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Chapter 1

Introduction

Abstract

Biology has been forgotten. The rise of the machinic State since the industrial revolution has seen increasing emphasis on the final products for the purpose of capitalist exploitation, at the expense of considerations of process, i.e. how things are made, used, and interpreted. The rise of 'intellectual property' is a move that replicates the machinic productions of industrial invention. The development of newer technologies challenges this product-based approach. Digital technologies, in particular, have led to a machinist style approach from regulators; but the 'turn' of the law with regard to those technologies has led to an increasingly machinist, colonising, form of regulation. With the development of alternate newer technologies, that in all likelihood will supersede current digital technologies, the current approach of the law could lead to an inadvertent misbalancing of the law. In particular, the rise of quantum and biological compute could lead to a considerable strengthening of legal rights without any legal reform taking place – which would in turn lead to a self-destructive amount of machinist regulation. The monograph proposes reform to address this issue, thereby more broadly seeking to reinstate a cultural State that is process based, and thus more sustainable model of existence.

Keywords: Biology, copyright, culture, regulation, machinist, quantum

Introduction

Biology has been critical to culture. It has been critical to the development of the State, to the individual, and increasingly so to newer forms of technologies. Biologies are how we as individuals create, engage with the world, and develop the broader lot of humankind. Yet, despite the importance of biologies, regulation has increasingly moved away from acknowledging them. Regulation has, over time, held an increasing amount of machinist characteristics, placing boundaries around cultural works. These boundaries are the result of laws that focus on final products, rather than an appreciation of processes relating to the use of culture. Whilst the law has gained machinic tendencies, so have many regulated technologies – for example, digital technologies have specific protection mechanisms protected by law, which favour entire blocks of works as protected units.[1] Regulation has taken a 'false turn', not just in taking on machinic characteristics to a degree far removed from biological considerations, but also in its adaptation to digital technologies.[2] Copyright law, for example, has seen rights strengthened in light of the ability of digital computers to make perfect copies reasonably easily and quickly. However, newer technologies, such as biological and quantum compute, do not operate in a similar fashion. This will lead to stronger legal protection than seen before, potentially upsetting the so-called copyright balance[3] – and will lead to a further machinic approach in law which will may also influence a more machinic style of biologic compute. This monograph tackles the issue, and proposes regulation which is more aware of biological process, reversing the

[1] See discussion *infra* Chapter 2.
[2] See discussion *infra* Chapter 5.
[3] See discussion *infra* Chapter 6.

'false turn' that has occurred with regulation of digital technologies. This chapter will outline the overall argument and approach of the monograph, and then outline the chapters that will follow.

Biology as a component of the State

Biology is critical to the creation of cultural works, that is, works that are created for pleasure rather than for necessity. Since the emergence of culture early in history, the human body has been a necessary component not just for the necessities of life, but also in the creation of cultural works. With the rise of technologies such as bioprinting and DNA editing, or even devices that interact with the human body such as those involving augmented reality, we are seeing an ever-closer union between biological bodies and external devices. Those devices have primarily been mechanical, but they are also becoming biological as with 3D printed biological prosthesis, with biological substrates for cultural works, and biological compute. The State holds certain conceptions of the human body, of biologies, and the development of cultural works. This goes beyond e.g. the regulation of authorship to the ways in which the State presumes we think – for example, not just the famous 'invisible hand' of capitalism but also the lesser known 'invisible hands' of State rationality and cultural work creation. The conception of the 'invisible hand' of capitalism has, and is being, transformed by the rise of machinic and biologic variants, but the State has no consideration of the consequences of this alteration. The hands are as invisible to the State as they are to the individual. To deal with this invisibility, a regulatory system is proposed to provide checks and balances towards the ever-increasing encroachment of the machinic technologies and upon the way the law favours machinic approaches to technologies rather than process based biological approaches.

With regard to biology generally, the State has been built from the combined creative acts of the human body. Without the human body, the State would not exist as an entity; human beings themselves would not exist. Under this premise, we should therefore posit the question whether technologies that integrate with biologies (such as biologic compute) encapsulate the human nature of the State and State creativity. As the human body has been such a central component to the development of the State, does the current ascendancy of machinic legal approaches remove the importance of biologies, of the human body, within the State? Will it influence the manner in which we perceive ourselves, and how we interact with one another? Will the traditional State be supplanted by an interconnected system of machinic beings, far removed from the natural biologic State of human bodies?

States have, naturally, regulated the human body - this has taken various forms, from the regulation of abortion, the regulation of health services, through to extreme examples of State led extermination of racial groups; a "push button order."[4] It has similarly regulated biologies directly.[5] The technologies of regulatory law have been a central component. As Heidegger discussed in his work, law itself is a form of technology; but so is the human body.[6] However, the modern-day State rarely explicitly considers the niceties of regulation of the human body upon cultural works. This could be for historical reasons, namely that in the past focusing on the relationship of the human body to creative endeavours has led to inexcusable human rights abuses.[7] Nonetheless, as technologies are increasingly interfacing with biologies, a failure to consider the consequences could lead to a situation

[4] Bronowski, Ascent of Man, BBC (1973). See also Foucault, The birth of biopolitics, Picador (2004); Foucault, The Birth of the Clinic (1963; Vintage 1975).
[5] See discussion in Chapter 4.
[6] Heidegger, The Question Concerning Technology and Other Essays (1954; Harper Perennial 2013).
[7] Consider the relationship between Nazi art and policy diktat – Bachrach and Luckert, State of Deception, WW Norton & Co (2009).

where creative endeavour is endangered. It does not follow that there will automatically be abuses of State power if we consider the importance of biologies, any more than not considering it is going to. If anything, given the biologic technological challenges of the future, such consideration may prevent such abuses.

This monograph addresses that issue of why the biological body has become 'hidden' in the discourse of cultural regulation, and the theory of what the State implies the human body is. The laws that govern cultural works do not address the body *per se*; they tend to address at best the boundaries of what an 'author' might be as part of legal doctrine. They implicitly suggest certain physical traits of creators and of distributors, based in part around pre-existent technologies, both machinic and biological. The monograph outlines why biologies themselves are a critical element in the development of the State.

