviour virtually (Bardin, 2015). In a general sense, Simondon (2011) is making a distinction between the conscious production of transformations within the subject and its milieu, and the autonomic/reactive or *allopoeitic* transductions undergone by the object. On the one hand, a subject has a degree of conscious control over their transductive endeavours which can result in their undertaking predictive actions that anticipate the future problems that may arise in their milieu (Bardin, 2015). On the other hand, the limited intentionality of technical objects means they cannot “invent” new strains of information. In this view technical objects are consigned to the reception and transmission of information as opposed to the creative endeavours available to the subject (Simondon, 2011). In his Simondon-inspired mechanology of smart objects, James Ash (2018) theorises technical objects in terms of allopoeisis. Ash (2018) argues that allopoeisis is “...where a technical object is (reproduced) according to the criteria, codes, and programmes of its environment” (Neves, quoted in Ash, 2018, p. 28). However, the object is not determined by these programs and codes and will take on an independence of its own. Here, the object will enact its own individuations once it has been produced. Thus, a technical object is an independent entity circulating amidst the world, it is “... a germ of further processes of individuation” (Bardin, 2015, p. 103). Technical objects have three distinct characteristics: the first is that they express the social and cultural relations guiding their production, the second is that they possess the ability to individuate themselves further through the transductive possibilities available to them, and the third is that they offer further opportunities for groups and individuals to individuate themselves.

The structure of technical objects bears some similarities with emergent objects. Emergent objects, like technical objects, emerge out of a milieu and are influenced by the programs, codes, and criteria of their environments. This is evident in every case study undertaken in this thesis, with video game weapons, NFTs, and the *Libre 2* all influenced by the technical logics, cultural logics, and economic logics of their respective milieus. The physical characteristics of these milieus, such as the systems of the body, or the hardware upon which each emergent object is predicated, also exert an influence on each emergent object and the assemblage that produces it. Like technical objects, emergent objects individuate their surroundings, however, unlike technical objects these individuations originate from a being that is differentiated from these technical foundations. Throughout this thesis I use the term *allopoeitic* to signify that emergent objects are both preceded by a milieu, and that they

embody this milieu in their technical structure. This for example, means that the features and behaviours of these objects are not incidental features but the expression of a much broader set of socio-cultural logics. As allopoietic objects they are produced in contexts specific to themselves and they embody the codes, criteria, and programs of their environments (Ash, 2018).

The socio-cultural, technical, and productive conditions required for the emergence of an object necessitate that the milieu in which it originates is more complex than what my definition “localised field of Being” may seem to suggest. Guattari’s (1992) analysis of technology in *Chaosmosis: an ethico-aesthetic paradigm* sheds light on this complexity by redefining the link between the allopoietic structure of these objects and the role of the social, technical, productive and cultural machines that strategically mobilise them. Thus far I have established that emergent objects originate in a univocal, continually individuating Being driven by primary machinic production. From this primary process a milieu is then localised to a specific field of individuations in which an assemblage, and an emergent object will originate. As part of the ontogenesis of emergent objects, the milieu dictates the structural characteristics of both the underlying assemblage and the emergent object. The milieu will (in part) govern the ways that both object and assemblage will come to be mobilised by various organisations, for example, as commodities. Thus, Guattari (1992) claims that we should “...consider the problematic of technology as dependent on machines, and not the inverse” (p. 33). The machinic perspective of the milieu I develop here addresses this gap between the milieu and the production of the object using the concept of machinic production. While I consider the technical structures, objects, and processes of the underlying assemblage and the emergent object as being the crystallisation of forces and processes other than themselves, I go one step further to conceptualise social arrangements, structures, and forces as machines that define the operative contexts of these objects (Sauvagnargues, 2016).

Machines presuppose technology, they produce a set of environmental conditions, operator logics, and productive arrangements necessary for the emergence of a technical artefact. Despite invoking a technical imaginary, Guattari’s (1992) view of the term “machine” does not designate a specific artefact or ensemble, instead, it looks to holistic view of machinism in its ... “technological, social, semiotic, and axiological avatars” (Guattari, 1992, p. 33). From a conceptual perspective this broadens the machine to encompass the totality of productive arrangements within Being. Under this definition social arrangements,

organisations, and institutions are all machines. These machines, whether capitalist, technical, or otherwise are not neutral but embody specific logics and agendas. They are a part of the milieu in which a piece of technology emerges, hence, technology is a subset of the machine (Guattari, 1992). In terms of emergent objects, I view the capitalist system of production, circulation, and investment as the primary machinic structure of the milieu in which they are produced and circulated (Deleuze and Guattari, 2017). The *Libre 2* sensor and its mobilisation within neoliberal healthcare regimes and neoliberalism's broader project of competitive modulation bears witness to this. It is also evident if we look at the platformised structure of gaming and how this functions as a milieu of individuation for multiple games. These objects, however, do not exist without an accompanying set of social assemblages and their respective operative contexts. The milieu, therefore, is not just a localised field of intensities from which objects are individuated, but also a field populated by other social assemblages and organisations (Sauvagnargues et al., 2016).

The analyses of milieus, the origins of technical objects, and the role of machines that I have undertaken in this chapter show that it is possible to trace the origins of emergent objects back to the milieu as a localised field of individuations. The character of the milieu as this pre-objective, or pre-individual field of becoming(s) preceding the formation of an object has a significant role to play in the eventual structure of an emergent object. This is because the milieu represents an environment of codes, criteria, and programs that define the operational and technical characteristics of these objects, for example, how the structure of a hammer refers back to a milieu of human bodies and nails (Sauvagnargues et al., 2016). Complicating this analysis, however, is the fact that the milieus in which emergent objects are produced are already technical; emergent objects not only arise out of the crystallisation of a subject's labour, but from other socio-technical arrangements, objects and operative contexts. Guattari's (1992) machinism sheds light on this, holding that a milieu is not just a field of raw materials but an environment of social, cultural, and technical machines that invest in technology and mobilise it towards specific ends. In this way the underlying structures of NFTs, for example, are shown to be governed (in part) by the investments of anarcho-capitalist and libertarian machines in addition to a network of decentralised computers.

It is now time to examine how we might conceptualise the next layer of emergent objects. Starting from the basis of Being, conceived here as a univocal series of becoming(s), I moved to the milieu as a localised field of individuation preceding the formation of objects.

Following Guattari (1992) I suggested that into this milieu social, cultural, and technical machines are individuated, and that it is these machines which establish the operative contexts in which emergent objects arise and are mobilised (such as neoliberal self-government, and the anarcho-capitalism behind NFTs and cryptocurrency). The next section deals with the socio-technical assemblages from which emergent objects arise. It sets the stage for the empirical-technical sections of this thesis where I analyse the components and relations that go into producing emergent objects. It is also where I discuss the relationship between the socio-technical assemblages underpinning each emergent object and the process of emergence itself.

Machines, Assemblages, and Emergence

In this section I introduce and refine Deleuze and Guattari's (2013) "general logic" of the assemblage. I solidify what I understand an assemblage to be in the context of emergent objects and, in turn, acquaint the reader with the ontological criteria that will be addressed in each case study. I use this reconstruction of the assemblage to distinguish between the underlying structure upon which emergent objects are produced, and emergent objects as differentiated beings. The concept of emergence is introduced here as a shorthand for describing the production of difference between an emergent object and an assemblage. To formalise this relationship between assemblages and emergent objects I invoke the scholarship of Manuel DeLanda (2016), GD Broad (2014), and Peter Fazekas (2014). Although reading the likes of Simondon, Deleuze, and Guattari through a concept more closely aligned with Anglo-analytic philosophy may seem strange or even provocative, there are several notable homologies and assumptions shared between each of these thinkers and their respective systems. I show that the concepts of emergence and systems are wholly compatible with the productive relations of assemblages. Assemblages are well-suited for grasping how seemingly disparate and heterogeneous processes, materials, and infrastructures can enter into relation with each other within a single field of becoming(s) to create something that I will argue is an "emergent object".

To orient this analysis of the assemblage, it will be helpful to provide a short description of its parts before descending into its particulars. It is also important to note that Deleuze and Guattari never formalised what they meant with the term assemblage, often referring to it as a "general logic" rather than a strict structure (Nail, 2017). Due to this lack of formality, my own understanding of what an assemblage is has benefited enormously from Thomas Nail's

(2017) work on the subject. Following Nail, I take an assemblage to be a collective term for a grouping of abstract machines, concrete assemblages, and personae, defined by external relations as opposed to an internal essence (Nail, 2017). Assemblages are Deleuze and Guattari's alternative to unified bodies and objects. Unlike an object, an assemblage can have its elements "...added, subtracted, and recombined with one another *ad infinitum* without creating or destroying an organic unity" (Nail, 2017, p. 23). An assemblage, therefore, is not a unified entity with a fixed identity or an essence that somehow transcends the sum of its parts. It is also not a fixed set of components, but a temporally specific way of describing a particular arrangement of things, in other words it is more akin to an event (Nail, 2017). The term assemblage is used to encapsulate the interactions taking place between each of its elements. What counts here is not the elements, conceptual terms or the transcendental "form" of a thing, but the molecular relations occurring between its various entities. Thus, as Nail notes, "The assemblage constructs or lays out a set of relations between self-subsisting fragments" (Nail, 2017, p. 23), and, as a result of this, I use the assemblage as an organisational term for a set of systematic relations involving an identifiable, but nonetheless flexible, collection of abstract machines, concrete assemblages and personae.

I devote the next few paragraphs to unpacking the three elements of an assemblage: abstract machines, concrete assemblages and personae. To begin, the abstract machine is "...the network of specific external relations that holds the elements (of the assemblage) together" (Nail, 2017, p. 24).³ This network of external relations or "abstract machine" is what drives the individuation of an assemblage, however, these individuations and this network of relations between elements are themselves the product of two other processes worth covering here – "becoming" and "involution" developed in tandem by Deleuze and Guattari (2013) in *A Thousand Plateaus*. In this chapter, Deleuze and Guattari (2013) construct an understanding of relationality that centres on "becoming" as "involution", which in turn serves to inform the set of conditioning relations invoked by the term the "abstract machine" (Deleuze and Guattari, 2013). Thus, to know the abstract machine as the conditioning relations of an assemblage, one must also know the nature of these relations to fully appreciate its inner workings.

³ Brackets are mine.

Deleuze and Guattari conceptualise becoming as a form of involution (Hanson, 2000). As opposed to evolutionary becoming, which privileges differentiation (as-becoming) and filiation (as-relation), involutory becoming privileges molecular interaction (as-relation) and dissolution (creative involution) (Deleuze and Guattari, 2013). The term involution is mobilised by Deleuze and Guattari in opposition to evolution – where evolution is a system of “descent and filiation” (Deleuze and Guattari, 2013, p. 278), involution is a system of molecular relations between entities, forming “...a block that runs its own line ‘between’ the terms in play and beneath the assignable relations” (Deleuze and Guattari, 2013, p. 278). Involution does not depend on the differentiation of forms, but rather, depends on the entanglement of elements. These entanglements lead to the dissolution of the form as it undergoes the process of becoming (Hanson, 2000). Contrary to evolution, involution does not make a predicate of the being in order to become; it occurs despite the absence of the concept that it might eventually come to be (Deleuze and Guattari, 2013). Deleuze and Guattari, like Simondon, are arguing that becoming precedes the being, and furthermore, that the becoming of a being is real whilst the fixed terms assigned to that which is becoming are, in fact, fictitious (Deleuze and Guattari, 2013).

This departure from linear modes of becoming brings us to the metaphor of involved-becoming as a “block”. In this model becoming is not so much a straightforward set of relations binding two entities together in a determined mode, but rather an emerging region of relations. Deleuze and Guattari (2013) argue that becoming is predicated on the involution of multiple entities with one and other, however they are careful to reiterate that this is not necessarily a relationship of cause and effect where the outcome of becoming is predetermined by a set group of laws governing this relation. In fact, quite the opposite is true, where the two entities interact, there emerges a region, or block of becoming encompassing:

...not only a whole operation of demonic local transports, but a natural play of haecceities, degrees, intensities, events and accidents that compose individuations totally different from those of the well-formed subjects that receive them (Deleuze and Guattari, 2013, p. 298).

Here, becoming is shifted from the set regions of “well-formed subjects” to an indeterminate set of latitudes located between the longitudinal coordinates of the entities (Deleuze and

Guattari, 2013). In this liminal space or “block” emerges a region for both dissolution and creation. In the process it becomes populated by a manifold of events, intensities and degrees that constitute the actual event of becoming before the emergent being is recreated as something identifiable (Hanson, 2000). These relations, these so-called blocks, are more or less perpetual, and, consequently, the becoming of concrete machines are too.

Returning to Nail’s definition of the abstract machine as “...something that lays out a set of relations wherein concrete elements and agencies appear” (Nail, 2017, p. 24) and as something that “...functions as a kind of local condition of possibility” (Nail, 2017, p. 25), the twofold processes of becoming and involution emerge as crucial components of these conditioning relations. An assemblage is therefore both a process, *and* a network of heterogeneous elements situated amidst a localised field of possibilities; it is also abstract, and as such, it is without an internal essence (Nail, 2017). The relations of the abstract machine are relations that, by definition, must involve the molecular involution of concrete assemblages, in addition to being able to open regions of becoming and dissolution. The reason for which, is that the conditions of possibility must also be conditions of becoming. According to Deleuze and Guattari (2013), there is no possibility for becoming without the partial dissolution of entities (Deleuze and Guattari, 2013). This is to say that these conditioning relations are the dissolutions of previous arrangements that then facilitate further possibilities for individuation. Hence, possibility is another way of referring to the local play of haecceities and events populating the region of becoming. In this way the assemblage bypasses the need for a fixed essence or being and is instead defined by the external relations occurring between its concrete elements. When discussing the concrete assemblages of the emergent object and its abstract machine, I view the latter as a set of relations that facilitate the continual individuations of its concrete elements that ultimately lead to the emergence of the object.

This descent into the inner workings of the abstract machine intersects with the second key element of the assemblage – the concrete assemblage, or, more specifically, concrete assemblages. Whereas the abstract machine is defined as the conditioning relations of an assemblage, the liminal coordinates of becoming, and the condition of an assemblage’s possibilities, the ‘concrete assemblage’ refers to the existing, undissolved elements of an assemblage (Nail, 2017). If the focus of the above discussion was the undetermined space between definitive points, enabling the play of haecceities and the eventuation of

becoming/individuation, the focus is now on concrete assemblages as points in-themselves. That is, we must now transition to the entities that predicate the external relations that define an assemblage. There are no fundamental concrete assemblages that I can refer to as concrete assemblages par excellence as all assemblages are composed of a multitude of differing (heterogeneous) elements. What is common to all, however, is that these concrete assemblages are the “...existing embodiment of the assemblage” (Nail, 2017, p. 26), they are the tangible, yet non-essential, embodiment of the assemblage. One of the defining characteristics of assemblages is that it is not a unity, macro-organism, or an organisation that requires a set number or type of concrete assemblages to be what it is. Rather, concrete assemblages are interchangeable, interrelated, and liable to change, as the abstract machine requires that they do so in order to become.

The utility of the assemblage in the context of this thesis is that it encapsulates the distributed networks of entities and the relations between them that precede the emergence of an emergent object. This refers to the array of technical components that constitute computational platforms, cryptocurrencies, and biosensors. In Chapter 3 I go into greater detail about the kinds of components that go into these assemblages, but some obvious examples include network, processor, and storage stacks, the structure of object-oriented programming objects and the broader infrastructures of platforms like Valve’s Steam. Emergent objects like video games, NFTs and the *Libre 2* are predicated on the individuations (driven by becoming(s) and involutions) of an underlying assemblage involving numerous components. As a result, emergent objects are ontologically precarious because they only emerge after the instantiation of an assemblage, but as we shall see, this assemblage is not limited to a specific arrangement of concrete assemblages. Emergent objects can maintain their stability despite permutations in this underlying assemblage. This indicates that the assemblage preceding the emergent object is neither identical to the emergent object (in that it can change, but the object cannot), but nor is it entirely separate from it. There is thus a tension between the object as the emergent entity and the assemblage as the ground from which it arises.

The relations between the abstract machine and an array of concrete assemblages are mutually constitutive; each transforms and constructs the other in real time. In *A Thousand Plateaus*, this relationship is framed through the intersection of two opposing planes or polarities (Deleuze and Guattari, 2013). There is the plane of organisation or development,

that develops forms, subjects, organs and functions, and there is the plane of consistency or intensity where there are only “...speeds and slownesses between unformed elements, and affects between nonsubjectified powers” (Deleuze and Guattari, p. 312). These two planes bear more than a passing resemblance to the abstract machine and the concrete assemblage. The concrete assemblages exist on the organisational plane as identifiable forms, entities, subjects and organs, while the plane of consistency houses the abstract machine.

Deleuze and Guattari (2013) claim that one unconsciously moves between the plane of consistency and the plane of organisation. They argue that the opposition of the two planes is like a set of abstract poles that are connected, but heterogeneous (Deleuze, 2013). The relation between these polarities structures the process of individuation within the assemblage. This is evident in the case of the abstract machine (the plane of consistency) in that it requires the concrete assemblages (the plane of organisation) to facilitate the intensive molecular interactions between the elements, while on the other hand, concrete assemblages are contingent upon the abstract machine for their individuation. This has a twofold application for emergent objects that I will illustrate with an example from one of my case studies; first, a video game weapon entails a set of concrete assemblages, i.e. material components and coding infrastructure, however, if these elements are not accompanied by these relations of becoming, there can be no individuation, no abstract machine, and therefore, no assemblage. Second, we require the multipolarity of these planes to properly address the forces driving the emergence of an object. For example, without the combination of an abstract machine with a set of concrete assemblages, there can be no instance of existence because nothing will be produced. In this case, neither can be taken without the other, the concrete assemblages need the abstract machine to condition them as well as provide the aleatory spaces for their becoming, whilst the abstract machine is predicated on the existence of concrete forms to which it can take up positions between.

The third, and final aspect of an assemblage is its personae (Nail, 2017). Similar to concrete assemblages, Deleuze and Guattari situate the personae of an assemblage on the plane of organisation or development; perhaps this is because this is the region where subjects are formed (Deleuze and Guattari, 2013). Nail classifies personae as a set of “...immanent agents or mobile positions, roles, or figures” (Nail, 2017, p. 27) that are directly embedded within the machinery of the assemblage. While I agree with Nail’s position here, I want to go further in my analysis to look at personae through Deleuze and Guattari’s (2013 and 1992) concepts

of the existential territory and subjectivation. While it is difficult to fully encapsulate Deleuze and Guattari's full conceptual apparatus of existence, subjectivation, and becoming, a working definition of the existential territory is a *desiring machine that is subjectified through its interactions with, and alongside of, other machinic structures*, i.e. the social, cultural, technological, and biological machines operating in a milieu. In the context of a specific assemblage, this means subjects become personae only within this relational context even as they form the assemblage themselves (Nail, 2017). A human person (although not to the exclusion of other potential personae) falls into this category of a persona (singular) or personae (multiple) because they are subjectified by the assemblage underlying an emergent object and because they are an integral part of the assemblage itself. An example of this would be the role of an individual in bringing forth a weapon in the game *Destiny 2*; on the one hand this individual becomes subjectified as a player, a competitor, an account holder, and a person who owns or wields the weapon, and on the other hand their presence is a condition for the object's emergence, it is they who invoke it when they log in to the game, wield it, or otherwise relate to it.

Having completed this overview of the assemblage and its constituent parts, we arrive at the moment of differentiation between the emergent object and the assemblage. In the context of assemblage theory, this moment is what Manuel DeLanda (2016) calls "emergence".

Although I am conscious that DeLanda uses emergence to denote forms of social organisation such as community (DeLanda, 2016), I maintain that this concept is applicable to my own emergent objects. For his part, DeLanda uses "emergence" to connote an irreducible "whole" that arises from the processes and relations of the assemblage (DeLanda, 2016). What DeLanda means here is that if an assemblage was reducible to just the relations constituting it, it would simply "...form an aggregate in which the components merely coexist without generating a new entity" (DeLanda, 2016, p. 12), hence, if we are to say that there is an assemblage, it must be other than the sum of its parts. DeLanda makes another appeal to emergence by way of the flat ontological scale, arguing that if there wasn't some emergent property ensuring the irreducibility of assemblages, these processes would just collapse into a "seamless totality" (DeLanda, 2016, p. 12). Emergence is a product of both the external relations defining, producing and shaping an assemblage, and the ever-present abstract machine providing the conditions of becoming. Here involutory relations bring new possibilities and actions into being. In short, they result in the production of an emergent "whole".

DeLanda, like Nail, is careful to avoid any ascription of essence or ontological totality; the emergent whole is for him a *property borne out of* relations and is contingent on these relations (2016). For example, an emergent object like a weapon in a looter-shooter game is produced by the interactions between a multitude of components including power infrastructures, chipsets, code, platform and players. The consequence of which, DeLanda notes, is that the properties of the assemblage, such as the emergent object, are contingent upon these relations, meaning that “...if the interactions cease to take place the emergent properties cease to exist” (DeLanda, 2016, p. 12). My own commitment to immanence and flat ontology means that the emergent whole, and by implication an emergent object, is not a transcendent property of the assemblage because it does not exist on a different ontological plane; rather, it exists on the same plane as these relations (DeLanda, 2016). Using the example of the looter-shooter weapon, we see that it exists alongside the relations producing it, it does not, therefore, replace, subsume or synthesise them but exists as an other to them (Blachowicz, 2012). It exists, therefore, at exactly the same time as them, often occupying a visual space distinct from concrete assemblages such as the GPU, server or hard drive giving rise to it.

The moment of emergence establishes a bi-directional relation between an emergent object and the assemblage. For scholars of analytic philosophy emergence is not particularly new, having benefited from decades of analysis and varying degrees of popularity in fields like the philosophy of mind, and the philosophy of science. Whilst scholars of emergence differ with respect to their definitions of emergence, I use Broad’s (2014) definition of natural emergence. Like DeLanda, Broad claims that emergent properties arise from a certain system state but are ontologically and existentially irreducible to them. It is not then that emergent properties are greater than the sum of their parts, but that they are *other* than the sum of their parts. In Broad’s (2014) theorem this is expressed as follows: Emergent properties are: (1) neither identical to, nor derivative of, the underlying physical properties of the system; (2) genuinely causal (i.e. they have causal powers independent of these underlying physical properties); and (3) emerge only when an appropriate set of physical properties is instantiated. The homologies between DeLanda’s (2016) model of emergence and classical emergence are obvious. Where DeLanda (2016) discusses how the productive relations between each component of the assemblage contribute to the production of something beyond the total of its parts, Broad (2014) approaches this in terms of systems and emergent qualities. Where the applicability of this assemblage-emergence, or system-emergence model comes to

the fore, is its ability to describe the relationship between the hardware, software, individuals, networks and bodies that constitute the underlying assemblage, and the emergent object that arises from their interactions. Using emergence accounts for the flexibility of the arrangements predicating each object, the material, spatial, and ontological difference between components and emergent objects, and the respective causal powers of each.

My reading of Deleuze and Guattari in this thesis takes the assemblage to be a kind of system, albeit one that is a dynamic network of relations with an undetermined structure that can, and does, change over time. Like Broad (2014) and later Fazekas (2014), I claim that the emergence of an object like an NFT, video game weapon, or the *Libre 2* is only possible after the instantiation of a particular assemblage. However, this is not a strictly causal relation but one characterised by individuation and metastability. The emergence of each of these objects represents the individuation of a new and ontologically differentiated entity from an underlying assemblage. The emergence of an object is however, only one moment in a procession of individuation beginning in Being itself. These individuations become progressively localised to a particular milieu populated with various social, cultural, and technological machines that form a specific, pre-objective field of individuations. From this field an assemblage arises replete with its own concrete assemblages, abstract machines, and personae that, upon reaching a certain threshold, produces an object that is other than both this underlying assemblage and the broader milieu. This is the broad procession that underlies this work, and each of the following analyses undertaken in this work affirms this structure from Being to object.

This foray into the assemblage and its abstract machines, concrete assemblages, personae and becoming(s) has unveiled a thread of movement extending from Being, to the milieu, an assemblage, and the emergent object. In the case of an emergent object the formation of an assemblage is an essential *condition* for an emergent object's existence. In Chapter 1 I mapped out the philosophical issues that stem from an object constituted by a multiplicity of material, computational, economic and cultural processes. This object arose alongside a material context of power grids, servers, microchips and circuitry through coding languages and into a socio-cultural milieu where its meaning would be negotiated and contested. The appearance of such an object is therefore neither coextensive nor ontologically synonymous with the underlying assemblage that produces it, however it also not entirely separate from it. This is where the concept of emergence as the production of ontological difference between

the assemblage from which the object is individuated and the object itself comes in. Using the concept of emergence in conjunction with Deleuze's (1994) difference and individuation completes the picture; the object, like any other entity, arises from the continuous individuations of Being, and these individuations perpetually produce differences in the forms of temporary entities and relations. Between the assemblage and the emergent object is an individuation that produces the requisite ontological difference, i.e. the moment of emergence. Thus, emergence is a privileged individuation that establishes both a difference and an entanglement between the two.

Towards an Ontology of the Emergent Object

I conclude this chapter by synthesising the philosophical approach taken in each of the three case studies of this thesis. The work I have undertaken in this chapter developed a Deleuzian ontology of video game objects, NFTs, and the *Libre 2* sensor. I began this project by

applying two approaches to objects from Immanuel Kant and Graham Harman. I showed that both philosophies of the object were ill-equipped to deal with the ontological realities of my case studies. Prominent amongst my objections was that neither of these approaches was able to deal with the dynamic, precarious, and contingent nature of emergent objects. In its place I developed a model in dialogue with Simondon (2011, 2020), Deleuze (1994), Guattari (1992, 2013), and Broad (2014).

The ontology I have developed in this chapter grounds each of the subsequent case-studies by situating the emergence of an object in four distinct phases. Emergent objects are not isolated entities with a unique essence, but a specific point within a procession of becoming(s). This procession begins with Being in general and culminates with the emergence of the object.

These phases can be grouped in terms of the following: (1) Being (2) milieu (3) assemblage and (4) emergence. While a complete overview of this theory goes beyond the scope of this chapter, I use these phases to group and describe the key theoretical facets and assumptions that will be taken forward into the analytic portions of this thesis. This final section provides an overview of the analytic framework and the conclusions that can be drawn from my broader arguments. It is also an opportune time to suggest that the literature I have referenced here is by no means exhaustive. Due to the heterodox demands of each case study, the interdisciplinary nature of the work, and the extensive bodies of literature corresponding to video game weapons, NFTs, and wearables, I have avoided adding them to what is already a dense and wide-ranging chapter. Instead, each of the case study chapters will address this

relevant literature on its own to maximise the coherency of the thesis.

Returning to the ontology of emergent objects and the four major phases of becoming, the first of these phases begins with Being itself. Following Deleuze's (1994) work in *Difference and Repetition*, Being is conceived as a univocal field of becoming(s) where difference is produced through individuation. This view holds that instead of various entities constituting different beings, these entities are in fact just differences within Being. In this way, individuations are becoming-events that produce differences within Being itself. The production of difference, therefore, refers to the formation of a new entity that becomes individuated from its surroundings (but never wholly differentiated). Whilst this first phase is not analytically relevant to each case study, it does ground both the allopoietic structure of emergent objects, and the process of emergence in a series of systemic individuations (notably that of an assemblage).

In contrast to the first phase, the second phase, which I have termed "the milieu", will prove analytically necessary in each case study because it denotes the localised field of becomings from which an emergent object emerges. This understanding of the milieu as a localised field of Being has been sharpened by my adoption of Guattari's machinic perspective of this field. Guattari (1992) suggests that any milieu is populated by pre-existing organisations and arrangements, be they socio-cultural, technological, economic, or signifying machines. With the addition of these machines an important relationship emerges between emergent objects as individuated entities and the machines with which they interact. I argue that emergent objects are allopoietic that is, that they are produced by, and according to, processes, criteria, and forces other than themselves. In this way the context of the milieu and the machines populating it become determinants of the emergent object because they form the operative context in which emergent objects will emerge and in which they will be operated. For example, the machinic systems of neoliberal capitalism in Chapter 6, and techno-anarchism in Chapter 5, have influenced and mobilised the technical structures of the *Libre 2* and NFTs respectively. Following the lead of Simondon (2011), DeLanda (2016), and Deleuze and Guattari (2013) then, emergent objects emerge from a flat, undifferentiated material field defined by pockets of intensity, or "flux". Amidst this pre-individuated field, the requisite differentiations and complexities conditioning the production of objects become through waves of individuation.

The third stage is that of the assemblage, that is, prior to the emergence of the object an assemblage needs to be formed. Following Nail (2017), I break the assemblage down into three main components, the concrete assemblage, the abstract machine, and the personae. In each case study this is identified as a common structure. Viewed in terms of the flow of individuations from Being to emergence, the establishment of an assemblage is but one (albeit important) stage in the procession of individuation. The applicability of this framework for examining the network of relations leading to the establishment of the emergent object stems from both its homologies with the systematic models of emergentists, and its broader applicability with respect to subjectivation and individuation. Where Broad (2014) viewed emergence as an outcome following the establishment of an underlying system and the production of ontologically distinct, i.e. emergent qualities, Deleuze and Guattari's (2013) general logic of the assemblage gives a broader account of how human and non-human entities enter into relations with one another. Using the concept of the assemblage as opposed to a system provides a deeper and more nuanced account of the entities, objects, and relations that contribute to the emergence of new entities.

This leads me to the fourth and final stage of this procession – the emergence of the object. Once an assemblage has been instantiated, the object emerges in what is a privileged individuation. This individuation is privileged because it is the event in which an ontological *difference* is established between the assemblage, the milieu, and the newly formed emergent object. At this moment an emergent object is differentiated enough from both assemblage and field to be encountered as an entity in its own right. The production of difference, that is, the emergence of the object from the underlying assemblage and its wider milieu has significant implications. Here, the emergent object becomes partially separated from its milieu and takes on the potential to precipitate individuations for itself. This fourth phase in the procession of becoming denotes the moment in which the object attains a degree of self-referentiality, and, depending on the finer points of its technical structure, it becomes able to affect its milieu in interesting and undetermined ways. In Chapter 4 this is shown in how the object can affect ludological haecceities, while in Chapter 6 this is discussed in terms of how the *Libre 2* factors into subjectivating its wearer and modulating user behaviours.

In this thesis I analyse emergent objects using an ontology informed by the work of Simondon (2011, 2020), Deleuze (1994, 2013), Guattari (1992, 2013), and Broad (2014). I view emergent objects as a privileged point in a broader procession of becoming(s) grounded

in a primordial, univocal Being, and ending with the myriad potential individuations of these objects. I use the relational, event-forward model of the assemblage in lieu of a traditional systems theory and I have augmented it with concepts such as individuation, metastability, difference and emergence. My later analyses of specific emergent objects ascertain the concrete assemblages that constitute these arrangements, how the relations between each of these elements factor into broader individuation, and, ultimately, the moment where difference is produced through the emergence of each object. Of key concern is how these relations facilitate the becoming of the object as an emergent property; it is, therefore, not a case of what, but of how. Emergent objects are henceforth to be taken as a point of differentiation in a milieu and the result of a complex lineage of differentiations. The next chapter will delve into the specific technical structures and components of emergent objects, from the materiality of computational infrastructures to the structure of object-oriented programming and platform logics; it thus empirically verifies the presence of the assemblage that precedes the emergence of each object.

Chapter 3: The Technical Constitution of the Emergent Object

Introduction

In the preceding chapter I focused purely on the philosophical conception of the object. My intention, in that chapter, was to lay out a new framework for understanding emergent objects like video game weapons, NFTs, and the *Libre 2* sensor. Through my development of the concept of the emergent object, the problems of essences versus events, identity versus becoming, and process versus stasis were addressed. At the end of that chapter, I concluded that emergent objects were, in fact, the immediate, productive outcome of a primary process of machinic production. I proposed that these objects required an *assemblage* to be instantiated in order to exist, and that they were subject to several processes including individuation, allopoiesis, and ontogenesis. Here, I stressed the centrality of Deleuze and Guattari's (2013) concept of the assemblage as a powerful tool to address the myriad components, processes, and routines necessary for the object's emergence. The assemblage is not only philosophically powerful – it is also empirically useful. However, on account of the theoretically oriented nature of the previous chapter, the technical aspects of the emergent object assemblage were only briefly mentioned so that I could focus on building the philosophical framework for the rest of this thesis. In response to this, this chapter will be the other to its philosophically exhaustive predecessor. Whereas Chapter 2 laid out the foundation for a materialist philosophy of an emergent object, this chapter leans into the empirical side of the problem to answer the following question: What are the technical, processual, and organisational components common to each emergent object?

Taken at face value, the empirical structure of each emergent object is relatively simple. For example, one might be tempted to simply list the technical components germane to each object and be done with it. However, the nature of emergent objects and their relationship to the assemblages that produce them necessitates that I cannot simply focus on one single aspect or region of this underlying structure. Each emergent object involves multiple components that exist in a relationship of flux with one another. Between system redundancies, platforms, and wearable objects, each structure will experience permutations

and interchanges that do not necessarily compromise the integrity of the assemblage. It is also not enough to just describe the functions of each component (although this is certainly part of it). On the contrary, my approach to answering this question takes into account baseline hardware and the diagrammatic constitution of the computer, the relationship between bits and the computer's processor, storage, and network stacks. It also describes the production and operation of coding languages, and how this operates in a purposefully underdetermined way.

In addition to describing the productive baseline of each emergent object, there is also a need to interrogate how each of these components, from hardware to code, interact with one another. For example, terms like “hardware” and “software” are helpful to the extent that they can help us to delineate a machine's network of transistors from its operating system. However, the distinctions between the components of the machine, the data it processes, and the programs it runs are less clearly demarcated than these terms might first suggest. For the sake of clarity, I begin this chapter by defining the relationship between hardware and software through a materialist lens. I demonstrate that an emergent object is irreducible to a software object such as the data objects found in OOP, or a network of processor and storage stacks. Rather, the emergent object is a differentiated entity that emerges out of the productive relations that occur between these elements. This demonstrates that an emergent object is fundamentally entangled with this array of components, processes, and actors, but remains irreducible to them. In the context of this chapter, this means that while it is possible to identify the array of elements and coding processes that lead to the emergence of the object, there is still an indeterminacy that differentiates one from the other. I venture that it is this indeterminacy that influences the ontogenesis of each object – in the process of remaining an object, the emergent object must, paradoxically, continue to become an object. The emergent object, therefore, is a process.

This chapter draws from a diverse group of approaches and disciplines, including computer science, the philosophy of technology, media studies, software studies, and platform studies. The empirical focus of this chapter is not solely technical, however. Consonant with the machinic approach of this entire thesis, my empirical investigation of emergent objects has also necessitated engaging with the social and organisational structures of entities such as platforms. Thus, I begin this chapter with an analysis of the hardware components constituting the assemblage underlying the emergent object. I examine each of these

elements' respective functions, roles, and relations. In a similar vein, I move on to the coding practices and logics that feature in the production of emergent objects such as Object-Oriented Programming (OOP). After this, I introduce one of the central socio-technical formations in which emergent objects are produced, invoked, traded, and owned: the platform.

In the final part of this chapter, I show that the production of an emergent object does not take place in a social and cultural vacuum, but rather, will often occur within the specific socio-technical context of the platform. Taking up the idea that platforms are a form of socio-technical assemblage, I argue that they are arranged according to the axiomatic of what Deleuze and Guattari (2017) call the “capitalist machine”. From here, I trace the influence of this platform on the commodification of emergent objects. Specifically, in the context of two emergent objects: video game weapons, and NFTs. With respect to NFTs, and video game weapons, these emergent objects are almost always produced within the context of capitalist production and commodification. As such, our encounters with them are invariably mediated through platforms like Steam, IOS, or OpenSea.

Technical Machines, Processors, Storage, Networks, Bits and Languages

This section analyses the technical components, processes, and systems of computing. Utilising the heuristic of the assemblage, the following exploration of hardware and software identifies the concrete assemblages factoring into the production of emergent objects. Calling on the work of media materialists like Bernhard Rieder (2020), Jean-Francois Blanchette (2011), and Nathalie Casemajor (2015), I examine what Nail (2017) calls the existing embodiment of the assemblage, which in this case, encompasses the network, processor, and storage stacks comprising the computer. I begin this section with an exploration of the relationship between hardware and software through the lens of individuation and difference. My intention here is to map the relationship between hardware and software before delving into the specific functions of the network, processor, and storage stacks.

Given that the intention of this chapter is to map out the network of components and processes vital to the production of an emergent object, I will first describe the basic material components, or “hardware”, underpinning the computer. These phrases, however, could do

with some unpacking given that the terms “hardware”, “software”, and “computer” are not without their respective caveats and nuances. When thinking about “hardware” and “software”, for example, I follow Bernhard Rieder (2020) in claiming that both hardware *and* software are part of a mutually presupposing system. Thus, rather than hardware and software being two separate entities in themselves, each individuates the other. There are two justifications for taking this position. The first is logical: hardware is a condition for software in the sense that some combination of processor, network and storage stack is required so that a program application can be run. It follows then that the software is entangled with hardware as the former is a condition for the latter’s functioning. In Chapter 2 I described this relationship as both nomological and indeterminate i.e. it is not directly causal but does suggest that hardware is related to software in an indeterminate manner. This point is exemplified by the fact that software influences and potentiates hardware – the flow of bits, the pulses of electrons and activation of routines is driven by software. Hence software individuates hardware in terms of the operations that it performs. This fact can only be rationalized in terms of a monadic Being in which the higher-level individuation of software is a differentiation borne out of a pre-existing field of interrelations. In my view, software is individuated from hardware on the basis that the latter is the productive base of the former. In addition, software also comes to exert downward pressure on hardware by co-opting it to run a program, thereby influencing the individuation of the hardware.

The second justification for this position is technical – the hardware of a system, that is its storage, network, and processor stacks, whether developed in-house or sourced externally – is fundamentally influenced by the programs, platforms, and systems, designed to operate on it. In simple terms, this presupposition takes the form of software programmers adapting to the limitations of hardware. An example of this can be found in the way that OOP languages work by assembling bits into blocks of data to be transferred across a systems infrastructure (Blanchette, 2011). In this situation, hardware presupposes the form of the programs and operations running on it because the programming language is itself a response to the limitations of a particular hardware and the demand for efficiency. On the other hand, new hardware is designed to work specifically with existing operating systems and platforms. For example, Apple’s A series silicon is built for the company’s particular operating system and ecosystem. Thus, the software running on the hardware can also presuppose how the hardware is constructed.

This presupposition between hardware and software attests to the materiality of software and the relationship between machinic production and individuation. Software cannot be entirely separated from the hardware that it runs on because it is a product of hardware and its individuation. However, as we have seen, this relationship has proven to be bi-directional because there is also a downward pressure exerted by this software on the hardware itself. The advent of platformised computing exemplified by the likes of Microsoft and Apple has also borne witness to how software can influence the kinds of hardware that will be developed subsequently. Read from a Deleuzian perspective (2017), capitalist machines in both the micro and the macro sense are determining the form of new hardware in accordance with existing software. Thus, the production of hardware and software is a site of what I have called primary machinic production. It is a process in which entities are produced from their conjugations with other elements such as capitalist machines, hardware components, and software so that each might continue to individuate.

Emergent objects, therefore, become implicated in this basis of interacting machines, hardware components, and software processes. They are differentiated from the individuation of each of these elements as a privileged moment in which a new difference within Being is established. As a result of this, producing a theory of emergent objects means taking hardware seriously. It also means undertaking an examination of the core components comprising a system, and it means developing an account of exactly how all of this works. Moreover, for emergent objects like video game weapons, NFTs (to varying degrees), and the *Libre 2*, it means understanding that these components may be part of a system that employs multi-server architecture.

The work of media materialist Jean-Francois Blanchette (2011) provides an excellent foundation for conceptualising the operation of hardware within the framework of the assemblage. I am particularly interested in his account of how network, processor and storage stacks function, and what these operations reveal about the genesis of an emergent object. Blanchette's (2011) work interrogates the influence of network, processor, and storage stacks on software development. He shows that abstraction (i.e. assembling bits into blocks or "objects", using encapsulation or inheritance, etc.) is a mediating logic that has arisen because of the limited resources of a system's processor, memory and network (Blanchette, 2011). Blanchette's (2011) investigation supports my argument for the bi-directional individuation of hardware and software. He shows that the organisational processes of coding

have not emerged *a priori*, but rather, they have emerged in relation to the material infrastructures of computing. What follows is a brief overview of these components, namely processor, memory and network stacks, and how each element facilitates the production, flow and dissemination of bits.

When using the term “hardware” I am referring to the processor, memory, and networking stacks that constitute a computational system. As Ceruzzi notes, “The key element of computer design – software as well as hardware – is to manage the complexity from the lower levels of logical circuits to ever-higher levels that nest above one another” (2019, p. 83). In this way the hardware of a system is the site of the basic primary production of computing while software represents a more complex form of individuation. As such, it becomes necessary to demystify the relationship between the baseline operations performed by hardware and the secondary abstractions of software to understand how an emergent object comes into being. Hence, I will start with perhaps the most well-known piece of hardware – the CPU. Put simply, the CPU or Central Processing Unit contains the circuit logic tasked with executing sequences of instruction (programs). These instructions govern a programmer’s access to basic resources such as numerical routines, memory management services, and flow control services (Blanchette, 2011). As Blanchette notes, each processor provides its own set of instructions intended to perform functions and produce results. This set of instructions within a processor is known as its “machine language”, which provides a programmer with an interface through which they can access the processor (Blanchette, 2011).

The machine language of the CPU provides an important example of how the material constraints of hardware influence the abstractive processes of software routines. While the simplicity of the machine language is a vital facet of how the processor functions in terms of executing various tasks, it remains a highly inefficient way for a programmer to interface with the processor and thus, has prompted the individuation of new programmatic languages to circumvent this inefficiency. This is because machine language is made up of a binary set-up of 0s and 1s. On this basis its logic circuits enact functions like “And”, “Or”, and “Not” in addition to the mathematical counterparts of addition, multiplication and the negation of 1s and 0s. Thus, if one were to program the CPU to perform even a simple function using machine language, it would become inefficient given the limited or basic scope of this language to express more abstract functions (Ceruzzi, 2019). This constraint has since led to

a general practice amongst programmers whereby commands are issued via a high-level programming language before being translated by an intermediary program known as a compiler. In essence, this practice serves to facilitate greater control and customisation relevant to the problem being solved. Hence, more abstract functions can be performed without becoming mired in the comparatively limited functionality of the machine language.

