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God’s Artefacts: The beauty of mathematical structures in physics

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Declaration

I declare that this thesis has been composed solely by myself and that it has not been submitted in whole, or in part, in any previous application for a degree. Except where it states otherwise by reference or acknowledgement, the work presented is entirely my own.

Signed: Charles Pickles, the 16th of August 2021
Abstract

The purpose of this thesis is to argue the following case: amongst the structures of the world beauty is characteristic of those investigated by mathematical physics. It is a plausible response to this that their aesthetic presence manifests the intentional hand of divinity and contributes to our comprehension of them.

A common modern picture of the universe is that there is nothing to be found amongst its basic constituents but physical items and processes. Many scientists, philosophers and others take this to be a rational outcome of the natural sciences, particularly physics. Theories of the natural sciences exclude meaning, purpose, value, normative standards, and teleology as a matter of methodological principle.

The restriction of explanation to these aspects of the world, however, which yield highly productive theories and ways of testing them, is often however inflated to an overall metaphysical picture in which the causal relations of physical events are taken as accounting for everything that ultimately exists and its origins. The world, in a common phrase, is often described as a consequence as ‘disenchanted’.

Consistent with this view, ‘beauty’ when it is experienced in the natural world is largely taken to be a psychological projection onto an otherwise barren physicality in line with what is considered properly real. This is also true of mathematical physics. Physicists and mathematicians in this area often describe the intense beauty of the structures they deal with, but these aesthetic effusions are rarely taken to have serious theoretical, philosophical, or theological conclusions about the matter, structure, and ultimate origins of the world.

I contest this view. One reason for developing a different and broader framework for comprehending the world in its entirety is that we too are able to create physical structures and even beautiful ones if we choose. The structures we create are subject to the same mathematical and aesthetic normative criteria that any structure of the world must obey for it to be possible to exist. In our case what we create, our artefacts, rely on our purposes to come to fruition. Contra the ‘disenchanted’ picture of ‘nature’ there is thus a metaphysical commonality between our artefacts, the necessities of their construction, teleology and the events and processes of the rest of nature.

Since we are a part of the natural world and since nature ‘allows’ us to interfere with its causal processes to produce novel items of our own design, a full conception of nature must include what makes that possible: the a priori teleological and normative mathematic-aesthetic principles which anything must satisfy to come into existence.
Thus, whilst the activities of the natural sciences isolate one part of the world to yield productive theories, what remains hidden are the conditions in virtue of which the world can exist such as to make teleological interference possible. These are found at the very foundations of the world. Ontological naturalism, the philosophical position that supports the idea that the world is ultimately nothing but the natural processes in it and their effusions, cannot I argue support the very possibility of the sciences on which the metaphysics of naturalism depends.

I contend as a consequence of this thought, that there is an *inclusive* metaphysical framework which provides a place for personhood, scientific methodology and teleology from the ground up as equal ontological participants in the cosmos and all in it. The possibility of a natural ‘science’ *itself* is provided for by the framework which I propose. The idea of a ‘nature’ open to methods of empirical investigation is not an intellectual given but the outcome of comprehending its nature in such a way that it can be seen as a world of process and causal events. Human history shows us this is so.

The best ultimate explanation of all this is that of a divine personal agent from whom the world intentionally emanated and who it filled with normatively available structures and aesthetically expressive features indicative of personal agency. We respond to the presence of divine intention in our capacity to recognise the hand of agency in those a priori features of any existence. Like beauty anywhere which seems to reach beyond itself, the ‘beauty’ of the base structures of the physical world provides us with a channel to divine intention and enhances our response.

The acknowledgement of the world as the outcome of personal intent I conclude, is not a deductive one in the same sense that our recognition of other persons and their artefacts is not finally a matter of proof but is not as a consequence irrational.
Lay Summary

The aim of this thesis is to argue that the sub-particles and the forces and structures investigated by physics are the ultimate outcome of divine creation. Physicists and mathematicians often write about the intense beauty of those structures. I contend that we respond to that beauty as we might to beautiful objects of our own creation. That being so, it is rational to see the divine hand in them as it is to see the meaningful hand of another in our own artefacts.

This is a view that should not be misinterpreted. I do propose it in opposition to the postulates and forces of science, but as a way of understanding their presence as intelligible beautiful structures at all. In a somewhat analogous manner, a painting, whilst entirely ‘physical’ is dependent on the artist for being a painting and being aesthetically engaging or not. Much about the physicality of the painting understood as a ‘painting’ can be gleaned by knowledge of it as the outcome of intentional creation.

A common modern picture is opposed to this view. It argues there is nothing to be finally seen in the universe but empty ‘physicality’. It has led to the cosmos being described as ‘disenchanted’; no meaning, purpose is to be found among its basic constituents, and hence, it cannot manifest properties expressive of divine personhood. This ultimate picture of the universe is taken by some to be a natural outcome of what the sciences of nature, particularly physics, have revealed about what the world is ‘really’ like.