The human biological body has formed the State as we know it, ultimately leading to the establishment of a complex web of rules and regulations that govern the human body itself. It reflects the symbiotic nature of the human body itself, with all its bacterial relations – over 90% of the human body is made up of symbiotic matter, and so it is perhaps to be expected that this trend carries over to the broader State relationship itself in the sharing of the human body to the State.[8] The body has become such an integral part of the State that it should be no surprise that it is often forgotten or neglected, which has led to the failure to realise the importance of biologies more broadly. Society is built around the able bodied, hence the battle of those with disabilities to be able to either gain recognition with the State or be able to fully engage with it (hence, in part, one of the reasons for the term "disability").[9] The notion of the physical body has arisen to prominence in authoritarian regimes who seek to restrict the general freedoms of individuals from certain groups, but in terms of the generic activities of the populace at large, the physical characteristics of individuals and how those engage with the State through their bodies, and how that informs the nature of the State, has been ignored. Instead, the State has created various legal concepts to represent a legal formulation of the individual – for instance, the notion of the author in copyright law and inventor in patent law.[10] This is an individual who, at various times, has been 'romanticised' in contradiction to the physical realities of experience and idea formation, and ultimately the reality of the human body as a necessary component of the human mind. The system of the State separates the notion of the individual as a living being into distinct regulable activities and outcomes, both of which are for the provision of capital creation. As a consequence, the State has been moving away from a consideration of the individual as a biologically situated entity.

The monograph argues that the underlying rationality of States is founded in the biological bodies, and is fundamental to its continued existence; we are not, to quote, "machine [people] with machine minds and machine hearts."[11] For example, the laws governing human cultural behaviours tend to imitate the realities of the human body; in the same way we relate to others as a single entity when in reality they are a series of symbiotic relationships, so the State relates to humans in this way. Such approaches underplay the details and realities of interactions in the cultural universe. There is, in effect, a rhizomatic existence of biological inter-dependencies, similar to those argued by Deleuze and

[8] Dupree & O'Malley 'Varieties of Living Things: Life at the Intersection of Lineage and Intersection' 1 Philosophy and Theory in Biology e003

[9] Wills, Dorsality, Minnesota Press (2008); Wills, Prosthesis, Stanford University Press (1995); Smith and Morra, The Prosthetic Impulse, MIT Press (2006).

[10] See e.g. Consider discussion in Woodmansee & Jaszi, The Construction of Authorship, Duke University Press (1994).

[11] Chaplin, The Great Dictator, Charlie Chaplin Productions, One Production Company, UA (1940).

Guattari.[12] These biological realities are found within the technologies of governance, but these are increasingly set alongside machinic technologies. Machinic technologies may be biological, non-biological or a mixture, but machinic technologies will influence the natural biologic rhizomatic relations between humans and the State. In order to assess that level of impact, it is necessary to consider the application of the law to specific situations. For example, 3D printing of biological materials has additional legal protections when those materials incorporate computer code. That computer code encourages the inclusion of additional means of biological control and leverage of the biological body. For example, it could allow execution of biological processes in a 3DP liver, but it could also be possible for the law to require the execution of such code. The manner in which law favours particular relations not just between individuals, but those individuals and the State through devices such as computer code, should be considered.

Making a State aware of the biologies of culture

Having assessed the importance of the physical body in the development of culture and the regulation of culture by the State, the monograph then considers legal reforms. Those reforms are to ensure the realisation by the State of its policies upon the human body, for the generation of future cultural content. The chapters begin by considering the application of existing laws and rules to newer technologies, such as 3DP and 4DP bio-printing, augmented and virtual realities as linked to the human body, as well as other forms of biological substrates such as biocompute. The direction of regulation will be noted and questioned, especially concerning the manner in which biological bodies are being interacted with. For example, will biological substrates, or indeed the human body, change due to alterations in the State-body relationship? The importance of biologies in the development of the cultural State will be considered, to help draw up red-lines that should not be crossed by State regulation.

The set of principles that will be drawn up will reveal a need to move away from past laws that ignored the importance of the biologies in day-to-day activities, to realise the importance of the human body in cultural regulation. As bio devices become ever more commonplace, and as such devices become ever more integrated within biologies, it is important for the consequences of this to be realised. It is therefore proposed that there be a parallel system of safeguards to run alongside existing regulation, to make sure that such technologies do not impede the creative abilities of individuals. It will focus on the process of creativity and the role of biologies within those processes. The system will not seek to restrict existing forms of IP protection for newer forms of technical devices, but will seek to provide some limits and oversight to the system to ensure that the importance of biology is not ignored. It is proposed that there will be an oversight body, to recommend alterations to the current regulatory system in order to ensure that the State is taking the human body into account, or if the State is failing to encourage investment in socially beneficial inventions. For example, current IP protection leads to a focus away from the use of machinic and biological watermarking technologies for biological medical purposes such as quality control, and instead favours investment into machinic style technologies that track and trace the use of digitally watermarked copyright content.

Industrial Biologies

Our biology, our physical means of being, have become increasingly ignored by the State in the field of intellectual property with regard to its impact on the making of culture. Whilst laws and regulations have increasingly focused on value of intangible information, they have done so in a manner which is ultimately rooted in the industrial revolution and focus is similarly machinic in character. With the turn

[12] Deleuze and Guattari, A Thousand Plateaus, Continuum (2004).

to an information-based society, the tendency has been to focus on the work as a product, rather than a process. Occasionally, biological concerns come to the fore but this is mostly limited to subject matter such as biotech patents; a machinic, industrialised approach is typically taken by the State which has indirect but significant impacts on the development and role of biology within society. The contention of this monograph is that it is critical copyright law engages with the importance of biology, because copyright law is covering more content, and it will be argued, has the widest impact when it comes to the law. There is considerable overlap between patents and copyright,[13] patent focuses on the inventive aspects in the making of works and is at a higher level of abstraction; copyright law tends to protect the final work and, significantly, its operation. This monograph is about how copyright law has been influenced by machinic considerations, something that has also impacted patent law, and the impact of that upon the biologies within the State. There has been a failure to consider that the law remained, overall, machinic in character rather than sufficiently being aware of process, especially biological process. As technology has developed, in particular with the rise in biological substrates but also other technologies such as quantum compute, it becomes clearer that our ontological understanding of biology and information is skewed.