At this juncture a mutually presupposing or *dyadic* relationship between hardware and software arises. The realities of machine language programming, and the necessity for a programmer to interact with the CPU so that they can get it to perform a series of instructions, has led to the individuation of more abstract programming languages that allow programmers to issue complex commands. Through this abstraction, a moment of differentiation emerges between the machine language on the one hand, and the higher-level programming language on the other. Where the machine language is more closely tied to the pulses of bits, and therefore, the operation of hardware, the higher-level language is an individuation driven by this primary process. There is not strict causal relation between these two languages – while the higher-level language has arisen in response not the limitations of the machine language it is not derivative of it, rather, it is an intervention or translation. At a practical level, the result of this is that programmers prefer to use more time-efficient or abstractive programming languages such as Object-Oriented Programming (OOP). What this means for the system's hardware, though, is that the functions it is carrying out have come as a direct result of the software commands being issued. The very real “material” transfer of information, the compilation of bits into a sequence, the movement of electrical impulses across the transistor circuits, etc., are all being enacted at the behest of the software. Thus, the opposite side of this dyad comes into play – hardware becomes individuated to the extent that its material composition and its order of operations, if only momentarily, have changed. Software individuates hardware by exerting downwards control even while it remains contingent upon, and is influenced by, the hardware that it runs on.

The dyadic relationship between hardware and software figures into the broader ontogenetic structure of each emergent object. In terms of hardware and software, the drive towards individuation through the interactions between each of these elements reflects the becoming of a complex object from a more primordial machinic production. While I have started from hardware because it delineates a local field of production, this thread of becoming extends to the social, cultural, metallurgical and technical machines presupposing the emergent object.

The emergent object, because of this relationship, is neither entirely software nor hardware, but an individuation or difference produced by a continuously individuating system. Thus, the embodiment of a weapon in *Destiny 2* through software like the Tiger engine is ontologically significant to the extent that *how* it processes information stems from the limitations, controls, and regulations of the hardware. In addition, the software in this instance also exerts a top-down pressure on a platform's array of hardware. This is the basis of the weapon's irreducibility – it is unable to be extracted or distilled into a pure hardware array, and nor is it able to be located purely in the software, because it is constantly differentiated from this assemblage. Of course, there are numerous and more detailed accounts than the one that I have provided here; however, the ubiquity of abstraction and modularity demonstrates the all-important dyad between becoming-as-differentiation within the computational assemblage, and the abstractions borne out of this. It shows that while software and hardware are useful terms for describing various aspects of the assemblage, the more pressing fact is the ways in which this distinction becomes increasingly blurred when subject to further analysis.

Returning to Blanchette, the next relevant hardware element to discuss is the storage stack. Storage stacks have had various incarnations over the years, such as punch cards, magnetic tapes, and hard drives, while more recently they have settled into solid state and flash memory (Manovich, 2002). Like the CPU, the storage stack adopts a logic of abstraction where bits are transferred in blocks to circumvent slow transfer times. At the level of the interface, these blocks of data are organised into, and accessed as, files. Blanchette states that “The abstractions that make up the storage must thus provide consistent services to applications in the context of wide discrepancies in the performance characteristics of storage technologies” (2011, p. 1049). He notes that the imperative for consistency has necessitated that most storage stacks adopt a “block” structure that allows for larger transfers of data (Blanchette, 2011). The upside of this is that the number of operations required for an application will be reduced, because they are dealing in blocks as opposed to bits. The logic being that the slower rate of transfer necessitates that such transfers be as limited as possible, ergo one large transfer is better than four smaller ones.

The process of individuation can be traced to the operation of the storage stack and the introduction of computer files. Similar to the emergence of higher-level programming languages, files are abstractions that are both a response to, and driven by, the productive base of hardware. When the term file was introduced in the 1950s, however, it was a strictly

practical intervention. Early “computer files” referred to a collection of punch cards that were, quite literally, in a file (Ceruzzi, 2019). However, subsequent developments such as the UNIX system saw the introduction of an inode (index node) that provided an index to the disc location where a particular block and its file data resided. Later developments saw further abstraction in the form of super inodes that sit on top of the UNIX system. Similar to an inode, a super inode points to blocks that are UNIX files linking the file directory with multiple drives.

The logic of the storage stacks, inodes, and files remains similar to other programmatic abstractions. Abstracting data by grouping it into blocks and arranging directions to it across multiple drives reflects the primary and secondary individuations of hardware and software. Here, the individuation of addresses, blocks, and indexes provides time-efficient access and convenience to the programmer. It also mediates the way that one interacts with a concrete system of drives and data. Thus, the primary individuation is seen in the way that the organisational logic of files emerges from the material realities of the storage system and the conditions that it engenders. In the case of emergent objects this foray into storage stacks has a twofold significance. First, it demonstrates that the data containing the information, routines, codes, and addresses responsible for the production of an emergent object are embedded in physical space. That is, parts of the emergent object are located in specific geographical regions. Second, it demonstrates that this information is constituted by matter – the movement of information is enacted in the pulse of electrons and the transfer of bits. In this sense the physical infrastructure of the platform in which the emergent object is produced is of ontological importance, because this infrastructure is part of the same procession of individuation of which the object is part.

The final hardware component is the network stack. This stack governs the transmission of structured bits (blocks), from one computer to another. The operative logic of a network stack from a design point of view is to ensure a high throughput of data with low latency (Blanchette, 2011). From an engineering perspective the network stack refers to the traversal of signals across physical media such as copper or fibre optic cables. While Blanchette (2011) claims that the costly nature of these networks mandates that the traffic criss-crossing these shared communication links be subjected to fair management policies, the increased platformisation of these network infrastructures has seen a concerted effort to monopolise this architecture for the sole benefit of platforms (Plantin et al., 2018). In recent times, networks

have increasingly become integrated within platforms (Plantin et al., 2018). At a technical level network stacks employ a modular logic that can incorporate several different standards within a single modular framework. Frameworks such as the OSI contain several layers managing the movement of bits from physical media to various applications and back again. These layers are: physical, link, network, transport, session, presentation, and application, and each provides a different type of service, such as the network providing routing and the transport ensuring reliable delivery (Blanchette, 2011).

As it relates to this sketch of the computer, we see a movement of machinic individuation toward abstraction and differentiation. First, there is the need to transfer data across physical mediums (i.e. across copper or fibre optic networks). Second, there is the interaction between the physical and the abstract to ensure efficiency, and third, there is modularity, with different layers of the stack devoted to different functions. The processing of information across mediums produces several forms of difference or what Blanchette (2011) calls “abstraction”. Whether corresponding to processor, memory, or storage stack, there is an ever-present relationality between the component, the code and the function as programmers seek to circumvent the differences and restrictions stemming from the diverse capabilities of these components. From a philosophical perspective, the relations between high-level coding languages, machine language and the abovementioned components is indicative of a mutually constitutive process of production and individuation. The code, while being derivative of the hardware, also actualises the potential of processor, storage and memory stacks. This indicates that the emergent object, as an entity that is produced by and contingent upon these stacks, is individuated from the continuous relations between these different layers.

Constructing the Object: Objects in Programming Languages

In this section I take a closer look at Object-Oriented Programming (OOP). I examine the ontological and epistemological underpinnings of software objects and show that the confluence of material, historical, economic, and social realities inherent to programming have led to the importation of the “object” as a boundary object in developmental contexts. Thus, I unveil a “double objectality” within the structure of the emergent object. What the subject encounters visually, haptically, mechanically, etc. is either literally described as an object at the level of software, or the product of an inheritance tree composed of several of these software objects. However, despite this similarity in classification, the carryover from what is instantiated as an object in code and what is encountered by us as an object is less

straightforward than what we might first think. Because an object in OOP is very rarely a 1:1 with the emergent object that the user sees, and because OOP objects embody concepts, properties, and methods that govern certain aspects of an emergent object's behaviour, there is a variable yet still obvious difference between these two kinds of objects. This difference between what is delineated in OOP and what is encountered by the user over the course of this chapter reveals a deeper characteristic residing at the ontological core of all emergent objects – that is, that there is no strict structure of objectality required at the level of the code, and thus, that an emergent object's appearance and behaviour can be the same despite having a very different implementations in software.

The exploration of OOP objects and their relationship to emergent objects can be extrapolated further to examine the production of difference between the object as it is instantiated in code, and the emergent object as something that is contingent on code yet is nevertheless distinct from it. This distinction between how an object is coded and its character once it has emerged is ontologically significant because it reveals a gap, or minimal difference, at the core of the emergent object. In other words, for an emergent object to be taken as such, i.e. as an object, it needs to successfully obscure the very processes that it is contingent upon for its existence. This, however, does not make the following study of the realisation of the emergent object in software irrelevant. Although there are several ways that a programmer might assemble the emergent object, all of them must still follow a coherent logic to successfully differentiate the object. In this way there is a tension between the fact that there is no set way to program an emergent object, no equivalence/resemblance between what is programmed and what is encountered, and the requirement that the emergent object still be coherently realised in software in order to realise the difference between itself and this underlying coding.

In relation to the remainder of this chapter, I frame my analysis in terms of developing an understanding of OOP objects before examining their relationship to emergent objects. I delve into the historical development of OOP as a programming language and reflect upon how engineers like Nygaard, Dahl and Kay developed OOP not only as a programming language, but as a definitive approach to computing (Black, 2013). An approach that was borne out of a specific philosophical worldview and one intended for specific applications and functions. Of course, describing the process of OOP's development does not allow me to make the ontological claims necessary for understanding these objects. To this end, I make

the case for understanding OOP objects as material entities delineated by socio-linguistic intervention. In other words, OOP objects are typically instantiated in code based on a programmer's understanding of the world rather than being internally defined by some essential characteristic. Hence, an inheritance tree in OOP is representative of a programmer's understanding of both the relations between different kinds of objects, and the characteristics that make up an object.

Particularly noteworthy in my analysis is where OOP objects represent forces or concepts that cannot be physically present as objects in non-computational contexts. This includes properties such as being a projectile, or the classification stationary. Just as one cannot find the number two or just the colour red "out in the wild" – one cannot find the classification projectile in the world as we would a hammer or a rock. As such, I argue that OOP objects, as socio-linguistically demarcated entities, are more closely aligned with the constructivist concept of Boundary Objects found in Science and Technology Studies (STS). Boundary objects have been adapted from Bruno Latour's model of *interessement* or translation by Susan Leigh Star and Paul Griesemer (1989). The concept of a boundary object encapsulates the processes of meaning translation and meaning standardisation within an institutional setting. For Star and Griesemer (1989), a boundary object is an object whose meaning is robust enough to exist in a coherent form across multiple contexts of meaning, yet plastic enough to entertain this multiplicity of interpretations. In the context of OOP objects this references the fact that the meaning of any given OOP object is not set but can vary both within and across its context of development. What this means is that an OOP object is not as ontologically distinct as an emergent object and is instead a conceptually amorphous term that becomes more concretely delineated as the programmer adapts it to a specific developmental context.

This distinction between the emergent object and the OOP object proves important. Where I have argued that emergent objects are objects because of their properties, their magnitude in relation to other objects, and their ability to precipitate individuations in their surrounding environments, OOP objects are only metaphorical objects because they operate like a taxonomy of concepts in a representational system. Although this system makes use of the term object to differentiate one concept from another, these are not really objects in the philosophical sense. In this respect, OOP objects are used as building blocks in a system that describes the relationships between things, thus, the emphasis for the programmer is the

logical inherence of methods and their desired outcomes in the specific context of a program. This means that there is an inherent flexibility within OOP, as the ontological status of objects is given to them by the programmer and interpreted by other members of their organisation or team.

This understanding of OOP objects as boundary objects introduces another set of distinctions between the OOP object as a boundary object and the emergent object as not a boundary object before going any further. While emergent objects are often composed of OOP objects, and OOP objects are a form of boundary object, emergent objects remain distinct from OOP objects because each of these other categories of objects are sufficient, but not necessary, conditions for an emergent object to exist. Put differently, an emergent object can be contingent upon OOP objects to exist and to perform the behaviours that are both required and expected of it, however, if I was to change its programming methodology to an entity component system, it would still perform analogously to its OOP counterpart. What this reveals is that whilst our emergent object does require some form of programmatic organisation to function, after all, it is situated within a computational structure, it doesn't need or require a specific kind of organisation.

OOP did not arise as a fully realised programming language. Instead, it arose as part of a series of iterations that, at first, borrowed from existing software paradigms before individuating into the form of the first fully fledged software language SIMULA (Alt, 2019). For the purpose of brevity, I locate the beginnings of OOP in the SIMULA languages developed by Ole-Johan Dahl and Kristen Nygaard throughout the 1960s. The first SIMULA program was intended to write and run simulations such as a ticketing and reservation processes for aeroplanes. This program had to be able to map and describe the interactions taking place within these real-world systems, and as such, needed to devise a way of modelling these systems within the code itself. This commitment to modelling real-world processes necessitated that Dahl and Nygaard diverge from existing paradigms of software development that tended to focus on solving a specific problem or class of problems like FORTRAN or COBOL, to something that better encapsulated the complex field of relations that constituted real-world processes. Instead of having a single function mapped out as an endpoint after a series of commands and functions had been completed, Dahl and Nygaard experimented by having quasi-parallel functions where individual objects could interact with one another outside of a strictly determined sequence (Alt, 2019).

However, SIMULA 1 was far from a “true” OOP language as it did not simulate the interplay of objects. Rather, SIMULA 1 simulated processes that involved objects. It wasn’t until the later SIMULA 67 language that this quest to recreate real-world processes led to a complete departure from what Casey Alt (2019) terms “third generation” programming languages with object-oriented characteristics, i.e. SIMULA 1, in favour of true OOP languages like SIMULA 67. I emphasise this change for two reasons. The first is that SIMULA 1 is a process-based language that sought to represent checking-in at the airport as a single process of action and reaction. As such, SIMULA 1 did not demarcate boundaries for each entity in the system. Instead, it attempted to simulate the process as a totality, hence, while there was some limited parallel processing, it was not yet at the level of a full field of objects interacting with each other in a non-linear mode. In fact, the objects were not even fully encapsulated in SIMULA 1. The second and more significant reason is that the choice to break down each element of the simulation into a separate entity that was defined by both internal and external properties, as well as the boundary between them, represented a fundamental paradigm shift. Now, instead of the program running a single simulation, it modelled the interaction of every object in the sequence. In short, it imposed an object-oriented view of the world at the level of the software itself.

SIMULA 67 saw the introduction of the first objects in OOP. Each object was demarcated on the basis of a definitive boundary that differentiated it from other objects. The introduction of the software object in SIMULA 67 diverged from previous development practices where coding was done in linear, and semi-linear, progressions with some rudimentary bundling of functions. Instead, SIMULA 67 allowed for parallel functions to take place within self-contained entities. Thus, the imposition of a border or the “encapsulation” of the object allowed programmers to sever “...the cohesiveness of the program into a number of independent entities whose interactions dynamically emerge to approximate the end goals of the application” (Alt, 2019, p. 292). What this meant for programmers, and indeed software as a whole, is that rather than conceiving of code as a sequential series of instructions, the code could be modelled to represent the interactions taking place in the world between enclosed entities. Hence, a hammer in a video game is not only represented to the player as a hammer, but also is a hierarchical arrangement of software objects at the level of the code. So, the emergent object of the hammer as it is programmed in OOP is, at the level of the code, a set of objects whose mutual interaction with one another produces the properties of

the emergent object.

The encapsulation of objects introduced new ontological structures for OOP objects. OOP objects now had an internal structure based on the code bundled within. This internal structure was no longer entirely evident to the persons or objects interacting with it. There was now a withholding of the object's internal structure, a kind of computational pseudo-noumena that could remain separate from the object's surface, even while these functionalities were disclosed on the object's interfacial surface. As Alt (2019) states, "Object orientation solves this problem of both hiding internals but presenting functionality through the concept of an interface or protocol" (p. 296). Accordingly, encapsulation also entails a reversal of this dyad – the object now has an external surface that can describe which of the object's internal methods may be requested by another object (Alt, 2019). Hence, OOP objects are defined by what they do and can be deployed to different ends by programmers without these programmers needing an explicit understanding of their internal structure. In this way, OOP works by actualising the functions of an object without demanding that every programmer have a coherent and universal conception of what that object, or any object is, nor even an understanding of its internals. What matters for the program is to ensure that the object hierarchies used to organise, group, and define the functions of such objects are logically ordered to ensure the satisfactory operation of these entities.

While I could devote an entire discussion to SMALLTALK and the innovations that Alan Kay and his team at the Palo-Alto Research Centre (PARC) undertook, the most important aspect of these innovations was, in fact, the process of formalisation that took place there. Although a broad historical view of computing and programming will show that software development is essentially a series of negotiations with the constraints of a system, the development of OOP at PARC demonstrates that ontologies are often constructed and then imported into a system, rather than existing in and of themselves. While objects in OOP certainly exist insofar as they are a bounded set of bits tied to material components and they are essential to a functioning program, the existence of these objects and the logic informing their presence is both highly intentional and the result of artifice.

OOP should be viewed as an instantiation of a worldview as much as it is a programming language. While the development of OOP was (and still is) iterative, and the worldviews of its developers heterogenous, the paradigm still bears the marks of one of its central figures –

Alan Kay. Kay himself has stated that SMALLTALK's objects were intended to resemble the monadic ontology of Gottfried Leibniz to the extent that some objects are "...idealizations of concepts – Ideas – from which manifestations can be created" (Kay, 1996). Here, everything is an object, even the idea or form of the object itself. Kay took Leibniz's monad as a mind-like simple substance that could perceive and act, and the correlative fact that everything else was a derivative of that monad (like a body, etc.) and embedded it into the very structure of SMALLTALK. Thus, Kay's intervention attempted to formalise a recursive system where the code could embody and communicate ideas through the interactions of objects, i.e. the monads. While discussing Leibniz's philosophy any further goes beyond the scope of this chapter, I will remark that this passage quite neatly demonstrates this relationship between OOP, ontology, and constructivism. OOP enacts a pre-existing worldview rather than producing its own state of affairs. This is to say that a 17th century philosopher did not just happen across the logic of OOP, but that the process of negotiation in the construction of object-oriented languages led to importation of this logic.

What this reveals is that OOP as a paradigm for writing software can entertain a multitude of ontological positions while remaining workable. Although the paradigm of development in OOP may remain similar to Kay's vision, it does not mean that every single programmer that has employed OOP since has been a devotee of Gottfried Leibniz. What it does indicate, is a generally much more pragmatic approach to programming insofar as it does not matter whether one is familiar with German idealism, it doesn't even matter if they don't even have a rudimentary grasp of philosophical ontology in general – it only matters that they have an understanding of objects and OOP equal to the task of writing a program. Recent scholarship on this intersection between OOP and ontology seems to support this, with Justin Joque (2019) arguing that the history of OOP "...suggests that both objects themselves and even the concept of what an object is are unstable and emergent" (p. 336). Moreover, the developmental pipelines of modern software production have meant that the several programmers working on a project do not need to know the internals of an object that their colleagues have produced, they just need to know the pre-programmed methods of that object and what class it belongs to. As a rejoinder to this, even in my own consultations with programmers specialising in OOP, they have emphasised the importance of a clear organisational logic to structure the inheritance hierarchies of objects, as opposed to having a strict conception of the objects' ontology. Thus, even at the level of production the conceptual boundaries of an object are loosely demarcated to the extent that one does not

need to have an intimate knowledge of philosophy or even the code constituting the internals of the object. On the contrary, it is the correct positioning of the object in the inheritance hierarchy ensuring the efficient function of the program that remains paramount.

The process of developing objects in OOP, our collective use of them, and the understandings that we have of them, suggest that it is more helpful (and accurate) to designate OOP objects as boundary objects to encapsulate the productive and functional realities of the thing. That is, the object in OOP should be taken as one whose exact meaning, purpose and ontology can vary according to the interests that create, use and study it. Indeed, according to the originator of the boundary object Susan Leigh Star (2010), a boundary object has three main characteristics with the first being interpretative flexibility. For Star (2010), interpretative flexibility denotes the lack of concrete determination around the object's meaning for different groups. In the case of an OOP object, this means that the object can be conceptualised differently based on use case, production, and the predilections of the coder. Star (2010) finds that the production of meaning can often derive from factors such as one's cultural, economic, and educational background. In the context of this chapter we see this interpretive flexibility play out with OOP objects where Alan Kay (1996) has stated that it is akin to Leibniz's monad, while Joque (2019) argued that it is a material object demarcated by linguistic signification, and Alt (2019) says that it is an encapsulated piece of code and a carrier of functions essential to the function of their game. In essence, each of these interpretations coexist quite comfortably alongside one another even though there is a different set of understandings evidenced across each of these parties. This suggests that OOP objects are interpretively flexible to the extent that they are resilient enough as a concept to entertain these different understandings, while remaining stable in terms of their use.

This co-presence of meanings brings us to the second central characteristic of the boundary object – the so-called “...material/organisational structure of different types of boundary objects” (Star, 2010, p. 602). In the context of OOP objects specifically, this material/organisational structure involves an overlapping set of heterogeneous groups that write, arrange, produce, and in some sense consume these objects. Amongst these groups the necessity for cooperation – in a developer setting for instance – means that there is no single understanding or interpretation of OOP objects that must predominate over others aside from the fact that the code is valid. Multiple programmers will work on the same project involving the same objects with different understandings of what that object is and the relations it needs

to have with others. Here, a programmer working on a user interface might have a different conception of a given object to her colleague working on in-game mechanics, yet despite this, cooperation remains possible because there is a pragmatic, function-centric set of operational assumptions guiding how programmers use and integrate objects. Thus, instead of being an issue for the system, the proliferation of these different interpretations can continue so long as both the logic of the object's use and its functions within the context of the wider program are negotiated to a minimum working standard. In a more concrete example, this can mean that an axe in the video game could be either an aggregate of objects like axe, inventory, and damage, or it could be combat system, weapon and axe. What matters here is not the arrangement, nor the ontology of the object, but rather that the object meets the goals set out in this organisational context, which in this case is that the video game object works consistently for the player.

When producing and creating an OOP object, or indeed doing the kinds of programming that attempt to model/create worlds, the creation of these models invariably provokes questions as to the nature of the world and how best to model it. Or, more specifically, what one thinks the world is. As a form of boundary object, OOP objects are subject to the same questions with the added twist that it is up to the programmer to sift through their understandings of the world, and then to instantiate them in some form of an approximation in code/data. This is complicated further because OOP begins with the assumption that everything can be encapsulated as an object, hence even abstractions thought of as distinct from objects like concepts or ideas are made into and used as objects. Where this becomes a matter of boundary-ness is when the programmer(s) must translate their propositions about the world into a series of objects. In turn, this is where the final aspect of the boundary object comes to the fore – i.e. the dynamic between “...ill-structured and more tailored uses of the objects” (Star, 2010, p. 601).

When examining OOP as a programming language, we need to first consider the reality of programming a world constituted entirely with objects. For example, when developing a model of a gun, the object is not only the gun but is also the confluence of several other objects such as the class of object it belongs to (projectile weapon), and the forces and principles governing its behaviours (physics, damage, ammo, etc.). In any one of these cases these objects represent a series of methods, behaviours and yes, objects, that programmers need to describe the behaviour of. In some instances, objects may have very specific uses

such as being a unique item essential for the fulfilment of an in-game task. In this case it would belong to a specific inheritance hierarchy that would delineate its behaviours to the exclusion of other non-essential objects. This would be an example of a tailored use of an object as everyone in the development team has a concrete understanding of what that object is, the object's function, and its use. However, objects that represent other aspects of the world such as interaction markers, damage, and even object-ness (i.e. the ability to be an object in the game world, not the program) are examples of ill-structured uses of the object in the sense that they are general stand-ins for universal processes and traits. Here, there is no set use case for these objects, and they are more likely used by multiple team members to impart a general behaviour upon a specific aspect of the game. More to the point, the use of these abstract objects is determined by the interpretation of the programmer. Here, the programmer might have one understanding of object x and tailor their use of it accordingly, while their colleague might employ that same object to achieve something entirely different. Nonetheless, the organisational and operational context remains stable.

Objects in OOP are therefore entities constructed by programmers to approximate and model a system. Functionally, they are boundary objects in the way that they integrate into production environments while remaining operationally stable despite a proliferation of interpretations. As such, they reflect Joque's (2019) claim that even:

...the most eloquent notions of how a program should be written often fall away under the stress of deadlines and the collaborative work of committees...even the definitions of objects and other programming concepts offered are often ideal and aspirational; in the negotiation of actual implementation, they are frequently unsettled (p. 336).

However, how does this relate to the ontology of emergent objects? And what conclusions can we derive about their modes of existence? Clearly, a single OOP object does not constitute the entirety of an emergent object's qualities, behaviours and aesthetics. In very few cases is there an absolute 1:1 between the object constituted as an OOP object and, say, a gun in a video game. Rather, it is more likely that the emergent object is individuated from the confluence of several objects ordered within an object hierarchy. These objects interact with one another in a sequence structured by the programmer, and through this, initiate a moment of individuation that I would call the emergence of the object.

The OOP object designated as a weapon does not typically encompass the entirety of its available functions but relies upon its interaction with objects representing ideas or traits such as “projectile”, “equippable”, etc. within an inheritance hierarchy demarcating an object class. This indicates that the relationship between emergent objects and OOP is one of dependence, with the emergent object requiring at least one (very unlikely), but more likely several, OOP objects to attain the properties, characteristics and presence required for it to achieve the threshold of objectality. That is, attaining the full suite of features means the interlinkages of an object hierarchy must contain every object representing a function or behaviour that the programmer has set out as being essential to an emergent object’s behaviour. Similarly, because there is no prime OOP object that fully encapsulates, structures, and drives the embodiment of all these properties, the emergent object is not exhausted by any one OOP object and remains differentiated from it on the basis that it is not reducible to just one of these objects or locations.

The distinction between what I as the person who encounters the emergent object, and its instantiation in code governing the functions, behaviours and potentials of the emergent object, means that there is a myriad of ways to produce it that are not limited to just OOP (entity component systems being one such example). It is more accurate, then, to apply Broad’s (2014) concept of emergence here and see the emergent object as an entity that is distinct from OOP objects. This is because the emergent object is contingent on the interaction of each of these different OOP objects with each other but is in no way a 1:1 or reducible to the code underlying it. In the context of video game emergent objects, we see this at play in how objects are conceived and produced by developers. For developers, the emergent object or what the player encounters is seen as a composite of coded functions that ensure the intended use of the object (although this is not quite correct). At a basic level this is of course just code and data inscribed into the hardware of a machine (and below that just various electrical impulses). However, at the developer’s level, this is encountered as a description of the emergent object’s behaviours, i.e. does it fly through the air? Can it be bought or sold? Can it heal or cause damage? Can it be equipped, etc.? Importantly, the manner of this description is neither determined nor completely given on the basis of some brute underlying object. There is no “one size fits all” approach that would form the underlying essence of all emergent objects outside of the fact that it just needs to fulfil its intended function. In this way coding can vary, and an emergent object could conceivably be undergirded by programming written within the logics of an Entity Component System,

OOP, or even an Actor Model.

So, what does this indicate about the relationship between programming, OOP and emergent objects? First, it shows that there is an ontological difference between how an emergent object is encountered as an object and how that objectality is realised by the programmer. For emergent objects this shows that there is no 1:1 ratio between what is encountered on screen and its description in coding language. On the contrary, the OOP objects constituting the strata of individuation preceding the emergence of the object are a group of descriptions and functions that, while predicating the behaviour of the emergent object, are not the emergent object itself. Thus, the emergent object is contingent on these descriptions to work but is not reducible to them as the underlying computational assemblage extends beyond the bounds of the code to elements such as the hardware. This suggests an ontological condition of nomological emergence. The emergent object is not reducible to any one of these functions nor even their grouping. It is, however, dependent on them. Moreover, in OOP there is no set way of realising these functions, the same ends can have different means as we have seen in how inheritance hierarchies are formalised. The lack of determination in how these languages organise and enact the functions/characteristics of emergent objects reinforces the point that I made earlier about OOP being a kind of boundary object. As long as the functions of the object are ensured, the conceptions of what that emergent object is (i.e. an axe and the functions that it performs) and what an OOP object is, can and do differ according to different developers, players and other relevant parties.

Moving towards a definitive ontological model of an emergent object means examining these structures at the level of code to ascertain the relationship between the object that is encountered, and the structures that form the basis of its characteristics and functions. It means taking a close look at how it is realised as a difference produced by the interaction of entities such as OOP objects. In turn, this difference or moment of emergence becomes the gap between how the emergent object is being described by programmers and how one encounters it. Going forward, I argue that we should demystify the emergent object as a temporary property that might look complete for the user but is in fact a kind of temporary obfuscation of complex processes and interactions. Nevertheless, this is not to say that the emergent object's being is entirely determined by these descriptions. Once encountered, these objects retain the potential for other forms of individuation. Through their interaction with users, traders and players, and their surrounding environments, emergent objects can

precipitate individuations in their milieus.

Platforms and the Production of Objects

This section examines the socio-technical assemblage(s) in which emergent objects are produced, bought, sold, consumed, and encountered. Part of the ontological complexity of emergent objects stems from the fact that their underlying assemblages are either determined or influenced by platform infrastructures. In Chapter 4's study of video game weapons, we see this influence play out in how the Steam platform governs the emergence and individuation of weapons in the game *Destiny 2*. We see that the governance of Steam extends to the types of hardware involved in the assemblage, the software facilitating the weapon's performance, and the types of subjects that are produced by Steam and the weapon itself. Due to the distributed, amorphous, and constantly evolving nature of platforms, however, an all-encompassing definition of these entities goes beyond the scope of this chapter. Nevertheless, the outsized influence of platforms on the production, distribution, consumption, circulation, and use of emergent objects warrants further examination. The definitional interventions made in this chapter are secondary to the influence of platforms upon emergent objects. I am interested in how platforms as a capitalist assemblage have accelerated the conversion of emergent objects like video game weapons and NFTs into both commodities and vectors of individuation. In addition, the multi-server architecture of platforms means that emergent objects can have a productive base distributed across several regions, while also producing a single emergent being that appears across several desktops.

While I acknowledge the amorphous and multifaceted nature of platforms, I have opted for a simple definition of platforms as a "...socio technical assemblage encompassing the technical elements (of software and hardware) and associated organisational processes and standards" (De Reuver et al., 2018, n.p.). I take platforms to be an assemblage constituted by a flexible arrangement of hardware, software, and subjects governed by an implacable capitalist logic. Platforms are instantiations of what Deleuze and Guattari (2017) call the "capitalist axiomatic", an operative logic that "...organises all the decoded flows, including the flows of scientific and technical code, for the benefit of the capitalist system and in service of its ends" (2017, p. 269). Emblematic of this definition are platforms like Valve's Steam, Microsoft's Xbox, and Meta's Facebook, which mobilise this structure toward the ends of capital, namely profit.

As Engert et al. (2020) have noted, there are multiple strategies, implementations, and governance structures that a platform might adopt. Although, I will note that all the strategies and implementations covered by Engert et al. (2020) are all still governed by the pursuit of capitalist efficiency. Even within the purview of the capitalist axiomatic there are still differences in the structure of platforms that, depending on the emergent object, can radically affect the ontogenetic formation of that particular object. For example, a decentralised cryptocurrency platform such as OpenSea that is focused on direct peer-to-peer transactions amongst individual actors has different standards and regulations around object production, transaction, and ownership than Steam. Despite these variations, platforms are the underlying socio-technical assemblage through which the object becomes actualised. As a result of this, platforms become an important site through which to orientate an analysis of each emergent object.

Platforms provide different pathways towards emergence for each object. They enable or constrain certain aspects and qualities of an emergent object such as how it is encountered, used, circulated, and produced. There is thus a complex and mutually constitutive relationship between the emergent object and the platform, an emergent object can only attain the status of a distinctive entity because its individuation is enabled by the underlying structures of a platform, however, it also precipitates individuations and subjectivations for that platform. There are various types of platforms. Some have a centralised governance system like the Xbox, while other have a more decentralised form of “peer-to-peer” governance like Ethereum. Scholarship from Nieborg and Poell (2018), Engert et al. (2020), and Kerr (2021) shows that platforms are far from purely technical structures that exist just to fulfil a certain function. On the contrary, these studies suggest that platforms are interpenetrated with socio-cultural logics that dictate their respective affordances and drive the production and distribution of emergent objects. It is these logics that lead to the becoming-commodity of an emergent object by establishing the required conditions for commodification and fetishisation.

I use the term “platform” here to denote a socio-technical assemblage comprising both technical components like software and hardware and the associated organisational processes and standards (De Reuver et al., 2018). Platforms feature a central, low-variability codebase that can be supplemented by modular services. These services include app-developer kits to

social networking services, marketplaces and launchers. Where some platforms might focus on providing cloud-based solutions independent of a specific array of peripheral hardware systems and devices, such as Amazon web services, other platforms, like Xbox, Steam, Apple IOS, and Google integrate these software ecosystems with select devices such as consoles. Platforms, whether purely software-focused or not, encompass a variety of material network infrastructures like servers, databanks, and off-grid power supplies to ensure the provision of their services (Bratton, 2015).

As socio-technical assemblages, platforms encompass organisational protocols, processes and standards that operate according to a distinct socio-cultural logic. They are not just a technical arrangement of hardware and software then, but a self-regulating system of social relations and logics. The conception of platforms as developed by Bernhard Rieder (2020) shows how platforms actively seek to reify a comparatively abstract base of software into tightly controlled pathways for development. By taking care of “...complex tasks like transnational app distribution and payment processing” (Rieder, 2020, p. 119) for third-party developers and taking care of peripheral legal and commercial concerns, platforms redefine the industrial architectures of software development. Rieder (2020) notes that platforms do this by imposing boundaries and providing convenience to consumers in the form of prefabricated development and distribution pathways. Platforms, therefore, actually produce and reproduce capitalist logics of ownership, production, and circulation through the imposition of boundaries and their control over this assemblage of hardware, software and subjects.

The embeddedness of capitalist logics within platforms is evidenced by corporate ownership, the facilitation of multi-sided markets, and private ownership of the core codebase. In the context of emergent objects, we see the embeddedness of capitalist logics in how platforms govern their production, circulation and commodification. The system of capitalist social relations (re)produced by platforms is not just an incidental phenomenon, but rather is indicative of its ontological structure and the form of assemblage that it is. For example, Deleuze and Guattari (2013) distinguish between four typologies of assemblage: Territorial, Nomadic, State and Capitalist. As I have argued, platforms are capitalist assemblages. They are characterised by the habitual territorialisation and overcoding of a particular site of production and method of circulation (Nail, 2017). Platforms assert control over a territory and control the circulation of commodities by determining the kinds of flows and blockages

occurring within a milieu. In the case of emergent objects such as NFTs or video game weapons, platforms continually enforce a regime of operational sovereignty over how these objects are produced (as in the case of development standards), how they are distributed (transnational app distribution and marketplace legitimacy) and how they can be circulated (via platform provided transaction software). In specific cases, platforms like Meta, Xbox, and Ethereum, function as capitalist assemblages – they facilitate and control the transaction, development, and circulation of various kinds of products by delimiting the boundaries in which they can circulate as commodities.

Emergent objects produced within the bounds of a platform are subjected to these capitalist logics. Obvious examples include the video game weapons bought as “extra content”, NFTs bought on Ethereum, or a trading forum for video game emergent objects in an MMORPG (Ping, 2019). In of these each cases the host platform is facilitating, and to some extent controlling, the circulation of the item while providing assurances of the legitimacy of the transaction through its authority over the market territory. In this way the emergent object transitions from being just an item in the game, VR world, or a piece of blockchain, to a commodity that is valuable precisely because it is capable of both circulation *and* being subject to recognised ownership. The infrastructure of the platform and the capitalist logics embedded within, therefore, enable the individuation of the emergent object through a combination of its territorial sovereignty and ancillary affordances like trading and ownership.

From the perspective of both Gilbert Simondon (2011) and Deleuze and Guattari (2013), the individuation of a being occurs (in part) through its interaction with its surrounding milieu. In the context of an NFT or video game weapon, and the platforms in which they are produced, we see that platforms provide an opportunity for the becoming-commodity of these objects by allowing them to be purchased and traded. This ability to be traded is achieved through social and technical structures within the platform that govern the circulation of emergent objects through distinct channels of purchasing, trading, and owning. Here, the influence of the capitalist axiomatic on the social organisations and logics embedded in the technical structure of the platform is revealed. The platform-assemblage operates as a marketplace and as a factory. It produces emergent objects through its privately owned network of hardware and software and opens up avenues of individuation that are specifically capitalist. The

emergent object is only able to become a commodity because there is an opportunity for it to be produced, circulated, and encountered *as* a commodity. This is seen with the creation of wallets, libraries, and profiles that register the ownership of each object, or in a platform's native marketplace. More broadly, this reveals that the ontogenetic becoming of the object is contingent on the operative context of the platform. Platforms allow emergent objects to be produced, circulated and stored, but only in terms of their own market-based logics. In this way the capitalist logics embedded in platforms are not incidental aspects of the milieu in which the object undergoes its individuation, but rather are determinants of the object's commodification.

In terms of their production, Emergent objects are ontogenetically contingent upon platform infrastructures. Emergent objects require the platforms servers, software, and networks to be produced and circulated, while these infrastructures also further facilitate emergent acts of individuation like commodification. While a key part of reaching the threshold of objectality is how the object is individuated from the interrelations of code, hardware, and invocator, the performative difference or object-ness of the emergent object is no less important. Platforms are influential in providing an avenue through which the emergent object can perform this difference through becoming a commodity. Platforms do this by allowing the circulation of the emergent object in a marketplace and signalling to prospective actors that the object is something in itself and therefore distinct from the assemblage. The alleged singularity of the emergent object is used to underwrite the assumption that the object can be worth something in a particular context. As a commodity, the emergent object attempts to differentiate itself from the assemblage and the surrounding milieu by becoming particular. It does so, for example, by becoming delineated as something that one can have or own to the exclusion of others. Here, the platform's ability to both produce difference and exert control over the circulation of an emergent object within its territory produces a form of artificial scarcity.

The construction of an emergent object as a form of commodity reinforces the centrality of difference in its ontogenetic structure. Indeed, the lack of correspondence between how an object is implemented on-screen and how it is instantiated in code or sustained through the interoperations of hardware reveals a disjunction between what is being performed in terms of operations, and what is being encountered. While the emergent object that one encounters is contingent on the processes occurring within the platform-assemblage, its aesthetic character does nothing to disclose these realities. Indeed, the drive towards differentiation

appears to obscure these processes as much as possible. The becoming-commodity of the emergent object further capitalises on this disjunction by merging the commodity-form with the performed objectality of the emergent object. Here, the commodification of the emergent object is contingent upon its mystification as an object-qua-object, relying on the suppression of the object's ontological contingency to mask the fact that its socio-technical milieu is fundamentally different from non-digital forms of objectality.

The commodification of the emergent object can in part be attributed to the regimes of control imposed by capitalist assemblages over their respective territories. Although seemingly modular in construction and decentralised in their operations, all platforms exercise strict control over the kinds of exchange facilitated within their territories. From a technical perspective, this occurs in how they mediate and regulate exchanges between different actors while also establishing and maintaining the relevant network of databases, software, and standards that support reciprocal mechanisms of ownership and exchange. In turn, this provides emergent objects with new opportunities for individuation. For example, value-ascription can occur within a market setting, and a desire to consume may be prompted. In the case of the Ethereum platform for example, exchanges are enabled by peer-to-peer transaction software and compatibility with third-party "crypto" wallets, while ownership is assured by a central blockchain register. In the case of Steam, Xbox or Meta, native marketplace functions dovetail with developer tools to ensure a pipeline of commodities between users. What's more, these platforms provide the necessary interfaces and game spaces in which emergent objects can arise, thereby integrating heterogeneous game worlds with overarching marketplaces and forums to flatten the distinction between various objects in game worlds.

Notwithstanding the emergent behaviour of becoming a commodity-form, being a commodity is by no means a necessary condition for an emergent object to be considered as such. Rather, the commodification and fetishisation of these objects indicates that being situated within machinic structures such as platforms influences the operational logic of these objects. In turn, this suggests that the emergent objects such as NFTs, video game weapons, or even the *Libre 2* are ontogenetic because the degrees to which commodification and fetishisation or individuation occur are not strictly determined. To further clarify, while platform structures can and do provide the baseline conditions for emergent properties like becoming a commodity, this is by no means predetermined. Instead, there can be a wide

variety of partial conversions to commodities through informal trading, unsuccessful attempts to commodify game resources, and fluctuating conceptions of how an object is valued. What matters here then is not that the platform exercises absolute control over the destiny of the emergent object. What does matter is that platforms provide a set of conditions and affordances that both produce these objects and facilitate different forms of individuation.

The influence of platforms upon the kinds of individuation available to, and undertaken by, emergent objects indicates that platforms are central to the ontogenesis of these entities. Because they are developed, situated, and circulated within the socio-technical structure of platforms, emergent objects are contingent upon these infrastructures, and yet are also individuated sufficiently enough to be considered distinct from them. It is this co-constitutive tension that will form the basis of the case studies conducted in the later parts of this thesis. Likewise, the present hegemony of the capitalist-assemblage form must also be centred as part of this analysis because the genesis of the emergent object as-commodity-form relies upon a demarcated platform territory through which the object can circulate. In this way, platforms provide both assurances of the object's worth and pathways for its circulation. Thus, platforms engender new forms of emergent behaviours such as the previously mentioned convergence between the encountered emergent object and commodity-form. In this way the platformisation of emergent objects is not an incidental aspect of emergent objects, but instead, converges directly with the distributed, trans-territorial, concurrent, and emergent properties of this unique form of object.