As Merchant has argued, over time humanity has moved from a more nature-based approach to understanding the world to one dominated by a desire to control and compartmentalise specific modes of exploitation.[14] A natural approach would appear to be consistent with biological theories of process;[15] process relates to flow, and in the words of Plato, flows in the natural realm:

> "Such is the nature of the Earth… In the Earth itself, all over its surface, there are many hollow regions… joined together underground… Such is the conformation of the earth and its rivers" [16]

Flows, however, do not just relate to naturalist elements such as rivers, but flows can relate to thought processes – hence the notion of 'information flow' to represent the human way of thought,[17] through to other variants such as notion of memes.[18] The notion of process thus is based in an understanding of the natural world. However, within copyright law, we typically refer to property – a concept which stemmed from the granting of rights over land from the Crown. Copyright deals with an extension of this, with intangible property being key. The property allows for exploitation of a copyright work, in the units of the work. The law protects what is, in effect, an industrialisation of copyright work – the process of reproduction, distribution and so forth. It is argued that the law is machinic nature, a direct consequence of the machinic nature of the industrial revolution. The law has adapted these characteristics from the workings of machinery.

If we compare the proprietary, machinic form of copyright exploitation with process theory, there is a clear divergence between the two. This has been discussed, if not explicitly, by many, for example in the work of Joseph Beuys.[19] Beuys was often concerned about perceived nature and form of material; he contrasted this with the notion of 'work' both as a way of making things and as a final product. On the surface, his works were about materiality through the use of materials such as felt

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[13] For further discussion *infra* Chapter 4.
[14] Merchant, The death of nature, Harper One (1983).
[15] See discussion *infra* Chapter 4.
[16] This discussion takes place after his analysis of ideas - Plato, Phaedo, in Hamilton and Cairns (eds), Plato Complete, OUP (1961) at 92-93 (Ph. 111d-113d).
[17] Elkin-Koren, It's all about control: Rethinking copyright in the new information landscape in Elkin-Koren, and Netanel (eds), The Commodification of Information, Kluwer (2002)
[18] Dawkins The Selfish Gene, Oxford University Press (1976).
[19] Beuys, What Is Art?, Clairview (trans. Barton & Sacks, 2004); Staeck, Beuys Book, Steidl (2012).

and fat.[20] The deeper meaning of his art (the work!) was to consider the processes of interpretation within the human mind.[21] Others have made similar distinctions between the process of making and the final products of capitalist exploitation.[22] Copyright law itself has certain limited avenues which appear to recognise process – for example, the concept of ideas (where copyright protection will be deemed not to exist or to permit an infringement), the notion of reverse engineering (in certain specified circumstances) or within the reasoning of copyright infringement cases. Process patents could be another example. Nonetheless, these examples are all situations where the notion of the machinic final product is the overriding concern; process is about those products rather than a wider consideration of processes as a thing in itself; or indeed, as a part of the biological process.

In a manner similar to that of creativity,[23] where the processes of creation have been side-lined in favour of proprietary legal constructions, so it is with biologies as the substrate in which works exist and are interpreted. Creativity was central to the development of society, and yet it was very rarely acknowledged within the law. So it is with the form of the materiality of information, and the concomitant role of the biologies in the transmission and interpretation of that information.

The initial cause of this failure to acknowledge the vital role of biology in the cultural Sate through law is due to two broader issues which will be discussed further. These are a) due to a failure to accept the notion of 'information' more broadly within the State and b) a failure to recognise the importance of physicality for intangible works. The State has primarily concerned itself with specific informatic forms. These can concern, for example, the laws and rules themselves, but also of course the normal subjects and rules. As outlined above, the focus on physicality, in particular biology, has been lacking with the law tending to focus on categorisation of things, leading to a distanced "thingification."[24] The consequence of this can be seen with the approach of law to any newer technologies, be that the gramophone, the Internet or DNA coding, whereby the focus is on topics such as reproduction and subsistence, rather than how the form and physicality of information may influence the development of the State, and in particular, the processes leading up to that.

Physicality is critical to every single act of the human being. With no physical body, without our biology, we are quite literally nothing; just as the State would thus be nothing. Whilst the development of the cultural law has been around exploitable units of exchange, and whilst there have been tensions between the machinist nature of law compared to the creative endeavours of some individuals (where there is a clash, e.g. infringement proceedings), we have forgotten about the role of physicality. The preoccupation, in recent history, with the notion of the 'soul', of the role of the individual as a person and not a mere tool, has led to a misstep, in that we have tended to forget (or wanted to forget) the importance physical biology as a part of information creation. This has, naturally, not been much of an issue in recent history other than with regard to the (important) concern of access to, and receipt and use of, works for people who require additional or alternative accessibility options. It is only with the increasing development of technologies such as biocompute, of issues such as DNA coding, robotics, the 'uncanny valley,' and artificial intelligence that the future of law to address the role of the biological body has become technologically important.[25] For example, DNA coding, in the broadest

[20] Thompson, Felt: Fluxus, Joseph Beuys, and the Dalai Lama, University of Minnesota Press (2011).
[21] Consider Beuys, Honey Pump in the Workplace (Documenta 6) (1977); Beuys, 'Honey is Flowing in All Directions' (1976) for details see https://www.tate.org.uk/art/artworks/beuys-honey-is-flowing-in-all-directions-ar00128 (last accessed 28th December 2022).
[22] Most notably Steiner, World Economy, Rudolf Steiner Press (1936; 1972 reprint).
[23] See Griffin, State of Creativity, Edward Elgar (2019).
[24] Cohen, Transcendental nonsense and the functional approach, 35 Columbia Law Review 809 (1955) at 815.
[25] *Infra* Chapters 5 & 6.

sense (for example, using DNA as the basis for computer software that runs inside the human body) poses unique challenges to the notions of not just what is permissible with biologies (which may or may not be synthetic), but also potentially with the human body. There is often a fine line between the two. Regardless of one's viewpoint of efficacy and morality, the current copyright approach in terms of informatics creation is that the issue is one of copyright subsistence, and not of process biology. The failure to acknowledge biological physicality as a relevant aspect to the cultural State will have increasing effects now that we are entering a period of history where biology is not just the body of the human which makes a work, or a biological ingredient within a work (e.g. blood) but a fully developed substrate that could, in theory, even make decisions itself (e.g. AI in biological neurons).[26] We know that the human body holds information; but what about information contained in DNA – what if that were placed within the human body? This is an increasingly possible situation – technology exists to store data in DNA,[27] and this is likely to become ever more widespread even for the mere hobbyist.[28] Microsoft has developed a means to keep data in plant cells.[29] This was done purely for cost reasons, because cells are cheaper to store information in than storing the information in mechanical hard drives. Fast forward to today, we have the situation that DNA can have computer software (even malware) stored within it.[30] How will the regulation of this technology evolve, and how will the law evolve to deal with the issues that it raises?[31]

What is therefore clear is that there is an ever-increasing shift to utilise biological bodies for creative purposes, not just as a means for the process of creation, but as a physical information container. Clearly, there will be several stages as part of this. To begin with, two interrelated key limits are a) interaction with DNA itself is not yet particularly developed; b) it is not yet possible for biologically stored code to allow a human to control or interact with it at a 'deep' level (such as thought). There are some trends in this direction though, for instance, the use of implants (even brain implants)[32] to control prosthetic limbs and animals have been used to control devices via brain implants. Others have taken to having implants inserted into them.[33]

The likely future is that biological material will be used to store code in order to operate implants. The next logical step would be for that implant to interact directly with code, which in turn will interact with the human body. At a simple level, this could be, for example, to store data about blood sugar levels, with an implant device to upload the data to the Internet. Such use of technology is the

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[26] See Cortical Labs - https://www.cortical.io/ – they use synthetic neurons which are derived from biological neurons.

[27] 1988 was the first use of DNA to store data (embedding of an image in DNA) – see Extance, How DNA could store all the worlds data, 537 Nature 22 (2016) at 23; also see Church, Gao and Kosuri, Next-Generation Digital Information Storage in DNA, 337(6102) Science 1628 (2012); Fister, Fister, Murovec and Bohanec, 'DNA labelling of varieties covered by patent protection: a new solution for managing intellectual property rights in the seed industry' [2017] 26 Transgenic Research 87.

[28] Consider DIY Bio - https://diybio.org/ ; https://thatmre.medium.com/a-guide-to-diybio-updated-2019-abd0956cdf74

[29] Microsoft, DNA Storage, at https://www.microsoft.com/en-us/research/project/dna-storage/

[30] Ney, Koscher, Organick, Ceze and Kohno, Computer Security, Privacy, and DNA Sequencing: Compromising Computers with Synthesized DNA, Privacy Leaks, and More, SEC'17: Proceedings of the 26th USENIX Conference on Security Symposium (2017) at 765-779.

[31] *Infra* Chapter 6.

[32] See Musk company 'Neuralink' at www.Neuralink.com (and projects detailed therein); Wakefield, Elon Musk reveals brain hacking plans, at https://www.bbc.co.uk/news/technology-49004004

[33] Marr, What Is The Internet Of Bodies? And How Is It Changing Our World?, available at https://www.forbes.com/sites/bernardmarr/2019/12/06/what-is-the-internet-of-bodies-and-how-is-it-changing-our-world/?sh=49cdb4f968b7 . Also consider the work of Kevin Warwick - https://pureportal.coventry.ac.uk/en/persons/kevin-warwick

possibility to significantly alter society. Imagine if a Wi-Fi implant is able to transmit data from one person to be received directly by another.[34] This could be information that then is in turn influencing the operation of an implant. This remains, though, a far cry from telekinesis per se, as there remains no means to directly interface with the brain of another, but wearable technologies may obviate some of that 'need,' for example devices such as Google Glass or ear implants.[35] In any event, we can observe a technological convergence occurring not just at the level of what we have come to understand to be divergent technologies, but at the level of biological technologies. We begin to enter an era of direct body to body contact, one that could ultimately lead to DNA contact with others without direct, physical, bodily contact. Whereas we can contact others through devices such as sight and sound, the amount of reproduction possible, and the perfection of that reproduction, is limited. Whilst biological substrates for cultural works could see considerable increase in the level of this reproduction, and thus communication, as will be argued in subsequent chapters biologic compute is also likely to lead to greater property rights by the simple application of the current law, and also more protection of track and trace technologies. This is the paradox of the biological substrate.

Whilst the focus of the monograph is the biological, we can also not fail but need to discuss quantum compute. This is discussed further in chapter five, but biologic compute will also facilitate new biologic substrates and methods of communication. For example, there is a clear overlap between the development of artificial intelligence ('AI') style systems in quantum compute and the understanding of the operation of neurons (and synthetic neurons) as part of biologic compute. In these scenarios it is critical that we are aware of the nature of the biologic physicality in terms of law – as noted above, current legal protections will potentially be increased by mere virtue of the characteristics of the technology. This is not any technology either - this is the overlap between AI in quantum and biologic compute, which is in many respects moving toward the question of what life is, and what the meaning of it is.[36] This may seem far removed from the core of this monograph, but this developmental direction of AI directly raises the thorny question of what constitutes consciousness.[37] We have the spectre of legal regulation, copyright law, directly influencing and directing the development of AI in a machinic way, and given the overlap with DNA editing, potentially the development of life itself.