Conclusion

From the outset, the focus of this chapter has been on the technical realities of the emergent object. Where the initial elements of this thesis have focused on discussing and developing a lattice of philosophical theory for the emergent object, this chapter has sought to drill down into the discrete elements of computing. This work argues that emergent objects are a privileged differentiation borne out from an underlying assemblage. Emergent objects are therefore different, and differentiated, from a network of interacting hardware, software, and human actors. To defend this proposition, I have looked at the components constituting basic computing such as the now ubiquitous network, storage, and processor stacks, as well as the abstractions of code. My intention was to establish the material foundations of computing through demonstrating the dyadic nature of hardware and software, and, by extension, to link the causal origins of emergent objects back to the operations of hardware. It is my hope that

this combination of media materialism, computer science, and software studies can help ground our understanding of emergent objects within the infrastructures giving rise to it. In turn, this forms the empirical basis of our assemblage-based materialist framework for emergent objects in subsequent sections.

Having established these basic precepts, the second goal of this chapter was to branch out from the functions of hardware to study how emergent objects are instantiated in code. In undertaking this task, I explored the ambiguous relationship between OOP objects and emergent objects. I showed that OOP objects evidenced the qualities of “boundary objects” and showed that they were more akin to an organisational metaphor that allowed programmers to objectify abstract concepts as well as objects themselves. More interesting, was that an emergent object could be a composite of several of these objects stitched together in an inheritance hierarchy, and that these hierarchies can be flexibly arranged so that the same emergent object could be implemented in very different ways. What this demonstrates, from an ontological perspective, is that there is something of a gap or *difference* between the object that is instantiated in code and the emergent object that is encountered. This study of OOP objects showed that software, like the material infrastructures supporting it, also relies on the confluence of several heterogeneous components to produce the object. In this way the technical structure of the emergent object becomes a question of a particular arrangement of productive components.

The third and final goal of this chapter was to analyse the outsized role that platforms have in determining the ontological structure of emergent objects. I argued that platforms should be conceptualised as socio-technical assemblages deeply interpenetrated by the capitalist axiomatic. Further to this, I examined how platforms exercise control over the being of emergent objects by regulating developer pathways and methodologies while also controlling peripheral systems and components. In turn, the baseline controls exercised by platforms also opened the doorway to other forms of individuation by linking up multiple users across the world and plugging them into a transnational socio-technical system. In this way, platforms have been shown to be key determinants in the ontological fabric of emergent objects as well as drivers of becoming such as commodification. Platforms achieve this by establishing territorial sovereignty necessary for commodity-generating affordances like marketplaces and transactional software.

Going forward, this thesis will take the technical map of emergent objects developed in this chapter and overlay it with the philosophical framework developed by its predecessor. In Chapter 4, this will be applied to the study of video game weapons in the game *Destiny 2*. On another note, this chapter has demonstrated that an assemblage-based framework is appropriate for emergent objects given the heterogeneity of each part, the constant requirement for interaction, the layered processes of abstraction, the socially embedded nature of platforms and code, and the fact that each emergent object is not reducible to the sum total of the assemblage. Hence, the “ontological difference” that resides at the heart of the emergent object.

Chapter 4: Video Game Weapons

Introduction

In this chapter I analyse the ontogenesis of a gun in the video game *Destiny 2*. In doing so, I determine the concrete structures of its being and reveal that it is not an immaterial or fictional object, but rather is an emergent object produced by an underlying assemblage. This case study focuses specifically on the Steam platform as an assemblage that produces, distributes, and maintains emergent objects across multiple spaces simultaneously. As the productive base of the object, Steam is both an integral part of the emergent object and emblematic of a broader trend towards platformised gaming. As such, it has become a key determinant in the weapons ontological structure. In analysing the weapon in terms of its ontogenesis, I not only reveal the fundamental matters of their being and existence in philosophical terms, but also, open new pathways through which to analyse the agential powers of these weapons as individuated entities. Although the word “gun” refers to a broad category of objects found within the game such as generic, unnamed weapons, and named unique weapons, emergent objectivity is not confined to one type of gun or one type of weapon. Indeed, I venture that all the weapons found in *Destiny 2* are emergent objects because they all share a similar ontogenetic structure. The guns encountered in *Destiny 2* are contingent on an underlying assemblage encompassing technical infrastructures, conditions, subjects, and individuations. While ontologically differentiated from the weapon, the platform- assemblage of Steam is a necessary condition for the existence of the gun. Even at this early stage it is clear that the relationship between the underlying assemblage and the gun satisfies Charlie Broad’s (2014) first criterion of emergence, namely, that the emergent being is reliant on the instantiation of an assemblage to come into existence. On the other hand, these guns produce individuations in their immediate milieus, subjectify individuals, and take on causal powers endemic to themselves. In this way, guns in *Destiny 2* satisfy Broad’s (2014) second criterion – they possess a set of causal powers distinct from this underlying assemblage.

In this chapter I show that platforms, as a form of capitalist assemblage, provide the conditions for the gun's emergence. I argue that the weapons encountered in the video game *Destiny 2* are contingent on this platform-assemblage because the platform constitutes the productive base necessary for the emergence of the weapon (Schweizer, 2012). Focusing on

the PC platform Steam, I examine the influence of this platform on the processes responsible for how a weapon in *Destiny 2* appears, how it is created, how one interacts with it, and how the object maintains its existence despite these contingencies. As scholars like Montfort and Bogost (2009), Schweizer (2012), Garboursy (2015) and Tavinor (2018) have shown, a weapon in a video game is not simply a simulation, but rather, is the product of a long chain of processes and interactions taking place between the physical components of a machine, software processes and routines, as well as the mechanics inputted into the game itself. The approach I take to guns in *Destiny 2* in this chapter explores the consequences of this shift to platformised gaming through the lens of ontogenetic differentiation. I view platforms as a productive network of heterogeneous components whose instantiation leads to the creation of emergent objects, and in doing so, I foreground the radical contingency of video game objects on a broader arrangement of components and processes that extend far beyond a collection of polygons rendered on screen.

In the first part of this chapter, I provide some background on *Destiny 2* alongside a description of the Steam platform through which the game is launched and then played. After this, I develop the theoretical framework employed in the analytical portions of this chapter. In this section I develop my approach to the Steam platform as a socio-technical assemblage. I ascertain the material, social, and organisational properties of this system and discuss the relationship between the hardware of the system and the higher-level abstractive processes of the games software. I then foreground Deleuze and Guattari's (2013) concept of the assemblage as the critical theoretical framework for this case study. I effect a synthesis between the assemblage as a productive arrangement of heterogeneous components and the concept of emergence to describe the differentiation of video game weapons as emergent objects. I supplement Manuel DeLanda's (2016) account of emergence with Charlie Broad's (2014) formulation of emergence as the production of difference, a difference that takes the form of a new and irreducible entity. I use Broad's (2014) notion of emergent causal powers alongside the Deleuzian (2013) concepts of individuation and subjectivation to explore the nascent causal powers of the weapon. In doing so I demonstrate how this object is, in fact, an emergent object arising from the infrastructure of the platform assemblage. I conclude this chapter by discussing the implications of this ontogenetic structure in terms of how the guns found in *Destiny 2* initiate deterritorialisations in their milieu as partially nomadic objects.

Destiny 2, Platforms, and Media Materialism

In this section I describe *Destiny 2* and Valve's Steam platform. I focus on the relationship between Steam as a socio-technical assemblage and the material structures of networked computing. My approach synthesises the theoretical groundwork of Chapter 2 with the technical analysis of Chapter 3 by performing an empirical analysis of platforms through the lens of machinic ontogenesis. I show that the underlying structure of platformised gaming produces an emergent, ontogenetic video game weapon. This is seen in the relationship of difference and dependence between the underlying socio-technical assemblage of the platform, and the production of an emergent object through these structures. I begin this section with a brief background on *Destiny 2* and the Steam platform on which it is played. I read the structure of the platform through the general logic of the assemblage to show that the ontological flexibility of assemblages reflects the disparately organised, constantly evolving, and somewhat underdetermined structures of platformised computing. I then differentiate the ontogenesis of emergent objects from contemporary approaches to the ontology of video game and digital objects from the likes of Grant Tavinor (2018), Yuk Hui (2016) and Bernhard Rieder (2020).

Destiny 2 has been a mainstay of the looter-shooter genre since its release in 2017. Unlike first-person shooter (FPS) games, looter-shooters are distinguished by their emphasis on procuring rare in-game items such as weapons, pieces of armour, and other artefacts. The design of looter-shooters is typically oriented around a shared open-world as opposed to the linear level-based missions seen in traditional first-person shooters. The most recent data available on Steam for the past 30 days shows that the player base had averaged 100,691.9 concurrent users (Steam Charts, 2022). As a case study, *Destiny 2* underlines the importance of taking a platform-centric approach because it is a platform-based media, rather than a physical one. This differentiates it from older console-based media because it features a distributed productive base of hardware and software rather than a localised one. Gameplay in *Destiny 2* features users located in different time zones, nations, and regions, occupying the same game space concurrently. Players share a common science fiction setting or "map" with each other and engage in missions, competitions, challenges, and galactic warfare with one another. Typically, gameplay takes place from a first-person perspective where the player's weapon takes pride of place in the foreground, in the middle and back grounds, the player sees a mixture of enemies, alien ruins, non-player characters, and the avatars of other

players. *Destiny 2* has multiple servers in different regions with players accessing this through their respective Steam accounts, and players will often occupy the same in-game world from different spatial (i.e. geographic coordinates) and temporal (i.e. time zones) coordinates.

Steam is a PC-based platform owned by parent company Valve. It operates as a launcher, storefront, networking site and access point for individuals seeking to play video games. Unlike other platforms, such as the earlier versions of Microsoft's Xbox or Sony's PlayStation, Steam (aside from a new hand-held device) is not bought as a physical console. Rather, Steam is a desktop application that co-opts and adapts the player's existing hardware to play games (providing some basic prerequisites are met). Downloading the launcher allows players to connect to Steam's transnational array of storefronts, servers, players, and resources that enable virtually any game to be played. When playing *Destiny 2*, Steam enables players to launch the game via the desktop application where they are then allocated a game-world associated with their region. Upon entering the game, players will see their avatar emerge into a shared game-space alongside those of other players. Here the player's avatar is united with others in a variety of cities, battlefields, and ruins across a reimagined solar system far into humanity's war-torn future. Despite being in spatially disparate regions, these players can attempt to cooperate and complete missions, slay enemies, compete for in-game items, and explore the setting concurrently. Despite some variation in their immediate perspective and field of vision (as this depends on the in-world position of the avatar and is always from a first-person perspective when in combat), the game world, replete with its objects, items, enemies and other players, is the same for every player regardless of access point.

The increasing popularity of platformised gaming in recent decades has generated an interesting and diverse body of scholarship on the subject. Although it goes beyond the scope of this chapter to provide a comprehensive overview of this area of scholarship, I use the term "platform" to denote a socio-technical assemblage that encompasses technical components such as network infrastructures, hardware items such as processors and storage stacks, as well as proprietary software such as launchers, operating systems and developer tool kits (Williams, 2015). Platforms are composed of social actors such as players, developers, consumers, and workers (Engert et al., 2020). In the context of this chapter, the term "platform" refers to a socio-technical assemblage encompassing manifold

heterogeneous components. When I refer to Steam as a platform for example, I am including everything from the basic hardware of computing, the “lower-level” computing tasks undertaken by the system’s microprocessor, as well as the higher-level abstractions handled by the game engine, platform operating system, or rendering algorithm (Montfort and Bogost, 2009). By taking this approach I do not consider video game objects in isolation; rather, I understand them as existing within a network of heterogeneous components and interactions that structure the production and existence of video game objects. In the case of *Destiny 2*, platforms like Microsoft’s Xbox, and Valve’s Steam, are prime examples. The platform-centric approach undertaken in this chapter parallels more recent arguments from Tavinor (2018) who emphasises that video game and virtual reality objects are predicated on tangible entities such as data objects. However the approach taken in this chapter differs from Tavinor’s (2018) in that rather than emphasising the fictive nature of these objects as a “...functional quality of a representational, depictive, or interactional medium” (p. 149), I argue that the ontogenetic nature of these objects should be emphasised with respect to the underlying structure of the Steam platform and the potentialities stemming from the dynamic interplay between the emergent object, the player, and the resultant indeterminacy between the object and its milieu. While Tavinor (2018) argues against exotic commitments to the metaphysical “realism” of video game objects, I am less concerned with distinguishing between what can be considered fictive and what can be considered real, and instead seek to approach video game objects descriptively. The ontological analysis of weapons in *Destiny 2* undertaken in this chapter, therefore, foregrounds the facticity of the encountered object as its primary object of study. I also respond to Tavinor’s (2018) fictive objection in the later portions of this chapter.

The assemblage-based model advanced in this chapter differs from other significant works on the ontology of digital objects such as Yuk Hui’s (2016) *On the Existence of Digital Objects* and Bernhard Rieder’s (2020) *Engines of Order*. Hui’s (2016) objective seems to be the re-conceptualisation of data, or, more specifically, the objectification of data within network infrastructures as a defining aspect of our current era of technicity. However, the focus of this chapter is on conceptualising the mediatised emergent object, i.e. our weapon in *Destiny 2* within the socio-technical framework of a platform-assemblage. I argue that the emergent object we encounter in *Destiny 2* is not only constituted by material formations of data and hardware, but also determined by interactions with both its surrounding milieu and the subject themselves. In this way Hui’s (2016) approach leads to a conception of data objects

that evidence a more concrete, but less dynamic ontological structure given that they do not have the same opportunities for emergent behaviours.

The centrality of Deleuze and Guattari's assemblage as a heuristic for developing an understanding of the platformised emergent object differentiates this chapter from the approach taken by Bernhard Rieder in his work *Engines of Order* (2020). Although both *Engines of Order* and the present work share a similar conceptual and methodological genealogy originating from Rieder's dialogue with Gilbert Simondon and the influence Simondon himself had upon Deleuze and Guattari, some key differences remain. The first of these differences is that Rieder does not specifically focus on the objects encountered in game spaces, indeed, his approach does not directly address the ontology of digital objects and instead views it as part of the larger technical ensemble of algorithmic production (Rieder, 2020). Rieder argues that computing technology is "...a sprawling ecosystem of objects and trajectories that require inductive conceptualisation" (Rieder, 2020, p. 61.) Rieder's approach, therefore, by virtue of its subject matter, is more suited to addressing the ontology of algorithms than the ontology of specific objects.

While Rieder reaches similar conclusions as to the ubiquity of hardware and the contingency of software on material infrastructures (Rieder, 2020), the framework of technical ensembles, individuation, and metastability that he has adapted from the work of Gilbert Simondon needs to be developed further to encapsulate the ontology of weapons in *Destiny 2*. It is here that I would stress the applicability of the concepts introduced in this chapter such as emergence, the platform assemblage, becoming, and the ludological haecceity as a means by which we might properly grasp the ontological dynamism of video game weapons. Platforms, as spatially distributed socio-technical assemblages engender a form of emergent object that is not only emergent with respect to the successive layers of technical individuation it needs to undertake to appear on screen, but also facilitate the emergence of novel causal powers in video game objects. By centring these events, I emphasise, as Simondon (2020) and Nail (2021) do, that emergent objects such as a gun from *Destiny 2*, are never finished or constituted. Rather, the emergent behaviours, events and actions that these emergent objects can undertake are themselves presupposed by the object's unfinished ontogenetic structure. I claim, therefore, that these actions are part of the gun's becoming-object.

In the following section I expand on this idea that video game objects are ontologically indebted to an assemblage of relations and components. I argue that platforms are significant to the study of video game object ontology insofar as they represent a series of conditions that are necessary for the object's emergence. A philosophical enquiry into the existence of video game objects in a game like *Destiny 2* should not analyse such an artefact without considering the infrastructures that underpin its production. I say this because a platform-based approach through the lens of an assemblage will help sharpen our understanding of the following: (1) what makes a video game an object and not merely a representation of one, (2) what leads to its emergence, and (3) what are the requirements for its continuing existence. Formulating an ontology of video game objects necessitates accounting for the relationship between the emergent object on screen and the types of relations that give rise to it. Focusing on the materiality of the platform and the indebtedness of video game objects on these platforms also highlights another problem that can be resolved by using an assemblage-based approach. That is, how we might reconcile the ontological difference between each element of the underlying platform and the differentiated, yet ultimately dependent relationship that the video game weapon has with the platform.

Platforms, Assemblages and Emergence

In this section I use the concept of the assemblage to study the relationship between the Steam platform and the gun in *Destiny 2*. In doing so I ground the emergence of the gun as part of the productive interrelations of the Steam assemblage. I analyse Steam using the framework of concrete assemblages, abstract machines, and subject positions. I show that Steam is an assemblage produced by the interrelation of heterogeneous components such as hardware modules, software processes, and subjects (Deleuze and Guattari, 2013). Analysing this diverse array of technical objects, devices, and routines constituting platformised computing, I delineate between the assemblage on the one hand, and the weapon on the other. Where Steam encompasses the conjugations of hardware components, abstract software routines, rendering algorithms, and invocator-subjects, I show that the gun is a differentiated entity produced by these interrelations. Using this structure of assemblage and emergent object, I then explore the processes of individuation and subjectivation that arise post the guns emergence. As a new point of difference within Being, I argue that the gun produces its own haecceities both within, and without the game space, figuring into new complexes of subjectivation and assemblages of play. I show, therefore, that the emergence

of the gun is essentially a moment of becoming-differentiated from the assemblage of the platform

An assemblage is a collective term for a grouping of abstract machines, concrete assemblages, and personae. Within the context of Deleuze and Guattari's *oeuvre*, this concept is advanced as an alternative way to approach the ontology of different entities, an approach that rejects the essentialist concepts of unity and totality in favour of metastability and processual becoming (Deleuze and Guattari, 2013). According to Nail, one of the primary characteristics of assemblages is that they are able to have various elements "...added, subtracted, and recombined with one another *ad infinitum* without creating or destroying an organic unity" (Nail, 2017, p. 23).⁴ An assemblage is not determined by any one group of elements or an element, but rather, emerges from the relations between them. At a structural level an assemblage cannot be a fixed product or object but is instead a temporally specific way of describing a particular arrangement of things (Nail, 2017). The concept marks a paradigmatic shift away from emphasising the interiority of components or entities, and towards the interactions that take place between these components. What counts here is not the elements, conceptual terms, or the transcendental "form" of a thing, but rather the molecular relations occurring between its various entities (Nail, 2017). Thus, an assemblage is used to encapsulate a series of relations holding together a set of self-subsisting fragments and, because of this, I use the term assemblage to refer to an identifiable collection of abstract machines, concrete assemblages, and personae.

For the purposes of the following analysis, I divide the structure of an assemblage into three different elements or categories of relation: abstract machines, concrete assemblages and personae (Nail, 2017). The term abstract machine denotes a series of relations that hold and condition the material embodiment of an assemblage together. In other words, the abstract machine provides a localised set of possibilities linking the nominally discrete elements of an assemblage together. It is perhaps difficult to understand the role of the abstract machine in isolation, as it is a relational phenomenon existing in the interstitial spaces between concrete entities. However, if one considers the relationship between the abstract machine and the concrete assemblages that Deleuze and Guattari (2013) take to be the material (actual) embodiment of the assemblage, we see how the abstract machine functions in the context of Steam – where concrete assemblages denote the diverse array of material

⁴ Italics in Original

components underpinning the Steam platform in the form of hardware components like network, processor, and storage stacks, software objects and algorithms, energetic infrastructures such as power banks, and peripheral hardware elements like the player's own computer, monitor and controller, the abstract machine refers to the relations between these elements serving to hold the platform together as a discernible entity.

The underlying computational structures of Steam are a form of concrete assemblage. In the case of Steam, the material embodiment of the platform includes the platform's own hardware, software, and network infrastructures in addition to the personal computers of users. As part of an assemblage, these structures are concrete assemblages interlinked and maintained by the conditioning relations of an abstract machine. This relationship between concrete assemblage and abstract machine is what ensures the metastability of the platform against fluctuations in components, individuals, and system states. These fluctuations occur, for instance, when a server crashes or when a user logs in or out of the game and the platform. Despite these interruptions, both Steam and the weapon remain uncompromised. There is thus a compositional flexibility within the platform – its concrete components will change across time while Steam and the emergent objects it produces remain stable. This network of concrete assemblages also encompasses higher level “software processes”. Consonant with my analysis of hardware and software in Chapter 3, the production of the gun involves successive layers of abstraction predicated on the mutual individuation of hardware components and software processes (Schweizer, 2012). The intermingling of higher-level abstractive processes such as interventions from the machine's operating system and game engine, for example, are just as necessary for the emergence of the object as the hardware itself because they potentiate these components (Schweizer, 2012). The production of the object, therefore, is not determined entirely by base-level routines, but individuates in tandem with higher-level algorithms such as those governing the weapons physics and rendering.

The third element of an assemblage – the personae – are the individual subjects whose identities are produced through their relationship with the assemblage (Nail, 2017). In the context of Steam, this role is fulfilled by players, community members, developers and other subject positions as produced by the platform. Guattari (1992) conceives of the production of subjectivity as a becoming-subject driven by the conjugation of the existential territory (the subject) with technological machines of information and communication. He states that “...technological machines of information and communication operate at the heart of human

subjectivity” (Guattari, 1992, p. 4), meaning that a subject’s interaction with a machine or an assemblage produces a new form of subject position. Steam does this by establishing specific roles and positions such as players, consumers, and profiles. This process of subjectivation also extends to the player taking on the role of one who invokes the weapon. Recent work from Chesher (2023), for example, states that media assemblages (search engines, voice assistants) engender a relationship of invocation as opposed to direct use. Similarly, the productive context of emergent objects as a part of an assemblage means that agents invoke the object by conjugating with an assemblage, i.e. by logging into the game world. Here, the act of logging into the game world by the subject also sees them invoke the object into being. The conjugation of the subject with the Steam assemblage thus changes their relationship with the gun from one who just encounters or uses the object, to one who actively produces the emergent object by becoming a part of the assemblage.

The tripartite structure of the assemblage: concrete assemblage, abstract machine, and personae, presupposes a set of processes germane to the present analysis – individuation and subjectivation. The abstract machine of Steam is not limited to the individuation of the emergent object. It is a field of possibilities that guides the continual individuation of the assemblage past the threshold of object emergence and towards new individuations and becoming(s). As the first, and therefore *the* primary process, individuation denotes a phase-shift event, in this case, one that emerges from the relation between an entity and its surrounding milieu. It is thus a process of becoming arising within Being itself and one that continues through to the continuous individuation of an emergent object. Here, I use individuation in reference to the micro-becomings initiated from the relations taking place both within the assemblage itself, and the weapon’s relation to its surroundings. According to Simondon (2011) and Deleuze and Guattari (2013), individuating events constitute an ever-present horizon of possibilities attached to an entity; they encompass the becoming of internal states *and* the becoming of entities against their milieu. In the context of weapons in *Destiny 2* and platform assemblages this process is observable across two distinct registers. First, there are the individuating events taking place within and between the concrete assemblages constituting the platform such as those between codebases, processors, and programs. Second, there are the individuating relations between the emergent object and its milieu.

The dualism of individuating events described in the above paragraph, i.e. those that take place *within* the assemblage of Steam and those that occur in relation to the gun as an emergent object, also extend to two distinct processes of subjectivation. Both the Steam assemblage and the subject's relation to the emergent object (i.e. the gun) enable the becoming of new subjectivities such as invocator, profile, worker, player, leader, or tank. Here, subjectivity is not a transcendent or immutable form existing in opposition to the social, the technical, or the political, but rather, is produced adjacent to each of these through the investments of desiring machines and their interactions with different networks of assemblages (Guattari, 1992). In this respect, both Steam and the emergent object form intertwined complexes of subjectivation that influence the becoming of the subject in significant ways. When a player logs into Steam for example, the construction of the subject is filtered through discursive categories like the user's profile, purchase history, personalised recommendations, and geolocation information. Here, the subject's actions are filtered through a pre-established horizon of possibilities or options and the choices offered by Steam shape the production of subjectivity by circumscribing how the subject performs themselves. We also see this process of subjectivation in relation to the gun in that it initiates a particular set of becomings for the player. At a basic level an interaction with the weapon presupposes them as a combatant by providing an option to shoot and slay others, to be melee based, or ranged, to engage in certain tactics at the cost of others. The weapon also initiates different actions and reactions in the body by changing the players movement patterns or bodily state, in other words, it affects the player. From this perspective, both platformised gaming and the emergence of the object are vectors for individuation and subjectivation. Platformised gaming initiates and influences the production of subjectivities through the incorporation of the subject into the assemblage, while the subject's interaction with the emergent object creates differentiated subject positions such as those of combatant, tank, or scout.

The ontogenetic structure of Steam is revealed in its composition as an interconnected array of spatially distributed, yet interrelated material components and processes. Steam encompasses everything from software abstractions, productive relations between hardware, and the invocations of subjects. The unstable and temporal nature of these agencements necessitates that when conceptualising video game objects we abandon any pretensions of their having an internal essence or an essential composition because the weapon emerges through a continuous process of differentiation driven by a flexible arrangement of

components, actors, and relations. The difference in subjectivations, affects, and aesthetics between the gun and the assemblage also reveals a fissure or gap between the two. It is this gap that delineates the moment of emergence as a privileged moment of differentiation insofar as it reveals: (1) a relationship of ontological difference between the emergent video game object and underlying assemblage, and (2) the ongoing contingency of the object on the platform. Our emphasis, therefore, must now shift from this underlying system to the emergence of the object as a privileged individuation in which a new point of difference is established.

The gun emerging on screen in *Destiny 2* is not reducible to the underlying assemblage nor is it the case that the inverse is true (DeLanda, 2016). The term emergent object is used to express this difference between the platform assemblage as a set of physical properties and processes, and the video game weapon as a differentiated entity with its own causal powers. The nature of this relationship between a video game weapon and a platform-assemblage reflects Broad's (2014) description of emergent properties as: (1) neither identical to, nor derivative of, the underlying physical properties of the system; (2) genuinely causal (i.e. that they have causal powers independent of these underlying physical properties); and (3) emerging only when an appropriate set of physical properties are instantiated. Reading this moment of emergence through a Deleuzian (1994) framework of difference, emergence becomes a privileged moment of differentiation driven by the productive relations of an assemblage. The array of concrete assemblages and personae making up the Steam platform-assemblage is in a state of constant individuation driven by the abstract machine. There is thus no direct causal link between a strictly demarcated system state and the emergent object. My analysis of Steam has shown that the individuations giving rise to the weapon are flexible, and the underlying assemblage is fairly metastable. This means that video game weapons predicated on platform infrastructures are irreducible to the processes leading to their emergence. They are differentiated from each component and process despite being produced by them. As newly emerged entities these objects have an entirely different set of properties to those of the components that constitute them, and they are abstract enough to maintain their existence despite permutations in the underlying hardware.

The difference between video game objects as emergent objects and the Steam assemblage is readily observed in the object's mode of appearance. When the gun first appears to the player on screen it is as if it has only just emerged from the void. This is because the weapon

is not a totalised body confined to a particular set of coordinates or milieu like a non-emergent object is. It does not, therefore, travel across space from point x to point y prior to its emergence. Rather, like Deleuze and Guattari's nomad (2013), its arrival is an intensive affair rather than an extensive one. Point-to-point travel for the emergent object is absent and instead the weapon's emergence on screen is experienced as an intensive manifestation. From the player's perspective the object bursts into ludological space after having been invoked. The weapon seems to appear as if out of nowhere, and its appearance precipitates a suite of individuations that not only subjectivate the user, but also individuate the game space in which the weapon is situated. In this sense the weapon does not start as a self-contained being in the processor before gradually travelling to the interface. Instead, it has "become" through the individuation of an assemblage. The weapon is therefore a difference produced by the relations occurring between the platform-assemblage and its various personae, as well as the interlinkages of concrete components.

This emergentist approach resolves an ontological question as to "where" the object exists within territorial space, i.e. the space of the platform assemblage, and the game world(s) accessed by the players. Where and how the emergent object comes into being is guided by the routines of the game's program, which in turn provides additional parameters for where it appears within the game space. This is often subject to the game's mechanics such as the model type and place within the games inventory, my ownership of the weapon, whether it is part of an ongoing quest narrative, or even if I am logged-in or not. In the ludological space of *Destiny 2* the object's emergence from the player's perspective is therefore subject to certain determinate factors such as at the end of a gameplay sequence or narrative. However, from the ontogenetic perspective of the trans-territorial assemblage, the weapon emerges with an intensive "speed" borne from the relations between the various parts of the platform (Deleuze and Guattari, 2013). Ontologically, the distinction between travel and emergence is an important one because it gestures to the fundamental tension within the emergent video game object. Indeed, it reveals a process of ontogenetic differentiation between the emergent object as an entity produced by a platform-assemblage, and the assemblage itself. In this way the old hylomorphic perspective of the object is invalidated. Form and matter here are no longer strictly unified because the material systems that the emergent object is contingent on are distributed across the world. This is also supported by the fact that once the object has emerged, there are different rules, behaviours and properties that serve to further differentiate it from the system that gives rise to it.

The ontogenetic foundations of platform-based video game objects reveal an emergent relationship between the object that the player interacts with, and the underlying assemblage with which it is concurrent. The analysis undertaken in this section has illustrated that platforms like Steam resemble Deleuzian assemblages at a structural level insofar as they are identifiably composed of concrete assemblages, abstract machines, and personae. This section has showcased that an emergentist approach to platformised gaming can account for the heterogeneous relationship between the video game weapon as an emergent object and the underlying assemblage of the platform. Here, the concurrency between what is fundamentally an undetermined assemblage of interrelated hardware components, algorithms, network infrastructures, players, developers and potentialities (amongst many others), and the video game object as an emergent entity has been theorised in terms of emergence. The emergent video game object is ontogenetically differentiated from the assemblage, yet nomologically related to it. In theorising this relationship, I pointed out that the trans-territorial nature of the platform-assemblage confers some nomadic qualities on the emergent object in the way that its emergence is characterised by intensive manifestation rather than territorial traversal. The remaining task of this chapter, therefore, is to use this framework for its intended purpose – that is, to complete an analysis of video game weapons as emergent objects in the game *Destiny 2*.

Destiny 2 Emergence, Platforms, and Assemblages

In this section I trace the emergence of the gun from its genesis in Steam through to the assemblage of play. I carry forth the presupposition that the gameplay of *Destiny 2* is predicated on the underlying assemblage of the Steam platform, and I analyse the emergence of the gun as a privileged event in which a difference is established between the assemblage and the milieu. I delineate the ontological difference between the gun as an emergent object and the platform-assemblage of Steam. Where the former is a privileged point of differentiation, the latter is a system of abstract machines, concrete assemblages, and personae. I emphasise that this difference between the gun as an emergent object and the platform-assemblage engenders new threads of individuation that are endemic to the gun as opposed to the assemblage. I couch these threads in terms of Broad's (2014) statement that emergent entities possess causal powers specific to themselves. This section sees the introduction of the term "ludological haecceity" to encapsulate the gun's role in initiating becoming(s) inside of ludological space. Having made the argument that video game weapon

are emergent objects, I argue against Tavinor's (2018) claim that game objects are metaphysically fictional entities.

The relationship of ontological difference (and dependence) between the gun as an emergent object and the platform-assemblage of Steam can be intuited by the qualitative differences between these two interrelated entities. Taking the gun as it appears to the player in-game, we see that its sense of objectality is observable in its position as a clearly individuated entity situated amidst the ludological space of the game-world. In-game, the gun follows a Simondonian (2011) structure of figure and field, where it is differentiated from the broader ludological field by a suite of aesthetic, interactive, mechanical, and tactile properties that differentiate it from other aspects of the world such as players and non-interactive objects. In terms of the gun's aesthetics, the structure of each weapon in *Destiny 2* will often follow a generic model type such as a revolver, rifle, etc. or, in some cases, it may be a unique item with a unique model type and name. From a mechanical perspective the weapon is further individuated by a manifold of ludus-specific qualities such as damage output, ammunition capacity, rate of fire, and range amongst others. On the other hand, players might interact with it in a variety of different ways, including haptic feedback from the controller, commands from the keyboard, and the phenomenological qualities associated with how it appears and how it sounds.

In contrast to the gun, which appears and behaves as an individuated object, Steam as a platform-assemblage does not evidence a direct 1:1 relationship between itself and the weapon on the screen. On the contrary, Steam constitutes an assemblage of heterogeneous core computing components like network, storage, and processing stacks, as well as abstract processes, programs, algorithms, and rendering protocols that certainly contribute to the emergence of in-game objects like the gun but remain ontologically different from them. In the case of *Destiny 2*, the weapons in this game appear to be nomologically contingent on the platform architecture for their existence. I say this because although the gun emerges alongside the physical properties, processes, and conditions of the assemblage, it maintains its existence even whilst these underlying conditions change and evolve over time. This indicates that the relationship between these two entities is not directly causal. This difference is also indicative of the process of productive differentiation in which the weapon is embedded, as there is a lack of equivalence between the emergent object and the system to which it relates. We see this when the gun in *Destiny 2* continues to exist even as different

parts of the underlying assemblage undergo hardware modification, and experience network interruptions and changes in personnel.

What we encounter in a game-space is a form of emergent object arising from an entire platform-assemblage. The ontogenetic indebtedness of these objects to the productive relations of raw stacks of computational infrastructures, code, graphics engines, and interfaces, shows that the video game object exists parallel to the assemblage rather than being synonymous with it. When playing *Destiny 2*, the player is therefore interacting with an emergent object when they encounter and use the weapon. Here, the weapon drives towards singularity through the individuations it undertakes, individuations such as interacting with the player, firing, moving, and being used. Whilst this object is both ontologically and visually non-identical with the platform assemblage however, it remains nomologically linked to it in what is fundamentally a relationship of contingency as without the instantiation of Steam, there is no weapon. The emergent nature of these objects also predisposes them to a kind of nomadic and trans-territorial being. The gun, while confined to a set of coordinates in the game world, has the potential to become visible within multiple spaces outside of the ludus simultaneously. This is exemplified with individuals playing *Destiny 2*, as, while their bodies might be located in entirely different national spaces, they still apprehend the same emergent object on-screen and react to it in different and significant ways.

The potential of these objects to appear anywhere with the requisite equipment is significant. Not only because it introduces problems for hylomorphic or bundle theories of the object as they relate to an ontologically privileged original, but also because it is indicative of a set of nomadic properties and potentialities within the emergent object. Here the trans-territorial nature of Steam and its use of a scattered array of concrete assemblages, i.e. cloud-based storage, multi-server architecture, and trans-territorial networks of fibre optic cables, results in an ever-present potential for the emergent object to appear anywhere with a screen, a willing invocator, and an internet connection. Like Deleuze and Guattari's (2013) nomad, the emergent object is ontologically predisposed to defying the enclosures of territorialised state regimes by existing outside of them. This is because these emergent objects exist ontologically adjacent to the platform assemblage (whose material embodiments occupy multiple territorialities in different states), meaning that they have the potential to exist externally to any one state's territory. These weapons then, cannot be

entirely subsumed or situated within a single territorial arrangement. Although one might claim that the screen upon which it emerges constitutes a given region or state territory, the emergent object exists across all of the interconnected screens in different forms. The weapon appears to the player who owns it in one way, and differently to the players who don't. Given that the productive reality of the gun is external to any one territory, it follows that they are ontological nomads since there is no fixed territorialised point from which they *must* emerge, and furthermore, where they will appear is likewise indeterminate.

The reality of the object's appearance indicates that its manner of emergence is at least partially characteristic of Deleuze and Guattari's nomad insofar as its arrival is a question of speed rather than movement. As Deleuze and Guattari themselves note, movement designates "...the relative character of a body considered as 'one', and which goes from point to point" (Deleuze and Guattari, 2013, p. 444); accordingly, they describe movement as extensive because it can only be determined relative to the segmentary space of a territory. On the contrary, however, "Speed" is an intensive and decidedly nomadic quality that denotes the absolute character of a body whose heterogeneous parts fill a smooth space like a vortex and is therefore capable of springing up at any point (Deleuze and Guattari, 2013). This characteristic is shared by the gun in *Destiny 2* because it does not move from component to interface as a non-emergent body does. Rather, when I log into the game the weapon emerges fully formed on screen as a result of Steam's productive network of trans-territorial interlinkages and processes even as it maintains the possibility of appearing simultaneously on a different interface, or alternatively, receding back to a state of latency. Despite the trans-territorial coordinates of these components, the weapon does become subsequently integrated into the game's world. Once it has emerged, for example, the weapon becomes subject to a suite of rules, regulations, and behaviours as dictated by the game's mechanics. A partial nomadism is revealed in this tense relationship between the emergent gun and the territorialised game-world. While the gun maintains a degree of autonomy in the player's hands, it remains constrained by the rules and pre-set outcomes of the world.

One notable consequence of these ludological constraints is that the weapon does "move" across the territory of the game world once it has been produced. However, the rapid arrival of the weapon on screen also suggests that the weapon's emergence is a consequence of productive relations rather than the cross-territorial traversal of an already constituted object. This tension between the assemblage prior to the emergence of the object, and the

comparatively narrow range of potential individuations and subjectivations available to the gun upon emergence, can be described through the Deleuzian lens of individuation or perhaps even micro-becomings. In this framework, the emergence of the weapon into ludological space establishes a new distinction between the emergent object and its surroundings. At a basic level this is essentially a version of the object-milieu relation first formulated by Simondon that sees the object differentiated, and then continuously individuated through its interactions with the world (Bardin, 2015). For the gun in *Destiny 2*, the constructed nature of the game-world influences the kinds of individuations undertaken by the weapon because these events are more or less determined by the game's systems (player choice notwithstanding). In this way the rule sets governing qualities like weapon physics, damage, movement, speed, aesthetics, enemy choice and level design not only determine the horizon of possibilities available to the gun, but also influence its becoming at a micro-level. They do this by forming the content of the milieu to which the weapon relates, and in the process, constraining certain vectors of becoming. In this way the milieu exercises a territorialising effect on the gun.

The emergence of the gun in *Destiny 2*, as a privileged moment of difference, establishes a set of causal powers endemic to the weapon and distinct from those of the underlying assemblage. As per Broad's (2014) definition, emergent properties have novel causal faculties that are distinct from the underlying system of physical properties to which they are related. In the case of *Destiny 2* the emergence of the weapon into ludological space carries with it causal powers that are both externally and internally affective insofar as they can: a) effect transformations in the user, producing reactions, eliciting emotions, invoking actions and transferring information through space, and b) initiate emergent dynamics within the game by interacting with other objects in the space in a more determinate, but not entirely closed off manner. For example, when I shoot an opponent in *Destiny 2* (Le Blanc, 2006). Like Deleuze and Guattari's example of *Go* where a piece has only "...a milieu of exteriority, or extrinsic relations with nebulas and constellations, according to which it fulfils functions of insertion or situation, such as bordering, encircling, shattering" (2013, p. 411), the appearances of these objects can only relate to a milieu of exteriority, inserting and situating themselves across both ludological and territorial spaces to relate with others.

The extrinsic causal powers of guns in *Destiny 2* share a homology with the concept of the haecceity. In *A Thousand Plateaus*, Deleuze and Guattari state that nomadic assemblages

affect individuations through haecceities or intensive events (Deleuze and Guattari, 2013). For Deleuze and Guattari, a haecceity is an intensive event that produces a change within an assemblage's milieu (Deleuze and Guattari, 2013). In the case of an emergent object, however, it is not the assemblage that is affecting these haecceities, but the emergent object that has these powers. Thus, the power to produce becoming-events within the game space of *Destiny 2* is a specific type of haecceity belonging to the gun and only the gun. Hence, they are a *ludological haecceity*, that is, an intensive event taking place within the bounded environment of the ludus and subject to certain rules and regulations determined by the game's developers. These rules and regulations include gameplay mechanics structuring in-game events such as the weapon's damage relative to enemy types, reload speed, rarity or any other "special effects". These haecceities affect becomings in the gun's surroundings by causing neighbouring entities to enter into mutually constitutive relations with the emergent object. This reveals that at both the moment of arrival, and in the process of production, the relation between the productive relations of the platform-assemblage, and the emergent object and its milieu, is characterised by a constant series of becoming(s).

This applies to our emergent object in two distinct ways. First, the gun subjectivates the personae of the platform-assemblage by relating to them through peripheral hardware like controllers, keyboards, monitors, and mice. This ability to interact with the literal existential territory of the player enables the gun to call on the agential powers of the subject to influence the way that it is used in-game. Here, the personae of the assemblage, in addition to concrete hardware components, become a precondition for the event of a ludological haecceity, insofar as they provide the requisite conditions for effecting changes within the in-game environment. We see this when a player uses a controller to do things like cause damage, interact with other players, and transport the weapon about the world. These relations are not just confined to the user's visual faculties. The peripheral hardware of the Steam assemblage provides a multitude of ways for users to interact with these weapons, including actions like holding, using, or moving, as well as through other sensory experiences such as touching or hearing. This suite of experience-enabling features can also produce changes in the ludus such as making the player interact with the emergent object in such a way as to produce individuations in their surrounding milieu, i.e. moving something, slaying an enemy, or causing changes in the game's output in response to the user's behaviour.

Second, the gun, like the nomad, is a vector of deterritorialization within its milieu (Deleuze and Guattari, 2013). As Deleuze and Guattari (2013) note, the nomads' traversal across space produces changes and individuations within the surrounding milieu, i.e. the intensive events they call "haecceities". This causal power has the effect of making a space, which is to say that the individuations the nomad effects by emerging into a given space or place leads to the "becoming" of that space. Hence Deleuze and Guattari's aphorism that "...nomads make the desert no less than they are made by it" (2013, p. 445). This process surfaces when the arrival of an emergent object has a profound effect on a given milieu. The gun individuates a game space even as the inverse happens and the space comes to individuate the emergent object by producing new becomings. In relation to the gun in *Destiny 2* this vector is twofold. First the weapon "makes" the space one perceives on-screen by populating it, relating to other objects within the space, and being a potential conduit for the player's agency (as we see with weapons in video games). Second, this making-of-space is not confined to the screen but extends to the perceiving and interacting personae. Here the individual begins to make choices as to how to interact with the object and thus facilitate further becomings in the space by exercising their agency.