Yet, as noted above, these are not questions that have been directly asked in the cultural context of intellectual property law. This is a question different to that of the debates about the nature of artificial intelligence, or the morality of creating life, or controlling biotechnology through the use of patent protection. This is a question of the information itself; what is its form? How does it function in different technological substrates? Should a work be treated differently if it is in the form of DNA? Does it matter if data is stored on top of the DNA, or within it, utilising say 'junk' DNA? We need to take into account the biological substrate; we need to know the means by which our methods of information production exist if we stand aside the usual paradigms of information production.

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[34] ''The Internet of Bodies' - see *ibid*.

[35] See *infra* chapter 6.

[36] See *inter alia* Sandrone, Bacigaluppi, Galloni, Cappa, Moro, Catani, Filippi, Monti, Perani, and Martino, Weighing brain activity with the balance: Angelo Mosso's original manuscripts come to light, 137 Brain 621 (2014).

[37] Turing, Computing Machinery and Intelligence, 59 (236) Mind 433 (1950); Johnson, Passing the Turing Test: AI creates human-like text at https://bigthink.com/the-present/ai-language-models-gpt-3/ ; also consider similarities to discussion in Descartes, Meditations on First Philosophy (1641; CUP trans Williams and Cottingham (1996)); Descartes, Meditations on First Philosophy: Objections and Replies, in "On Meditation Three: Innate ideas" (R Descartes, Meditations on First Philosophy, 1986 CUP edition) at 78; Descartes, The Passions of the Soul, Hackett Publishing Co., (trans. H Voss, (1989)); Descartes, Treatise of Man (1637, pub. 1662; Prometheus (2003)).

What we should be considering is what role biological substrates and biological information has had in society, and what the foundation of that has been. What we can undoubtedly say is that biological information has played a critical role in society; especially communication of information. The birth of culture is reliant on biologically situated information- it is enmeshed within it. Replicability has been central to this, but the debate of reproduction in culture (and copyright) has been kept distinct from it. Reproduction of biological information is one of the key drivers in our society; this is replicated in the technologies that we develop, mimicking what Einstein mockingly called "spooky action at a distance."[38] Whilst replication in the biological substrate has been going on since the dawn of time and the birth of civilisations, replication within culture has been something that is treated as separate and brought within the realm of copyright and capital exploitation.[39] Notions of mimesis (memes),[40] and the regulation of ideas, are brought within copyright law.[41]

Societal development takes resources - natural, and labour. The physical state develops akin to the human child, out of the biological world, and passes though phases such as that of the machinic industrial revolution. Both State and its biological citizens have physical embodiments dependent upon the physical world. Maslow's famous pyramid of human needs is invariably cited,[42] with needs such as food and shelter being critical, but in the same way the physical state needs 'food' to survive - natural resources. The individual needs sociation, situating the body in an environment, and so does the State. Yet this is often overlooked, in particular with regard to the development and use of information. We forget that information, that which enables the link with the physical world and others, is itself physically, biologically, based. We tend to meld with the world around us. Heidegger discussed this with his notion of the 'tool', the argument being that we tend to mesh, become one, with what we are using. That could be a hammer, to use his example, but he took a wide view of technology and that view could also incorporate the political technologies of a State.[43] Whatever, we tend, in Heidegger's words, to become at one with the tool. In the same way, we become one with the information. We internalise it. We are, of course, aware of words being on a page, or music on a tape, but are aware of the complete tree of informatic forms, the way in which we actually use our eyes to interpret the words?[44] Less so, and that is especially so in terms of the legal approach which, as will be discussed later, is influencing our interpretation of information through the biological substrate.[45] Law at best will merely trace the very basic physical underlying paths that information may follow (such as the distribution chain of a book) but not the greater detail (such as how sight or memory works); the biological, spatial, path is largely alien to the law, and so that path remains largely unexplored.[46]

Biological resource as part of the State

[38] Einstein, "Does the inertia of a body depend upon its energy-content?" (1905) in Einstein, Lorentz, Minkowski and Weyl, The Principle of Relativity, (trans Perrett and Jeffery), Dover (1952).
[39] Note the discussion of biological process theory in particular, infra Chapter 4.
[40] Dawkins The Selfish Gene, Oxford University Press (1976).
[41] Lovejoy, The great chain of being: A study of the history of an idea, Harper Torchbooks (1960); Griffin, Copyright and Design Law, Reuters (2023).
[42] Maslow, A theory of Motivation, 50 Psychology Review 370 (1943); Csikszentmihalyi, Creativity: Flow and psychology of discovery and invention, Harper Collins (1996).
[43] Heidegger, The Question Concerning Technology and Other Essays (1954; Harper Perennial 2013).
[44] Changizi, The vision revolution, Ben Bella Books (2010); Changizi, Harnessed: How Language and Music Mimicked Nature and Transformed Ape to Man, Benbella Books (2011).
[45] *Infra* Chapter 5.
[46] *Ibid*., and *infra* Chapter 6.

The early history of *homo sapiens* is based around the existence of physical resources. Much to do with prehistory concerns the collection of natural resources and hunting;[47] cave painting and the like is, in part, an attempt to pass on to future selves and future generations a record of those resources and gathering thereof.[48] Collaboration and conflict formed around the resources, conflict and collaboration that would later form into ever increasingly complex legal rules.[49] Early cultures were based around these physical elements, informing the development of the biological body. These rules have enabled us to live longer, and in general be able to spend more time in the process of cultural creation rather than mere subsistence living. The function of biology has been recognised in philosophical writing - Plato's *Republic* focused assessing ideal numbers of people, and breaking the biological bond between Mother and baby.[50] Works such as John Moore's Utopia (1516)[51] focused around the organisation of society and number *vis-à-vis* resources. Malthus famously (1798) proclaimed the potential collapse of civilisation based on a lack of human food resources.[52] Nietzsche's works questioned whether we wish to proceed to develop a society incrementally developing upon the resources of a previous generation, or to start afresh.[53] When it comes to philosophical works, the reader by now may have thought about Foucault's notion of biopower.[54] In essence this concerns the ability the state to influence citizenry by seeking to extend life. In this sense, the biological body could be considered to be a means by which to provide resource control. However, the discussion of biologies in this manner, whilst potentially including cultural information, does not address the issue of biology as a substrate for cultural information in terms of it being used as a technology.

The physicality of the technologies of informatic control can be extremely involved, yet are often neglected. Hohfeld recognised some of these when considering his theory of legal relations - but not the relations *per se*, but the additional rider he added of "value added facts."[55] To take this and apply it property, property may be a description of physicality; it can refer to the legal boundaries and rights over the physical property; it could refer to the legal concept of property. With intellectual property law it can become ever more confused - property in the intangible thing; property in the right over the intangible property; property granted in the right to be able to make a copy; property in the physical work; property in an aspect of the work; property in the intangible aspect rooted in the tangible. Doubtless there are more that the reader can think of. There is then an issue over the means of 'existence' – boundaries; control; ownership, all of which are influenced by the physicality of the information. The modernist pursuit of knowledge, of science, in information is very much into the physicality of the physical ontology of God – namely, God the scientist, creating the concepts of informatic discourse, the means of existence, yet hiding the mechanism of physical existence. It is these flows of the informatic discourse, of biology, of the quantum forms of information, that the law is particularly poor in accepting or conceptualising. As with notions of right, the means of existence

[47] Leakey, The origin of humankind, Science Masters (1994); Milisauskas, European Prehistory: A Survey, Springer (2011); Blamires, Guidestones to the Great Langdale Axe Factories, Blamires (2005).
[48] Powell, Prehistoric Art, Thames and Hudson (1966).
[49] Keeley, War before civilisation, OUP (1996); Divale, Warfare in Primitive Societies, ABC (1973); Ferguson, The Causes and Origins of 'Primitive Warfare:' On Evolved Motivations for War 73(3) Anthropological Quarterly 159 (July 2000).
[50] Plato, The Republic (380BC) book 5 para at 457d (Adam edition, CUP, 2011).
[51] Moore, Utopia (1516; Penguin (2012)).
[52] Malthus, An Essay on the Principle of Population: 1803 edition, Yale University Press (2018).
[53] Nietzsche, Beyond Good and Evil (1909-1913; Dover (1997)); Nietzsche, The Gay Science (2nd edition, 1887, trans Kaufmann, Random House edition 1974).
[54] Faubion (ed), Essential Works of Foucault 1954-1984, Penguin (2002) Volume 3; Foucault, The birth of biopolitics, *supra* 4; Foucault, The Birth of the Clinic, *supra* 4.
[55] Hohfeld, Fundamental Legal Concepts as Applied in Legal Reasoning, Yale University Press (1919).

(boundaries, control, and so forth) have a physical existence alongside their legal ones. This is particularly well demonstrated by a consideration of knowledge theory. The basis of knowledge theory arose in times of ancient Greece and the work of Plato.[56] This theory was focused more on knowledge generation *per se*,[57] rather than physicalities, but it did make references to them, e.g. ideas being akin rivers.[58] The knowledge theory has developed much over the last two thousand years - perhaps the best known one is Locke's Essay on human understanding,[59] alongside works of others such as Condillac,[60] Hume,[61] Berkeley,[62] and Leibniz.[63] Locke's essay focuses on the processes in acquiring knowledge from the perceived physical world, significantly noting that the more precise the perception, the better the ability to produce something more developed.[64] Core to his thesis was the notion of combining what he terms simple ideas e.g. colours into complex ideas e.g. predicted movement.[65] His work would, one would think, be ideally suited to the regulation of intellectual property, in particular copyright given his involvement in the debate that led to the Statute of Anne in 1710.[66] However, what instead happened was an emphasis upon his other work, the labour theory, and a link to that theory was made out in later cases in the 1700s.[67] It also tied in with the general direction of case law. Essentially, the law was more focused on providing a legally prescribed means of rights protection, rather than the processes (including biological processes) by which that information came into being. Focusing on the provision of such boundaries is understandable, for it is undoubtedly easier to define (or redefine) boundaries over something that already exists, rather than trying to understand the murky depths of the processes of the mind - particularly when it comes to providing a financial reward or incentive for an author or publisher. Furthermore, the use of property reflected societal development (a form of democratic entitlement),[68] and was a move away from inquisition reasoning and attempts to control 'undesirable' individual thought. However, this, alongside the increasing divergence into scientific conceptions of knowledge, led to the current situation where there is not enough interrogation of the biology of information, or of thought processes. Paradoxically, given the rise of State biological power (as discussed in chapter three) where the State uses biologies to maintain its power, the move away from biological process to exploitable final units is itself a challenge to the States' own attempts to lengthen life and control the human body.

In that paradigm of conflict, it would therefore be illogical, self-contradicting, for the law to emphasise a combination of biopower over life and legal boundaries thereof, over that of biological process information. Yet, that is where we are. Following the historical tend to emphasise control over the final units of production,[69] we have remarkably few legal judgments that indicate a willingness to

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[56] Plato, Phaedo, in Hamilton and Cairns (eds), Plato Complete, *supra* 16 at 40-98.
[57] E.g. Gulley, Plato's Theory of Knowledge, Methuen (1962).
[58] Plato, Phaedo, in Hamilton and Cairns (eds), Plato Complete, *supra* 16, at 92-94.
[59] Locke, Essays on Human Understanding, (1689; William Tegg & Co, Leeds (1880)).
[60] Condillac, Essay on the origin of human knowledge (1756; CUP trans Aarsleff (2001)).
[61] Hume, An Enquiry Concerning Human Understanding (1748; Hackett Publishing Co. (1993)).
[62] Berkeley, The Principles of Human Knowledge (1710; Collins (1962)).
[63] Leibnitz, New essays concerning human understanding (1765; The Macmillan Company trans Langley (1896)).
[64] Locke, 'An Essay concerning human understanding', fn.59, Book IV, Chapter 1 at §9
[65] Locke, *ibid*, Book II, Chapters 2 and 3.
[66] Statute of Anne 1710, 8 Ann. c.21.
[67] For a full discussion see Deazley, On the origin of the right to copy, Hart (2004).
[68] For discussion of this see Griffin, *supra* 23, Chapter 7.
[69] Consider for example the control through Licensing Acts - Putnam, Books and Their Makers in the Middle Ages, Putnam and Sons (1897) Volume I; Putnam, Books and their Makers in the Middle Ages, Putnam and Sons (1897) Volume II.