The predication of a gun upon the structure of a continent spanning platform-assemblage like Steam engenders the emergence of causal powers endemic to the weapon and only the weapon. The ability to not only call on the agential powers of the player who controls the weapon, but also to produce changes in the behaviour of other players and non-player characters (NPCs), showcases the effect of the trans-territorial assemblage in engendering an emergent object replete with a set of undetermined potentialities and properties. The emergent object's ability to act in a way that is neither wholly governed by the game as medium, produce becoming-events through its interactions with others, and contribute to the production of surrounding milieus whilst remaining ontologically distinct from the assemblage it resides parallel to, leads me to reject the claim that video game objects are equivalent to other fictional representations such as those found in painting or television. Whereas scholars like Grant Tavinor (2018) see video game objects as a "...functional quality of a representational, depictive, or interactional medium" (p. 149), and therefore as a form of fiction, I would instead argue that a weapon in *Destiny 2* is in fact an emergent form of game-specific object, and therefore that a more appropriate comparison would be with an object such as a paintball gun or a rugby ball.

The reason for this argument is twofold: the first is that the structure of *Destiny 2* as a platformised looter-shooter endorses a form of play that is less focused on the fictional aspects of its in-game story. Indeed *Destiny 2*'s story is a peripheral aspect of the game released periodically throughout the year in the form of a finite series of missions. As a result, the story of the game tends to be enjoyed by players as a reprieve from the repetitive unfocused play of the game but is not itself the main focus. Hence, rather than *Destiny 2*'s story, i.e. its fictional or narrative aspects being a definitive aspect of the game, the game is focused on providing an open-world sandbox through which players can compete with one another through raids and other such competitions. In this sense the broad emphasis of this platformised game is not so much on providing an interactive medium through which to tell a story. On the contrary, it is to provide players with a defined set of rules and settings to engage *each other* in game play. Here the subject positions of the assemblage, which in this instance is the players, appropriate the weapon as an object that is required simply to engage in gameplay in a way that is comparable to a paintball gun or rugby ball. In this case, although the technical complexity of emergent objects is conspicuous when measured against the simplicity of the ball, it alone is not sufficient grounds to confer a fictional status upon one and not the other. Presumably, I could create more complex forms of objects for non- digitised games, and they would still be accepted as real.

The parallels between the emergent objects of *Destiny 2* and more conventional “non-digital” game objects bring me to my second point. That is, that the interactivity between the player as part of the assemblage and the weapon as an emergent object has the potential to affect a set of ludological haecceities. In themselves, these haecceities cause the weapon to overcome the determinant form of a representation and move into the realm of emergent gameplay dynamics. The causal powers of emergent objects in *Destiny 2* prove to be bi-directional here, insofar as they factor into competitive play between players in meaningful and undetermined ways as well as in terms of the narrative itself. Where a gun in the context of *Destiny 2*'s narrative-driven gameplay could presumably be likened to a fictional representation because it factors into the performance of that story, a gun in the context of this platformised multiplayer game facilitates a multitude of relations that are neither governed by the narrative of the game, its mechanics, nor even the personae who use them. Rather, the emergence and singularisation of the gun against the milieu of the game space and the player proves to bring in each of these elements in generative and interesting ways. The gun emerges from the game space itself to arrest players in their unmediated contexts, in

their hands it becomes a tool that is used to both participate in the representational facets of the game, and to achieve their ends in the meta-practice of competitive play. In this way there is a double understanding of the emergent object as an object in-game, and the becoming-tool that occurs when players encounter it directly in their own milieu.

In concluding this section, it will help to take stock of where I started and where I have now finished. I began this section by stating that because of their predication on the assemblage of the Steam platform, weapons in *Destiny 2* bear an emergent relationship with the productive network of the underlying assemblage. I demonstrated this by exploring how a gun in this game emerges from, and exists alongside, a complex series of relations taking place between a group of heterogeneous human and non-human components. By juxtaposing the complex, disparate, and flexible nature of the Steam assemblage with the aesthetically homogenous yet simultaneously trans-territorial being of these emergent objects, I demonstrated the ontological irreducibility of these weapons to the underlying platform assemblage. In exploring the consequences of this relationship, I showed how these quotidian weapons garnered new causal powers endemic to only themselves, insofar as they could become involved in the production of ludological haecceities and other affective relations with the player. I then showed how these haecceities affect individuations in the weapon by causing successive events in which the weapon “becomes”. Specifically, via in-game actions and the mechanics (governed by code) that shape the contours of the weapon’s possibilities. As a consequence of this bi-directional relationality, I have argued these emergent objects are not readily comparable with “fictions” to the extent that their interactivity with the different personae of the assemblage transforms them into tools that are analogous with other game objects such as a paintball gun. In this way, guns in *Destiny 2* do not figure so much as part of the story or the game’s fiction; they are an essential part of play and inter-player competition used to achieve aims that may be orthogonal to the game as a narrative-driven representation. Thus, if one were to call them fictions, then this would run the risk of calling into question a number of other game-specific objects.

Conclusion

By emphasising the situatedness of weapons in *Destiny 2* within Valve's Steam platform I have revealed that their being is far more complex than what is apparent at first glance. The platform-centric approach taken in this chapter shows that video game objects are emergent objects produced by a complex assemblage of components. In using the example of a weapon in the looter-shooter *Destiny 2* I have shown that the interlinkages between different elements of this assemblage, from hardware components and infrastructures to abstract processes and graphical algorithms, all factor into the production of an emergent object. In doing so I have illustrated the utility of an emergentist approach to the ontology of these objects by showing how an ontological difference between the object as a differentiated entity, and the platform as an underlying assemblage, coincide with Broad's (2014) claim that emergent properties contain within themselves distinctive causal powers over and above the underlying system. This has been illustrated in how emergent objects like our weapon affect ludological haecceities and transform their milieus, even as they interact simultaneously with multiple players. The trans-territorial nature of the Steam platform and its productive network of components, then, have proven to be the engines for the perpetual becoming and emergence of the weapon. I suggest that my approach has shown that future inquiries into the being of digital objects should not look to a single part of the assemblage as the determinant of the emergent object, but rather, should examine this productive environment as a whole.

By adopting an approach that foregrounds the empirical reality of the assemblage and engages with platform studies, I have shown that video game objects are at least nomologically contingent upon the operations of this assemblage, and thus, emerge from them and exist alongside them. I suggest here that video game objects are ontologically parallel to these components in the sense that they occupy the same ontological plane as each component, and are nomologically contingent upon them, yet nonetheless, are irreducible to them. The video game objects of platformised gaming are thus more complex than mere fictional representations, or the data objects that constitute them. I suggest then that the neologism "emergent object" better encapsulates this relationship between what appears on screen and the infrastructures that undergird it.

Going forward, the arguments I have made in this chapter could perhaps open possible avenues for developing a more nuanced view of video game ontology and digital ontology as a whole. By engaging with the brute facts of digital production, dissemination, and circulation, in addition to emphasising the necessity of relationality, process and heterogeneity, subsequent research can begin to abandon hierarchical notions of “simulation” in favour of mapping out an emerging category of the real. Certainly, this foray into the novel existential conditions of video game objects like our weapon in *Destiny 2* sets something of an imperative for philosophers interested in digital ontology, as any alternative theory must endeavour to describe something other to what has hitherto existed. It is thus that I have endeavoured to make the case for Deleuze and Guattari’s assemblage in conjunction with the insights of platform studies as a means through which to ascribe what is *prima facie* an unlikely, but nevertheless robust set of conditions shared by the horse-archer war-machine of their treatise, and the emergent objects we encounter on screen. It is in this spirit of maverick externality, rapid arrival and departure then, that video game objects emerge amidst the interfaces, game spaces, and interstitial spaces of global computing.

Chapter 5: Non-Fungible Tokens

Introduction

In this chapter I argue that Non-Fungible Tokens (NFTs) constitute a form of emergent object. Synthesising the conceptual bricolage of assemblages, individuation, and becoming I developed in Chapter 2, with the technical analysis of computing in Chapter 3, I account for how NFTs are produced, instantiated, cultivated, and differentiated across different ontological registers. Although I am aware that classifying NFTs as a form of object can be contentious, given present debates over the nature of these entities, I will nevertheless make a materialist case for why NFTs should be viewed in these terms. While this chapter shares a common object of study with other contemporary analyses of NFTs (Wang et al., 2022; Vardhan et al., 2022; Dowdeswell and Nachshon, 2023), it differs significantly with respect to its overall focus, methodologies, and conclusions. While these previous studies have situated NFTs within socio-economic and socio-cultural practices of commodity production and consumption, this chapter focuses on the comparatively under-researched ontology of NFTs. Where researchers have generally sought to emphasise the tenuous relationship between the NFT as a technical object and the cultural object they stand in for, this chapter shows how the diverse range of socio-cultural qualities possessed by NFTs are, in fact, a product of their ontogenetic structure. I show that the ontogenetic structure of NFTs endows them with emergent causal powers and qualities, including ontological dynamism, mobility, and the potential to cause individuating events within their milieu. I argue that competing theorisations of NFTs are neither incomplete nor flawed in their analysis, and, furthermore, that we should not attempt to synthesise them into one meta-theorisation. On the contrary, my analysis reveals that the precarity of NFTs with regards to their identity, their economic value, and their legitimacy as an object, is not an incidental feature of their being, but rather, results from an ontogenetic structure that continuously engenders emergentist phases of becoming.

The analytical framework I use in this chapter draws from the work of Gilbert Simondon (2011, 2020), Gilles Deleuze (1994), Felix Guattari (1992), and Bruno Latour (2011). It incorporates a diverse range of concepts including emergence, individuation, immutability, mobility, and subjectivation to support my argument that NFTs are a form of emergent

object. From a philosophical and technical perspective, I maintain that the status of an NFT as an ontologically distinct object is predicated on a nomological relationship between itself as the emergent object, and the underlying assemblage of hardware and software that produces it. On the other hand, I argue that the mobilisation of NFTs as objects is equally indebted to the productive investments of capitalist machines operating transversally to it. Couched in Deleuzian terms, NFTs have been mobilised by anarcho-capitalist and technoutopian social machines to redefine the limits of what can be considered a commodity (Deleuze and Guattari, 2017). The result of this process is a new commodity in the form of an NFT that exists external to other more established machines, including those of the state and the judiciary. Like the other emergent objects analysed in this thesis, I contend that NFTs are distinguished by their grounding in a socio-technical substratum of hardware and software that both produces them and opens potential avenues for individuation. However, both the investments of multiple social machines and the manifold universes of meaning with which the NFT relates, have resulted in a constantly shifting set of identities and socio-cultural qualities assigned to these objects.

In the process of researching this chapter I was struck by the manifold attempts to conceptualise NFTs. Some authors consider NFTs to be either objects in themselves (Mackenzie and Bērziņa, 2022), an indexical “pointer” to an existing piece of art (Russell, 2022), or a virtual contract specifying one’s ownership over an art object (Lyubchenko, 2022). Despite the heterogeneous nature of each author’s approach, all seemed to be in general agreement when it came to the technical construction of NFTs. In each case an NFT was understood to be a unique token stored on the Ethereum blockchain that used a token standard such as ERC-721 or ERC-1155. The contrast between the relative stability of each scholar’s understanding of this technical structure and their suggestions as to its ultimate use (if such a thing exists), value, cultural relevance, or identity, suggests that even a complete description of every component, process, and standard will not serve to conclusively determine any of these factors. This indicates that the identity of an NFT is not entirely determined technically, but rather, emerges according to the object’s interaction with different universes of meaning, the investments of machines, and the desires of consumers. In this chapter I avoid making similar determinations based on observing context-dependent uses of NFTs. Instead, I examine the processes that create the very possibility for these multiple meanings, identities, and uses to emerge.

The task for this chapter, therefore, is not to conceptualise NFTs as part of an already existing category of commodities, signs or contracts. On the contrary, I demonstrate that the tendency of NFTs to open onto multiple regimes of meaning is a by-product of their technological being or techno-facticity. I argue that the ability to open onto these regimes is indicative of emergent causal powers beyond those determined by its underlying technical assemblage. These aims are reflected in the structure of this chapter. I begin with an initial descriptive section before embarking upon three separate stages of analysis. The first part of this chapter provides a brief history of NFTs, examining their roots in the histories of electronic cryptography (later to become blockchain), financial technologies, and networked technologies. In this section I explore the broader milieu(s) into which NFTs have emerged, showing how they have come to be mobilised by capitalist, speculative, and libertarian social machines. I then shift my focus towards studying the technical antecedents required to produce and maintain an NFT. In this section I look at how the technical structure of NFTs reflects a primary, machinically driven differentiation that is responsible for the production of an emergent object, and the socio-technical structures of crypto-platform computing that it is dependent on. Consonant with Chapter 4, I approach the underlying structure of a crypto-platform as a form of assemblage, that is, as a productive formation of heterogenous objects and processes whose interrelations constitute both the causal and spatio-temporal roots of NFTs. I then locate the becoming-object of the NFT in an individuating event that sees it detach from other fungible assets. I examine how a cluster of technical structures such as standards, smart contracts, and ledger systems enable a form of technical individuation that sees the object detach from its milieu.

In the next section I analyse the consequences of this detachment or “phase-shift”. I use Deleuze’s (1994) concept of difference and Gilbert Simondon’s (2020) concept of technical individuation, understood here to be the process of separation between a technical object and its surrounding milieu, to explain how NFTs emerge to become an entity in their own right and not just part of an existing program or algorithm. This concept of differentiation is used to explain how NFTs possess an ever-present potential for further individuation; here, I locate potential becoming-events within the interactive horizon that is formed as part of the emergent object’s relation to its milieu. I identify ERC standards in their various forms as the locus of this separation and the driver for this individuation. I explore the consequences of this separation in terms of Latour’s (2011) concept of the immutable mobile, linking the capabilities of NFTs with this category of inscription. Section four continues this theme by

exploring the importance of becoming through the lens of Felix Guattari's (1993) "incorporeal individuation" at the intersection of several universes of meaning. In this part of the chapter, I examine the relationship between the NFT and the surrounding socio-technical, and socio-cultural universes that drive processes of becoming. In doing so, I highlight the bi-directional function of the object-milieu relation to show how NFTs have figured in complexes of subjectivation, producing new groups of subjects such as NFT artists, crypto-enthusiasts, and speculators.

An Overview of NFTs and their Development

This section provides an overview of the socio-historical contexts in which NFTs have been created, mobilised, and operated. My aim is to show that NFTs did not emerge "out of nowhere" but are part of a series of technological developments stretching back to the 1970s. These developmental contexts are diverse, representing the culmination of several strains of innovation in three main areas: financial technology, electronic cryptography, and networked computing. Due to the diversity of this developmental context, I have divided this section into each of the aforementioned areas. I show how the coalescence of financial technologies, electronic cryptography, and networked computing led to the formation of present-day NFTs. More generally, NFTs attracted widespread public attention during the early 2020s after a series of high-profile sales coincided with increased public activity online. Perhaps the most noteworthy of these sales was Mike Winkelmann's \$69 million sale of an NFT representing the first 5000 works of his *Everydays* series, a sale that only contributed to increased public interest in these artefacts as potential investments (Kastrenakes, 2023). Over the ensuing years, public interest in NFTs as a form of investment, digital object, contract, or record of ownership has waxed and waned with successive hype cycles. As I mentioned in the introductory sections of this chapter, NFTs remain subject to a multitude of different interpretations and meanings in contemporary scholarship. As yet, NFTs do not have a single clear-cut meaning but are continuously shaped by competing conceptualisations that are strategically negotiated by a range of creators, platforms, organisations, and investment machines.

Before beginning this section in earnest, it will help to provide some background with regards to NFTs and other relevant terminology. When referring to "an NFT" or "the NFT", I am referring directly to the string of characters stored on a blockchain such as Ethereum

(Hartwich, 2023). While I acknowledge that there may be a colloquial understanding of NFTs as being synonymous with a reference object such as an artwork, contract, website, or other form of digital object (like a video game weapon), these are not NFTs in the strict sense of the term. On the contrary, I refer to the various object(s) that an NFT can index as reference objects. These reference objects are the supposed object that a given NFT is intended to establish provenance over. There are, however, instances where NFTs guarantee possession by storing their reference objects “on chain”. For example, the 2017 NFT series *CryptoPunks*. In this case, the artwork and the NFT can be synonymous with one another. In terms of my analysis, however, the merging of a reference object and the NFT does not invalidate my claim that NFTs are emergent objects but does perhaps result in interesting kinds of individuation through their increased aesthetic faculties.

The qualities possessed by NFTs as a class of emergent object are indebted to a group of technical processes that utilise the features of cryptographic technology. These features include the ability to securitise data, the transparency of a shared decentralised ledger, and the functional immutability of cryptographic tokens (Imran, 2023). NFTs are differentiated from other fungible assets that use blockchain by the ERC-721 smart-contract standard (Wang et al., 2021). This standard defines and enables certain attributes whilst also providing a unique ID code that makes this piece of data unique and unexchangeable. NFTs exercise provenance over a reference object by virtue of this smart contract. Here, the contract information stipulates the reference object or, in the case of on-chain works, contains the reference object itself. Contemporary commentaries on NFTs have sought to liken the uniqueness of the data and metadata stored on the blockchain to the organic singularity of a non-digital object (Arora et al., 2021). Where a traditional non-fungible object such as an artwork will have a unique position in both space and time and a history that cannot be exchanged like-for-like with another object (Benjamin, 1992), the singularity of an NFT is instantiated in the particularity of the code, and the accompanying record of the token’s history.

Despite gaining widespread attention in recent years, the origins of NFTs can be found as far back as the 1970s with the work of Whitfield Diffie and Martin Hellman on cryptographic keys (Imran, 2023). A historical analysis of the roots of NFTs reveals an indebtedness to a wide variety of developmental contexts, including those of financial, cryptographic, and networked technologies. These contexts will be traced in further detail below. To develop an account of the ontogenesis of NFTs, the broader socio-technical and socio-cultural histories

surrounding their development proves important. In keeping with the dominant analytical thread of this thesis, I situate the development of NFTs as a part of a primary process of machinic production in which the investments of social, cultural, and technical machines have driven the individuation of the object. From the perspective of Simondon (2020), for example, we see this in how a technical object or machine does not function in isolation, but rather comes into being in relation to a surrounding milieu populated by other technical objects. For their part, Deleuze (1994) and Guattari (1992) have expanded upon this idea to argue that technical objects are only ever partially individuated from their surrounding field, and are, as such, always preceded by a pre-existing milieu of social machines (Guattari, 1992; Deleuze, 2013). Despite this difference in terminology, however, both sets of philosophers share the assumption that a technical object is never isolated and is instead always conditioned by the assembled possibilities of its surroundings.

Following this insight from Deleuze and Guattari (2017), I argue that the capitalist machine (along with its various subsets and offshoots) precedes the genesis of an NFT. The capitalist machine does this by organising flows of knowledge and production, and, by constructing the context(s) in which an NFT is operated. The capitalist machine, therefore, figures in everything from the production of an NFT to its use, and signification (Deleuze and Guattari, 2017). While the technical structure of an NFT may stand alone in its technical facticity, that is, as a set of standards and time-stamped information, it is informed, produced, and attached to a broader socio-cultural milieu. This milieu dictates the conditions of its use and provides opportunities for further individuation. From this perspective, the history of NFTs is part of the broader history of internet protocols, blockchain development, and networked banking, with each of these fields being permeated by the axiomatic of the capitalist machine. For example, the core innovations leading to the creation of NFTs, such as the ability to securely timestamp, store, and maintain data on a decentralised network of servers, are underscored by an imperative to remove blockages in the flows of information, redefine the limits of a commodity, and generally advance the interests of capital. These intertwined histories of cryptography, financial technology, and networked computing attest to an ever-present desire to produce new commodity forms out of new technologies. Predecessors of the NFT such as Bit Gold, Digicash, and Bitcoin all bear witness to this desire to axiomatise cryptography in the form of a commodity (Letteri, 2021).

The long-standing relationship between NFTs and the field of cryptography can be traced back to the 1970s with Whitman Diffie and Martin Hellman's work on cryptographic keys. The following years saw further developments such as public key cryptography in 1978, Koblitz and Miller's elliptic curve cryptography in 1985, and the development of public timestamping in 1991 by Haber, Bayer and Stornetta (Imran, 2023). Following the integration of cryptographic keys and timestamping, several organisations attempted to integrate cryptography with networked banking, such as 1998's Bit Gold and 1999's Timesec secure timestamping system (Imran, 2023). These iterations not only contributed to what would eventually become blockchain technology, with Haber and Stornetta launching the first blockchain service Surety in 2003, but also represent the first attempts to mobilise cryptography and timestamping for the benefit of capital. In this context the combination of cryptography with timestamping was seen as a way to publicly represent one's ownership of a commodity or currency in a secure way (as was the case with Timesec and Bit Gold), or as was the case with Surety, to digitally seal documents as a way of assuring their authenticity (Whitaker, 2019). In this situation, the production of these cryptographic technologies was informed by an organisational logic that deployed cryptographic keys to insure commodities and information against tampering, specifically through the use of timestamping and the rapidity of networked transmission. Surety is also notable for the fact that it has gone on to become the basis for all later blockchain programs, popularising an algorithmic structure that marries a time-stamped ledger with a cryptographic hash (Whitaker, 2019). In effect, this linked a record of each transaction together. Consequently, if users were to tamper with one part of the data it would also disrupt the data of the whole chain – thereby revealing to the relevant stakeholders that the entire ledger had been compromised.

Surety's algorithm supplemented these features by distributing a shared ledger across multiple computers in the network (Whitaker, 2019). This meant that whilst there was no overarching network authority, it did mean that members had to put their trust in the algorithm. Without going further into the minutiae of these developments, it is important to point out that the creators of Surety effectively established an acceptable method through which to ensure trust and security across a network. In effect, Surety's structure made the information stored on this shared ledger very difficult to tamper with. This engendered trust between actors and organisations using these infrastructures to record and document transfers despite a lack of central authority and the anonymity of users. The affordances of Haber and Stornetta's blockchain would go on to inform the person or persons who would eventually

create Bitcoin. Indeed, out of the nine sources cited in Bitcoin's inaugural white paper, three of them directly cited Haber and Stornetta's work. Bitcoin was also only created after Haber and Stornetta's blockchain patent had lapsed (Whitaker, 2019). Bitcoin would then go on to garner widespread attention as the original and most valuable cryptocurrency, eventually spawning the competitor known as Ethereum which has now become the standard blockchain through which to create NFTs.

As transferable digital assets, NFTs are indebted to innovations in the field of financial technology. They rely on a specific set of mechanisms through which to record exchanges of currency (both crypto and non-crypto), in addition to providing the necessary affordances for buying, selling, and storing NFTs. NFTs, then, are situated in a broader milieu encompassing blockchain cryptocurrencies and anonymous, decentralised, and networked transfer systems operating outside of the purview of more established banking territories. From a socio-cultural perspective what we see here is the influence of anarcho-capitalist machines upon both how NFTs are used to prove ownership in under-regulated markets, and their adoption by a set of typically libertarian tech-enthusiasts. At a technical level, NFTs are a product of the widespread integration of blockchain-enabled decentralised ledgers with an automated transaction system. However, their use has historically been informed and negotiated by anarcho-capitalist machines. For example, purchases are idealised as being anonymised and actioned without the intervention of a higher financial authority. This is a fact often touted by crypto-enthusiasts who argue that decentralised peer-to-peer markets are superior because they can be operated without the need for an overarching state-assemblage that disrupts the flow of commodities. While Bitcoin and Ethereum are certainly the most well-known examples of decentralised ledgers, they are nevertheless indebted to spiritual predecessors such as Digicash, which was an anonymous electronic cash transfer system, Bit Gold, one of the earliest forms of decentralised digital currency, and B-Money, an early prototype of a decentralised cryptocurrency (Imran, 2023). The various iterations and their respective innovations regarding networked finance helped to establish the eventual basis for NFTs. In their own way, each of these spiritual predecessors sought to draw on technologies that facilitated the flow of capital despite the limitations and risks inherent to anonymised and decentralised systems.

The release of Bitcoin in 2008 was a continuation of this trend of using blockchain to create anonymised decentralised currencies. In recent years, Bitcoin has been effectively mobilised

by anarcho-capitalist machines as a vehicle through which to effect transactions outside of state-backed modes of exchange. For example, countries such as Singapore have identified it as a popular method to launder money related to criminal enterprises, while El Salvador has opted to make it legal tender as of June 2022 in an attempt to profit from an enthusiast set eager to adopt it. Like Surety, Bitcoin employs the same basic architecture of block and hash, but it also offers a financial incentive for users to maintain copies on the ledger. This financial incentive originated with a practice known as “mining” where users could win bitcoins by solving mathematical problems tied to verifying a transaction hash. Thus, the “miner” can profit from maintaining the links between blocks by unearthing an occasional Bitcoin in the process (Whitaker, 2019). The value of each Bitcoin is in some part derived from Nakamoto’s imposition of artificial scarcity. The limited number of coins has resulted in their becoming increasingly valuable alongside increased demand and the intensification of mining. However, the value of Bitcoin has also been subject to other sources of volatility. There have been several significant fluctuations in the price of Bitcoin due to speculative buyers, criminal organisations looking for ways to launder money outside of the purview of the state, and early adopters who see it as a groundbreaking technology.

The attempted commodification of blockchain technologies continued with the launch of Ethereum in 2015. In response to the absence of a Turing-complete programming language application native to Bitcoin, Ethereum came complete with an accompanying application interface known as the Ethereum Virtual Machine or EVM. This programming application represented a major improvement over the architecture of Bitcoin, as it provided a toolkit for programmers to create and propose new applications, smart contracts, and token standards for the blockchain. Ethereum was where the first token standard for NFTs emerged – ERC-721. The term “ERC” stands for “Ethereum Request for Comment”, which was a direct reference to older Request For Comment (RFC) protocols used to build and refine the TCP/IP network from the late 1960s onward. In this early period RFCs were essentially a series of type-written, and later digitised, technical documents that could be created by any of the computer programmers working on this project (Braman, 2011). In later decades many of these RFCs would be enshrined as a set of operational protocols, procedures, and standards guiding subsequent TCP/IP development. In a similar way to RFCs, ERCs function as a framework through which developers can suggest new token standards and protocols for the Ethereum network. However, where RFCs had a lower threshold for acceptance insofar as they were developed collaboratively by programmers and implemented iteratively, ERCs must undergo

a vetting and editing process overseen by a board of editors who have the ultimate authority as to whether an ERC is approved or not (Becze and Hudson, 2015).

This mechanism for suggesting, actioning, and establishing new applications led to the codification of the first NFT standard – ERC-721 – in 2018. This standard facilitated the creation of a unique and indivisible piece of data contained within a smart contract. ERC-721 is a smart contract containing the necessary affordances for executing and minting an NFT. It provides a framework through which creators can inscribe a data sequence demarcating an NFT as unique, while also containing a section where the creator can “chain” the NFT to its reference object (Arora et al., 2021). Where Ethereum gas and Bitcoin mimicked fiat currencies by being fungible and divisible, NFTs are neither divisible nor exchangeable like-for-like with another token. What makes an NFT unique, in this case, is the specific information contained within its smart contract. Namely, the unique hash and the descriptors specifying its provenance. Situating the creation of the ERC-721 standard within the broader flow of blockchain commodification, the mobilisation of cryptography, and the continual development of financial technology reveals that NFTs are a new machinic phylum. A phylum that draws these disparate technologies and social machines together to create a new commodity form. Whereas fungible cryptocurrencies tie directly into the capitalist machines quest to deterritorialise state, and other institutional flows of currency, the creation of NFTs takes this logic further to create a form of object that can overcome the limits of digital replicability through the instantiation of non-fungibility.

I will delve further into the socio-technical specifics of NFTs in the sections below. The purpose of this section has been to situate these objects in their historical context through a machinic lens. This overview has shown that NFTs are the product of generations of historical developments, benefiting from early work in cryptography, establishing feedback mechanisms based on the RFCs so integral in the early days of internet development, and incorporating the anonymised transaction mechanisms originating in the networked finance sector. NFTs, therefore, represent the convergence of several technologies and their accompanying social systems. Their existence is predicated not only on the technical knowledge of programmers and engineers, but also on the ability for these individuals to suggest and implement changes in an environment that is open to the possibility of change. The history of NFTs reveals that they are a fundamentally socio-technical product, one equally indebted to the technical affordances produced by successive generations of

technological production and innovation as they are to the social structures providing avenues for their stabilisation. While there is much more that I could say on this subject, it is now time to turn my attention to the ontology of these objects and how this series of interactions between these technologies engenders the emergence of the NFT-as-object.

The NFT in its Socio-Technical Structure

In this section I examine the technical antecedents of NFTs. I ground NFTs as ontogenetically individuated emergent objects and show that they are emergent entities that are differentiated from an underlying assemblage yet dependent on it. In terms of the procession of individuation that runs through the present work, this section marks a point of transition from a milieu of machinic production, to an assemblage. The relationship between the object as an emergent entity, and the assemblage as the system on which it is dependent, is one in which the NFT is produced in a privileged event of differentiation. This means that while there is a relationship of contingency between the emergent object and the assemblage, it is neither ontologically identical to this system, nor is it capable of being reduced to a set of components. NFTs also only emerge within a pre-existing milieu, one that is constituted by social machines that invest in and mobilise the object according to their whims. In this sense, the individuations that are taken on by NFTs, i.e. becoming-commodity or becoming-object, are not incidental features determined by the underlying assemblage. On the contrary, these individuations, and the becomings they drive, emerge only in relation to the milieu(s) in which the object emerges.

This section proves that like all emergent objects, NFTs originate within a technical structure that encompasses a set of conditions, components, and relations necessary for their emergence. I start this project by examining the hardware antecedents required for this emergence before going into the specific software components of blockchain, smart contracts, and token standards. Here, I avoid the pitfalls of a reductionist argument by showing that the emergent properties of NFTs are the product of the relations between each of these components as opposed to just one component or another. To this end, I use Deleuze and Guattari's (2013) assemblage theory to encapsulate the productive relationship between this group of heterogeneous components. These components may range from the structure of the code and the programmatic architecture of the blockchain, to the hardware ensembles of an NFT's host server, and the invocations of actors.

NFTs are unable to exist independently of the arrays of hardware, power infrastructures, and networks facilitating their production, dissemination, and performance. They also require an agent or agents to produce and distribute them, as well as someone who invokes them through a computational assemblage (Chesher, 2023). Without this necessary but flexible array of concrete infrastructures and actors, the code constituting various NFTs would not be able to run, and therefore, the object would fail to emerge. This contingency on an assemblage is a specifically “metastable contingency”, which is to say that an emergent object remains reliant on an assemblage of human and non-human components even after it has emerged. The metastable contingency of NFTs is also a relationship of individuating difference as the differentiation of the object is driven by the productive capabilities of the underlying assemblage. Thus, while the properties of an NFT are clearly distinct from those of the assemblage that it depends on, it continues to espouse this assemblage because it cannot become fully separate from it. In this case, although an NFT is dependent on the hardware and software structures of globalised and platformised computing to exist, the qualities and properties assigned to it are in no way exhausted or entirely determined by its technical antecedents.

Before mapping out these antecedents there is still a notable structural difference in the kind of emergence characterising the being of an NFT. While I follow CD Broad’s (2014) theorem that NFTs are emergent to the extent that: (1) they are neither identical to, nor derivative of, the underlying physical properties of the system; (2) emergent properties are genuinely causal (i.e. they have causal powers independent of these underlying physical properties); and (3) they emerge only when an appropriate set of physical properties are instantiated, there is still a certain amount of play or flexibility in the arrangement of the physical properties of this underlying system. In Chapter 4 I discussed this flexibility in terms of the gun in *Destiny 2* and its relationship to the Steam assemblage. I showed that the gun persists as an emergent entity despite permutations in this underlying assemblage, for example, when a software update occurs, a server crashes, or a player logs out. In a similar manner, an NFT might experience some perturbations in its technical structure; for instance, when it is stored on different hardware, when it is transferred across platforms, or when it undergoes a change of ownership. Despite these changes an NFT maintains both its emergence and its identity as a particular being. In this way the metastable contingency of an NFT upon a base-level of hardware and software is certainly a necessary condition for its existence, but it is not itself

subject to a specific or immutable arrangement. Indeed, immutability is only necessary to one specific component of an NFT which is itself predicated on a baseline of hardware and software; everything else maintains a degree of flexibility.

The ontogenetic structure of NFTs can be analysed using the heuristic of the assemblage and broken down into a triumvirate of abstract machines, concrete assemblages, and personae (Nail, 2017). Beginning with the “concrete assemblages” of an NFT, I use this term to refer to the tangible set of components and relations that constitute the underlying physical system of the emergent object. Despite this focus, I will not be discussing the role of hardware beyond acknowledging it here as a necessity for the NFT as an emergent object. Despite the centrality of interchangeable components like hardware arrays, network infrastructures, etc. to the production of NFTs, this topic was exhaustively covered in Chapter 3, and there is not a substantive difference between what has already been discussed to warrant going over them again. The flexibility of these hardware arrangements also means that it is not necessary to point out a *particular component* as being integral to the NFT’s existence, rather, it will suffice to say that NFTs are predicated on a distributed network of computers, servers, and other infrastructure as discussed in the previous chapter.

I will instead focus on the blockchain(s) that NFTs are predicated on, the standards that they use (i.e. ERC-721), and finally, the decentralised platform infrastructures that facilitate their circulation. In each case I take these elements to be the existing embodiment of the assemblage – they are the concrete forms through which the assemblage realises itself and through whose interactions the emergent object is produced. More to the point, it is these specific aspects of NFTs that demarcate them as NFTs and not another kind of object – they separate a piece of code from a previously generic mass and maintain its sanctity against forceful reproduction and alteration. I will also emphasise that it is the affordances of blockchain construction and ERC standards that enable the differentiation of an NFT as an emergent object. This is because they replicate the qualities of non-digital or non-emergent objects by separating (i.e. individuating) them from their milieu (Simondon, 2011), which in this case is the computational assemblage. I have chosen to group these software elements in this category because of the homologies between code and concrete assemblages. That is, each of these concrete assemblages is effectively instantiated discursively by the programmer when the code is written, is related to physical processes such as the firing of electrons across hardware, and most importantly, does not represent the possibilities of an assemblage in an

abstract form. On the contrary, the token standard, blockchain, and smart contract produce the individuations through which becoming possibilities are then created.

At the time of writing, NFTs can be predicated on several variants of blockchain technology. The popular NFT marketplace OpenSea (2023) lists Ethereum, Polygon, Arbitrum, Optimism and Klaytn as possible blockchain options through which one can create, store, and trade NFTs. Each of these blockchains has its own idiosyncratic relationships to Ethereum token standards as well as its own protocols governing minting and storing NFTs. This chapter will be focusing specifically on Ethereum because it is the first, and most well-established, blockchain for creating, storing, and trading NFTs. Notwithstanding the diverse range of blockchain templates available to prospective NFT creators, each token relies upon a basic combination of data and hash to ensure that their authenticity and exclusivity is verifiable within a market setting. The blockchain is integral in this respect because it provides a secure record of ownership that can be registered by all users across a distributed ledger and thus ensure confidence in the validity of the information.

The first concrete assemblage contributing to the emergence of an NFT is the block and hash structure of blockchain technology. From an analytical perspective, the present emphasis on the blockchain is due to the fact that it provides a protective infrastructure that preserves an NFT's singularity against external interference. Thus, the blockchain contributes to the singularisation of the object by making it immutable (Park et al., 2022). The structure of Ethereum's blockchain means that additional applications such as smart contracts and token standards can operate concurrently with this added securitisation. This securitisation is achieved with an object-oriented organisational structure that arranges data into "blocks" containing specific information and protocols before linking them together via a hash. Like OOP programming, there is not a strict resemblance between these data blocks as a representation of the NFT or as an object-in-itself; instead, these blocks are concretised by the programmer's interventions and contain purpose-specific information.

Every block within a blockchain is composed of a combination of data, the hash of that data, and a pointer to the previous block (Park et al., 2022). The hash is the unique identifier for the block. It is generated algorithmically based on the type of data that is stored within each block, hence, if someone were to change the data of any block in the chain, the hash would change too (Park et al., 2022). The mutual feedback between data and hash enables the

blockchain's securitisation function. By making the interlinkages between each block contingent on the sanctity of the data contained therein, programmers can assure the so-called immutability of the chain. This is because the chain is produced by calculating the hash of a previous block and incorporating it into the data of the next block. Therefore, if one were to alter the data of any of the blocks within the chain the interlinkages would fail, given the lack of resemblance between former elements (Park et al., 2022). The transformation of code and its interlinkages into an asset is predicated on the blockchain's imposition of immutability, as it can no longer be modified or reproduced without altering the thing in and of itself.

NFTs also require the addition of smart contracts to the blockchain. These contracts enable the creation of token standards such as ERC-721 which are then used to make a particular token unique, and therefore non-fungible (Arora et al., 2021). Smart contracts are a form of automated application that provides a group of programmatic affordances through which creators establish a basic template for NFTs. This is where the structure of interrelations between particular concrete assemblages such as blockchain, smart contracts, and token standards come to the fore – smart contracts offer a pathway through which programmers can inscribe certain qualitative properties upon a piece of code. Without the added securitisation of the underlying blockchain, however, these qualitative properties could be altered at will or copied indefinitely, thereby compromising the continued individuation of that object. Smart contracts allow the creators, or “minters”, of an NFT to establish a predetermined set of stipulations, rules, and conditions that once met, can allow the release of funds or the execution of other commands (Park et al., 2022). The addition of smart contracts is one of the central individuating processes leading to the NFT's eventual formation as an emergent object, because they endow it with a set of characteristics, qualities, and behaviours that distinguish it from other undifferentiated pieces of blockchain.

NFTs are differentiated from fungible cryptocurrency tokens by the ERC-721 token standard. This standard is used by prospective creators to make a token non-fungible by codifying its scarcity (Park et al., 2022). The ERC-721 token standard achieves this by making a formerly exchangeable crypto token non-exchangeable with others, thus singling it out as unique or non-fungible. As an additional application, token standards form an ensemble with the blockchain, and in the process, produce a completely individuated token. The ERC-721 standard provides several mechanisms for individuating a piece of code to an object-in-itself. First, the metadata of the NFT and its ownership is publicly available and readily transparent.

This means that one can make a concrete and recognisable claim of ownership over the object, and that this ownership is reflected by the NFT and the Ethereum market (Park et al., 2022). Second, the property of transparent execution makes all activities relating to the NFT, such as minting and transacting, readily available to the public. Third, it enables every NFT to be traded and exchanged, ensuring that the scarcity created by the code is supplemented by exchangeability. Hence, NFTs can be exchanged using fungible assets such as different forms of currency. Further to this, creators can control other parameters such as scarcity by modifying the number of NFTs minted, and whether or not they will receive royalties upon subsequent resale(s).

The final aspect of NFTs worth considering is the operation of the ERC-721 standard as another driving force behind the token's individuation. I use "individuation" here to signify the becoming-individual, or rather, the becoming-NFT of the emergent object as well as to emphasise the role of the ERC-721 standard in this process (Simondon, 2020). This is not to reduce the becoming-object of an NFT to something as formulaic as blockchain ERC-721 + reference object = NFT/emergent object, but rather, that features of ERC-721 such as exclusivity, immutability, exchangeability, etc. differentiate the NFT from what was previously a fungible series of tokens in such a way as to allow it to interact with regimes of economic, cultural, and social values. The interaction between the smart contract, token standard, the blockchain, and the reference object it presides over provides a necessary agglomeration of entities, affordances, conditions, and individuations from which the object can subsequently emerge. We see from this grouping of concrete assemblages that the emergence of an NFT is subject to a particular arrangement of an underlying physical system. This arrangement then initiates a phase-shift where a formerly fungible piece of blockchain becomes differentiated enough to become subject to market forces, scarcity, and fetishisation as an object in its own right. But, where physical assets still have properties such as weight, spatio-temporal coordinates, and a more tangible sense of materiality, NFTs achieve a sense of objectality through a process of individuation. This process binds a representation (or may not in certain cases) with an agreed-upon social contract that links a piece of code with established practices of ownership and exclusivity. Indeed, because ERC-721 maps an owner to the NFT's unique identifier, ownership is a) ensured against unlawful reproduction, and b) able to be recognised and thereby able to have its value socially constituted on account of these safeguards. In this way, standards provide a technical insurance that, in turn, serves to drive the NFT's value as an asset.

In this section I established that the structural roots of NFTs not only encompass a wide array of hardware components, but also rely on the interrelations between the following components: blockchain, smart contracts and token standards. I showed that the productive bases of an NFT, like the gun in the previous chapter, was a computational assemblage. While blockchain technology helps to securitise the underlying data and ensure its sanctity against external interference, smart contracts enable further individuation by letting creators establish certain conditions for use, and ERC standards like ERC-721 help to demarcate a token from others. In the next section I demonstrate that this underlying assemblage of components, and the relations between them, helps to establish the conditions necessary for the emergence of the NFT. Beyond this, I also want to point out that these components imbue this newly emergent object with a horizon of possibilities that extends beyond what is inscribed in these underlying technical structures; this includes its mobilisation by social machines and its own possibilities for fetishisation, individuation, and socio-cultural construction. The following section departs from this point to examine the consequences of this form of emergence, before looking at how this structures the kinds of individuation NFTs undertake.

Individuation and Becoming

The assemblage of hardware and software underlying an NFT not only drives the individuation of the object but is also responsible for endowing it with a suite of qualities typically associated with non-digital objects. These qualities include permanence, provenance, and historical singularity. Determining why the productive relations between the blockchain, smart contract, and token standard figure so heavily in the process of becoming an object, however, mandates taking a closer look at the individuations driving the differentiation of an NFT from its milieu. In this section I approach the genesis of NFTs through a Simondonian framework of individuation and phase-shifts. I use the term “phase-shift” to refer to substantive changes in the object’s milieu, while individuation refers to the ongoing process of becoming-object undertaken by an NFT (Bardin, 2015). Although I draw from the work of Simondon (2011, 2020) in this section, I do not confine the milieu or the process of becoming-object to technical operations. In keeping with the ontogenetic framework of machinic production and the metaphysics of Being-as-becoming, I see

individuation as encompassing the socio-cultural, technical, and causal regions of becoming-object.

My position here aligns with Guattari's (1992) argument that the machines do not succeed technics, but rather, are a precondition for it. Social machines underpin an operative context in which NFTs are produced, used, and understood (Sauvagnargues, 2016). Evidence of this productive machinism surfaces in the history of NFTs and their emergence after several attempts to produce new commodity forms using cryptographic technology. Here, cryptocurrencies emerged as a new form of commodity and have been closely associated with techno-capitalist and anarcho-capitalist social machines. As we have seen with Digicash, Bit Gold, and Bitcoin, the capitalist machine and its anarcho-capitalist offshoots have periodically attempted to mobilise cryptography to produce de-centralised forms of currencies. While this section examines the relationship between the base components of an NFT and the origins of technical objects using the work of Simondon (2011, 2020), I also follow Guattari's (1992) later insight that the milieu contains a myriad of universes of meaning operating concurrently with one another.