consider process. To take an example, we can go back to the labour theory in copyright law.[70] This theory predominates in the UK tests for copyright subsistence, which emphasises the author's labour, skill and effort.[71] Typically this results in discussion about financial investment – not the biological investment of labour, skill or effort. It has even been referred to as "brain labour,"[72] but this labour is not biological labour – it is merely the amount of time spent on something, again reducible to non-biological components. Sometimes the UK test has been referred to as being a 'sweat of the brow' test,[73] indicating a link to the human body, but in reality it is not, it is a test looking at time and investment. Similar issues arise in patent law with the 'person skilled in the art.'[74] These references to potentially human traits are misleading, and miss the larger picture that biological process is ignored. The exceptions to this are, arguably, those cases that considered the merit of potentially infringing works. For example, *Burnett* v *Chetwood* (1721) the potentially infringing work could be permissible if it added something new, something "educational."[75] It provided for the subsequent making of works; a process – rather than a backward-looking protection of a unit of exchange. That approach continued for abridgements and translations until the 1886 copyright commission suggested abolition leading up to the Copyright Act 1911.[76]

In summary, the failure to recognise the importance of biology, of the biological substrate of the State, of the importance of biological process, is ultimately a self-defeating failure in the modern State. As newer technologies develop, particularly biological ones such as biological compute, the law will appear out of step with the underlying biologies that comprise the State. Biology has been a key central element to everything – lest we forget, absolutely every single thing - to such degree, that we have lost sight of the centrality of the biological flow. If this failure is to be continued, it will be to the peril and inevitable collapse of the State. The collapse of this biological constant would be the collapse of the current state. This does not need to be so.

Method

Ontology, broadly speaking categorisation, is topic that itself defies categorisation.[77] In the context of the monograph, it is employed in a realist sense, namely, to recognise the importance of biology in the creation and operation of the modern-day State. The approach is one that seeks to reveal a forgotten strata, a way of thinking, that gradually became eroded over time, and virtually eliminated with the rise of machinic ways of thinking that arose with the industrial revolution. A consideration of technologies, of the ontology of technologies, reveals a complex network of interrelated rhizomes;[78] a set of technologies of which digital technology is but one part. Biological compute is part of these technologies, overlapping with the existence of existing biological entities. It reveals the continued centrality of biology, something which has simply become obscured by machinic reasoning. No longer is technology just machinic, it is also biologic, breaking down into a biologic machinic being that is more integrated, engaged, engrossed, invasive, parasitic than ever the works of HR Giger envisaged.[79] The biological is not machinic but a process, a way of being that is inevitable yet one which the State

[70] Griffin (ed), Merkin & Black on Copyright and Design Law, Thompson Reuters, r.59 (2023).
[71] *Infra* Chapters 2 & 4.
[72] *Walter* v *Lane* [1900] AC 539 at 556 (per Lord Brampton).
[73] Waisman, Revisiting Originality, 31 EIPR 376 (2009); Guadamuz, Do androids dream of electric copyright? [2017] IPQ 169.
[74] Infra Chapter 4.
[75] *Burnett* v *Chetwood* (1721) 35 Eng Rep 1008.
[76] For deeper discussion see *infra* Chapter 2.
[77] For discussion see Koepsell, 'The Ontology of Cyberspace', Open Court (2000).
[78] Deleuze and Guattari, A Thousand Plateaus, Continuum (2004).
[79] Hirsch, HR Giger, Tashen, 2022; Salin, Dark Star: HR Gigers World, T&C Films, (2014) documentary.

is blind to; the State is machinic, and it is not seeing the rise of the biologic in its future. The method of this work is to take an ontologic approach, to consider the roles of technologies past and future, to explain and experience the role of the biologic, to realise that the State has taken a 'false turn' in its appreciation of technology; to enable, as a new turn, the State to appreciate, engage and experience the role of biology in its future development. Biological information will be key, biological information that will, it is argued, be largely copyright protected in nature, with that copyright protection being the key facilitator of control. Copyright is machinist, but it is argued that we could make it biologically aware, to carve a biologic future for the State and to prevent the inevitable collapse of the current machinic State.

Chapter Outlines

Chapter two begins by considering the processes involved in the creation of information. It is argued that the State has focused on the final exploitable works as units of exchange, rather than on the processes of creation. By extension, this ignores the importance of the human body in the process of making cultural works. The chapter focuses on the work of Joseph Beuys, who emphasised the materiality of objects, and how their characteristics influence human interaction.[80] In that vein, it would be possible to argue that human bodily characteristics are an integral element to the development of the State. It will be argued that the State concerns itself primarily with machinic notions of materiality and 'thingification' rather than process of making culture, of making the State. As such, materiality and thingification disguise the importance of the human body, clothing it with trophies of State regulation. The importance of information, and the forms of information, is considered *vis-à-vis* the human body. The critical conclusion is that State regulation does not consider the biological body in the creation of culture, and given the direction of technological developments, this sets a dangerous precedent.

Chapter three argues that the failure to acknowledge the role of the biological has consequences for intellectual works. These go beyond the mere issue of boundaries, to the core of what it is to have thoughts and to be human. The chapter begins by considering the criticality of the senses in the creation and receipt of certain artistic works and inventions, and outlines how this has been neglected in key theories (either by design or contemporary lack of scientific understanding). It then follows this through to the distribution of those works and inventions, outlining how physical factors influence, effect and prevent the dissemination of information in ways that the law often fails to take into account. By way of further example, the chapter takes a comparative approach between established *ex post* theories of intellectual property protection, and compares them to historically accepted views of IP development between 1700-1900. This demonstrates the importance of physical and biological factors, in a manner not considered within the *ex post* theoretical justifications. For example, whilst Locke considered perception and memory, he did not consider those factors more broadly vis-à-vis regulation. The chapter then proceeds to consider works which critique the interrelated functions of the human body with machines, such as feminist theory in Merchant and the works of HR Giger.[81] There is some consideration of future technologies, such as contact lens technologies, which could considerably improve sight and the ability to 'screen grab' what we see, to consider the impact of such potential technologies upon existing copyright protection.[82] All this combined reveals the need to

[80] Beuys, What Is Art?, Clairview (trans. Barton & Sacks, 2004).
[81] Merchant, *supra* 14, Giger, supra 79.
[82] E.g. Google Glass – Alphabet, Google Glass at https://www.google.com/glass/start/ (last accessed 1st March 2023).

consider broader physical factors in regulation, in particular biologies and how devices interact with them.

Chapter four considers the ways in which law has regulated biological aspects that have an impact upon the creative process of the individual in making cultural works. Thus, this chapter considers how regulation has impacted the way people either create cultural works using technologies as part of the biological body, and how the creation of cultural biological works has been impacted. The chapter argues that in relation to the former, regulation has had limits in terms of being able to reach into the innermost thoughts of the individual. Instead, the technologies of regulation are those that impact the human body rather than human thought directly. This has involved altering or affecting the individual's ability to be able to interact with others, for instance through the utilisation of proprietary boundaries, or other means of restriction, for example imprisonment, or removal of access to a computer or printing press. Essentially, these are all imprecise methods by which to alter the cultural outputs of individuals. However, regulation is not so imprecise in the creation of biological cultural works. These are the differences and issues that this chapter will consider, in order to suggest how different approaches to regulation can influence the direction of creative biotechnological endeavour.

Chapter five argues that regulation has reached a 'false turn' in its fetishism of the digital at the expense of the biological. It is becoming increasingly commonplace to interact with biological entities in a coding environment. There is some similarity here to computers, where the early computers were interacted with at a machinic level, only to develop later the higher levels of abstraction with which we are familiar today. We can observe this trend with biological inventions, with the increasing ability to be able to edit DNA; to be able to store data within biological forms; to be able to have a biological compute unit.[83] The chapter argues that the machinic nature of copyright law will influence the development of these biological advances. It is the contention of this book that as the world has become more informatised, we have an increasing expanse of copyright regulation. Indeed, copyright regulation has considerably expanded as a consequence of the expansion of information technologies. This is why we increasingly see the use of copyright and watermarking technologies in the use of information technologies, and why this monograph argues that we will increasingly see the use of these technologies in the biological context. As the monograph will investigate, watermarking technologies are one of the foremost means by which the biological substrate is likely to be regulated in in the future, if not already in the present. It will be outlined why this is likely to become more significant than, say, existing patent law. The consequences will be considered, e.g. on the development of 3DP livers, on AI and prosthetics[84] in terms of whether existing legal protection will benefit from a copyright element or not; and whether or not other regulations such as those governing bioprinting will lead to favoured forms of biological cultural works.

Chapter six considers how the biological substrate interacts with other new forms of technologies, such as quantum computing and biological compute. For example, Microsoft and Monsanto have both been long standing researchers into storing data within plant cells and DNA respectively. What could the possibilities of these technologies be? It would not be beyond impossibility that this could be used to store data within the human body, and that in turn, it would be possible to somehow read that data. If that data can be read, then it can be used to execute other code elsewhere. Could it lead to direct human-human connectivity over Wi-Fi? Though this may seem like science fiction, the development of the technology moves fast, and therefore it is prudent to consider plausible technological advances. The chapter will also consider the relationship within developments such as

[83] See discussion *infra* Chapters 5-7.
[84] See *infra* Chapter 5.

AI, where the coming together of biological compute and quantum compute requires an awareness in law of the biological substrate. This chapter will consider the current legal framework to assess to what degree these technologies might become viable, for example, in terms of obtaining clearance for technologies that might store data in the human body. This will help to ensure that any proposed legal reforms will remain relevant.

Chapter seven considers proposed reform. This chapter will outline the basis of the proposed system, focusing on the importance of the biological substrate in the creation of cultural works. The chapter will refer back to the initial chapters focusing on the history of the State and the centrality of the biologies. It will then compare this history to the recent developments discussed in later chapters to assess the differences in approach. In order to ensure that the State continues to consider the importance of biologies, a set of principles are outlined that States should adhere to when considering cultural works. The monograph proposes an oversight body which will seek to ensure that technological developments do not inadvertently undermine the critical role of biologies. The chapter will also discuss how the existence of such a body within society might influence the future development of biological cultural works.

The final chapter concludes the monograph. With the rise of technologies that interface with the human body, and potentially become at one with it, there is an ever increasing need to be aware of the importance of biological substrates. Without the biologies, States would not exist, and society would crumble. We tend to ignore the importance of biology, in part to eschew its importance due to the criticality of the mind, or because of the courting between that which is industrial and machinic in nature, with that which is capitalist, legal and machinic. However, as will have been made clear in the monograph, it is critical that we identify the key central attributes of the biological substrate that have made the State what it is, and which are critical to its continued development. The fetishism of the digital is but a 'false turn,' a dead-end technology. We must prevent people from becoming "machine [people], with machine minds."[85] We are humans, we are biological, and the State is biological. Colonisation by the machinic is not a possible future. A clear statement of principles about the importance of biologies, and regulations to help realise this, will be a key means by which to ensure the continued survival of the State:

"Biology usque in aeternum"

[85] Chaplin, The Great Dictator, *supra* 11.