NFTs meet Simondon's (2011) condition for becoming an object – they are produced by a phase-shift that sees them become differentiated from their surrounding milieu. This phase shift, however, occurs as a result of the interrelations between each concrete assemblage and a subject rather than the crystallisation of labour. The formation of the NFT as a newly differentiated object, therefore, is a process of emergence. This is because the NFT's separation from its milieu is dependent on pre-existing technical apparatuses and the social machines that produce them, i.e. our concrete assemblages, our anarcho-capitalist machines, and the subjects who create and purchase them. This moment of separation is driven by the interrelations between the concrete assemblages of the blockchain, smart contracts, and token standards, as well as the personae of the assemblage. In the first part of this section, I ground my analysis of emergence with an overview of technical individuation. I emphasise the importance of an object's separation or differentiation from its milieu, and how this separation is the locus for establishing its borders in relation to a surrounding field. I provide an interdisciplinary perspective on this separation by reading the becoming of NFTs through the lens of Bruno Latour's (2011) "immutable mobile". Later, I use this framework to explore the implications of this differentiation for NFTs. Namely, how the transition of an NFT into a unique object engenders the production of competing meanings, uses and operations.

In Simondon's work a technical object is defined by its separation from the primordial unity of the world, or milieu (Simondon, 2011). In becoming distinguished from the world, the object takes on a technical mode of existence — it is no longer a part of the world, but rather, mediates between an individual and a previously unified field (Bardin, 2015). Where the surrounding world was a primordial “unity” rather than an ensemble of objects, the continuous fracturing of this world for Simondon (2011) resulted in an ever-expanding milieu of technical objects. In this way each technical object becomes separate, distinct, or otherwise differentiated from this now heterogenous milieu (Simondon, 2011). This separation from the world results in an object that is both dynamic and mobile. Having been liberated from what was previously an under-differentiated technical ensemble, the object is free to traverse this milieu that then becomes a ground for the object. The differentiation between technical objects and the world-milieu enables the object to take on the status of an individual and undertake interactions with the world on its own terms (Bardin, 2015). Where there once was an under-differentiated milieu or unity (before being fractured by the first technical object and so on), there is now an object and field between which interactions can take place. In turn, these interactions form the basis of phase-shifts or events, where the newly emerged object both “becomes”, and produces becomings, taking on new characteristics, qualities, and identities, after each interaction (Bardin, 2015).

Reaching the threshold of objectality is not simply a matter of nominally classifying a thing as an object, nor is it a matter of the object's identity being socially constructed. Instead, the moment of differentiation represents a particular mode of being taken on by an object once it has undergone the process of separation from its milieu (Simondon, 2011). This initial separation provides the conditions for a subsequent process of individuation which, for Simondon, denotes a series of possible aleatory relations between the object and its surrounding milieu (Simondon, 2020). Although one might be tempted to dismiss the interaction between an object and its milieu as mere exterior relations, and therefore, as being insignificant to the ontological constitution of the object, they are significant because they continuously re-produce that object (Bardin, 2015). I suggest then, that an NFT has not exhausted the possibilities of its being once it has emerged; rather, the event of emergence instantiates a new series of possibilities and relations that will influence the kind of thing it will become. Taking this approach to NFTs remedies certain weaknesses inherent to constructivist and nominalist approaches to these objects as it allows me to conceptualise

them as objects while acknowledging their contested, precarious being within a framework of ontogenetic plasticity. My attention now turns to how NFTs are produced and how this process of individuation figures into their crystallisation as an emergent object. While most of the descriptive work to this end has been done insofar as establishing how blockchains, smart contracts, and token standards interact with one another to produce the necessary conditions required for the existence of NFTs, how this figures into their overall ontogenetic structure warrants further analysis.

NFTs are produced by a person, or persons referred to as a “minter”. The minter’s labour is essential for the initial determination of the qualities, attributes, and provenance (as in the case of its reference object) of the NFT. However, the ability to determine these initial qualities stems from the expanded affordances of the token standard, smart contract, and the blockchain underpinning it (Vardhan et al, 2022). The interrelations between these three elements constitute the necessary conditions for producing an individuated NFT. Both the process for “minting” an NFT and its underlying technical structure reveal the factors driving the emergent object’s initial separation from its milieu, and, why it is insufficient to use the term “technical object” in reference to NFTs. First, the process of minting an NFT indicates that there is a minimum amount of labour that goes into creating it. The minter is thus a subject embedded in an assemblage of hardware, token standards, blockchains, and other computational structures. NFTs are not produced *ex nihilo* then but come into being through the efforts of their creator and the creator's interaction with an assemblage. In Simondonian terms this initial act of creation is what engenders the production of a technical object, because it represents the crystallisation of the intentional labour of the subject (Bardin, 2015). However, as we have seen, this moment was preceded by several machinic couplings such as the investments of capitalist and anarcho-capitalist machines, the mobilisation of the blockchain, the invocation of the minter, and the desires of consumers. Hence the process of minting an NFT can be thought of as an individuating moment or phase-shift that sees the formation of an assemblage and the separation of the object from a previously undifferentiated milieu. This moment brings a set of disparate concrete elements into relation with one another and solidifies the relations between them, resulting in the formation of an object. In other words, it is the phase-shift that instantiates a privileged individuation in which a difference is established between the emergent object and world.

While NFTs share the requirement for a subject's intentional labour to become separated from their surrounding field, they differ from Simondon's technical objects in one crucial respect. Contrary to Simondon (2011) who designated the detachment of the technical object via the crystallisation of the subject's labour as the initial moment of separation, NFTs as emergent objects prove to be more complex. This is because this separation is itself predicated on yet more technical and socio-technical processes. The milieu(s) in which NFTs are produced are already themselves socio-technical; certainly, the creation of an NFT is predicated on three key concrete assemblages, not to mention the numerous hardware antecedents that are causally necessary for their emergence. In addition, it is worth returning to Guattari (1992) here to note that a minter's choice to create an NFT is not usually incidental. Instead, they will often create an NFT at the behest of corporations like the NBA, Ubisoft, or Sotheby's, or will create one to commoditise one of their own creations. In this way the crystallisation of the minter's labour is itself contingent on a pre-existing suite of technical objects and social machines. This crystallisation relies upon both the technical interlinkages of three distinct lower-level components, as well as a set of organisations through which the newly emerged object can circulate. As such, the origin of the NFT is an ontogenetic process of becoming-object, where the separation from its milieu is already contingent on other technical objects and social machines. The effectiveness of the subject's attempt to differentiate the NFT as an object, therefore, is contingent upon the existence of other technical objects and machinic structures. In this way the very separation of the NFT, i.e. its becoming-object, is in fact a moment of emergence that is contingent upon pre-existing social fields, the intentionality of the minter, and the interlinkages between heterogeneous components. Because of this added complexity, NFTs are emergent, rather than technical objects.

The emergence of the NFT represents a privileged moment of differentiation, or a becoming-distinct in relation to its milieu. It is in this moment of differentiating itself that it gains the potential to become a mobile object. In using the terms "mobile" and "mobility" here, it is not my intention to draw a direct comparison between the spatialised mobility of physical objects and the more complex flows of NFTs. I do, however, suggest that the separation of the NFT and its emergence as an object does give it the ability to traverse and circulate through milieus in a manner that is both distinctive and productive. This mobility is a result of becoming separated from the surrounding field and a newfangled framework of self-referentiality. While a pre-individuated milieu cannot entertain a reference to an individual

entity, and therefore has limited capability to record changes within itself, the individuated NFT can (Bardin, 2015). By virtue of being sufficiently differentiated from its milieu and thus also having the ability to relate to other things in its own right, the possibility of movement in relation to the milieu arises. Here, the self-referentiality of NFTs is simply a result of becoming individuated as an object and gaining a history that is unique to itself. For example, the properties and features provided by the concrete assemblages underlying the NFT help to register and record aspects of its history such as the date of its creation, how many times it has been transacted, and its movements across networks and wallets (Arora et al., 2021). The in-built transparency of the register also makes this history available to all members of the network, meaning that information regarding its history is readily available to all individuals on the network.

NFTs and their newfound properties of mobility and self-referentiality recall Bruno Latour's (2011) concept of the "immutable mobile". In terms of its intellectual genealogy, this notion emerged from a lineage that originated (in a very general sense) with Simondon, continued with Deleuze and Guattari, and was adopted by scholars from Science and Technology Studies (STS). The concept of an "immutable mobile" was initially intended to explain the evolution and success of different methods of inscription, as well as the knowledge(s) that these inscriptions conveyed. An immutable mobile is a kind of ideal inscription that enables the robust transmission of knowledge across different actors and institutions. At its core, an immutable mobile has two key properties – immutability and mobility. For immutable mobiles the former property mandates that the information contained within the inscription should remain consistent (i.e. immutable) even as it experiences perturbations in its surrounding environment and is transferred across different actors and institutions. On the other hand, the requirement for mobility means that this inscription should be mobile, that is, easily transferable and transportable across actors and territories. In this way, Latour (2011) argues, immutable mobiles function successfully as a form of rhetorical device because the combination of mobility and robustness has helped to establish common bodies of knowledge across disparate territorial arrangements. In turn, this has helped establish higher levels of consensus over the information contained within the inscription and ensure that the same information can now be reached by multiple actors across multiple territories. Thus, an immutable mobile can convey information consistently across multiple actors whilst remaining functionally the same.

In the case of NFTs, the combined mobility of the newly emerged object and its newfound sense of self-referentiality reflect some of the key characteristics of Latour's (2011) "immutable mobile". At first glance, this is obvious with the mobility of NFTs in that they are capable of being transferred and circulated through networked markets and infrastructures. Before proceeding with this analysis, however, it is best to delineate between where NFTs are referred to as a single entity, and where they are referred to as a category of things. This is because a single NFT is by definition a unique object, and thus, the information contained or inscribed within each object remains wholly unique to it – hence its non-fungibility. On the other hand, NFTs as a *category* of immutable mobile have a shared set of characteristics that serve to underwrite their immutability and define them as a distinct type of inscription. Hence, when discussing NFTs as a category of emergent object, it is evident that their immutability is underwritten by the securitisation of a blockchain that makes it difficult for actors to tamper with the information contained therein (such as who the owner is, the reference object, etc.), while the information itself may remain unique to itself and only itself.

NFTs as both a category of emergent object and a specific emergent object can traverse the spatialities engendered by different crypto networks while ensuring that the information they carry remains the same. For specific NFTs, this is achieved through an embedded technical structure that makes the transaction dependent on both the technical assurances of the distributed ledger, and the underlying blockchain. Transferring an NFT can only be achieved by meeting a set of predetermined conditions laid down by the creator, owner, or platform which, upon being met, let an NFT be transferred between individuals and organisations. Attempting to tamper with the underlying record of the transactions (such as who owns it), will prove difficult because of the underlying blockchain. Taking a categorical perspective, the mobility of all NFTs is ensured by the way that they are discursively structured as a category, that is, that they are by definition mobile. For example, the ERC token standard governing the creation of an NFT either implicitly or explicitly defines it by the fact that they are at first networked, that they are capable of being owned and traded, and finally that the record of this ownership is publicly available to the extent that its owner is identifiable. As Latour (2012) points out, making the inscription, in this case our NFT, both available to the masses (in terms of its ownership being publicly available, and the inscription circulatable) and difficult to tamper with (i.e. it is underwritten by the securitisation of the blockchain), means that the object is able to silence "dissenters". Specifically, by assuring the

information's sanctity to a wide range of different actors. As such, NFTs appear to be a new form of technically underwritten category of inscription that underpins one's ownership of an asset.

NFTs also embody Latour's (2011) suggestion that creating a successful mode of inscription means to "...invent objects which have the properties of being mobile but also immutable, presentable, readable, and combinable with one another" (Latour, 2011, p. 66). This is most easily demonstrated with reference to the various taxonomies of NFTs from scholars such as Ali and Bagui (2021), who identify the property of immutability as a central characteristic of NFTs. It is easy to see here that the interfacial systems providing users with access to the information contained on a blockchain's ledger also work to make sure that the NFT's properties, owners, and alleged provenances are both presentable and readable to a wide range of actors across a network. In terms of the relationship between the emergent objectuality of the NFT and its performance of immutable mobility, we see that the same processes that lead to the object's emergence from a previously undifferentiated milieu also contribute to its formation as an immutable mobile. Moreover, the immutability and mobility of NFTs is not an incidental feature accompanying their emergence, on the contrary, it is the result of a strategic decision to mobilise the features of cryptographic technology to ensure their legitimacy as objects. In a similar way to Latour's (2011) suggestion that immutable mobiles are used to reinforce certain arguments and positions by reproducing the same information, NFTs rely on the properties of immutability and mobility to convince a network of users as to their legitimacy as objects, and their stability as carriers of information.

This combination of historical singularity and self-referentiality endows the NFT with a form of recorded mobility. The movements undertaken by NFTs, such as how many times they are transacted, how much one sells for, etc. become inscribed and recorded as part of a particular object's history. The accumulation of the object's history presents new opportunities for individuation – the object can become differentiated historically through the actions that it undertakes and the record that these actions produce. In any case, its mobility is a direct corollary of being differentiated from the world and the horizon of possibilities that opens because of this. However, the potential for further acts of individuation has proven to be problematic when theorising NFTs, with contemporary scholarship (particularly in the humanities) grappling consistently with the kind of entity that NFTs are. For example, some scholars have conceived of them as objects (although not ontologically) (Wang et al., 2021),

legal contracts (Dowdeswell and Nachshon, 2023), commodities (Russell, 2022), and properties to name just a few. It is here that I would suggest thinking through the current ambiguity regarding the nature of NFTs using the framework that I have developed above. This is to say that the contentiousness of NFTs as objects and commodities is not a consequence of ontological or discursive ambiguity, but rather, is a consequence of an ontogenetic structure that is inherently precarious.

Consider, for example, that when an NFT reaches the threshold of objectality it already belongs to a socio-technical milieu intersected by several social machines, each with a different set of interests, operative contexts, and regimes of signification. In doing so the NFT has become mobile – not only because it now moves across networks as a self-contained entity, but also because it now interacts with a diverse range of socio-cultural meanings and discourses. The ability to traverse different milieus extends to different socio-cultural regimes of meaning making and their discourses and the newly individuated object interacts with these different social machines and new operative contexts, often with unforeseen results. As a consequence, the NFT's meaning, status, and legitimacy as an entity changes as it becomes incorporated in certain socio-cultural milieus. Structurally this is a direct corollary to the object's individuation as the relations between the NFT and these new milieus produce changes in both the object and the milieu (Simondon, 2020). I am aware that this is a rather complex series of relations to explain in purely theoretical terms, and therefore, it is perhaps best to illustrate this process using an example from contemporary art scholarship.

In a recent paper Francis Russell (2022) proposed that the mechanism for determining the value of an NFT is essentially one of critical labour. In other words, Russell (2022) argued that the value of an NFT was directly indexed to how much labour had been expended upon it. At first glance this seems to be a rather anachronistic argument to make given that much of creating an NFT is automated, and that NFTs chained to low labour time objects can be (and often are), more valuable than ones with high labour time. However, Russell's (2022) point was that this labour is not just imparted by the "minter" or artist who initially produced the NFT, but rather, encompasses the critical labour of the art critics themselves. The value of NFTs, therefore, is imparted by subjects who expend labour when they relate to them and appraise them as objects (Russell, 2022). Hence, an NFT takes on its value, its meaning, its desirability, etc. by relating to a wider socio-cultural space. Therefore, the value and meaning of the NFT is not static but has the potential to undergo numerous metamorphoses. At first

glance this argument seems to suggest that the identity of NFTs, and by extension their value, is socially constructed. However, when viewed from an ontogenetic perspective the influence of critical labour becomes indicative of an underlying structural dynamism.

If we were to theorise the influence of critical labour on the value of NFTs using the ontogenetic framework developed throughout this thesis, we see that it is the differentiation of the newly individuated object from the milieu i.e. its emergence as an object, that enables it to interact with external milieus (of which critical labour is a part) in new and altogether undetermined manners. As a consequence of these interactions, the NFT undergoes subsequent phase-shifts (i.e. events) of individuation where it becomes subject to different instances of individuation. In the case of Russell's (2022) study, these interactions might drive the value of certain NFTs higher as they interact with the socio-cultural milieus of art critics, while the value of others might be relegated. Importantly, these forms of relations and their associated potentials are derived from the NFT's status as an object unto itself. Without this condition of being able to interact with a milieu on its own terms, subsequent acts of individuation such as value fluctuation could simply not occur. More to the point, this process is a direct result of the NFT's technical structure as it is the qualities of immutability, permanence, and non-fungibility that allow it to take on the structure of a distinct object replete with its own history, values and provenance. As a result of these interrelations and its consequent emergence, the NFT becomes something in its own right and begins to take on its own relations with various socio-technical and socio-cultural milieus.

The example that Russell (2022) provides using critical labour is just one such scenario. Scholarly debates over the capabilities and ultimate purpose of NFTs tacitly acknowledge this inherent dynamism when they ascribe different identities based on the context of each case study and the disciplinary frameworks used to understand them. In the case of the NFT what I have shown is that the moment in which the object emerges does not signify the completion of its being, but rather, represents the moment in which a new horizon of potentials is opened for the object. The phases of individuation that they go through are not just purely physical or technical, but also social. I will finish with the suggestion that it is because of this ontogenetic dynamism that the emergent object remains in question despite having a settled technical structure. In the next section I map out the diverse range of socio-cultural milieus with which the NFT can possibly interact whilst delving further into the structure of these relations. For now, I have established that NFTs share a similar structure to Gilbert Simondon's (2011)

technical objects in that they are a form of crystallised differentiation separated from a surrounding milieu or field. However, where Simondon's technical objects are characterised by an initial primordial phase-shift, NFTs are emergent objects with respect to how this individuating moment is facilitated by the interrelations between an assemblage of technical components and subjects. I have argued that this type of emergence provides NFTs with a form of mobility, that is, the ability to traverse different milieus and to produce individuating moments on their own terms. The newly individuated emergent object, by becoming itself also generates a history unique to itself. Thus, each interaction, transaction, or transformation that an NFT undertakes contributes further to its non-fungibility by creating a history unique to itself, and only itself.

In this section I have demonstrated that the becoming-object of the NFT is a process of emergence driven by an underlying technical substratum. I argued that the emergence of an NFT does not just signify that it has reached the threshold of objectality, but also implicates a Simondonian phase-shift through which the NFT becomes differentiated from its milieu. As I have noted, this first phase-shift does not occur in isolation; instead, it is an event indebted to the conjugations, investments, and desires of a pre-individuated milieu permeated by techno-capitalist and anarcho-capitalist machines (Deleuze and Guattari, 2017). I have shown then that NFTs are part of a long thread of individuations involving numerous attempts to mobilise the technical structures of electronic cryptography to create new commodities. In this way the technical being of an NFT is inextricably linked to a pre-existing milieu, and perhaps more abstractly, to Being itself (Deleuze, 1994). As we have seen, this difference between the emergent object and its milieu results in the generation of two crucial qualities possessed by NFTs. The first of these is the emergence of the NFT's self-referentiality as an individuated being that grants it the ability to both possess, and form, its own unique history. The second, and perhaps most crucial quality (at least in terms of the following section), is that by becoming separated or severed from its milieu, the NFT becomes mobile in the sense that it can now interact with different milieus productively. This ability to traverse different milieus generates a horizon of aleatory relations that can create new meanings and value ascriptions for an NFT (as was the case with value and critical labour). In turn, this leads to the perpetual individuation of the NFT as it "becomes" in relation to its milieu.

NFTs, Meaning and Subjectivation

I devote this last section to interrogating the relationship between social machines, objects, and milieus. In doing so I build on Guattari's (1992) theory of object-milieu relations to account for how NFTs continually undergo phases of individuation once they have emerged. Reading these phases through Broad's (2014) axiom that emergent beings take on their own causal powers, I argue that the phase-shifts produced by NFTs are representative of these causal powers. Specifically, I focus on what I term to be the generative potential stemming from each "encounter" between object and milieu before examining how this drives the perpetual "ontogenesis" of that object. As such, the character of these milieus as socio-cultural systems of meaning and value become a central concern for this section.

Coincidentally, this is where I depart from Simondon's (2011) comparatively narrow version of individuation and revisit the work of Guattari (1992) and his concepts of "universes of meaning" and "subjectivation". I deploy the work of Simondon (2011), Deleuze (1994), and Guattari (1992), to examine the NFT within this structure of an individuating emergent object and milieu. I use Guattari's (1992) notion of the "existential territory" and "universes of meaning" to explore the complex and simultaneous nature of these different regimes of meaning as they act transversally to the object. I use the concept of emergent object mobility to theorise how NFTs have become an individuated form of existential territory existing at the intersection of several universes of meaning. I point out that whilst NFTs originated within a milieu interpenetrated by anarcho-capitalist machines that sought to strategically mobilise its technical form to underwrite a commodity, their emergence has meant that they are no longer anchored to this milieu as a matter of necessity. In modelling this, I expand upon Simondon's (2011) concept of the milieu as a differential field to which the emergent object relates to include Guattari's concepts of machinism and incorporeal "universes of meaning" (Guattari, 1992). Here, I revisit my previous point that these external regimes of meaning-making play an outsized role in transfiguring the identity of the object while attempting to formalise them within an ontological framework inspired by the work of Deleuze and Guattari (2013, 2017).

In his 1992 work *Chaosmosis: An Ethico-aesthetic Paradigm*, Guattari introduces the concept of "universes of meaning" as part of a broader interrogation of machinic ontogenesis. For Guattari, the term "universes of meaning" is used in reference to a seemingly infinite field of ontologically heterogenous regimes of signification (Guattari, 1992). Universes of meaning

denote milieus constituted by different socio-cultural machines that, in this context, define the operational context of technical machines and machinic assemblages. For Guattari (1992) and Deleuze (1994), the monadic structure of Being and the flexibility of the machine means that there is no metaphysical distinction between machines whether they are technical, desiring, or otherwise. Examples of these universes can be regimes such as socio-cultural logics, economic logics, capitalist modes of social organisation, and techno-epistemologies guiding the organisation of a technical object. Relating this to the structure of technical machines and technics as a whole, Guattari (1992) begins with an idea that has already been familiarised in this chapter, that is, that technicity is not a predicate for machines, but rather, that machines are a predicate for technicity. For Guattari (1992), a machine does not just address a specific existential territory or a given technical machine. Instead, the term “machine” encompasses the wider social, cultural, and technical assemblages defining the context of a technical object’s operation, meaning, and use. These machines, therefore, constitute the wider milieu of the technical object and influence everything from how it is used, to the social organisations structuring its production. As we have seen throughout the history of NFTs, this operative context is one of techno-capitalism defined by multiple attempts to commodify the promises of decentralisation, the securitisation of blockchains, and the versatility of smart contracts to produce new commodity forms.

Guattari’s (1992) machinism is a useful heuristic for exploring the implications of ontogenetic production. As an emergent, mobile, and dynamic object capable of crossing and interacting with milieus on its own terms, the newly emerged NFT is in a position where it has crossed a minimal threshold of objectality and has attained that status of an individuated being. Despite having crossed this threshold however, an NFT remains precarious with respect to how the character, meaning, and value of its being remains an open question. For example, despite their technical consistency, NFTs have not yet reached a stage of closure when it comes to the kind of thing that they are, their merit as a form of commodity/investment, and their status as an art object. This instability can be traced back to a fundamental ontological tension between the milieu(s) in which they emerged, and their emergence following a primordial phase-shift. In Guattari’s (1992) terms, the lack of consistency within a technical machine is a resultant of its ontogenetic structure. Similar to an emergent object, the technical machine in Guattari’s (1992) work has a structure that engenders itself dynamically insofar as it is produced by both the internal relations between its composite parts, and its interactions with external regimes of meaning and signification –

i.e. the so-called universes of meaning. Like the technical machines of Guattari's *Chaosmosis*, NFTs are also poised at the intersection of possibly infinite universes of value and meaning (i.e. our milieus) that map on to it as it interacts with it. A universe of meaning in this sense is a distinct regime of signification that initiates a form of becoming for the machine (Guattari, 1992). In this context, universes of meaning are constituted by social machines that may be economic, diagrammatic, cultural, functional, or technical amongst many others. These universes carry within them multiple meanings and ontological consistencies that can radically affect the production and reproduction of a technical machine, or, in this case, an emergent object.

The spectre of these universes does, however, beg the question as to where they fit in ontologically, or even metaphysically within this ontology of the emergent object. Whereas Simondon's (2020) milieu suggests a kind of spatiality, or setting in which the object's interactions take place, we have seen that the emergent object and Guattari's universes, although avowedly materialist, extend beyond the finite coordinates of the object's immediate milieu, and into the horizon of all possible individuations. The milieu, therefore, is not just spatial but a field of possible becoming(s), intensities, and machines. In accounting for the NFT's continual individuation within the present framework I locate these universes of meaning and social machines upon the same plane of immanence as the object, assemblage, and milieu. This is consistent with the monadic metaphysics of differentiation driving the ontogenesis of the NFT. Being here is both univocal and constantly becoming. Existential territories like the object or the machine are thus produced as a difference that emerges within this field, rather than as separate beings in themselves. In this way, the NFT is the individuation of a particular difference arising from a primary machinic production. Here, the universes of meaning and social machines that both produce, and continually individuate the object, are immanent to the milieu(s) of the NFT. Universes of meaning, therefore, are part of the milieu in which all emergent objects, not just NFTs, emerge.

As regimes of signification these universes of meanings are barely spatial. The machinic preconditions of technicity both constitute and intersect with the milieu(s) in which NFTs are produced, operated, and circulated. These universes form the systems of meaning constituting and conditioning milieus before they map onto emergent objects. The individuating events undergone by NFTs and the ontological perturbations taking place therein, are thus not transcendental events originating from an agential subject that then affix to a particular

object, but rather, occur within a shared materialist plane as a continual unfolding (Roberts, 2019). Thus, the social machines constituting these universes of meaning and the broader milieus of emergent objects are both super-individual, and immanent, forming the conditions necessary for the object and its continual individuation.

In Guattari's work, the existential territory of the machine is situated between the so-called actuality of the material-energetic flows (in this case the physical components constituting the NFT) and the incorporeal universes of meaning (Roberts, 2019). It is the interaction between these two regions that generates the ontological consistency of the existential territory because it is continually defined by the interactions of actual flows, i.e. material processes and components, and the virtuality of these regimes of signification (Guattari, 1992). Related to NFTs, it is this continuous process of incorporeal individuation driven by the interaction between object and milieu, that affects the kind of being it becomes. Incorporeal individuation poses both opportunities and threats for the newly emergent object because it continually (re)produces the object for better or worse. For example, the reception of NFTs from a socio-cultural perspective has been fractured despite their technical consistency. Here the ontogenesis of the NFT has been affected by its interaction with disparate universes of meaning. These universes, for example, have either contributed to the production of hype cycles, engendered regimes of financial speculation, informed the labour of art critics, or led to the fetishisation of NFTs as a form of art object. On the other hand, criticism from Marxist, financial, and judicial-legal regimes have devalued and demystified NFTs in equal measure. This reveals that the emergence of an NFT leads to multiple and often contradictory attempts to solidify and destabilise these objects. From an ontogenetic perspective these attempts have a similar consistency – they are successive individuating events.

The situatedness of NFTs at the intersection of these universes of meaning and the myriad constellations to which they relate as individuated beings pose both problems and opportunities. The reading of NFTs I have undertaken here has, up until this point, avoided discussing whether these entities will stay culturally relevant, whether they will be viable long-term, and whether they will turn out to be a Ponzi scheme (as some critics have claimed). To this day, NFTs continue to experience significant fluctuations in their market value, while public debate around the legitimacy of this object continues unabated (Hawkins, 2023). It is this fracturing at the heart of NFTs that reveals the very crux of the issue. While the technical and diagrammatic universes of meaning have attained a degree of ontological

consistency, its position at the confluence of these universes is by no means unified or consistent. Constellations of meaning such as those belonging to the abovementioned legal, economic, financial, and governmental universes of meaning operate simultaneously with one another but have not attained an overarching consistency. The recent history of NFTs attests to this lack of consistency, and by extension, the volatility of these ontogenetic entities. Having originated within a milieu heavily interpenetrated by financial, anarcho-capitalist, and libertarian social machines, NFTs were seemingly adopted overnight in the early 2020s by speculative-investment, artistic-institutional, and other cultural machines. The adoption of NFTs by speculative-financial machines served to situate them within a milieu of rapid commodity exchange and value speculation which led to what is now retroactively understood as the NFT bubble (Hawkins, 2023). This bubble saw a sharp peak in the value of these objects and the continual saturation of the market. Here, the encounter between the mobilised emergent object and this new speculative milieu produced a series of significations that shifted popular attitudes towards NFTs from a rather niche object popular amongst groups like crypto-enthusiasts and anarcho-capitalists, to a form of investment.

This period also witnessed a bi-directional reversal of this milieu-object relation, as the popularisation of NFTs led to both the formation and the performance of new forms of collective subjectivity. This process – referred to as “subjectivation” by Deleuze and Guattari (2017) – references the role that machines play in producing different forms of subjectivities, be they group or individual. These complexes follow a general structure of individual-group-machine, where subjects are produced through their relationships to heterogeneous machines including social organisations, technical machines, universes of meaning and other associated regimes of signification (Guattari, 1992). As Guattari notes, these “...complexes actually offer people diverse possibilities for recomposing their existential corporeality, to get out of their repetitive impasses and, in a certain way, to resingularise themselves” (Guattari, 1992, p. 55). In the context of NFTs this process of subjectivation occurred because their emergence produced a set of causal powers for the object which, in turn, allowed them to affect the subjectivation of desiring machines in new ways. NFTs, for example, facilitated the crystallisation of new social formations and groups, generating diverse categories of identity such as NFT artists, owners, crypto-investors, academic specialisations, and freelance developers specialising in creating NFTs. Technical infrastructures and social identities also merged to create various methods of attachment including crypto-wallets, ledger inscriptions, production histories, and provenances over objects. Here, subjects became defined through

their relation to NFTs as a social category underwritten by technical infrastructures. At an institutional level, this process of subjectivation is illustrated by the formation of NFT-focused divisions such as Sotheby's "digital art" section, which was formed in response to the subjectivating potentials of these objects. In this way we have witnessed a reversal of the original processes leading to the emergence of NFTs – where there were previously machines producing and mobilising technical objects, there are now emergent objects producing subjectivities and initiating becomings across different milieus.

This recent history of traversal, subjectivation and shifts in milieu has been closely followed by a series of academic commentaries in fields such as legal studies, criminology, and cultural studies. In each case, these disciplines have tried to make sense of these developments while attempting to curtail the volatility brought on by each encounter with a new milieu, and the subsequent formation of new subjectivities. In recent months however, the rapid decline in market value for NFTs has led to economists claiming that NFTs are "dead and buried" (Hawkins, 2023, n.p.). The assumption being, that the rapid decline in the market value of over-hyped NFT artworks with dubious aesthetics is somehow representative of their broader failing as technical objects. This claim, however, might prove to be premature given that NFTs remain popular amongst a nascent group of enthusiasts, digital artists, NFT creators, and anarcho-capitalists. At the time of writing, this controversy is yet to be resolved, with NFTs suffering from a fracture between their legitimacy as objects, the evangelism of speculators and enthusiasts, and their externality to state regimes. This is further exacerbated by the fact that NFTs remain under-regulated, and access to them is wholly determined by decentralised platforms and other software applications.

The present precarity of NFTs echoes Guattari's (1992) analysis of the *Concorde*, which, as he claimed "...moves effectively between Paris and New York but remains nailed to the economic ground. This lack of consistency of one of its components has decisively fragilised its global ontological consistency" (Guattari, 1992, p. 48). In a similar manner to the *Concorde*, the technical structure of NFTs as a category of object has gained a degree of closure and remains relatively functional within this context. However, like the *Concorde*, it remains dysfunctional in terms of economic, judicial or other universes of meaning. Where Guattari (1992) claims that the *Concorde* was fractured by a disjunction between the stability of its technical structure and its commercial viability, NFTs have similarly been plagued by an inconsistency between their stable technical structure and the judicial-legal, economic, and

collective belief systems that arbitrate their status as objects. In this way an NFT is an emergent object for all the reasons I have outlined in the above sections. It is indebted to lower-level processes, is produced through the interrelations of different components, and once emerged, manifests a being that is different from these self-same components. However, the structure of this underlying assemblage of components also means that its status as an object remains in question as it continues to become individuated. For NFTs, each potential interaction with its milieu or a Guattarian universe of meaning calls its legitimacy as an object into question relative to the logic of each universe. Thus, its status as a legitimate, real, or otherwise tangible object is somewhat paradoxically challenged at each of these moments.

In this section I have shown that the precarity of NFTs as a form of object is a byproduct of their ontogenetic structure. Situated at the confluence of several regimes of signification, but remaining individuated and mobile enough to be something to which these universes can map on to, the status of NFTs as a form of object remains precarious. This precarity, as I have argued, is not the result of a technical failure but is a direct consequence of a permeable ontogenetic structure that is sufficiently differentiated from a computational assemblage. Thus, NFTs continue to experience individuating events as differentiated entities and with the passing of each event, their ontological structure is likewise altered. Here, the aleatory relations between the emergent object and these regimes of signification contribute to the becoming of that object as it takes on new identities, but also, poses the risks of those identities being renegotiated and/or destroyed according to the sentiments of these universes. In this way I have demonstrated the NFT has hitherto been unable to attain a baseline level of stability because its identity is constantly negotiated and renegotiated. This is not to say that some form of object closure is unattainable, however. Presumably, the relations between NFTs and key regimes of meaning such as economic, judicial-legal, and governmental will become stable enough for it to remain a form of valuable digital object, or, on the other hand might lead to a situation where these disjunctions between universes become untenable. In either case, this section has proposed that the perpetual individuation of the NFT presents both threats and opportunities for itself as an object, and, while it will continually “become” as it interacts with these universes, the outcome of these relations is neither determined nor predictable.

Conclusion

The culmination of this chapter leaves this analysis in a paradoxical state between positing the objectality of NFTs while insisting on their ongoing precarity. On the one hand, I have made an argument for viewing NFTs as a form of emergent object, and on the other, I have shown how this emergence can prove detrimental to their longevity. In this chapter I have developed a radically different approach to the study of NFTs. Unlike previous theorisations of NFTs that have conceived these objects in terms of their position within siloed social, cultural, economic, and legal frameworks (Wang et al., 2022; Vardhan et al., 2022; Dowdeswell and Nachshon, 2023), I have developed an ontogenetic ontology of NFTs that reconciles these differences in terms of individuation and differentiation. That is, that NFTs are subject to persistent speculation, precarity and contention because they are sufficiently individuated as emergent objects and exist at the intersection of several competing universes of meaning. This ontogenetic framework has revealed that the being of an NFT is indebted to an underlying assemblage of components, however, in a manner resembling Broad's (2014) emergentism, they are irreducible to this assemblage. Using the work of Deleuze and Guattari (2013) I have shown that there is a complex relationship between the socio-cultural milieus in which NFTs emerged, and the concrete assemblages constituting the underlying technical systems from which they emerge. This combination of socio-cultural mobilisation, investment, and the productive interrelations of concrete assemblages, has led to the emergence of NFTs as a form of differentiated object. Using Simondon's (2011) conceptual *oeuvre*, I have argued that this moment of emergence represents a phase-shift in the milieu that sees an NFT become progressively differentiated from an underlying assemblage and that this differentiation is a pre-condition for the continued volatility of NFTs within financial and cultural regimes of value. Thus, NFTs Though NFTs are certainly reliant on an underlying computational assemblage, I have shown that they are neither ontologically nor technically identical to the blockchains, smart contracts, and token standards underwriting their existence. I have also shown that the immutability and transferability of NFTs are predicated on the interrelations of lower-level components.

Throughout this chapter, we have seen that an NFT's becoming-object is not a momentary instance and whose existence is perhaps limited by our interactions with it (like with a video

game weapon), but rather denotes a more robust differentiation from its programmatic/fungible milieu. This differentiation has opened an interesting series of potentials for the newly emergent object. Namely, that it has now become mobile and gains its own history. From an interdisciplinary perspective, the differentiation of an NFT from its milieu has meant that it has become an immutable mobile. The technical features of an NFT have facilitated its use as a new form of inscription that fulfils Latour's (2011) criteria that it be mobile, legible, and widely distributable. I have theorised that the emergent quality of immutable mobility appears to be an intentional decision, one rooted in a need to convince the public of both the NFT's legitimacy as an object, and the sanctity of the information and value it holds. As I have alluded to earlier though, it is not a settled matter whether this attempt at convincing will be successful or not.

NFTs have been a victim of their own emergence. As I have argued, the issues that they have faced to date regarding their legitimacy, meaning, and status have been the direct result of their successful emergence and the multiple phases of individuation and becoming that have followed in their wake. Upon emerging, an NFT is made distinct as an object but in doing so, it becomes fractured by the ever-present potential for multiple competing individuations. NFTs currently reside at this intersection of multiple universes of meaning, their horizon of potentials remains open, but precarious. To conclude then, I believe that the contribution this chapter has made to the study of these entities, is that the perilousness of this situation is neither the result of failed social-construction, a poor technical structure, or an alleged lack of tangibility. Rather that it is an ontogenetic one. Without the by-products of their emergent foundations, NFTs would most likely fall into a better-defined category of things. As it stands however, NFTs remain poised at the intersection of several universes of meaning as continuously individuating beings. As such, their consistency remains in question.

Chapter 6: The Freestyle *Libre 2*

Introduction

This chapter analyses the Freestyle *Libre 2*, a continuous glucose monitoring device (CGM) that produces and transmits blood sugar readings continuously as an emergent object. Where Chapters 4 and 5 focused on the relationship between emergent objects as entities produced by an underlying, typically trans-territorial computing assemblage, this final case study focuses on the emergent qualities of the *Libre 2*. Chapters 4 and 5 found that video game weapons and Non-Fungible Tokens (NFTs) are emergent objects that must continuously differentiate themselves or emerge from an underlying assemblage in order to exist as objects in their own right. However, the *Libre 2* differs in that it is, at least in terms of its consistent position in space- time, very much available to us as an object-qua-object. Unlike NFTs or video game objects, there is, *prima facie*, no requirement for me to log-on to a program to access the *Libre 2*. I do not need to be connected to a network to see it, touch it, or interact with it. On the contrary, I can, at this very moment, touch the small sensor embedded in my arm as I type this sentence without invoking it through any mediating interfaces or technology.

It is apparent from this description that wearable “smart” objects such as the *Libre 2* must be a different kind of emergent object. Thus, a sharp ontological delineation between a platform-assemblage that is largely concealed from the subject, and an emergent video game weapon, is not readily observable in a situation where the user wears the object and interacts with it directly. Where Charlie Broad’s (2014) emergent property was ontologically synonymous with my emergent object in Chapters 4 and 5, the *Libre 2* is simultaneously an object *and* an emergent object. However, despite being able to encounter the *Libre 2* directly as an object, I show in this chapter that there is a difference between the sensor that is mounted upon the arm, and the emergent object that extends beyond the immediacy of the bodily schema and into different socio-technical assemblages. I argue throughout this chapter that the *Libre 2* as both a component of an underlying system, and an emergent object, exists simultaneously across multiple registers. In turn, the *Libre 2*’s complex, networked, semi-autonomous, and productive capabilities engender two different forms of objectality, there is the enclosed sensor object, and an emergent object

The multiplication of the *Libre 2*'s objectality is not only evident when we acknowledge the device's simultaneous positions upon my arm and in dataspace(s), but also, how this simultaneity factors into the production of a new associated milieu. A milieu that encompasses the body, the sensor array, and the interfaces and networks of the Internet of Things (IoT). These interfaces and networks include sites such as the application interface on my smartphone, the records of my endocrinologist, the Bluetooth devices registered by my smartphone, and the databases maintained by Abbott (the *Libre 2*'s parent company). Much like the NFTs and weapons of previous chapters, these sites of emergence engender unique causal powers. The emergence of the object here creates the potential for what Gilbert Simondon (2011, 2020) calls individuation, and what Gilles Deleuze and Felix Guattari (2017) call subjectivation. Here, the processes of individuation and subjectivation are revealed in the *Libre 2*'s ability to externalise the body's homeostatic systems, call the wearer to action by producing metrics, communicate autonomously with multiple devices, and signify what were previously unregistered biological processes. Notably, this signification occurs through the use of metrics such as numbers, graphs, and other symbols.

In this chapter I bring these disparate threads of objectality together. Despite the differences between the *Libre 2* and my earlier case studies, I deploy the same analytical framework developed in Chapters 2 and 3. This chapter sees a similar combination of empirical analysis with the concepts of individuation, socio-technical assemblages, milieus, becoming, and subjectivation. As was the case with Chapters 4 and 5, my analysis is premised on the notion that the concrete technical components of the device, the body, and the smartphone, constitute an underlying assemblage from which the *Libre 2* emerges. However, unlike these other objects, I demonstrate that the *Libre 2* requires a much more direct relationship with the biological machines of the body before it can emerge. I begin this analysis with a brief history of the sensor and its production within the intellectual and technical paradigms of the IoT, wearable devices, the quantified self movement, and neoliberal healthcare policy. In doing so I address the broader socio-historical context of wearable devices and I situate the *Libre 2* within this set of movements, devices, epistemologies, ideologies and worldviews. After this, I show how these machines map on to, and help solidify, the *Libre 2*'s technical structure.

Having established the *Libre 2* in its broader historical and operative contexts, I examine the technical antecedents preceding the object's emergence. In this section I ascertain the allopoietic origins of the *Libre 2*. Utilising Guattari's (1992) framework of machine-driven

individuation, I view the production of both the sensor and the emergent object as a corollary of the surrounding environment, and its codes, logics and criteria (Ash, 2018). In doing so I break down the key structures of the sensor. These structures include the sensor's enzyme tip, Bluetooth transmitter, and its in-built mechanisms for storing and interpreting this data. I show how this technical structure causes the device to open to the surrounding environment in specific ways. This is significant because the sensor array mounted upon the arm is not closed off in the sense of being self-contained and fully autonomous in its functioning, but instead, becomes "open" to different milieus, inputs and other opportunities for individuation because of the interplay between these elements.

I complement this exploration of the *Libre 2* in its allopoietic context with an exploration of the autopoietic emergent object in section three. In this section I examine the ontogenetic implications of the *Libre*'s emergence, and how the object individuates itself through the production of metrics. I interrogate this relationship between the *Libre 2* and the production of metrics through the lens of allopoiesis and autopoiesis. I argue that while the production of emergent objectalities is indebted to the interrelations between the body, the sensor, and a network of devices, the emergent object is individuated through production of metrics. I argue that it is through this production of metrics and the ensuing feedback with the wearer that the emergent object becomes re-integrated into an autopoietic relationship with the user. Here, I show that the conjugation between the emergent object and the user establishes new possibilities for self-regulation.

I link the object's emergence into new data spaces and milieus with the revelatory powers of the device and its use of metrics. The *Libre 2*'s ability to bring multiple milieus together simultaneously means that it is able to reveal, translate, and visualise events occurring within one assemblage to another in real time. However, doing so requires that it is able to encompass the entirety of the underlying system, i.e. its emergence into dataspace is what enables it to interact, translate, transmit, and individuate simultaneously. I further my analysis by examining how this emergence engenders new causal powers in the *Libre 2*, enabling the conscious regulation of what was previously a metastable system – hence a new autopoietic node. Proceeding from the supposition that the revelatory capacity of this device is predicated on the technical features of the system and its subsequent emergence into multiple milieus, I argue that the *Libre 2* as an emergent object is now able to instantiate changes in the body by

affecting how it is regulated. Specifically, through direct, real-time interventions by both its wearer and those who have been allowed access to it.

The fourth, and final section of this chapter delves in greater detail into the emergent properties of the *Libre 2*. Specifically, how the *Libre 2* serves to integrate, regulate and control the body. I begin this section by exploring the link between the emergent object, its disclosure through metrics, and how this factors into forming new complexes of subjectivation. In the Australian context in which I am writing, for example, subsidised access to the *Libre 2* is governed by one's endocrinologist, who has access to the device's records and can make suggestions based upon the feedback produced by it. In this context, I examine how accessing the *Libre 2* goes hand-in-hand with ideals of self-government and the ideal body. Here, I link David Beer's (2016) work on neoliberalism and the use of metrics with the autopoietic node of the *Libre 2* and the numerical modulations of Deleuze's (1992) "Control Society". In doing so, I show how the device figures into complexes of control and subjectivation. In this final section I also raise a counterpoint to this line of argument by showing that although these logics certainly govern the operation of *Libre 2*, there is nevertheless a necessity for control in this context.

History and Background

In this section I examine the socio-historical development of the *Libre 2* sensor. This history encompasses more than just the development of the *Libre 2* or biosensors as a category of object. Instead, I show that the *Libre 2* emerged within, and as part of, a broader sequence of socio-cultural development or thread of individuation. Within the ontogenetic framework of the emergent object, the movements and paradigms preceding the production of the *Libre 2* are conceptualised as a set of socio-cultural machines. These machines have attempted to mobilise wearable technologies as a solution to a perceived issue and have determined the operative context in which these devices are distributed, used, and understood (Sauvagnargues, 2016). Therefore, like NFTs and video game weapons, the *Libre 2* is already part of a larger thread of machinic individuation, one that encompasses distinctive socio-cultural and socio-technical milieus including the Internet of Things (IoT), neoliberal optimisation, and medical self-surveillance. The following history addresses the dominant threads within this setting through a close reading of David Beer's (2016) metric power, technological paradigms such as the Internet of Things, social movements like lifelogging,

and the quantified self movement popularised in Silicon Valley (Lupton, 2016). In the following paragraphs I integrate these separate histories into a single account of the movements, technological paradigms, and cultures, necessary for the mobilisation and emergence of the *Libre 2* sensor.

I begin by clarifying some definitional and terminological matters pertinent to the following analysis. This section introduces a series of concepts central to any discussion of wearable devices including the IoT, wearables, biosensors, and smart devices. My intention is to situate the *Libre 2* within a taxonomy of devices ranging from the broad category of IoT objects (which can include everything from a smart fridge to Tesla's Cybertruck), to more specific categories such as wearables and smart devices. Although a comprehensive review of the technical, historical, and ideological histories of these design paradigms exceeds the scope of this chapter, I have endeavoured to acquaint the reader with where the *Libre 2* sits within this context. I do this by introducing and covering a body of literature relevant to biometric wearables. For example, David Beer's (2016) *Metric Power*, Deborah Lupton's (2016) *The Quantified Self*, James Ash's (2018) mechanology of smart objects and Joseph Pugliese's (2010) *Biometrics: bodies, technologies, and biopolitics*. Each of these texts represent significant, and often interlinked contributions to knowledge in this area. By covering the likes of Beer, Lupton, Ash, and Pugliese, I situate my own philosophical intervention into the ontology of biometric wearables within a scholarly milieu already well positioned to cover some of the emergent qualities of these devices. This includes the metrification of the body, the normative ascriptions of these devices, and the wider politico-technical assemblages to which they belong.

The *Libre 2* sensor is not directly connected to the Internet because it relies on the user's smartphone hardware and application interface to provide this connectivity. Despite this, the device is nevertheless a part of the Internet of Things (IoT) movement. The IoT is a design paradigm for a network of interconnected devices and its origins can be traced back to Kevin Ashton's 1999 Procter & Gamble address. In this address, Ashton outlined the benefits of a networked approach to the company's supply chain. He argued that attaching Radio Frequency Identification (RFID) devices to physical objects circulating within the supply chain would allow Procter & Gamble to autonomously track the movement of objects across spaces without needing manual intervention (Raya and Salam, 2022). Since then, the general notion of the IoT and its associated capabilities has expanded to the "...IoT is the network of

things, with device identification, embedded intelligence, and sensing and acting capabilities, connecting people and things over the Internet” (Rayes and Salam, 2022, p. 4). The IoT, as such, is a network of semi-autonomous objects possessing an array of embedded sensors and transmitters. These sensors and transmitters allow these “things” to not only register information about the device and its surrounding environment (location, temperature, sugar level, skin temperature, etc.), but also, communicate this information to other objects and applications across the network. This applies to the *Libre 2*’s core functions of registering fluctuations in sugar levels, timestamping these readings in regular intervals, and communicating them to other devices such as my smartphone, my wife’s smartphone, Abbott’s servers, and the databases of my local endocrinologist.

The functionalities of the IoT originate from a set of standards and processes that allow “things” to effectively communicate across a network. For example, each device has a unique identity such as an IP or bluetooth address, the ability to communicate with other devices autonomously (the *Libre 2* for example uses bluetooth), and the capability to sense certain kinds of information (blood sugar levels, time elapsed, and the total time embedded in the skin). The IoT is thus a framework for objectality that links the singularity of the *Libre 2*’s non-emergent properties with its emergent properties. That is, its emergence into dataspace is facilitated by establishing a twofold accompaniment between the unmediated object and its address in dataspace. On the other hand, the information that is registered about the unmediated object and its surrounds is translated and mediatised by application interfaces and the other devices in the network. This means that users encounter the emergent object not through the object itself, but through other objects and interfaces such as smartphones or computers. I intend to fully explore the ontological implications of this in the later sections of this chapter, however, I will leave the reader with the suggestion that the IoT already presupposes the notion of emergence with respect to how it doubles the being of an object. This is to the extent that the IoT establishes two registers of existence – the emergent object of addresses and transmissions, and the non-emergent of sensors and other hardware.

Although the IoT is certainly a part of the broader context into which devices like the *Libre 2* have emerged, it was preceded by other movements and practices such as the adoption of wearable “smart” devices. For the sake of clarity, wearable devices or “wearables” refers to mobile devices attached to the body. This category encompasses popular devices such as smartwatches like the Apple Watch, biosensors like the *Libre 2*, heart rate monitors like the

Whoop strap, and smart glasses like Ray-Ban's Meta Wayfarers. Although they have since become integrated within the IoT, Deborah Lupton (2016) notes that the practice of augmenting the body with wearable technologies can be traced back further to the 1970s with Steve Mann's adoption of a wearable (albeit clunky) computer. Hence, while these early iterations were neither connected to the internet nor able to transmit autonomously, they are still considered wearables to the extent that they were digital devices attached to the body. The following decades saw this practice of using wearable technology to document, record, and datafy lived experience expand from a small group of early adopters to a more common practice (Lupton, 2016). In these earlier periods, adopting wearable technologies typically meant attaching a portable webcam to oneself to record one's experience, wearing biosensors such as heart rate monitors or temperature gauges, or using computer programs to collect data about one's activities. By wearing these devices, users were provided additional affordances to track activities, record their interactions, and self-track vital signs like heart rate and skin temperature.

Concurrent with the development and distribution of smaller and more powerful hardware, the advent of platformised computing represented a significant development for adopters of wearable technology. This stage saw a confluence between increasingly capable hardware and the development of user-friendly application interfaces that made developing software for this next generation of devices relatively simple (Lupton, 2016). From 2009 onwards, devices like Jawbone, FitBit, the Apple Watch, Samsung's Galaxy Watch, and the Whoop strap became increasingly popular amongst fitness enthusiasts. This new wave of devices also saw the introduction of the first *Libre* sensor in 2015 alongside an accompanying smartphone application for Android and iOS. Admittedly, using technology to document one's activities was by no means a new practice. Recording oneself, after all, emerged from an already millennia-long culture of journaling/diary keeping. However, the proliferation of networked wearable technologies accompanied by (relatively) user-friendly application interfaces did lead to the emergence and intensification of cultural movements centred around the use of technology to continually scan and measure the body.

The continued evolution of wearable technologies saw the inception of several movements centred on using wearable devices to optimise the self. One of the more significant ones is the advent of the "Quantified Self" and "Data Selves". According to Lupton (2016), the term "Quantified Self" emerged in 2007 and broadly denotes "...using numbers as a means of

monitoring and measuring elements of everyday life and embodiment, it can be interpreted more broadly as an ethos and apparatus of practices that has gathered momentum in this era of mobile and wearable digital devices” (p. 2). Lupton’s (2016) research suggests that the Quantified Self movement has quickly expanded beyond the bounds of individuals simply tracking their personal information. Instead, Lupton (2016) argues that the Quantified Self has developed into a kind of social apparatus that actively encourages individuals to engage in self-tracking. Lupton (2016) notes that this is often not for the benefit of the trackers themselves, but rather, so that the objectives of others can be met. The adoption of self-tracking practices by organisations, i.e. the “others” that Lupton (2016) refers to, indicates a set of emergent social practices and logics that have now become central to the creation and operation of biosensors like the *Libre 2* sensor. The first of these logics shows that wearable technologies are firmly embedded in a logic of quantification and rationalisation to the extent that they continuously translate a set of bodily states and fluctuations into a series of readable datasets and metrics. The second aspect worth highlighting here is that the provision of this data also presupposes a set of interventionist practices on behalf of the user. This is because the data that is produced by the wearer is not simply a passive by-product of living, but rather, serves as a call to action for the subject. In this sense, the Quantified Self movement, like Beer’s (2016) notion of metric power, is about the optimisation of the self through the translation and homogenisation of bodily states into comparable, observable, and traceable datasets.

Alongside the emergence of the “Quantified Self” movement Lupton (2019) suggests that the adoption of self-tracking technologies by different groups of people has served to “...configure and materialize certain dimensions of human embodiment and selfhood” (p.16) leading to the generation of “Data Selves”. For Lupton (2019) the Data Self is a dynamic human – nonhuman assemblage that (re)produces an emergent form of subjectivity replete with its own unique agential capacities. She states that the conjugation of human and nonhuman is facilitated by visualizing the data produced by wearable devices so that the fluctuations of the body can be made both knowable and actionable. The *Libre 2* sits firmly in this category of a human – nonhuman assemblage as it is a wearable intended to provide the diabetic wearer with agential capacities that they do not have without the device, most notably, the ability to anticipate and react to changes in the bodies glucose levels in real time. Consonant with this is Lupton’s (2019) observation that these new agencies are filtered through idealised normative frameworks that interpret the data produced by the wearable. Most notably, the data produced by the *Libre 2* is filtered through a matrix of metrics,

standardised ranges, and ideals intended to generate behaviours and practices that align with the present medical consensus of what a blood sugar reading should be. The *Libre 2* in this way is not a tool that measures blood glucose in the narrow sense, but one that calls the user to perform the role of a regulated, healthy subject using the readings generated by the sensor.

At a more general level, the historical development of the IoT, wearable devices, and smart objects, has been inextricably linked to dominant social trends and their associated mobilisations. Embedded in these wearables is a logic of optimisation and action – the data is not just present; it is also actionable. Both Beer (2016) and Pugliese (2010) have situated this logic within the context of present-day neoliberalism and neoliberal logics of competition, optimisation, and efficiency. Although a decisive definition of something as multifaceted, contested, and situational as neoliberalism goes beyond the purview of this chapter, I follow Jamie Peck's (2010) definition that neoliberalism is a kind of "...problem space" (p. 21) characterised by market-complementing regulations and an emphasis on corporate and/or personal competition. Neoliberalism is characterised by the importation of market-like logics into non-market spheres such as government, healthcare, and education. As scholars like Lupton (2016), Beer (2016), and Pugliese (2010) have noted, both the IoT and wearable technologies have featured in the continuation of neoliberal logics. IoT objects and wearables, for example, have done this by aiding companies in their pursuit of supply chain efficiency, automating the regulation of subjects and their identity, and have colonised the body through wearable devices.

The colonisation of the body has been driven by the *Libre 2*'s position in a neoliberal and capitalist context. Specifically, it has been used to optimise the self according to the logics of neoliberal efficiency. For his part, Beer (2016) notes that the neoliberal context in which wearable devices have been developed, produced, and used has more often than not become inseparable from a disciplinary regime of self-optimisation. This is evidenced by a body of advertisements, company-issued white papers, and medical research papers that emphasise the utility of wearables with respect to healthy habit formation and preventive care (Kumar et al., 2022). This body of literature reveals a common underlying assumption — that having access to biometrics and being able to measure them against pre-set goals, ideal ranges, and other people, both encourages adherence in wearers, and provides actionable feedback to people in real-time. This logic is prevalent in the marketing of the *Libre 2* sensor. Both medical researchers and corporate advertisers have singled the *Libre 2* out as a more efficient,

economical, and accurate alternative to traditional methods of blood sugar testing. They argue that getting patients to adopt the device will invariably save medical institutions time and money (Kumar et al., 2022). This reading suggests that a theorisation of wearable biosensors like the *Libre 2* should consider the dominant modes of mobilisation and the effect this has on its horizon of possibilities in a given milieu. A Guattarian (1992) reading of this context suggests that the ethos of this originary context has influenced the *Libre 2*'s technical being and operational logics. This is because the device itself has been produced by a series of capitalist, neoliberal machines sharing a distinctive ethos of self-optimisation and development. In this way, the *Libre 2* is not just a tool of measurement, but one of discipline.

Although the former is a category of wearable and the latter is a type of data produced by a type of device, biosensors and biometrics are united by their emphasis on recording, quantifying, and reading different aspects of the body. However, due to the difference between an object that produces biometric data, i.e. the biosensor, and the biometric data itself, biosensors and biometrics can be embedded in multiple power regimes and logics of optimisation. Pugliese (2010) notes that biometrics are an integral part of how nation-states regulate the movement of bodies, determine identities, and read their citizens. For his part, Beer (2016) claims that biosensors may be vectors for neoliberal logics of self-optimisation and individual competition. Biosensors are devices that collect data from organisms, often through an array of sensors, transmitters, and chemical reactants that measure changes within an organism. As a category of object, biosensors include devices like continuous glucose monitors, heart rate monitors, blood oxygen readers, and skin temperature gauges. The term biometrics, however, refers to a data-type or metric produced by biosensors interpenetrated by an explicitly biopolitical logic. The biopolitical logics, according to Pugliese (2010), make the body visible by overlaying it with a "calculatory grid" that transforms the body into a knowable object.

Pugliese (2010) argues that reading the body with biometric data allows states and other actors to reduce bodies to a set of metrics. He notes that these metrics are not natural; rather, they are predetermined by the creators of biosensor devices, as well as the institutions that use them (Pugliese, 2010). In this way biosensors aid in the application of power and regulation of bodies in settings where states want to control flows of people (Singapore's passport-less customs is one such example). Beer (2016) also notes that biometric data often imposes ideal categories on device wearers by constantly measuring their data against

optimal ranges, comparing users, and making comparisons between past and future behaviours. In this way biosensors and the biometric data that they produce are used to discipline the wearer. For example, biometric data about ideal sugar levels in the blood is used as a way to impose a set of optimal standards on the wearer, and subsequently, influence their behaviour. While these critiques of biometric data are valid for the most part, the use of a biosensor like the *Libre 2* and its functions as an emergent object are more complex than simply imposing a set of ideals on the user to control them. While the *Libre*'s production of biometric data is certainly an exercise in disciplining the subject, it differs from regulating the flows of bodies across borders or encouraging "healthy" habits. This is because the form of discipline imposed by the *Libre 2* remains a matter of life and death for the wearer. In this sense the "...value-based models of the social world" (Beer, 2016, p. 154) embedded in the design of the *Libre 2* are, for better or worse, tied to an ideal of biological facticity: an ideal based on what the body would do if it still had the capacity to self-regulate.

Mechanological approaches to smart objects such as James Ash's (2017) in his book *Phase Media* emphasise the allopoietic and homeostatic structure of smart objects. Allopoiesis is construed here as the "(re)production of the system through the criteria, programs, and codes of its environment" (Ash, 2018, p. 28). In Guattari's (and my) terms, this functions as a useful shorthand for the operative context in which a technical object or machine is both produced and operated. Guattari (1992) goes further than this to state that allopoietic machines produce something other than themselves. Which, in the case of the *Libre 2*, can be seen in the production of disciplined subjects. At a more general level this operative context encompasses a range of different social machines and constellations of meaning. Thus, saying that an object is allopoietic includes criteria and codes such as technical blueprints, production methodologies, and codes, as well as organisational logics such as the aforementioned addresses assigned to each object in dataspace (Guattari, 1992). Allopoiesis is therefore germane to the thread of individuation binding each emergent object to the social and technical machines required for its production and subsequent use. It also presupposes the independence and self-referentiality of the object, insofar as the object is not merely something that is acted upon, but also acts upon others with a degree of agency. According to Ash (2018) the allopoietic genesis of smart objects sets the stage for an ongoing process of homeostasis, which in his Simondonian reading, is a limited set of predetermined self-regulating actions undertaken by the object over the course of its life.

Arguing from this perspective, Ash (2018) claims that allopoiesis and homeostasis provide a foundation for two emergent faculties endemic to smart objects – intentionality and protentionality. Intentionality can be thought of as a particular disposition of the object towards its environment, in other words, it's being-towards-the-world (Ash, 2018). In concrete terms this refers to the fact that technical components and apparatuses like blood glucose sensors, bluetooth sensors, and heart rate sensors provide smart objects with an intentional way of relating to its milieu. It is not the case then that detecting fluctuations in blood sugar levels is an accidental quality of a biosensor. On the contrary, it is a form of being-toward-the-world that provides every individuation with an intentionality to measure, detect, and transmit. On the other hand, protentionality is the ability of a smart device to anticipate various signals emerging from its environment and to act upon them by perturbing or being perturbed by other devices. We can see this interplay between intentionality and protentionality in the context of the *Libre 2*. First, it has an intentionality towards the body because the structure of its sensor tip provides a being-towards fluctuations in my sugar levels. As such, the *Libre 2* is able to register fluctuations in my blood sugar as its primary mode of interaction with its surrounding milieu. It also possesses protentionality to the extent that it anticipates these changes before autonomously perturbing other devices such as my smartphone to notify it of this change. What this means is that the *Libre 2*'s technical allopoietic structure, in other words, the operative contexts in which it has emerged, has endowed it with a specific form of intentionality towards its milieu while also granting it the capability to anticipate changes in this setting before then independently communicating these changes via semi-autonomous perturbation.

Although the work of Ash (2018), Beer (2016), and Lupton (2016) successfully links the machinic context of these “smart objects” with their technical functions and their autonomy, there is still a case to be made for emergence as it relates to the *Libre 2* as an emergent object. While intentionality and protentionality are both excellent heuristics for exploring the relationship between the internal structure of a smart object and its milieu, there remains a spectre of ontological difference between the embedded sensor in the arm and its emergence into multiple dataspace(s). Without this emergence into mediatised dataspace(s), the *Libre*'s ability to register changes in its surrounding milieu and to initiate phase-shifts from these individuating events remains limited. This is because it cannot successfully communicate or translate what it gleans from reading and anticipating these changes. In the absence of this emergence into multiple spaces, the *Libre 2* remains closed off and unable to disclose itself.

What's more, this emergent being is not identical to its internal structure, it is not reproduced as a concrete network of sensors and transmitters but emerges into dataspace as an address communicating metrics to other devices over the course of its life cycle.

It is worth taking a moment to consolidate what we have discovered before proceeding with a full-fledged technical analysis. From a historical perspective, I have shown that the *Libre 2* has its roots in the wearable technology movements as far back as the 1970s. In its current iteration the *Libre 2* is part of the broader IoT movement as an independent device embedded in a larger network of connected objects such as smartphones, servers, and databases. This position within the IoT necessitates that the *Libre 2* is subject to a predetermined set of addresses and standards. It also suggests that the ability to emerge into this network of objects is central to its being. At a minute level, we can view the *Libre 2* as belonging to a category of devices known as biosensors while acknowledging that the data it produces is explicitly biometric. The socio-cultural analysis I have undertaken in this section has shown that this biometric data is neither neutral nor incidental, rather, it has emerged out of neoliberal operative context emphasising competition, optimisation, and discipline. Here, I argue that the data that is produced by the *Libre 2* as an emergent object is a call to action for both the wearer and other viewers on the network (such as a loved one or endocrinologist). These contextual factors inform the general milieu in which the *Libre 2* emerges and helps to define its operation through an ethos of optimisation ordered via metrics.

At a philosophical level I am sympathetic to Ash's (2018) Simondonian reading of smart objects. My analysis in the following section reveals that the *Libre 2* generally adheres to his quadratic structure of allopoiesis, homeostasis, intentionality and protentionality. However, the *Libre 2*'s position in the IoT also indicates an emergent relationship between two registers of Being. The first of these – the components, chipsets, transmitters and encasings constituting the sensor that is worn – is adequately covered by Ash's (2018) reading. The second register, though, that of the dataspace in which the *Libre 2* emerges and is disclosed as an object, warrants further exploration because without this emergence the device is abrogated and unable to perform its intended operations. The following sections take up these questions from a philosophical perspective informed by the likes of Broad (2014), Simondon (2011, 2020), and Guattari (1992). Using their work, I trace how the confluence of a milieu populated by neoliberal machines, an allopoietic technical structure, and an emergence into dataspace, fundamentally determines the being of the *Libre 2* as an emergent object.

General Milieus and Technical Being

This section focuses on two key aspects of the *Libre 2* sensor. The first of these aspects is the general milieu within which the device has been created, distributed, and operated. As per the procession of individuation, analysing the milieu preceding the emergence of the *Libre 2* grounds the socio-cultural analyses of Lupton (2016), Beer (2016), and Pugliese (2010) in an ontogenetic movement spanning from Being to object. As I mentioned earlier, Guattari (1992) sees the logics and blueprints governing elements of an object such as its design, operation, and disciplinary function, as part of a wider milieu constituted by different social, political, and technical machines. In this way, I situate logics and organisational paradigms like the IoT, wearables, neoliberalism, self-optimisation, distribution, and metrification as part of a productive network of machines that have preceded and produced the technical embodiment of the *Libre 2*. The implication of Guattari's (1992) approach here, is that the *Libre 2* is a product of these different social, cultural, and technical machines.

In this section I use Guattari's (1992) concept of machinic production to read the internal structure of the *Libre 2*. I argue that the structure of the *Libre 2* is informed by the logics and codes of its environment. These codes and logics include the organisational frameworks of the IoT, socio-cultural machines like the quantified self, the data self, and metric power, as well as those of neoliberalism. I also consider the body to be an integral part of this general milieu as the intended position of the *Libre 2* sensor underneath the skin has clearly defined the sensor's electrochemical and electromagnetic appendages. I begin, then, with a brief reconstruction of Guattari's (1992) conceptual apparatus in dialogue with the technical structure *Libre 2*. This section covers the device's origins and its mobilisation at the hands of the aforementioned machines. I follow this with an analysis of each of the main components of the *Libre 2* and trace their influence on the device's intentionality and protentionality towards the surrounding milieu. I differentiate between the *Libre 2* sensor, which is part of the underlying assemblage preceding emergence, and the *Libre 2* as an emergent object. I show that where the former exists as a technical object, the latter only comes into being after an assemblage is instantiated. I conclude this section by arguing that these qualities can only be disclosed through its emergence into dataspace(s), and thus, that *Libre 2*'s full being is only reached after its emergence.

To set the foundations for the following analysis, it is necessary to return to Guattari's (1992) concepts of machinic production and the associated milieu. As was the case with the other emergent objects analysed in this thesis, the *Libre 2* originates within a particular milieu. This milieu can be thought of as the socio-cultural and spatio-temporal setting(s) in which the device has been designed, produced, and operated. The *Libre 2*'s positioning as a medical commodity, for example, is derived from this milieu. At a conceptual level, the term "milieu" denotes anything that is exterior to a particular being. In this case, it refers to the milieu directly exterior to the *Libre 2*. From a Guattarian perspective the character of milieu, such as its logics, understandings, and organisations, are a necessary precondition for an emergent object's existence. This is because these machinic forms constitute the apparatus in which an object is produced, where it will continue to exist, the meanings that it carries, and how it will be operated. For Guattari (1992), the structure of this milieu is machinic rather than metaphysical or phenomenological. Thus, modes of social organisation and production like capitalism, the State, or neoliberalism are machines rather than ideas or experiences.

Structurally, this means that the machine is an "...operator-concept that aims to explain real social processes, an operator of individuation, and an operator of social assemblages" (Sauvagnargues, 2016, p. 186.) In the context of the *Libre 2*, our preliminary analysis indicates that its milieu is structured by several social machines intersecting across technical, biological, and social registers. First and foremost, the *Libre 2* emerges into a milieu defined by the type 1 diabetic body and its inability to self-regulate. In Guattari's (1992) terminology, the diabetic body is a flawed autopoietic machine; it cannot reproduce itself successfully because it cannot achieve homeostasis. This inability to achieve homeostasis means that the body requires near-constant intervention from external agents to achieve an optimal balance between exogenous insulin and carbohydrate ingestion. To simplify this further, because the body is unable to automatically balance insulin production with energy ingestion and expenditure, diabetics must be able to accurately measure the level of sugar in their blood to work out how much insulin is needed. Too much insulin, and one risks hypoglycaemia and eventually death, too little and one risks hyperglycaemia and, likewise, an eventual death. This primary milieu, therefore, defines and directs an operative context intended towards the optimisation of blood sugar levels

With the *Libre 2*, optimising the wearer's blood sugar levels is achieved by providing real-time blood sugar measurements through the interface of a smart device. The provision of this information enables the wearer to make accurate judgements as to how much insulin or energy (usually in the form of carbohydrates), should be injected or ingested to achieve balance. We see a confluence of an intended function with the realities of the *Libre 2*'s milieu concretised in the technical structure of the sensor. The *Libre 2* sensor has several components that enable it to successfully interact with the body as part of its primary milieu. In order to measure blood sugar without directly penetrating the wearer's muscles or their bloodstream, for example, the *Libre 2* is inserted subcutaneously to a depth where the sensor tip can interact with the body's interstitial fluids (a direct proxy for blood sugar). Here, we see a sensor appendage measuring 5 mm from base to tip, 0.6 mm in width, and with a thickness of 0.25 mm. The tip of this appendage features a wired enzyme sensing layer coated with a polymer hydrogel that reacts in accordance with blood sugar levels (Kumar et al., 2022). This polymer hydrogel possesses a set of reactive electrochemical properties that enable it to convert the resulting oxidation reactions into electromagnetic currents that are directly proportional to glucose levels in the sample area (Kumar et al., 2022).

The electromagnetic current produced by the reaction between the sensor and the body's interstitial fluid is referred to the module that sits atop the skin. The module itself measures 35 mm in diameter and 5 mm in height. Internally, the sensor module has three main components, an on-board RF 430 processor that decodes and encodes the electromagnetic currents produced by the sensor, an NFC transmitter responsible for activating the sensor, and an EM9304 bluetooth chip that continuously transmits the newly encoded currents to the wearer's smartphone. This rather dense passage on electrochemical reactions, currents, and technical specifications showcases the effect of the milieu upon the concretisation of the *Libre 2* sensor module. It also provides empirical grounds for analysing what Ash (2018) would call the intentionality and protentionality of the device. The milieu in which the *Libre 2* emerges as both a biosensor and as an emergent object is defined primarily by the body.

Specifically, our biological and schematic understandings of it. The length of the embedded sensor, the materials coating its tip, and the small size of the module itself, indicate an operative context in which it is expected to be worn comfortably, react to the body, and successfully communicate these changes to an array of other devices. Thus, just as there is no hammer without a nail, an arm to wield it, and a house (or any other thing) to build, there is no subcutaneous sensor module without interstitial fluid, no transmitter without other

networked devices, and no processor without a series of metrics to encode and interpret the data.

The privileged position of the body within the *Libre 2*'s associated milieu is revealed through Ash's (2018) concepts of intentionality and protentionality. As it relates to smart devices, intentionality denotes a specific disposition or being-towards-the-world centring on a particular characteristic, aspect, or facet of that milieu. For Ash (2018), the intentionality of smart objects refers to the way that the allopoietic origins of smart devices engender a specific form of "...towardness to other things, while nonetheless having contingent qualities" (p. 38). Here, the *Libre 2*'s origins in a bio-technical milieu, one that encompasses machines such as the body, the IoT and other wearables, has resulted in a bi-directional intentionality that extends both towards the body and towards other devices. Using the example of the *Libre 2*'s sensor tip, we see this intentionality towards the body in the sensors predisposition towards recording the levels of sugar contained in interstitial fluid. Here, the electrochemical reactivity of the *Libre 2*'s sensor tip facilitates an openness of the sensor towards this facet of the body. On the other hand, the sensors embedded bluetooth and NFC sensors provide a degree of towardness to other devices. These in-built chipsets allow the *Libre 2* to communicate semi-autonomously with other devices located nearby, and, through devices like the smartphone, to server banks and other devices located further afield. This intentionality reveals that the milieus in which the device has emerged and in which it is embedded have fundamentally affected the kind of towardness the sensor has when relating to the milieu. In turn, this towardness becomes integrated as part of the productive milieu of the underlying assemblage. Here, the ability to open to the body creates a possibility for an individuation in which the sensor and the body become integrated into a network of relations that continually produce the emergent object. Indeed, the fluctuations that are registered by the *Libre 2* as an emergent object are themselves derived from the openness of the sensor.

We can also identify the protentionality of the *Libre 2* through an analysis of its technical structure. According to Ash (2018) protentionality "...can be defined as their (smart objects) ability to await specific forces or signals in the environment and respond to these forces and signals through the way that they perturb or are perturbed by other things" (pp. 46–7).¹ In this example, protentionality refers to the way that the *Libre 2* anticipates and responds to glucose

⁵ Brackets are mine

level fluctuations in real time. The structure of the sensor tip is such that it is already “toward” this part of the milieu, but the *Libre 2*’s ability to consistently track these changes is a result of its ability to perturb the body and be perturbed by it in turn. This example can be extended to include the response of the *Libre 2* to blood sugar fluctuations and the perturbation of other devices in the network. For example, the perturbation of one’s smartphone or smartwatch. These perturbations can be something as simple as the transmission of signals, to more complex acts such as sending alarms to both my smartphone and my wife’s when levels are dangerously low or high. It is obvious then that the protentionality of the *Libre 2* is influenced, if not entirely enabled by, a technical structure that employs reactive sensor tips and transmission technologies. These technical features facilitate a towardness to different environs while only tracking and perturbing certain aspects of them. While these aspects are important, it is worth noting that the intentionality and protentionality of the *Libre 2*, although concretised within the device, originated outside of it. This brings us full circle to the bi-directional structure of object-milieu relations. First, the milieu and its machines define the object and its functions with their values and operator-contexts, then, having emerged, the object relates back to these milieus and individuates them according to the logics embedded within. In this way the protentionality and intentionality are products of the milieu whilst also structuring subsequent interactions with them.

The development of the *Libre 2* is about more than just the crystallisation of labour. Rather, it has emerged out of milieus interpenetrated with biological, social, and epistemic machines. As part of a broader ontogenetic thread of becoming, the *Libre 2* sensor is individuated from the productive investments of these machines as a becoming-object. These machines define the properties of both the sensor and the emergent object, even as they attempt to mobilise them towards a particular end or ends. Although I am aware that we may expand this model to include a multitude of different machines, it benefits our technical analysis to focus on just three of the most prominent ones. The first of these machines was the body, which, as the primary milieu into which the *Libre 2* is expected to emerge, has heavily influenced both its design and future individuations. The second and third machines worth focusing on here are the IoT, because it is the primary operator logic into which the *Libre 2* has emerged, as well as the metric-focused neoliberal apparatus of self-optimisation.

I approach the IoT as a socio-technical machine that performs as an operator-concept for producing, organising, and designing devices. I trace the influence that the IoT has had upon the technical structure of the *Libre 2* sensor in terms of its on-board components and operational logics. As I mentioned earlier, the IoT refers to a network of interconnected objects, sensors, and devices. It denotes a way of organising devices as well as a way to conceive of the environment that eventuates from their interconnection. This logic is illustrated in the claim that the purpose of the IoT “...is to physically connect anything/everything (e.g. sensors, devices, machines, peoples, animals, trees) and processes over the Internet for monitoring and/or controlling functionality” (Rayes and Salam, 2022, p. 2) At an organisational level, the IoT requires that all of these devices and objects, i.e. the “anything/everything” referred to in the above quote, are denoted by an address in the IoT that is unique to a particular IoT device. On a technical level, this address is a consequence of entry into the IoT and is thus enabled by components that are directly embedded in these devices. These components typically take the form of bluetooth chips, NFC readers, or on-board Wi-Fi cards. In the context of the *Libre 2* we see the influence of the IoT in the sensor’s internal layout, insofar as it possesses both an NFC transmitter and a Bluetooth chip.

Read from a Guattarian perspective, the NFC transmitter and Bluetooth chip showcase the role of the IoT as both an intended milieu and as a socio-technical machine. The *Libre 2* was produced with the IoT as a guiding principle and as an operational logic. As a result, the form of the sensor has been determined by pre-existing ideas around the milieus and contexts in which it will exist. Just as its sensor length has been determined by the location of the interstitial fluid, the presence of the bluetooth and NFC sensors has been determined by the IoT as a machine that fundamentally defines the *Libre 2*’s operation. The *Libre 2* has therefore, been designed to emerge into a milieu of networked devices. It takes on its function in relation to them rather than in isolation. The milieu established by the IoT also allows the *Libre 2* to emerge as an emergent object because it becomes accessible *through* other devices. Indeed, the readings and information produced via the electrochemical and electromagnetic interactions taking place between the device’s sensor tip, the body of the wearer, and the processor of the device, are only accessible through the emergent object that manifests itself as difference. This is to say that the privileged moment of difference, or the emergence of the *Libre 2* as an *emergent object* is made possible by an accompanying smartphone application(s) and/or desktop interface. The IoT is a central part of the *Libre 2*’s milieu and that it has significantly influenced both the internal structure of the device and the way that it

functions in everyday use. The context of its development has helped to shape its features and provide an operative context. A context that is defined by external and autonomous relations with other devices. In turn, this sets the ground for emergence, integrating the fluxes of the body with electrochemical reactions, and translating and transmitting them to other devices and interfaces.

My analysis in this section focused on the body and the IoT as two key machines constituting the *Libre 2*'s milieu. I have argued that these two machines form part of a complex assemblage that encompasses an array of concrete biological and bio-technical components. This is in addition to a set of wider organisational and operational logics. I have demonstrated that these two machines have fundamentally influenced the structure of the sensor array attached to the arm, and therefore, that the sensor is defined by processes, machines, and criteria other than itself. *Prima facie* the components of this sensor array and the bodily milieu are both non-emergent, that is, they do not have emergent properties in and of themselves, and aside from being separate entities they belong to the ontological register of the underlying assemblage. This is evident in how they interact with one another directly and do not have properties that emerge beyond what have already been determined by either the fluctuations of the body and the readings produced by the sensor. The relation between the sensor tip and the body's metabolic and endocrine processes, therefore, produces an electrochemical reaction that is certainly complex, but not really distinct from straightforward causation. This brings us face to face with where the emergent part of the *Libre 2* comes in, and how this relates to social machines such as the previously mentioned neoliberalism and Beer's (2016) notion of "metric power".

Interfaces, Emergence, Interaction and Individuation

Thus far, my analysis has examined the allopoietic origins of the *Libre 2* sensor. In doing so, I have established a link between the concrete form of the sensor and existing biological, technical, and social machines. I have identified both the body and the IoT as having determined the technical structure of the sensor, from the materials used to detect fluctuations in blood sugar, to the on-board hardware that makes the transmission of information and the emergence of the *Libre 2* possible. This section continues this line of analysis but shifts its focus. Instead of focusing on the allopoietic origins of the *Libre 2* sensor, it now focuses on the origins of the emergent object. That is, the object that is encountered in dataspace, and the effect that the operative context of the milieu has had upon how it individuates itself. My argument here can be distilled down to the following: (1) the allopoietic structure of the *Libre 2* has led to the adoption of metrics as a way to disclose itself to the wearer; (2) the *Libre 2*'s entry into dataspace(s) represents a moment where the *Libre 2* as an emergent object comes into existence, i.e. as differentiation; (3) this difference is experienced primarily as the production of metrics; (4) the signification of the body establishes a partially autopoietic (autothanotropic) cyborgian assemblage.

By itself, the sensor array of the *Libre 2* is unable to reach its intended functionality without emerging into dataspace and communicating with other networked objects. This emergence into dataspace(s) adds a further degree of ontological complexity to how the object is encountered. This is because the object is encountered as the continuous production of metrics. Thus, the *Libre 2* as an emergent object is an ontogenetic movement shaped by socio-cultural machines like metrics, Arabic numerals, and data visualisations. This means that the primary functions of the *Libre 2* only occur in the datafied environments structured by the IoT, and that the socio-cultural meanings attached to the readings can only come into existence when they are continually (re)produced by the *Libre 2* in dataspace. I begin this section by solidifying my formulation of individuation through the production of metrics. Following this, I then reintroduce Broad's (2014) formulation of emergence before linking it to what we have already established about the *Libre 2*'s technical structure. I go on to discuss the implications of emergence in relation to the disclosure of the object itself. The reason for

taking up this idea of individuation early in the piece here is to pre-emptively reconcile the difference between how the emergent object is encountered by the wearer, and the emergent objectivity of the *Libre 2* that exceeds the production of metrics.

From a philosophical standpoint, introducing an emergentist structure account for the differences that begin to emerge between the embedded sensor apparatus and the emergent object. This difference between the mode of existence possessed by the sensor and the object that emerges into dataspace(s) becomes apparent when one examines the functional and aesthetic differences between the two. When it comes to the *Libre 2*'s sensor for example, these components are embedded into and attached to the body. Hence, the object individuates itself in relation to the body's sensory schema. Here, qualities such as being round, being white, occasionally uncomfortable, located on the right or left arm, emerge in relation to the body. In other words, the *Libre 2* sensor discloses itself phenomenologically as a part of, and in relation to, my bodily experience and my experience of being-in-the-world (Merleau-Ponty, 2012). This means that the *Libre 2* sensor by itself is already well situated within existing philosophies of the object notwithstanding its integration as part of the body. However, this immediate study falls short of encapsulating its emergent properties because of the ontological difference between the set of properties available to me phenomenologically, and the emergent object that is produced through the assemblage of sensor-body-device.

In contrast to the phenomenological immediacy of an encounter with the sensor mounted on the arm, the *Libre 2* as an emergent object is not encountered directly as is. Instead, it is encountered through other smart objects such as smartphones, computers, tablets, and smartwatches. It is encountered by these other objects as a corresponding address in the network, while its ability to sense and be sensed by other devices is enabled by what Ash (2018) calls the intentionality and protentionality of the device. This is to say that the *Libre 2*'s towardness to other devices, and the corresponding towardness of other devices towards it, is responsible for these first encounters in dataspace. Upon emerging into dataspace the emergent object is conspicuous in that it is not disclosed as a set of phenomenological qualities or affects (like roundness or hardness), but as a set of significations, metrics, and revelations. These significations and metrics are otherwise withheld or non-existent in the sensor mounted upon the arm. This emergence into dataspace as an initial address, and then as a set of signs on the interface of several devices, is indicative of a process of differentiation. This differentiation produces a difference between what is an underlying

system of components and their relations to the body, and an emergent object that is produced by the coalescence and interlinkages of this underlying assemblage. To be clear here, the *Libre 2* as an emergent object may disclose itself on-screen using metrics, but it is not itself a representation. Instead, it is an emergent object located in dataspace but contingent on an embedded sensor array and (re)produced by consistent fluctuations in bodily states.

Read through Broad's (2014) formulation that emergent properties are (1) neither identical to, nor derivative of, the underlying physical properties of the system; (2) genuinely causal (i.e. that they have causal powers independent of these underlying physical properties); and (3) that they emerge only when an appropriate set of physical properties are instantiated, the *Libre 2*'s position within dataspace and its subsequent causal powers are illustrative of an emergentist structure. This is because the *Libre 2* exceeds the properties and capabilities of the sensor mounted on the arm. Where the latter is governed by a narrow set of interactions occurring within a bio-technical milieu, the former is encountered as a set of metrics, calls to action, and feedback loops that elicit responses from the wearer and presuppose future behaviours – whether that be to eat something, go on a walk, or change one's diet or habits. This emergentist structure is further supported by the third part of Broad's (2014) definition as the *Libre 2* only emerges once a set of physical properties and relations have been instantiated. We see this at a schematic level with the sensor's internal arrangements such as its circuitry, on-board software, sensors, and transmitters, all being intended towards the production of an emergent object. We also see this with how a stable connection with another smart device is a necessity for accessing the *Libre 2*. We may also extend Broad's (2014) requirement that a set of physical properties be instantiated to include the specific forms of relation established between the body and the sensor. Here the *Libre 2* sensor can only penetrate to a certain depth below the skin in order to be able to interact with the body. If this is not achieved, the object cannot emerge beyond issuing an error code.

The ontogenetic structure of the *Libre 2* has a fundamental effect on the ways that it is encountered. The main result of which, is that there are now noticeable shortfalls that come from taking a purely phenomenological approach to explaining our encounter with the *Libre 2*. To demonstrate this, I will provide a description of how this encounter is structured, what is available to the individual, and what is obscured. An encounter with the *Libre 2* regardless of whether you are the wearer, or an approved "viewer" requires a networked device with a screen such as a smartphone, smartwatch, or computer. Upon opening the application

interface, the viewer is confronted by a large numerical reading depicting the wearer's current sugar level. This reading is situated inside a green (for optimal), yellow (slightly too high), orange (very high), or red (too low) colour block. Next to this is an arrow indicating the trajectory of future sugar readings, up for going high, across for staying the same, and down for going down. There are also angled arrows for going down slowly and going up slowly. Directly below this is a line graph depicting a continuous flow of the past six hours of readings. From this description it is clear that not only do metrics like sugar readings, historical readings, and future projections dominate our encounter with the *Libre 2* as an emergent object, but the object itself cannot be encountered in the same way as the sensor. Instead, the emergent object of the *Libre 2* must be encountered through other devices. This of course indicates the need for emergence to account for this difference, but perhaps more pressing, it calls our very access to the *Libre 2* into question, raising the issue as to whether we are dealing with the object directly or just a representation of it on-screen.

The disjunction between encounter, disclosure, and the emergent object necessitates situating the production of these on-screen metrics within a framework of ontogenetic individuation. Here, I view the production of metrics as the continual individuation of the object. In other words, the making-visible of metrics is an act of becoming-object. It is therefore direct, in the sense that it is a movement of becoming. A movement that is neither phenomenological nor representational but ontogenetic. Such a conception has some resonance with Graham Harman's (2002) tool-oriented explorations of Martin Heidegger's work, where he claims that the being of a tool is neither synonymous with its phenomenological appearance or representation, nor is it an extension of human agency (i.e. a means to an end). Instead, he argues that the functioning of a tool is something that is immanent to it and therefore "'ready-to-hand', not in the derivative sense of 'manipulable', but in the primary sense of 'in action'" (Harman, p. 20). Approached from this angle, the *Libre 2*'s continual production of metrics is an encounter with its being in-action. By continuously producing and revealing metrics, the *Libre 2* as an emergent object is fulfilling a possibility endemic to itself (namely, the reading of blood sugar in real time). This fulfilment of possibility does not therefore constitute an obscuring of being, but rather, constitutes an act of becoming-object.

This notion of ontogenetic becoming through the production of metrics is readily applicable to one's encounter with *Libre 2* in dataspace. Encountering the *Libre 2*, even when it is done through another device, is an act of individuation that sees me catch it in-action. Here, the

production of metrics constitutes a continuous ontogenetic movement that continually differentiates the *Libre 2* it from the underlying assemblage. The production of metrics signifies the interchange of bodily fluids with the electrochemical and electromagnetic impulses. It makes these interchanges visible in the form of numeric values that continually differentiate the *Libre 2* from its milieu. We can thus link the mediated nature of our encounter with emergent objects and the use of metrics. The latter is a way of making the former accessible and knowable to the user. As a result of this a structural triumvirate emerges. First, there is the object that emerges into dataspace, an emergent object that is encountered through other objects (such as a smartphone). Second, that this emergent object, contrary to the sensor embedded on the arm, does not disclose itself phenomenologically or representationally to the wearer, but rather individuates itself through the production of metrics. Finally, the third part of this triumvirate sees these metrics as a call to action based on an ethos established in the machinic structure of this milieu. Here, metrics become value-laden significations imposing a binary reading of the body.

I have traced the *Libre 2*'s emergence into dataspace and the impact that this has had upon how the object is both encountered and individuated. It is now time to return to my initial supposition that the milieu in which the *Libre 2* has emerged and in which it will operate has significantly impacted the methods it uses to individuate itself. This where Beer's (2016) and Lupton's (2016) work proves to be particularly insightful because we can trace the centralisation of metrics and metric power to the milieu in which it has emerged. As I have shown, an encounter with the *Libre 2* as an emergent object is not direct in the same way that encountering the sensor on my arm is direct. On the contrary, it is an active becoming of the emergent object through the use of a smartphone (or any other device's) interface and an accompanying set of metrics, real-time feedback, and a graph that documents past fluctuations in sugar levels. This is a movement of differentiation away from the body, the smartphone, etc. and it is the mode of being that makes the *Libre 2* as an emergent object, accessible to me. Not only because it is now available to my senses, but because it is able to disclose its being to me in a way that reveals a "truth" about itself. This disclosure is therefore a moment that establishes a difference. It is a state where the *Libre 2* becomes discernible and knowable above and beyond what is presupposed by its non-emergent structure. This refers to how the *Libre 2*'s emergence enables it to overcome its own concealment in both dataspace and upon the arm by disclosing itself through on-screen metrics. In each case the use of metrics to communicate changes in its surrounding milieu and

the associated changes in its electrochemical and electromagnetic states are ways of overcoming its concealment.

The revelation of the *Libre 2* using metrics is also a call to action predicated on a wider ethos of a desired optimum and a deficient sub-optimum. Metrics are used to communicate and situate the kinds of action that a wearer (or family members) should take. As Lupton (2019) notes “Digitised representations of bodily processes and attributes work to simplify the complexities of human flesh and action” (p.60). The metricised disclosure of the *Libre 2* is thus a form of signification. In other words, it is a logic that constructs the body, one that uses metrics to order bodily states in a binary logic of good versus bad. This facet of the emergent object directly addresses Broad’s (2014) claim that emergent properties possess causal powers unique to themselves and only themselves. Here the object that has emerged in a dataspace, discloses itself to both myself and others, communicates with other devices, and can initiate individuations in its milieu over and above what is available to the sensor that is embedded in the arm. For example, it might be able to make me stop driving, change my diet, or tell my wife to drop a bag of sugar on my desk during a Zoom meeting. In each of these cases these causal powers correspond to an ethos of what is optimal and permitted. An ethos which is communicated through metrics as in the movement of becoming-object.

Given the structure of the *Libre 2*’s surrounding milieu and the present emphasis on metrics as a way of quantifying, making visible, and organising data, the *Libre 2*’s production of them is not incidental. If we return to the first section of this chapter to revisit Beer’s (2016) claim that metrics feed into the establishment of norms, social facts, standards, and systems of knowledge, we see that production of metrics by the *Libre 2* is a result of its allopoietic origins in a milieu already dominated by metrics. I use the term allopoiesis here to refer to “...the (re)production of a system through the criteria, programs, and codes of its environment” (Ash, 2018, p. 28), to refer to the fact that the socio-technical realities in which the *Libre 2* is produced, distributed, and operated, means that it must embody the criteria and programs of this environment to be both useful and knowable. According to Beer (2016), metrics make complex objects and systems knowable. Metrics have become ubiquitous in our neoliberal context because they advance a seemingly objective logic of competition and optimisation by their continual production and interpretation of data. Applied to the *Libre 2*, metrics have been used to rationalise the electrochemical and electromagnetic interchanges between the sensor and the body. Metrics are thus a way of integrating the *Libre 2* (and by

extension the body) into broader assemblages of meaning, homogenising the difference between my body and those of other wearers by subjecting them to the same set of logics and significations. Significations that can then be compared and contrasted despite the physiological differences between them.

Before I move forward into the final part of this chapter it is worth going over what has been established in this section. First and foremost, I have shown that the use of metrics to disclose the *Libre 2* is both contingent on, and a result of, its emergence into dataspace. Rather than being a quality embedded within the sensor itself, the continual disclosure of the *Libre 2* can only occur once it has arrived in dataspace. I illustrated this distinction with the observation that by itself the sensor embedded in the arm is absent any layer of signification and its mode of disclosure to the wearer is more or less phenomenological. On the other hand, I proposed that the *Libre 2* as an emergent object is encountered through other objects as a continuous individuation through the production of metrics. These metrics have been consciously adopted to structure the disclosure of an emergent object, dominating the encounter with the wearer and continuously communicating its current status in multiple dataspaces. What is seen and taken up by the wearer in these encounters is thus not a representation of the object but a metricised unveiling of its present interactions with the body. In other words, it is making itself available for me (and indeed others who are connected to it) by disclosing a continuous loop of electrochemical and electromagnetic impulses. In doing so it translates blood sugar fluctuations into numeric values that are then measured against an already established ideal range. This simplification transcends the surrounds of the milieu in which this interaction is taking place, extending to the dataspaces of a potentially transnational network that is available to any number of relevant parties.

Moving forward into the last section of this chapter, I shift my focus from the ontological structure of the *Libre 2* as an emergent object to the implications of this for its being in the world. As a networked, intentional, protentional, and continuously self-disclosing object, the question arises as to what this means for its surrounding milieu, the body that it is signifying, and its relationship to broader medical and biopolitical assemblages. The following section builds on the foundation that has been established thus far to make the argument that the causal powers of the *Libre 2* extend far beyond just imparting knowledge. Instead, these powers encompass everything from integrating the body into numerous assemblages, to being vectors of control.

The *Libre 2* and Subjectivation

In this section I consolidate the advancements made thus far. I begin from the supposition that there is an ontological difference between the technical ensemble of the *Libre 2* sensor, and the emergent object that is encountered by the wearer. I have shown that while the emergent object encountered by the wearer is indeed contingent on an underlying assemblage of sensor-body-device, it is nevertheless irreducible to it. The irreducibility of the emergent object to this assemblage is evidenced by the stark difference between the assemblage and the differentiated object. My analysis has shown that the sensor is disclosed phenomenologically, while the emergent object must continually individuate itself through the continual production of metrics. Despite the process of ontogenetic differentiation undertaken by the *Libre 2*, the intertwined nature of the underlying assemblage and the emergent object does establish a series of novel relationships between several parts of the associated milieu. Perhaps more accurately, the underlying assemblage and the emergent object aid in the formation of new associated milieus that encompass the body, the ensemble of the sensor, the emergent object, and the state and corporate assemblages that respectively govern my access to the device and access to the data.

The intertwined relationship between the emergent object and the sensor array produces a simultaneous existence across multiple milieus. The *Libre 2* emerges in the body, in dataspace, and within national and corporate databases all at the same time. Couched in terms of Simondon's (2011, 2020) and Guattari's (1992) work, we see a potential consequence of this multiple emergence in how the *Libre 2* can affect individuations and phase-shifts across multiple spaces and settings. Where non-emergent devices such as tools possess a more limited suite of possible individuations, ones that typically require direct contact with another entity or to be situated in a network of actors, the *Libre 2*'s emergence into several milieus, along with its in-built structure of intentionality and protentionality, has meant that it has effectively transcended the spatio-temporal singularity of its immediate corporeal milieu (i.e. the body).

Upon emerging, the *Libre 2* becomes embedded across space and time as a single entity individuating across multiple sites. The remaining task of this chapter is to conceptualise and trace the implications of this multiplicity. I begin by discussing the relationship between the *Libre 2*'s self-disclosure and the regulatory systems of the body. I link the transformation of

biochemical processes into metrics with a broader socio-cultural regime of rationalisation and discipline. I also continue mapping the relationship between the transformational potential of the emergent object, the milieu, and the body, by examining the *Libre 2* and its emergence into state and institutional settings. In this section I develop Beer's (2016) and Pugliese's (2010) critiques of institutional power by linking the *Libre 2* with Gilles Deleuze's (1992) notion of the "control society". Deleuze's work becomes germane in this section because the real-time feedback of the *Libre 2* lends itself more to the subtlety and continuity of Deleuze's Foucault-inspired "control society", as opposed to the direct application of institutional power as seen in Michel Foucault's (1995), and later, Pugliese's (2010) work.

This relationship between the embedded sensor and the emergent object is characterised by both ontological dependence and ontogenetic differentiation. In this way both the sensor and the body in which it is embedded come to constitute what Broad (2014) would term the "underlying system", while the emergent object that exists in dataspace and is encountered through other objects becomes the "emergent quality". This emergent quality, or in this case object, comes replete with its own causal powers, modes of disclosure, and modes of existence. This combination of system and emergent object also fundamentally affects the relationship between the wearer and their body. The *Libre 2* does this by expanding (or indeed subverting) the biochemical interchanges responsible for maintaining the metastability of the body. This can be illustrated with a comparison between non-diabetic and diabetic subjects. Whereas the bodies of non-diabetics self-regulate autopoietically by releasing pancreatic hormones that control the amount of sugar in the bloodstream (glucagon and insulin), the diabetic shifts this process from unconscious and automatic, to conscious and manual. Here, the *Libre 2* externalises the body's mechanisms for maintaining metastability. In doing so, it recovers the lost autopoietic faculty of the body by producing symbolic representations of a process that is more typically registered biochemically.

Echoing Lupton's (2019) human-data assemblage or "Data Self", a new cyborgian assemblage is instantiated with the emergence of the *Libre 2*. We see this, for example, in how the *Libre 2*'s relation to the wearer creates a possibility for autopoietic regulation. This is precisely because the *Libre 2* allows the subject to (re)produce themselves through the maintenance of sugar levels in the blood. Thus, the ability to access minute-by-minute updates allows the subject to regulate themselves accordingly. Using the *Libre 2*, the subject can (re)produce themselves in accordance with each reading. Concurrently, the autopoietic production of the new cyborgian assemblage also ensures the autopoietic stability of the *Libre 2* as an emergent object. For example, the death of the wearer would also mean the death of the emergent object because it would compromise the assemblage of body-sensor-device upon which the emergent object is contingent. Hence, the cyborg assemblage exerts downwards pressure on the underlying assemblage producing the *Libre 2*. In other words, the maintenance of the cyborgian autopoietic assemblage also ensures the maintenance of the emergent object. Indeed, without the emergence of the *Libre 2* this relationship collapses in the absence of continuously reproducing metrics.

However, the *Libre 2* is not entirely self-sustaining, nor is it perpetual. The embedded sensor self-terminates 14 days after being inserted into the body and ceases to function as intended after this time. This could be for several reasons. It might be that the battery runs out after this time, it might be that the immunological mechanisms of the body begin to attack it, or it might be because of planned obsolescence. In any case, the *Libre 2* does not, therefore, ensure a complete autopoiesis. On the contrary, it instantiates an assemblage that drives towards its own death even as it drives the production of the emergent object. I argue, then, that the assemblage of the cyborg, and the assemblage that produces the emergent object are better thought of as *autothanotropic*. That is, that they establish an assemblage that can only nominally produce itself, and in doing so, individuate themselves towards a complete expenditure. An expenditure that will inevitably, and invariably, lead to the breakdown of these nascent assemblages. There is thus a complex and continuous interplay between the embedded sensor, the body, and the wearer as an agent. This interplay requires a combination of three machines; technical, cultural, and biological. Without the technical structure of sensor tip, its coating, the bluetooth and NFC sensors, the biological assemblage of the human body, and the emergent object that arrives into dataspace and continuously discloses these interactions, the signification required by the wearer could not exist.

The *Libre 2*'s ability to externalise the metastability of the body is indebted to the abovementioned trifecta of technical, cultural, and biological Machines. Whilst these machines are all necessary for this externalisation, however, I maintain that it is the emergence of the *Libre 2* that is primarily responsible for bringing each of these elements together. What's more, the *Libre 2* does this in such a way that the body may be 1) signified and 2) acted upon in real time. As an emergent object, the *Libre 2*'s operation requires that it transcend the spatio-temporal bounds of both the body and the sensor array. In doing so, the *Libre 2* becomes able to bring bodily fluctuations together with the electrochemical and electromagnetic reactions of the sensor. The bringing-together of these interactions, i.e. the simultaneity of these relations, is expressed in the emergent object's production of continuous readings. As we have established, the body by itself is constitutionally unable to transcend or really signify itself beyond a bodily phenomenology. On the other hand, the sensor array is a coin-sized bundle of circuitry, sensors, and chipsets. In contrast to both of these elements, the *Libre 2* as an emergent object is able to signify both of these milieus at the same time because it is systematically embedded in them, while also differentiated from them. Thus, the *Libre 2* is able to emerge across several interfaces and dataspaces simultaneously; in each of these milieus, it is also continuously individuating itself. In doing so it circumvents the "snapshot" effect of a regular monitor and provides a historical account of what has been, and a projection of what the sugar levels are likely to be in future.

The ability to encompass both of these technical and biological settings while transcending their immediate spatio-temporal surrounds allows the *Libre 2* to externalise the regulation of the body from internal and unconscious, to external and conscious. It is worth reiterating here that this is only possible within an emergentist structure. Indeed, the heterogeneity of each of these systems and their specificity within a given milieu means that neither of these systems have the same causal or individuating powers that the *Libre 2* has as an emergent object. Where the body, the sensor array, and the interactions between them constitute the necessary physical properties for the emergent being to arise, the *Libre 2* has genuinely causal, i.e. individuating, powers that transcends each of them. This is illustrated in the forms of individuation available to each component – the body is able to interact with the sensor according to the narrow paradigms of intentionality and protentionality and vice versa for the sensor. By contrast, the *Libre 2*'s use of metrics to disclose its being is less narrow because it is neither purely biological nor purely technical. On the contrary, it is socio-cultural to the extent that the readings carry an ethos centred on an ideal body and a set of calls to action

based on where each metric falls. Reading this through the paradigms of individuations and phase-shifts, the production of metrics is revealed to be an initiator for continual phases of becoming in the associated milieus. This is because the subject acts on these metrics or readings in accordance with logics of self-optimisation. If a metric is considered too high, for example, there may be phase-shifts in the form of extra injections, changes in their emotional state (frustration, dismay, etc.), or going out for a walk. If readings are too low, there may be changes in the form of inhibited activities, ingesting sugar, and anxiety. All these scenarios represent how the emergentist structure of the *Libre 2* manages to externalise the existing systems governing the metastability of the body by using cultural machines that signify the body in specific and value-laden ways. In doing so, the individuation of the object calls the subject to action.

The link between the technical, biological and socio-cultural, machines reconciled in the ontogenetic individuation of the *Libre 2* (the emergent object), recalls an earlier point from Nikolas Rose (1992). Rose (1992) states that “...neoliberal rationalities ‘require a numericized environment’ in which these free, choosing actors may govern themselves by numbers” (p. 691). In the context of the present work, this refers to the fact that the *Libre 2*’s signification of the body using metrics produces a form of self-government that adheres to existing neoliberal rationalities. Specifically, the *Libre 2*’s use of numbers to signify the body is a way of foisting control on the wearer as opposed to other entities or institutions. In this neoliberal formation, the inability to properly control one’s blood sugar levels is recast as a lack of self-control, and therefore, as the responsibility of the individual wearer rather than a medical issue to be dealt with by a relevant institution. Notwithstanding the necessity for self-government, after all, the allopoietic genesis of the *Libre 2* is defined by the diabetic body and its inability to self-regulate internally. It is nevertheless beneficial to explore the role of metrics within this apparatus of self-government through the lens of Gilles Deleuze’s (1992) notion of the “control society” as opposed to the institution-based regimes of discipline popularised in the work of Michel Foucault. This is because the production of metrics by the *Libre 2* is a modulation, rather than a mould.

In Deleuze’s (1992) work, the “control society” is defined as a mutation of the disciplinary society, as defined by Foucault (1995). Described in terms of an evolutionary continuum, Deleuze (1992) views the control society as a more contemporary complex of subjectivation that emerged within what was then present-day techno-capitalism. For example, where

disciplinary societies are discernible by their emphasis on moulding the subject according to a particular institutional form (citizen, worker, soldier, etc.), control societies are characterised by their consistent interventions or “modulations” that aim to engender certain kinds of behaviours within individuals (Hui, 2014). Notably, Deleuze (1992) claims that modulation is actualised through the use of metrics. Metrics, Deleuze argues, are the primary mechanism through which to compel certain forms of behaviour because they provide instantaneous, self-driven feedback that endorses specific kinds of behaviour. Deleuze (1992) seems to anticipate the present-day techno-medical assemblages that have given rise to devices like the *Libre 2* when he states that “For the hospital system: the new medicine ‘without doctor or patient’ that singles out potential sick people and subjects at risk, which in no way attests to individuation – as they say – but substitutes for the individual or numerical body the code of ‘dividual to be controlled’” (Deleuze, 1992, p.142.). Read in this way, the use of metrics to signify the body is an extension of the hospital system and is used to control the behaviours of diabetic subjects. It is therefore a form of medical intervention that seeks to circumvent the inefficiencies of the doctor-patient relationship. The call to action continuously (re)produced through metrics, therefore, compels the wearer to consistently intervene, i.e. modulate themselves until they are in alignment with a set of optimal standards already enshrined within, and by, the *Libre 2* as ideal ranges.

A new complex of subjectivation is thus formed between the emergent object, the medico-technical machines in the associated milieu and the subject themselves. There is now the possibility for a “good” modulated, disciplined cyborgian subject who responds effectively to the production of metrics. In other words, there is now a possibility to become an ideal self-governing subject just as there is the possibility to become a “defective”, unmodulated, ill-disciplined subject who does not respond to this continuous feedback. This point is supported by the standardisation of these metrics across all wearers, with readings becoming modes of feedback comparable to one another. At an institutional level, this integrates the wearer with other forms of assemblage such as those of the hospital or state. For example, if the wearer opts into an arrangement with certain medical institutions, their data is stored (along with others) in the databases of researchers, endocrinologists, and hospitals. This data will then form the basis of a dataset about the wearer that is used to compare their management with others. This data is also often used by endocrinologists to identify problematic behaviours, times, and patterns, which then become the subject of new interventions or perhaps more accurately modulations. As a consequence, the user becomes subjectified not only in relation

to their conscious control of self, but in relation to wider institutional apparatuses. The role of metrics in this new complex of subjectivation, therefore, not only recalls Deleuze's point about the modulation of subjects but also Beer's (2016) point that "Metrics are the very mechanisms and apparatus by which competition can be realised; metrics afford differentiations to be created and inequalities to be cemented" (p. 18). The choice to disclose the emergent object through metrics, therefore, is not only a way to modulate wearers and to produce them as subjects, but also to differentiate between them through the agonistic logics of neoliberal standardisation.

At this point it will help to re-integrate this process of subjectivation with the philosophical language of Simondon (2011, 2020), Deleuze (1992), and Guattari (1992). The above analysis has shown that the use of metrics is not an accidental feature of the device but is instead a way to mobilise neoliberal logics such as behavioural modulation, self-government, and competition to produce a disciplined subject – a subject that arranges themselves in accordance with an ethos of ideal readings and behaviours. At an ontological level, this relation between how the object discloses itself, and the effect that this is intended to have upon the user, is essentially a form of individuation. An individuation that, through its relationship to the wearer, morphs into a process of subjectivation. As I have argued in the earlier sections of this chapter, the production of metrics is the way that the *Libre 2* differentiates itself as an emergent object. When I or someone else encounters the emergent object, we bear witness to its differentiation as it continuously discloses its present state in real-time. In the first place, this is a form of individuation because it is fundamentally the relation between the emergent object and the associated milieu. Each change in metric represents a phase-shift from a previous arrangement toward another. However, these moments of individuation become integrated into complexes of subjectivation by acting upon the subject and initiating certain forms of becoming. We see this, for example, in our becoming-cyborg example above. Another crude example is the fact that the metastable and homeostatic processes of the body are no longer internal and are instead subject to the feedback loops and calls to action emerging at each moment of individuation. At this level one is becoming-level or becoming-healthy by acting upon the metrics disclosed by the device. At a slightly higher level, they are produced as a regulated or unregulated subject. In both cases the *Libre 2*'s ability to exist across body, device, and various socio-technical assemblages enables it to not only produce phase-shifts but to structure the processes of becoming undertaken by the subject.

Before concluding this section, it will help to clarify some of the ethical and normative assumptions behind the use of certain terminologies. In the above paragraphs I have deployed a bricolage of terms including “control”, “discipline”, and “subjectivation” to describe how the *Libre 2* operates in its milieu. It is my contention that the allopoietic genesis of the device and its situatedness in neoliberal logics of competition and self-government have made it necessary to trace the influence of these logics as they relate to the technical structure of the sensor. In addition, these logics have informed the subsequent causal (i.e. individuating and subjectivating) powers the *Libre 2* has as an emergent object. These contextual factors are both noteworthy and true to the extent that they address very real aspects of the device and its being. However, I want to avoid any ambiguity around the necessity of discipline and self-government. While Beer (2016) and Deleuze (1992) are right to claim that metrics have been mobilised in the creation of disciplinary and/or control societies, as well as to point out the dubious ethics of doing so, the situation of the diabetic subject, perhaps regrettably, calls for a level of self-discipline and control that is both necessary and valuable. Particularly, if one wishes to prolong their life and ensure that a modicum of quality is maintained over its course. As I have mentioned before, the primary milieu of the body is unable to regulate itself. Thus, it requires constant, measured, and disciplined interventions from the subject on a near-constant basis.

Recalling Hannah Arendt (1958) and her distinction between the kinds of activities undertaken by human beings (labour, work, politics), the participation of the wearer in these regimes of control and subjectivation are best viewed from the perspective that they are a necessary form of labour. For Arendt (1958), labour is the form of action necessary for existence. It constitutes everyday activities that are not just optional or optimal, but rather, are necessary for the continuation of one’s existence. Taken in the context of a diabetic’s compromised physiology, even if it is aided by socio-technical structures and emergent objects, it is nevertheless a fact that having this condition necessitates those additional forms of labour be undertaken by the subject over and above what has hitherto been identified as being essential to life. Indeed, like the management of blood sugar, different regimes and ethos of control and discipline abound in regulating how people eat, drink, and yes, breathe. However, very few people would deny that even in the absence of all disciplinary regimes these actions would still be necessary parts of life. It is certainly the case that neoliberal regimes of competition, self-government, and control have factored into both the technical

structure of the *Libre 2* and its use of metrics to disclose itself. However, it is also the case that adherence to a basic regime of control is necessary for the continuation of one's existence. In this way, terms like "control" and "discipline" take on two meanings; in the first instance they are indeed situated in neoliberal ethics and logics of self-optimisation, but they are also an unavoidable part of the labour of existence.

Conclusion

From the outset, it was clear that the *Libre 2* differed from both NFTs and video game weapons. Notwithstanding these differences, the above analysis has proven essential to the broader work of this thesis. This is because the comparatively well-defined relationships between the sensor, the body, and the *Libre 2* as the emergent object have effectively illustrated the process of differentiation residing at the heart of the emergent object. The difference between what is mounted upon the arm and the object that discloses itself through the production of metrics reflects what has been a recurrent theme of my research thus far. That being, to avoid the metaphysical baggage that comes with locating emergent objects on a continuum between "real" unmediated objects and "unreal" emergent objects. To a materialist or physicalist reader, the delineation between real and unreal seems absurd, given the assumption that physical processes and structures underlie the entirety of the universe. Hence, because all production is primary and machinic, it would seem that the continuum between real and unreal is really about the production of difference within the same order of reality (Land, 2011).

As I have demonstrated, this ontological difference exists between the system that is mounted upon my arm and interacts with my body and the emergent object that encompasses both sensor and body simultaneously, exists in dataspace, and discloses itself through the continual production of metrics. This difference is made complex by the dependency and contingency of the emergent object upon these underlying systems. After all, the *Libre 2* does not exist in isolation; instead, it needs a set of physical conditions to be met to come into existence. In this way I have argued that difference is produced from the relations occurring amidst each component and that these relations are necessary for this difference to exist in the first place. The components, the underlying system, and the milieu into which the *Libre 2* emerges have become important sites of analysis in their own right. As Guattari notes (1992), technical objects do not exist without a specific operational context, and, as Ash (2018) would add, this

operative context defines the intentionality and protentionality of each device by giving them a specific comportment towards the world. In the first and second sections of this chapter I built upon this foundation to show how the *Libre 2* (the emergent object) and the sensor array was subject to a specific operative context defined primarily by the diabetic body, the IoT, neoliberal logics, and metric power. I argued that preceding the *Libre 2* was a milieu defined by these biological, social, and technical machines, with each machine bearing influence on the technical structure of the device and the way that the emergent object disclosed itself.

In these initial sections I revealed that the allopoietic structure of the *Libre 2* sensor was defined by and large by existing machines, in the later parts of this chapter I focused on the device as an engine of signification and subjectivation. In the process I demonstrated how the *Libre 2* disclosed itself as being-in-action through the production of metrics as opposed to the comparatively limited phenomenology of the mounted sensor. This production of metrics through the emergence of the *Libre 2* resulted in the instantiation of an autothanotropic assemblage. That is, an assemblage that enabled the formation of a cyborgian assemblage that continuously drove towards its own death. I argued that the use of metrics was neither accidental nor arbitrary, but rather, tied into existing neoliberal ethos of self-government and control in which metrics formed the basis for behavioural modulations. I surmised that although enabling direct intervention into the body's endocrine system is necessary to the extent that it can establish a degree of metastability for the body and therefore stave off death, it is nevertheless structured by wider discourses of self-discipline and control. Here metrics have been strategically integrated with what Beer (2016) identifies as the competitive or agonistic undercurrent of neoliberal capitalism, forming a complex of subjectivation in which the wearer is produced as healthy or unhealthy, disciplined or undisciplined, or whether they require intervention.

Moving forward from the present analysis, biometric sensors like the *Libre 2* are more complex, affective, and intricate, than what one might first assume. Due to their differentiation from an underlying assemblage, they are able to bring together multiple individuating strains and garner subjectivating powers. They can initiate phase-shifts in their surrounding environments in ways that transcend the immediate material structure of their underlying systems, and tie into broader social trends and regimes of subjectivation. As a medical technology, there remains an ever-present, and valid argument for their existence as devices. Yet, I note that the *Libre 2* cannot be separated from the socio-cultural machines

populating the milieus in which it has emerged. Future research in this area might look more closely at the link between medical technologies like prosthetics and sensors to interrogate the allopoietic genesis of such devices. Researchers might like to examine how these devices embody a set of ideals and philosophies about the body, and who the wearer is intended to become in relation to them.

Chapter 7: Systemising Emergent Objects

Introduction

In this chapter I provide a final overview of the work undertaken in this thesis. I leave the reader with a set of schematics derived from each of the three case studies. These schematics function as a guide for future analyses and studies. By mapping the main points in the ontogenetic procession of becoming an emergent object, I develop a set of axioms common to all emergent objects. Over the course of this thesis my analysis of video game weapons, NFTs and the *Libre 2* has revealed a shared ontogenetic structure that can be distilled into a set of axioms. These axioms are ontological facts regarding the being and existence of these objects. They show that emergent objects are essentially allopoietic objects – they arise from an indeterminate, continually individuating field of relations and are differentiated from this field through a process of individuation-as-differentiation. As part of this process, emergent objects only arise after an assemblage comprised of several components, actors, and processes has been instantiated. Thus, their existence is contingent upon this underlying assemblage. Upon this moment of instantiation, the object emerges in a privileged event of individuation which I have called “emergence”. It is this event that leads to the video game weapon, NFT, or *Libre 2* becoming an object in its own right, one that is differentiated from the underlying assemblage that produces it. As a consequence of this event of emergence, each emergent object comes to possess its own unique subjectivating and individuating powers. By reiterating the findings of each of the case studies, and incorporating them into this processual model of becoming, I develop an ontogenetic schematic that may be applied to future studies of digital objects and milieus. The analysis performed across the areas of video game weapons, Non-Fungible Tokens (NFTs), and wearable devices, have revealed a set of common threads permeating each of these emergent object types. These commonalities have provided a set of theoretical and empirical grounds from which we can establish an ontology of emergent objects as a category of entity, or more accurately, a procession of becomings.

In this chapter, therefore, I both consolidate and reflect upon the discoveries made in this thesis. I call on each of the case studies in addition to the theoretical work of Chapter 2, and the technical work of Chapter 3. I identify a set of stages that define and differentiate these

objects from other kinds of entities. I show that emergent objects are not just confined to the three case studies undertaken in this thesis, but rather, that they are a category of entity that will continue to exist so long as the conditions for their emergence are met. This is to say that while new forms of emergent objects will invariably come into existence, even as others like NFTs and the *Libre 2* fall farther from relevance, emergent objects still stand to persist so long as the production of difference remains. As part of an increasingly mediatised and digitalised milieu, emergent objects are bound up in a primordial process of becoming that has extended to computational media and beyond. This process has seen the production of new objects to overcome the limits of capital as an event immanent to the continual individuation of Being (Deleuze and Guattari, 2017). Given this inexorable movement towards complexity from the ground of computational production, it is likely that new objects, commodities, and generative processes will continue to be individuated.

Making the case for objectality, emergence, contingency, and difference in the context of digital technologies necessitated that I develop a new set of theoretical tools. Ideally, this new theoretical toolkit would account for the continual production of difference as these objects emerge. This is despite the fact that these emergent objects are fundamentally contingent upon an underlying assemblage. Gilbert Simondon's (2011) insight to this end was that the becoming of an object is essentially a process of partial separation from an under-differentiated milieu. His claim that objects are individuated from their surrounding milieus has become not only a central tenet of my work in this thesis, but also, indicative of the moment in which the emergent object and the system become separate, yet interconnected entities. As I have demonstrated throughout this thesis, this has been complicated by the structure of the milieu as both an environment, and a set of assemblages encompassing the technical, the social, and the cultural. As Guattari (1992) notes, milieus are machinic, and it is machines that produce technical objects. Milieus, therefore, are permeated by several orders of machine with each bearing an influence upon the object and operation that emerges. Thus, the way that an emergent object is used, and the meanings that are assigned to it, is a matter of machinic investment and mobilisation. In the first section of this chapter, I consolidate these ideas and provide a framework for considering the milieu, its relationship to the assemblage, and how it forms the underlying systems from which the emergent objects emerge, and with which they then interact. Recalling the early parts of each of my case studies, I show that the milieu is both a condition *and* a determinant of the emergent object. The milieu defines the object's existence in particular ways while also providing the grounds

in which differentiation occurs. A differentiation that is inherent in the object-assemblage and object-milieu relation.

Perhaps unsurprisingly given the name I have chosen for these objects; emergence resides at the heart of an ontogenesis of emergent objects. In the second part of this chapter, I focus on emergence and its relationship to the formation of these entities. Throughout this thesis I have made extensive use of Charlie Broad's (2014) definition of emergence. This definition has proven useful because it signalled that the event of emergence presupposes the production of difference – a process that is necessary for the formation of objects. This concept of difference has provenance from several philosophical approaches, from the supervenience of the analytics to the difference of Deleuze (1994), and the severance of Simondon (2011). I explore the relationship between emergence, the formation of the object, and the production of difference in this section. I show that to become an object, particularly in relation to computational infrastructures as emergent objects are, is to be individuated enough to reach a threshold of objectality. This threshold, once it has been reached, gives the emergent object causal, i.e. individuating and subjectivating, powers that are distinct from those of the system upon which it is predicated. While this difference can be reached using different methods and systems, for example NFTs use blockchain while wearables use networked devices and interfaces, it is nonetheless present in all emergent objects and is a necessary fact of their existence.

Having established the emergent object in relation to its milieu and its subsequent becoming(s) via a continual process of individuation, I examine what this means for the object and its milieu. Specifically, I discuss this in terms of two distinct processes – individuation and subjectivation. Throughout each of my case studies, Broad's (2014) emphasis upon the causal powers endemic to emergent beings has set the stage for my discussions of individuation, encounters, and subjectivation. In this section I revisit these concepts to examine the emergence of the object endows it with specific causal powers that come to produce changes in the associated milieus. Inspired by the work of Deleuze and Guattari (2013, 2017), I situate these causal powers within two specific processes – individuation and subjectivation. In the context of the emergent object, I show that individuation is a driving force behind the process of becoming-object while subjectivation refers to the formation of subjectivities. I note that these processes of subjectivation and individuation occur across multiple registers. Just as an emergent object is produced by an

assemblage, I show that an emergent object can also become part of other assemblages.

In the final part of this chapter, I look to the future of emergent objects, the implications of this present work for philosophy and media studies, and the potential forms of individuation and subjectivation available to them. I argue that the ontogenetic, ontology of emergent objects I have built in this thesis challenges an established continuum. A continuum that generally views the non-digital and the digital as analogous to the material versus the immaterial. Whilst these objects may be precarious, potentially ephemeral, contingent, and predicated on complex socio-technical assemblages, I show that in this ontogenetic schematic of the emergent object we can preserve the materiality of the object through the paradigm of differentiation. I extend this discussion to argue that the model of the emergent object can transcend the examples I have provided in this work. I claim that it gestures towards a more fundamental relationship between the computational infrastructures generating, preserving, and distributing these objects, and the emergent objects that will continue to be produced.

Milieus and Machinic Production

This section analyses the origins of emergent objects. As we have seen throughout our three case studies, emergent objects do not usually emerge *ex nihilo*; rather, they are produced in specific contexts and deployed towards specific ends. My analysis of the *Libre 2*, for example, showed that the sensor device was what Simondon (2011) and Guattari (1992) would call an allopoietic object, that is, it is in the first place produced in accordance with the codes and criteria of its environment (Neves, 2001). Couched in terms of machinic investment, my use of the term “allopoiesis” refers to the fact that each emergent object is produced by a process of machinic production. Here, “allopoiesis” simply refers to the fact that emergent objects are produced by something other than themselves and according to pre-existing criteria. For example, the *Libre 2*'s environment was a complex consisting of neoliberal machines, technical machines, and the diabetic body's compromised homeostatic and metastable functions. In a similar manner, I observed that NFTs were part of a broader thread of individuations defined by repeated attempts to mobilise blockchain technologies by the capitalist machine and its subsets. I showed that these mobilisations were motivated by a desire to create new currencies and/or commodities such as Digicash, Bit Gold, and Bitcoin. Guattari's (1992) insight here was linking the production of technical artefacts with a milieu already populated by machines. In this section, I consolidate this process in relation to

emergent objects as a category of things. I show that all emergent objects originate in a milieu, and that this milieu presupposes the structural characteristics of these objects to a certain extent.

Following the establishment of the allopoietic and machinic origins of emergent objects, I shift my focus toward another element of the object's structure – the underlying assemblage. This assemblage is what provides the requisite conditions for emergence. The “general logic” of the assemblage I have used throughout this thesis borrows from the work of theorists like Deleuze (2013, 2017), Guattari (1992), Nail (2017, 2021) and DeLanda (2016). I have used the assemblage to describe the underlying structures upon which emergent objects are predicated and to invoke Broad's (2014) notion of an underlying system upon whose instantiation the emergence of a being is necessary. Where his use of the word “system” is helpful to an extent, Deleuze and Guattari's (2013) assemblage is better suited to describing the constant permutations, and structural flexibility of these arrangements. It also accounts for the subjects who are embedded within them, and their role in invoking emergent objects (Chesher, 2023). This is where the necessity of the technical work performed in Chapter 3 of this thesis comes to the fore. From an analytic perspective, it is not enough to simply point to the underlying assemblage; one must be able to identify the interrelations and structures that constitute it. This includes the coding languages that are used, the components making up the system, the relevant network structures, and the organisational logics that govern the make-up of the system. This is because all these elements are essential to the production of an emergent object. Doing this technical work enabled me to make two important distinctions later on. The first of these distinctions is that the milieu and the assemblage constituting the emergent object are not analogous to one another, and the second, is that by identifying this assemblage we have empirical grounds for positing a distinction between the emergent object and this underlying assemblage.

Over the course of this thesis, my analyses of the gun in *Destiny 2*, NFTs, and the *Libre 2* have demonstrated that the origins of emergent objects are allopoietic. Thus, I have shown that the emergence of each object is not an act of auto-production, but rather, is initiated by processes and agent's exterior to themselves (Ash, 2018). I have used the term allopoiesis to acknowledge that the production, structure, and use of emergent objects are indebted to external causes. As a heuristic, allopoiesis emphasises the importance of an initial contextual analysis by illustrating how this broader environment has a tangible effect on the structural

characteristics of these objects. By engaging with emergent objects on the grounds of allopoiesis I have demonstrated that they emerge from specific contexts and are often the product of attempted mobilisations or environmental requirements. Possessing an allopoietic structure, as Neves (2001) suggests, means that an object is produced according to the “...criteria, programmes, and codes of its environment” (p. 255). This environment or milieu, therefore, has had a profound effect on the eventual structure of the object. It is a precondition referring to a body of interacting assemblages and it influences the emergent object’s aesthetics, modes of disclosure, and intended uses. In the case of the *Libre 2* for example, this environment influenced its modes of connectivity with other devices and the modes of its disclosure, while for the gun in *Destiny 2* it influenced everything from its aesthetics to damage outputs, to its behaviours in game.

My analysis of the allopoietic origins of each object addresses the effect that the milieu has upon the object before, during, and after its creation. One of the key insights Guattari (1992) makes in his book *Chaosmosis* was that the structure of the machine precedes the technical object. Guattari (1992) uses the term “machine” to designate the broader social and technical arrangements populating the milieu of an object. He argues that a technical object embodies the logics and desires of these machines, and that these machines form the milieu that ultimately becomes the operative context for that machine (Guattari, 1992). For example, a hammer as a technical object is defined by several machines to which it relates. There is the body that wields the hammer, the productive context in which it is intended to be used, the techniques of the manufacturer, and so on. Thus, where Neves (2001) rightly argues that having an allopoietic origin means that the codes, criteria, and programs of an environment will influence the (re)production of a system, Guattari’s (1992) model allowed me to identify where these codes and criteria come from.

Drawing from Guattari’s work I claim that the criteria and programs structuring and informing the production of emergent objects are influenced by a pre-existing suite of social and technical machines. Whilst this was evident across each case study, I will use NFTs here as an example. In Chapter 5, I found that the technical structure of an NFT is predicated on an assemblage of hardware components, a blockchain, a smart contract, and a token standard. I showed that each of these concrete assemblages produced a suite of features for NFTs like securitisation, transparency, and immutability. These features allowed owners of NFTs and platforms to showcase the provenance and histories of these emergent objects in a manner

that is considered (somewhat) legitimate. In this section, my analysis revealed that the operative context of an NFT has been structured by the attempted capitalisations of anarcho-capitalists, speculators, and the reproductive potentials of computers. NFTs, as such, not only emerge from a milieu populated by these social machines but are also continuously mobilised towards specific purposes by them. My analysis here demonstrated that the features, qualities, and capabilities of NFTs were both created by, and then mobilised by, capitalist machines to create new commodity forms.

The ontogenetic analysis of NFTs undertaken in Chapter 5 situated them in a broader process of capitalist axiomatisation. I showed that their use as way to underwrite and stabilise new commodity forms such as digital art was a result of the techno-capitalist milieu in which they emerged. According to Deleuze and Guattari (2017), this process is a continuation of the capitalist machine's desire to axiomatise everything as a commodity. While it remains conceivable to imagine a counter-hegemonic use for NFTs, it remains outside of the popular imagination. The position of NFTs as commodities, therefore, is due to their genesis in a milieu that was already organised in line with logics of consumption and production. This process was also apparent in the other two examples included in this thesis. The gun in *Destiny 2*, for example, is defined by development and production logics, gameplay logics, and platform logics. The gun's technical being was also shown to have been structured by constraints around hardware and software. The competitive gameplay of *Destiny 2* is likewise inscribed in the very core of the weapon. What the weapon does, i.e. shooting, aiming, and moving, is nothing less than the result of the looter-shooter genre and the gun's intended use in gameplay contexts. For the *Libre 2* this was even more complex, given its genesis in relation to biological, technical, and socio-political machines. In this example, aspects of the *Libre 2*'s design and use were defined according to an overarching ethos of self-optimisation and self-government.

Whilst this is a necessarily brief summary of the complex origins of each emergent object, there is nonetheless a common thread that brings me to my first axiom of the emergent object: *emergent objects are allopoietic objects within the context of machinic production*. The origins of emergent objects are derived externally rather than internally. They are formed by, and according to, a set of criteria, productive logics, and technical logics immanent to their respective environments. The logics informing the allopoietic structure of emergent objects do not emerge *ex nihilo*, then, but are continuously (re)produced by a set of social,

cultural, and technical machines. These machines govern aspects such as the object's use, technical structure, and distribution. In this thesis, I have explained this process by adopting Deleuze and Guattari's (2017) productive machinism. A machinism that continually drives the individuation, or differentiation, of the object's surrounding milieu. In this way, the allopoietic structure of the emergent object is another way of saying that it is a becoming driven by primary machinic production. Emergent objects are an individuation that emerge from the productive investments of machines. They are, therefore, a subset of the machine.

Assemblages

My emphasis on the productive context of the emergent object should not obscure the fact that these objects have an underlying structure that is relational and processual. Throughout this thesis I have shown that this underlying structure is differentiated from the wider milieu and remains specific to a particular emergent object. As Broad (2014) and DeLanda (2016) argue, a precondition for emergence is an underlying set of systems, objects, and relations, the arrangement of which leads to the creation of a newly differentiated entity. The nature of this underlying system and the relationship between it, and the emergent object, has been a recurrent theme in my analysis. In Chapter 3, I grappled with this question from a technical standpoint. I demonstrated the incompleteness of a reductive approach to emergent objects by delving into the complex, multifaceted, and flexible social, technical, and organisational, arrangements contributing to their emergence. This non-reductive or non-essentialist approach was supported with numerous examples. Prominent amongst these examples was how hardware arrays can and do change in platformised contexts. I also showed that the objects used in object-oriented programming (OOP) were not truly objects but were a way of inscribing information in a way that was both transferable and malleable. In the context of video game objects, this was revealed in the lack of a true equivalency between the emergent object that the player encountered and a single data object. I argued that there was a difference between the emergent object and a cluster, or more accurately, an inheritance tree, of multiple objects that governed an aspect of the weapon's behaviour. I expanded this model even further, going beyond code to the structure of network, hardware, and software arrays that are necessary for an emergent object's existence. This is what I am referring to when I use terms such as "empirical realities" or "brute facts", and they underlie my choice to describe these systems and processes as an assemblage.

I have shown throughout this thesis that the underlying system responsible for the production

of emergent objects follows the structure of Deleuze and Guattari's (2013, 2017) assemblage. As I noted in Chapters 2 and 4, Deleuze and Guattari did not formalise their theory as a single system. Instead, they tended to use it as a general logic to investigate the structure of various entities (Nail, 2017). The reconstructive parts of my work have thus had to borrow from Nail's (2017) distillation of the concept for the sake of clarity. For his part, Nail (2017) identifies three key elements constituting an assemblage along with a lack of internal essence and a sense of temporal instability. A defining feature of an assemblage, therefore, is that it is made up of heterogeneous elements, that the arrangement of these elements is temporary, and that they are constituted by concrete assemblages, abstract machines, and personae (Nail, 2017). The first of these elements – the concrete assemblages – is the existing embodiment of the assemblage. I have identified this part of the assemblage with the discrete components and defined processes integral to computation. In the context of emergent objects, concrete assemblages are not only items like circuitry, chipsets, processors, cable networks, data banks, and monitors, they are also OOP objects, blockchains, sensor tips, and bluetooth transmitters. These are the discrete elements whose presence is required to instantiate the set of underlying conditions needed to produce the emergent object. However, the reason why I have used the term assemblage in this ontology of emergent objects, rather than “system” or “ensemble”, is that concrete assemblages can and do change but the assemblage retains its integrity. Using the concept of the assemblage, therefore, has allowed me to foreground the fluxes characterising the structure of platforms, the feedback mechanisms of the body, and other changes or updates in hardware or software. Using the term assemblage also captured these changes as an ontogenetic feature of the emergent object, supporting my argument that whilst it is certainly the case that these objects are contingent upon an arrangement, they are not reductively contingent upon a *particular* arrangement.

This brings me to the second element of the assemblage, one that is integral to the production and maintenance of emergent objects – the abstract machine. Throughout this thesis Nail (2017) has provided me with a useful shorthand for the abstract machine; it is “...the network of specific external relations that holds the elements together” (p. 24). At an abstract level I have linked this machine to a particular arrangement or group of relations known as involutions in which a region of becoming is opened up (Hanson, 2000). These relations serve to hold an assemblage together and drive future phases of becoming (Hanson, 2000). An underlying system, therefore, is not in itself a sufficient condition for the production of an emergent object; on the contrary, there needs to be a set of relations holding each of these

elements together and in such a way as to produce the object. The abstract machine permeates the interactions between these concrete assemblages while governing the possibilities that can eventuate from this arrangement. For emergent objects, I have shown how this is manifested in several different ways. For one, the emergence of the object presupposes an abstract machine maintaining a set of relationships for the duration of its existence. This is an inversion of the “bottom-up” process of emergence where the emergent entity (in this case an object) exerts downwards pressure to maintain this arrangement, and therefore, its existence (DeLand, 2016). The role of the abstract machine is also seen in the way that it maintains the homeostatic balance of the underlying assemblage despite permutations in the arrangement of concrete components. An example of this can be found in my analysis of the weapons found in *Destiny 2*, where the assemblage maintained a degree of flexibility in its structure and could tolerate network interruptions, hardware failures, and updates while maintaining the continuity of the emergent object, not to mention the ongoing variations in player hardware.

The next element of the assemblage, what Nail (2017) identifies as the *personae*, proves to be one of the more complex and interesting parts of the emergent object assemblage. Although Nail (2017) uses the term *personae* as a shorthand for the subjects and subject positions produced by an assemblage, it is more appropriate here to refer to subject-positions or subjectified existential territories. I have shown in my analysis of video game weapons, NFTs, and the *Libre 2*, that each of these emergent objects require a subject to embed themselves within, and thus become part of, an underlying assemblage. In this way, the assemblages producing emergent objects must be invoked by a subject (Chesher, 2023). Unlike transcendental ontologies of the object that privilege the subject as something other than the object, or as separate beings, the machinic, univocal Being developed in *Difference and Repetition* and *Anti-Oedipus* sees only productive conjugations and progressive differentiation. In this way, my analysis has proposed that the subject is not ontologically separate from the emergent object. On the contrary, I argue that the subject is part of an integrated machinic structure that produces the emergent object. Hence, the process of becoming-object undertaken by the *Libre 2*, NFT, or weapon, is a process of differentiation *from* the subject.

The position of the subject within this underlying assemblage has been complicated by the fact that while this assemblage-emergent object relationship presupposes a difference between the object and the underlying assemblage, my analysis has revealed that the subject

still features prominently across both registers. The first of these registers is exemplified in their being a part of the computational/platform/wearable assemblage. The second is the subject's encounter with the emergent object after it has emerged. As I shown in each of the case studies, emergent objects produce subjects in various ways. Emergent objects come to form complexes of subjectivation that produce subject-positions such as the player, the regulated subject, or the anarcho-capitalist crypto investor. In the case of the video game weapon and the *Libre 2*, I connected the emergence of each object with the creation of two new assemblages. On the one hand, the emergence of the video game weapon creates an object that integrates itself within the assemblage of play. On the other hand, the emergence of the *Libre 2* leads to the creation of a new cyborgian assemblage.

In the ontogenesis of the emergent object, subjects are engaged in a bi-directional relationship with the assemblage. On the one hand they are integral for its production and on the other, they are produced or "subjectivated" in relation to it. I have demonstrated this across each of the case studies undertaken in this thesis, with Chapter 4 showing that subjects become constructed as a player, profile, and consumer, in relation to the operations of the Steam assemblage, as a consumer, wallet owner, or trader across crypto platforms in Chapter 5, or as a wearer, a body, or subject in relation to the *Libre 2* as shown in Chapter 6. In each of these cases, subjects are constructed in various ways through their relationship to the broader assemblage and emergent object. Through their connection to these objects and assemblages, subjects take on different forms of identity and undertake different actions in accordance with the possibilities that become available to them. The subject is also an essential part of any assemblage because they constitute an integral part of its structure.

Returning to Broad's (2014) statement that the instantiation of a system is a necessary precondition for emergence, I propose that the coalescence of an assemblage is not only a requirement for the existence of an emergent object, but a better way of explaining the inherent flexibility of these systems. Using the assemblage in this way accounts for the flexibility of these components and individuals while also foregrounding their necessity. As I have shown, these systems are neither wholly technical nor reducible to a blueprint; rather, the production of an emergent object requires subjects of various sorts, from engineers, developers and moderators, to players, purchasers, and wearers. The underlying assemblages constituting emergent objects, therefore, can and will change over time as hardware is upgraded, platforms undergo changes, and personnel change. Despite the volatility of these

arrangements, it is still a necessary precondition of emergent objects that this assemblage is formed. Indeed, much of the analytical work I have done in this thesis has centred on discovering how these assemblages are formed and how this led to the eventual production of the object. However, whilst there is certainly a fundamental contingency upon a system, or more accurately an assemblage, these systems are often flexible and come with in-built redundancies to maintain the emergence of various forms of object. What this means, then, is that we cannot reduce these systems to a definitive blueprint, just as we cannot deny the emergent object's contingency upon them.

While emergent objects originate in a milieu populated by different social and technical formations, i.e. machines, I argue that the underlying assemblage constituting them is not analogous to the milieu in its entirety (although it is certainly part of it). The computational networks, infrastructures, and individuals constituting the assemblage upon which an emergent object is predicated, also form part of the object's immediate milieu. However, these components are not the entirety of the object's milieu because they are also differentiated from it. This was exemplified in my analysis of the *Libre 2* where I identified an underlying assemblage made up of the sensor and its parts, the networked devices of the IoT such as my smartphone, and the body itself. However, I showed that the associated milieu, of the *Libre 2* encompassed much more than just these elements as it also included everything from the neoliberal, to the capitalist, and national setting(s) into which the object emerged. It is evident, therefore, that two registers of difference are in play here. First, there is the difference between the assemblage and its milieu, and second, there is the difference between the emergent object and its milieu. In each case, this production of difference is evidence of a fundamental process of ontogenetic differentiation residing at the heart of an emergent object. It is the basis of a tension that once again brings me to Broad's (2014) formulation of emergence and the ontogenetic differentiation of object and assemblage. Considering this differentiation I propose the next axiom of this schema: emergent objects emerge only after an underlying assemblage is instantiated, these emergent objects, through the process of individuation, become differentiated enough from both assemblage and milieu to have their own consistency in relation to them.

In this section I have systematised the origins of emergent objects. Starting from the moment of their genesis, I have proposed that emergent objects are allopoietic objects. By stating that emergent objects are allopoietic, I refer to the fact that their design, operation, and

distribution are defined by the criteria and codes of their surrounding environments. In this way, I have shown that the construction and creation of an emergent object is influenced by other movements and machines. This includes technical blueprints, ideologies, and strategic mobilisations. Future studies of emergent objects warrant a close consideration of the milieus in which these objects have emerged, their histories, and their operative contexts. Having defined the role of these machines and milieus in producing, structuring, and distributing these objects, I turned to the underlying system responsible for the production of an emergent object. I posited this as an assemblage and supported this argument by showing that the systems constituting emergent objects are assemblages. This is to the extent that they are constituted by a triumvirate of abstract machines, concrete assemblages, and personae. I have identified this structure throughout this thesis and have supported it with empirical evidence. What remains, therefore, is to trace the assemblage and its link to the emergent object. In the next section I reiterate my reading of the classical emergence of Broad (2014) through Deleuze's (2013) notion of difference. I propose that the production of an emergent object is the production of difference, a difference that resides at the heart of the relationship between the emergent object and the ground of the underlying assemblage.

Emergence, Objects, and the Production of Difference

In this section I consolidate my understanding of emergence. Throughout this thesis, I have used the concept of emergence as both a heuristic for analysing emergent objects, and as a descriptive term for the relationship between two differentiated, yet entangled entities – the assemblage and the emergent object. This entanglement, despite appearing to be relatively straightforward at first glance, now warrants further consideration in terms of the broader metaphysical and ontogenetic context of this thesis. The reason for doing so now, after each case study, is that it allows me to draw out a common thread of differentiation permeating each object. In the following section I discuss the concept of emergence through the lens of individuation and difference. In doing so, I explain the becoming of emergent objects like video game objects, NFTs, and the *Libre 2*, in terms of Deleuze's (1994) materialist philosophy of difference.

I use the terms “emergence” and “ontogenetic differentiation” to specify the differences between objects that have not originated within computational assemblages, and the objects that have (such as our video game weapons, NFTs, and wearables). Concepts like emergence, differentiation, and nomological models of causation effectively encapsulate the differences

between the emergent object and the underlying assemblage. They place digital objects in a process of differentiation and becoming, a process that is generating new consistencies, rather than unreal “immaterial” objects. However, there remains the question as to how I reconcile the two theoretical threads running through this thesis. First, we have concepts coming from analytic philosophies that centre on the process of emergence. Second, we have our Deleuzian commitment to assemblages, becomings, individuations, and subjectivations that have informed this theorisation of emergent objects. The question arises then as to how each relates to the other, and whether emergence as an individuating phase-shift can be factored into an overarching framework of ontogenetic becoming. As such, I will venture a reading of emergence that forms the third axiom of this schematic: *the moment of emergence is an event in a rhizomatic thread of individuations. This event sees a minimum threshold of difference reached between the emergent object and the underlying assemblage. This event makes delineating between the two possible. This process of emergence through individuation precedes and succeeds the production of the object in a continual chain of becoming. It is never complete.*

In this thesis I conceptualise emergence as an event of individuation demarcating a point of minimal difference between the object, the assemblage, and its milieu. As Deleuze (1994, p. 38) claims in *Difference and Repetition*:

...individuating difference precedes generic, specific and even individual differences within being how a prior field of individuation within benign conditions at once the determination of species of forms, the determination of parts and their individual variations.

In this passage, Deleuze provides the justification for my claim that emergence is a form of individuation. He shows that it is not the case that emergent objects as ephemeral, contingent, and ultimately precarious beings are entirely other than their milieus or even that they could become entirely different from the assemblages from which they arise. On the contrary, they are rooted in a perpetual process of differentiation driven by the individuation(s) of a Being which is becoming. In terms of the ontogenetic structure of emergent objects, this recalls the fact that the entirety of their milieus will continue to experience permutations even once they have emerged. For the *Libre 2*, the body is constantly individuating, as is the sensor tip; this can be extended further to the atoms that constitute them. This is likewise the case for video

game weapons and NFTs. The computational systems, social arrangements, and game instances that they are embedded in are also individuating constantly. Returning to the qualitative differences that become observable between emergent objects and non-emergent objects, I propose that it is not a case of immateriality versus materiality, but a mode of producing difference that sees the object progressively differentiate itself from the assemblage.

The model of individuating-emergence I have introduced in this thesis explains the differences that make emergent objects distinguishable from their surroundings, the assemblages from which they emerge, and the ongoing states of precarity that continue to define their existences. Viewing emergence within this Deleuzian framework of differentiating individuations unveils a process of partial escape, a movement towards greater objectality and singularisation on the one hand, and the unsurpassable presence of the assemblage on the other. In *Difference and Repetition*, Deleuze (1994) describes such a process with the aphorism:

There is cruelty, even monstrosity, on both sides of this struggle against an elusive adversary in which the distinguished opposes something which cannot distinguish itself from it but continues to espouse that which divorces it (p. 28).

This opposition between what is distinguished, but what it cannot be wholly or ultimately distinguished from, is the process residing at the heart of the object's emergence. The precarity of these emergent objects, their contingency on several components, processes, bodies, and networked connections along with the distinctions between them and the object is, at its heart, the production of difference. The emergence of the object is therefore both an opposition in the form of the object and a divorce from the underlying assemblage, even as it espouses this underlying assemblage in its very existence. Hence, while Broad (2014) discusses this reality in terms of systems and qualities, I have grounded this in the very structure of Being-as-becoming. For emergent objects then, their emergence is an individuating event that produces a minimal difference between their assemblage, their milieu, and themselves.

The emergence of the gun in *Destiny 2*, NFTs, and the *Libre 2*, when read through this notion of continual individuation, difference, and emergence, provides a clearer distinction than

immateriality versus materiality. In this model, each emergent object is inextricably linked to its respective milieu and its respective particularities. The underlying assemblage forms an already differentiated aspect of this milieu whose instantiation such as platform-player-network, blockchain-token-network, and sensor-body-smartphone, provides a field of potential becomings that results in the emergence of a gun, an NFT, and the *Libre 2*. It is also the moment in which a substantive difference is produced in a perpetual chain of individuations. Thus, I argue that the specific qualities of these emergent objects, that they are usable in gameplay settings, valuable, or disclosing themselves, yet tied to particular instantiations such as the interrelations of components is at its heart, the production of difference in a milieu. I propose that it is not the case then that emergent objects are immaterial or in opposition to more tangible forms of materiality, but that the process of producing difference has created an object whose very qualities as a distinct object, qualities like precarity, contingency, and ephemerality, as well as the obvious aesthetic differences, are in part how it is differentiated from its surroundings. In this way these emergent objects are material but belong to a register of difference quite distinct from the rest of their milieu. Indeed, they are individuating away from it. It is therefore the case that these emergent objects are constantly individuating on the back of the productive relations between parts of an assemblage even as they try (and fail) to escape them.

By integrating emergence into this framework of individuating difference I have tied the production of emergent objects into Deleuze's (1994) cosmic scale unfolding of Being. I have shown that emergent objects are not borne from an entirely new process, but rather, a continuation of a primordial one. I suggest that while emergence is a significant factor in the becoming of emergent objects, insofar as they have become differentiated enough from their milieu to be recognised as nominally separate entities, it is neither the end of their becoming-object, nor is it a guarantee against their reintegration back into their underlying assemblages or, after that, their milieus. We see this point echoed by Deleuze (1994), where he claims "However, instead of something distinguished from something else, imagine something which distinguishes itself – and yet from which it distinguishes itself does not distinguish itself from it" (p. 28). In this way, we see that the precarity of the emergent object upon that which it is distinguished from – the underlying assemblage – is grounded in the very fact one cannot be distinguished from the other. There is always the threat of this difference being subsumed or transformed. If the emergent object does successfully maintain this minimal difference, these individuations do not halt upon its emergence but continue and even

accelerate as it interacts with the associated milieus as an individuated entity.

The following section focuses on what happens post the emergence of the object. Having now traced the origins of emergent objects from the milieu, to the underlying assemblages constituting it, and right to the moment of emergence, I have provided an account of where these objects originated, the influence of allopoeisis on their eventual structure, and the metaphysics of their emergence. It is clear then that while we can link their becoming to very real material structures, the emergence of these objects requires that a sufficient level of difference between itself and their milieu be produced. Although it is an ontologically significant event in terms of the production of being, the moment of emergence is not the end of the story for emergent objects. There is no escape from becoming, after all. On the contrary, this moment of emergence sets the groundwork for another set of properties, causal powers, relations, and processes that I have grouped into the following categories: individuation, encounters, and subjectivation. Having now emerged, it is time to discuss what this means from the perspective of an emergent object, and the effects that these objects can now have upon the world. The following section refers to the previous case studies, it examines the kinds of individuations and subjectivations available to each emergent object, and how these tie into their allopoietic origins and the structure of their broader milieus.

Individuation

In this section I summarise the causal powers of emergent objects using the lens of individuations, and later, subjectivation. Along with my case studies, I use the work of Broad (2014), Simondon (2011, 2020), Guattari (1992), and Deleuze (1994) to explore the different forms of relation that eventuate from the emergence of an object. I propose that this set of relations, processes, and becoming(s) represents a type of emergent causal power that is only possessed by an emergent object. The first kind of relation explored are individuations. These are the relations that take place between objects and their surrounding milieus and result in what Simondon (2011) would call a phase-shift. The second form of relation is known as subjectivating relations, or the productive relations that take place between the object and the subject. At this stage, I have mapped out the production of emergent objects to the point of emergence. Having done this, I have arrived at the point of difference in which the emergent object gains its own consistency against the assemblage and the milieu. Reaching this stage brings with it an accompanying change in focus. Where previously the concern was on how these objects emerge and the processes that drive this, it is now time to focus on what

emergent objects do once they have emerged and are in the world as (partially) singularised entities. In this section, I privilege my definition of emergence as a moment of differentiation to claim that emergent objects have causal powers endemic to themselves and only themselves. I then situate the unique subjectivating and individuating powers of these objects as a consequence of differentiation. .

I begin by establishing and contextualising the relevant terminologies used in this thesis. My justification for adopting this structure of individuation and subjectivation, from a rhetorical standpoint, is that it is a helpful way of organising my discussion of the kinds of causal powers possessed by emergent objects. Emergent objects possess unique causal powers which can be thought of as a form of individuating potential, a potential that becomes possible after their emergence. In this section, I trace the effect of these objects and their causal powers in relation to the subject. As I showed in my analysis of video game objects, NFTs, and the *Libre 2*, emergent objects are capable of producing and modulating different forms of subject. They can thus be integrated into disciplinary or capitalist regimes, and factor in the formation of new social groups like enthusiasts, crypto bros, and controlled or uncontrolled subjects.

Emergence, as a privileged moment in the ontogenetic differentiation of an emergent object, is a moment of individuation. Individuation is a pre-individual and post-individual process that I take to be part of machinic production. In the case of emergent objects, differentiation merely results in a temporary state or arrangement of things that will be superseded by another and so on. Thus, individuation does not cease with the emergence of the object but will continue in reference to it. The emergent object, in other words, will continue to individuate post its emergence. The lineage of this notion can be traced back to Simondon's (2020) work and his view that individuation is the process through which an entity or entities become themselves in relation to their surrounding milieu. In Simondon's (2011) work, individuation is presupposed by the difference between an object and its surroundings. This relation is therefore predicated on being differentiated from a milieu because differentiation is itself a condition for the formation of the object-milieu structure. Where this has become germane to my analyses of being post-emergence, is that these individuations change with the becoming of the object. I have shown, for example, that the emergence of this new entity means that the individuating powers it has must now refer back to the emergent object rather than to the assemblage, as was previously the case. Therefore, they are, as Broad (2014)

would say, genuinely causal, and are unique to the emergent being rather than the underlying assemblage.

The concept of individuation has been foundational to my analysis of the emergence of video game weapons, NFTs and the Libre 2. Individuation encapsulates what happens after emergence, and how this factors into the becoming-object of these beings, rather than their being-object. For example, one does not usually encounter or think about NFTs in terms of systems or assemblages, and even if I was to abandon this terminology of emergent objects, NFTs would still be primarily thought of as a category of things unique unto themselves. A category quite distinct from the systems that produce them. Encountering NFTs as singularised entities, therefore, suggests that the common forms of individuation initiated by them such as buying, selling, speculating, desiring, etc. are the result of their interaction with a milieu on their own terms as opposed to the assemblages. Emergence itself is a moment of individuation that sees a minimal point of difference produced between the object, its milieu, and the underlying assemblage. What follows after this emergence, however, is a different series of individuations that are only possible if they are related to an object.

The novel individuating potential(s) of emergent objects have been illustrated across the breadth of this thesis. In my analysis of video game weapons in *Destiny 2*, for example, I showed that the gun was a vector for individuations both within and without the game space. In these passages, I argued that the gun was notable for its ability to create, or otherwise prompt becoming(s) in its immediate environment. I showed that the ability to shoot or cause damage to an enemy could drastically affect the make-up of the game space in categories such as enemy behaviour, distribution, and the layout of the game's visual field. This line of analysis was extended to more basic examples such as prompting behaviours and reactions in the wielder. Here, the wielder experiences the gun's presence as both a call to action and as a way to immediately answer the challenges posed by the map that they are in. Revisiting the bi-directional movement embedded in the structure of emergent objects, that is, their simultaneous reliance on an underlying assemblage and the consistent individuations that help to differentiate them from it, the interactivity of the gun presents an interesting case study of this process in action. This is because the presence of the player is required across both registers – they are simultaneously embedded in the platform assemblage and the associated peripheral hardware attached to it (controller, monitor, etc.), as well as being the wielder of the object within the assemblage of game play. The assemblage, as such, is a

condition for encountering the object, but the continued individuations stemming from this encounter are what serve to differentiate the object further from its assemblage and its milieu. In this scenario, emergence is a precondition for the gun's being and becoming. Emergence allows the formation of behaviours endemic to the gun, that will then continue to individuate it further.

These causal powers are not unique to just the gun or video games as a medium. The case studies that I conducted on NFTs and the *Libre 2* showed how this process can play out in different ways in accordance with the object that emerges. My analysis of the *Libre 2* demonstrated that the production of this emergent object, and its entry into dataspace, produced an encounter with the object as a continuous, productive being. Where the gun individuated interactively and ludologically, i.e. through its interactions with the player, firing bullets, and causing damage, the *Libre 2* was shown to individuate through the continual production of metrics and only in relation to other devices such as a smartphone, smartwatch, or computer. Returning to our discussion of individuation and emergence as process of differentiation, it is clear that the *Libre 2* differs markedly from the underlying system upon which it is predicated because it continues to differentiate by producing metrics. Although it is easy to conflate the sensor that is mounted upon the arm as the same object, and therefore, to claim that we have direct access to it in a way that is distinct from the other emergent objects studied in this work, the *Libre 2* only emerges once it has achieved connection with the body and other networked devices. The *Libre 2* also needs to be invoked by the wearer *through* these devices. As a consequence of this difference, the individuations available to the *Libre 2* are comparatively more complex. For instance, the *Libre 2* forms a cyborg assemblage with the wearer. It is also able to call on the wearer to act in certain ways, regulate their behaviours (I am ok to drive, or I am not ok to drive), and autonomously elicit responses from other devices like initiating alarm bells in my and my wife's phone when limits are exceeded. By considering individuations as phase-shift events taking place in a milieu, we see that the *Libre 2*'s potential for individuations post-emergence or what Broad (2014) calls the causal powers endemic to emergent qualities, are both significantly more complex and different than those of non-emergent objects. Where the disclosure of its underlying assemblage can be thought of phenomenologically, the *Libre 2* is able to perform at a regulatory level. The object modulates behaviours in accordance with the metrics it produces.

Subjectivation

My exploration of individuation post-emergence has demonstrated that emergence, as the production of difference, is not the end of differentiation. While the object can be differentiated, identified, and interacted with because of the difference between itself, the underlying assemblage, and the surrounding milieu, I have shown that new individuations also emerge in relation to the object. At a conceptual level, this discussion of individuation has been a useful way to approach emergence and the causal powers it brings along with it. By positing this moment of emergence as ontogenetic differentiation, it becomes possible to account for the different effects of these objects upon their surroundings. However, as my discussion of the *Libre 2* has shown, individuation occurs in relation to subjects, individuals, and institutions. Emergent objects, therefore, do not just cause changes in milieus but also affect subjects in interesting and ever-evolving ways. As I showed in Chapter 5, NFTs possess a history indebted to the investments of desiring and anarcho-capitalist machines. The allopoietic structure of these objects must therefore be contextualised within a requirement (or indeed desire), for a decentralised commodity form. The result of these investments was the mobilisation of blockchain technology and Ethereum to produce NFTs in their present form. What happened after though was equally interesting – the emergence of NFTs engendered new social identities, subjectivities, and assemblages centred on investing, trading, and minting these objects. In simple terms the emergence of NFTs signalled the formation of new subjectivities produced in relation to them; in this way they became a precondition for the minter, the speculator or, for lack of a better term, the “crypto bro”.

I have demonstrated that the relationship between the emergent object and what I refer to as the subject extends beyond the typically hierarchical model of the subject-object relation. The subject is, after all, a part of the underlying assemblage and the wider process of machinic production leading to the emergence of the object. Likewise, the emergent object’s integration into new assemblages means that its powers extend to the production of subjectivity, or what Deleuze and Guattari would call subjectivation. In *Chaosmosis* (1992) Guattari defines subjectivity as:

The ensemble of conditions which render possible the emergence of individual and/or collective instances as self-referential existential Territories, adjacent, or in a delimiting relation, to an alterity that is itself subjective (p. 9).

Under this view of subjectivity, the existential territory is individuated or produced through its exchanges with different complexes of subjectivation (Guattari, 1992). This has been relevant to my analysis for two reasons, the first is that it reflects my earlier point that the subject positions of an assemblage are constituted by the assemblage just as much as they constitute it (Nail, 2017). Social machines and technical objects factor into the kinds of subjects that are produced, similarly, an emergent object can produce social formations and subjects like other technical objects. In a similar vein, Guattari's (1992) work highlights the malleability of subjectivities in relation to broader machinic complexes. Given the undetermined nature of the subject and its identity, it follows that the emergence of an object can and does have a dramatic effect on how subjectivities are produced.

The question remains as to how subjectivation is to be consolidated in the present schematic. Emergence is an instance of individuation where differentiating between the object and its milieu becomes possible; in this instance, the entry of the object into the milieu also represents the formation of a new complex of subjectivation. Emergent objects become part of what Guattari (1992) calls "...machinic apparatuses (for example, those involving computer technology)" (p. 9). In this way, the subject is produced in relation to these objects while the objects impose or inform certain kinds of subjectivities. This is further complicated by the fact that the allopoietic structure of emergent objects means that they carry with them values from existing regimes. Returning to the example of the *Libre 2* I illustrated this with how the choice to use metrics was tied directly to the *Libre's* origins in neoliberal capitalism and the concretisation of disciplinary and competitive logics. In this example, I revealed that the *Libre 2* actively contributed to the formation of a particular kind of subject through mechanisms such as using metrics to disclose itself, its strategic use of colour coding, and its embeddedness in medical institutions. This demonstrated that it was not solely an instrument of measurement, but rather, was an apparatus facilitating both the behavioural modulation and the control of the wearer. The *Libre 2* as an emergent object thus comes to form a new complex of subjectivation, one that can produce two forms of subject, the disciplined and the undisciplined. It also came to form a new subject-assemblage, what I called an autothanotropic cyborg because it allows the wearer to begin to (re)produce themselves, but only through the continuous drive towards its own destruction.

Throughout this thesis, I have shown that the process of subjectivation is not just confined to NFTs and the *Libre 2*. It was also identified in Chapter 4's rather more playful example – the

gun in *Destiny 2*. In this chapter I demonstrated how the gun functioned as a way of constructing subjects. Not only as wielders of weapons in the middle of an intergalactic war, i.e. as combatants, but also as specific categories of combatants. For example, different gun types could be used to support a player's transition into certain archetypes or categories of combatant. In this instance a sniper rifle could be associated with ranged or "stealth-based" combatants, producing a subject who takes on the identity of a ranger, a supporter of melee characters or grunts, and one whose navigation of the game-space would be influenced by the adoption of this moniker. I showed here that the player's actions were informed by the characteristics of the weapon that they handle. On the other hand, though, a shotgun might be indicative of a "tank" character, that is, someone who focuses on dealing and taking large amounts of damage, usually at the forefront of combat. While one might object to this categorisation of the gun in *Destiny 2* as a vector for subjectivation by claiming that tanks, rangers, or scouts are ultimately fictional identities that are inhabited by players temporarily, this distinction is still only derived from the difference produced by the emergence of the weapon. Thus, in ontological terms, the weapon remains real to the extent that it is physically instantiated and capable of interacting with other subjects in very real scenarios, notwithstanding the fictional backdrop of the game.

In this section I have traced the processes that follow the emergence of an object. Building upon a foundation of allopoeisis, assemblages, individuations, and emergence, I have shown that emergent objects do not enter in existence passively but go on to act as individuator. Using a Deleuzian framework, I have highlighted that the production of difference in a milieu necessitates subsequent changes or phase-shifts due to the perpetual becoming(s) characterising Being. Emergent objects are no exception to this rule as they create changes and initiate events. Perhaps more interesting, though, is the fact that emergent objects can produce different kinds of subject by creating new complexes of subjectivation. Recalling the work of Guattari (1992), I have suggested that emergent objects produce new categories of identity and activity. For example, the emergence of NFTs exemplifies how they are not only informed by social machines but go on to influence these machines and their subjects in different ways. Over our three case studies and throughout this chapter, we have seen that emergent objects factor into the production of different kinds of subject, from the enthusiast communities surrounding NFTs to the combat roles of *Destiny 2* and the disciplined wearers of the *Libre 2*.

Going forward, it is now time to look forward to the possible futures available to these objects, not just in terms of NFTs, video game weapons, and wearables, but as a way of viewing the relationship between what could alternatively be digital objects, digital artefacts, wearables and so on, and the systems from which they emerge. As I mentioned at the start of this chapter, it is not the case that this category of object is confined to these case studies; on the contrary, emergent objects will persist so long as these forms of relation and becoming remain possible. It is now incumbent upon me to discuss some of the implications that this may have for later works in this area in addition to providing one last summary of the concept going forward.

The Future of Emergent Objects

The work undertaken in this thesis has combined an empirical investigation of video game weapons, NFTs, and the *Libre 2* with a sustained theoretical-philosophical analysis. This combination of theoretical groundwork with each of the three case studies has resulted in a new ontogenetic model of emergent objects. This set of theoretical schematics and concepts, although informed by the empirical work I have undertaken, is by no means confined to it. Throughout this thesis, I have used the term “emergent objects” to encapsulate the ontogenetic reality of these entities. In this following section, I summarise a set of analytical threads that have permeated the breadth of this thesis. In doing so, I reiterate to the reader a set of axioms that might aid future analyses of emergent objects and other similar entities. The rationale behind this is to solidify the relevant processes, concepts, and potentials of these objects, as well as to lay the foundation for future investigations into the being of similar entities.

From the case studies performed in Chapters 4, 5, and 6, it is evident that emergent objects emerge as part of a continuous process of individuation. I have argued throughout this thesis that this process should be viewed as a thread of primary machinic production. A thread in which the investments of various machines facilitate an emergent objects movement towards differentiation. In this way, the emergence of an object begins with a series of historical developments, social arrangements, and socio-technical structures. The continual individuations of these machinic structures create a set of environmental conditions that become necessary for the production of emergent objects. I have already provided several examples of this throughout this thesis, however, the confluence of developmental cycles in areas such as computer graphics, console gaming, platformised gaming, cryptography and the

Internet of Things (IoT) are all instances of this process.

I have shown that emergent objects are produced by machinic structures. However, they become differentiated from these machines and assemblages as part of the process of becoming-object. Thus, emergent objects are entities produced by something other than themselves. I claim, therefore, that the origin of all emergent objects is allopoietic. This is to say that all emergent objects are produced by external agents, processes, and with technical components that are already individuated. Emergent objects are produced in accordance with the logics and criteria of their immediate environment and are influenced dramatically by their respective operative contexts. Notwithstanding this, emergent objects can go on to form autopoietic assemblages that produce themselves. We see this, for example, with the *Libre 2*. In this way, emergent objects can be said to embody these criteria and reflect them in their technical structure(s). In everything from the *Libre 2*'s use of metrics, to the commoditisation of NFTs, we see the influence of these lineages, the social imperatives of the milieus in which they arise, and the productive contexts in which they are formed, upon the structure of each emergent object. This shared commonality informs the first axiom of this section: *emergent objects are allopoietic objects, they originate from, and are influenced by, pre-existing social, technical, and cultural machines that populate and produce their milieus.*

I argue that the allopoietic ontogenesis of emergent objects necessitates, or even presupposes, a process of individuation. Individuation, taken here to refer to a process of continual becoming that defines both Being and the entities within it, is what allows an emergent object to be produced and enter into the milieu as a differentiated entity. However, because of the allopoietic origins of these objects, this process of individuation has been shown to arise from the instantiation of an underlying assemblage. An instantiation that arises through a combination of invocational desire, and machinic production. As Broad (2014) claims, the emergence of an entity is contingent upon a particular systemic arrangement. Emergent objects are no exception to this rule. The emergence of all our objects and all future kinds of emergent objects, therefore, will always depend upon the establishment of a particular series of processes and components. This process encompasses a series of complex interrelations between hardware, software, and network infrastructures, in addition to different groups of people. I claim, then, that all emergent objects share a similar contingency upon an underlying assemblage. Thus, we arrive at the second axiom: *emergent objects only come*

into being after an assemblage is instantiated. Upon the instantiation of this system, they are differentiated from it by an ongoing process of individuation-differentiation. The importance of establishing this underlying assemblage has been demonstrated throughout this thesis. For example, the gun in *Destiny 2* was, (and still is), contingent upon a particular formation of the Steam assemblage. In addition, my analysis of NFTs showed that they relied on an assemblage of networked computers, minters, engineers, and decentralised blockchains to emerge. Finally, the assemblage leading to the production of the *Libre 2* was revealed to be a combination of the body, the sensor, and the user's smartphone or smartwatch. Thus, without this first instantiation, there would be no emergent object.

Having traced the emergence of the object from milieu, to the formation of an assemblage, and then to a moment of becoming-object, I examined the effect of an object's emergence on the associated milieu. In each case study chapter, I devoted a section to demonstrating that emergent objects did not become liberated from the inevitable progression of individuations. On the contrary, I have shown that this moment represented a point at which a minimal difference between the assemblage and an emergent object was produced. In this moment of differentiation, we saw that new forms of becoming could now potentiate. For example, the effect of guns on in-game combat, the game world, and the player were discussed at length in Chapter 4. The advent of speculators, investors (if there is a difference), and NFT artists, was directly linked to the emergence of NFTs. Finally, the more intimate modulations of the *Libre 2* were explored in Chapter 6. The main takeaway from each of these investigations is that emergent objects have unique causal powers endemic to themselves. These causal powers can be further divided into two distinct categories – individuation and subjectivation. The emergence of these powers forms the basis for my third axiom: *emergent objects possess unique individuating and subjectivating powers. These powers are differentiated from their surrounding milieu and the assemblages upon which emergent objects are contingent.*

Despite the contingency of emergent objects upon an underlying assemblage, and the inherent precarity that this arrangement brings with it, the future of these objects and the ontogenetic framework developed throughout this work will persist so long as these systems do. For lack of a better term, this “theory” of emergent objects is not just confined to the three examples studied in this thesis. Instead, what I have uncovered here is a more fundamental relationship between machinic production, socio-technical assemblages, emergent objects, and the process of becoming. Beginning with Deleuze's (1994) understanding of

individuation and difference as the becoming of Being, the production of new objects and their difference to existing forms of artefacts is merely an event influenced by a more complex basis of technicity. As they are a part of this overarching process of unfolding, the production of an emergent object is not an exceptional event that defies the material structure of the world. On the contrary, it is a specific iteration of a process that repeats itself as Being unfolds. It is conceivable then, that as systems become more complex the objects or entities that they produce should express new forms of difference, even though these new entities may never be entirely individuated from Being itself. This is certainly the case for emergent objects, they are different and differentiated, but can never be wholly distinct from the systems and individuals that produce them. Indeed, what has been notable in each case study, is the tangibility of both the system and emergent object at the same time.

While it may be tempting to reject the term object in this digital context, given the lack of resemblance between non-emergent and emergent objects, the work of this thesis has been to rescue the term object despite this challenge. In the process of rescuing the object, I have shown how objectality is instantiated, described, and produced across multiple sites. Through my investigations into object-oriented programming (OOP), the structure of hardware arrays, and emergence, I have shown a substantive, and very object-like connection between what arises as an entity and what produces them. Similar to their non-emergent counterparts, emergent objects must attempt to escape Being by differentiating themselves from their milieu. Examples of this include the metricisation of electrochemical and electromagnetic reactions between body and sensor with the *Libre 2*, the behaviour of the gun as it is described using OOP, and the way that NFTs differentiate themselves through the properties of immutability and transparency.

In the future, it may be the case that new forms of emergent objects will accompany new kinds of assemblages. When I began writing this thesis for example, Mark Zuckerberg's metaverse was just announced, along with a slew of promises for new forms of Virtual Reality (VR) enabled objects. Now, at the time of writing this conclusion, Apple's AppleVision Pro platform has attempted to create a new milieu that merges emergent and non-emergent objects. It is also possible that the generative systems behind chatbots and other "artificial intelligences" could lead to the emergence of new objects or even entities. Here, the kinds of objects that will be produced, the forms of disclosure that they possess, and the systems that they are predicated on could all differ. Nevertheless, the fundamental

ontogenetic structure and the forms of relation giving rise to these new entities will remain the same. I can guarantee you though that the capitalist machine will be there. This is perhaps indicative of the utility of the present work. It does not just describe a limited number of objects; it develops a logic through which to understand them. This work also challenges lazy descriptive binaries in favour of theoretical accuracy. To some extent, this simply involves articulating a process of ontogenetic differentiation rather than positing a metaphysical chain of Being. It is here that I will leave this thesis as a set of considerations, structures, and heuristics for examining the being of objects predicated on computational infrastructures — objects that emerge in Being and strive to become differentiated from it.

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