I contest this view. The idea that only science can reveal the totality of everything is a framework picture about the place of science in the world so it cannot be explained by science. Human beings, for example have not always thought about the natural world as something which could be understood by observing them as causal happenings, discoverable via experiment and theory and described as ‘laws of nature’. That way of thinking about the world is an intellectual accomplishment.

I argue that there is another framework of thought about the world. This ‘metaphysical’ outline accommodates what is needed to comprehend the universe as amenable to scientific thought and practice as well as expressing aesthetic qualities. The picture I propose has a proper place as well for human persons and the divine person.

My argument turns on one of the necessary features of anything existing at all, including the events, objects, and processes of ‘nature’ as we now understand it: the recognition that everything is a structure of some kind, ‘stones’, ‘water’, ‘furniture’, ‘paintings’, ‘persons’ and atomic and sub-atomic forces are all structures.

Any structure must also have some aesthetic qualities. There could not be one that did not. Contra the ‘empty physicality’ hypothesis, if this is true then the whole universe and everything in it has
expressive qualities about which value judgements can be made, ‘this is ugly’, ‘this is beautiful’ and so on. Physics shows us that the very basis of the physical or natural world is not only highly structured, mathematical, and intelligible, but it seems might even work because it is beautiful. If so, the beauty found there would contribute to judgements about the truth or otherwise of theories of fundamental structures.

When we reflect on ourselves as embodied creatures, it is apparent that we too are part of nature and the physical world, whatever else we are. We are also self-conscious and rational creatures able to make artefacts and a myriad of other things which can only come into being as a result of our creating them in thought and manipulating the physical world to bring them about. So, contrary to the claim that the natural world is nothing but sheer physicality it can also allow for intentional artefacts which are not the product of regular causation, because we are ‘natural’, and we design things that do not emerge from purely physical goings on.

But our artefacts and those that are the outcome of purely ‘physical’ causes are nevertheless commonly bound by the characteristics of the bigger framework: In order to exist they must both consist of structures which obey mathematics and have an aesthetic character.

Could a world ultimately only physical explain this bigger picture and its unity of structure, aesthetics, purpose, and the ‘ordinary’ physical causality underpinning the structures of scientific investigation. I suggest not.

The best explanation of all this, I argue, is that of an ultimate personal agency responsible for the entire framework of ‘intentional’ construction, normativity, and aesthetic appreciation. In the intricate but purposeful beauty of the mathematical structures at the base of the physical world we perceive what we recognise in our own: an intent that it should be so.
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Introduction

The purpose of this thesis is to argue the case that amongst the aesthetic structures of the world beauty is characteristic of those investigated by mathematical physics. It is a plausible response to this that their aesthetic presence manifests the intentional hand of divinity and contributes to our comprehension of them.

Any world, I argue, necessarily comes in structural and aesthetic forms. This might be sufficient on its own to provoke theistic inclinations: the expressed beauty at the heart of the physical manifestation of creation, however, conveys transcendent emotions and thoughts which objects of beauty often provoke; they convey something of themselves but something of their creator beyond them.

The philosopher Anthony O’Hear captures the theistic significance of that experience,

‘...the religious impulse (is) a response to a natural object or work of art as beautiful: in which we see a thing not just as a ...‘fragment of nature’, but something which mediates between our own longing for perfection and some other world in which that perfection is realised’.\(^1\)

I contend that we respond in this way because the physical structures of the world manifest the same principles of aesthetic construction as do the artefacts we create. In the intricate but purposeful beauty of the mathematical structures at the base of the physical world we perceive what we recognise in our own: a personal intent that it should be so.

Overview of the argument

In defence of the position that beauty in intelligible structures reflects divine intention, I begin by providing an alternative to what is generally called a ‘ontological naturalist’ picture of the universe and all that it finally consists of. There are many variants of what the ultimate occupants of a naturalist universe are said to be. Some incorporate abstract elements like mathematics into their fundamental ontologies, others firmly deny anything other than what a ‘physical’ world, in all its natural forms, provides.

The essence of the picture is that all that ultimately can be said to exist consists of the immanence of the ‘material’ or the ‘physical’ in one way or another. No signs of divine life, intelligence, or inkling of the personal is to be discerned in that ontological space, and neither are any other signs of teleological life except, possibly, as outgrowths of the physical in biology.

I present the naturalist case as it is normally made with the presence of physics in the background or the foreground because of its scientific prestige. It is the discipline which is widely accepted as investigating the most fundamental physical structures on which all else that is ‘natural’ must ultimately depend, however the relationships between other various disciplines of the natural, like chemistry or biology and the ‘physical’ in physics are to be understood.

Naturalist pictures of the cosmos all begin where the practices of contemporary sciences begin, by extruding any reference to the personal and the divine as a point of methodological principle: explanations of atomic, molecular, inanimate, and organic processes are forbidden reference to teleology, both human and divine, in any theory that purports to explain natural phenomena.

It is a principle supposedly free of any metaphysical commitments. Nevertheless, it is frequently inflated into a metaphysical hypothesis about the nature of all reality: everything that exists or could exist is either reducible to, or dependent on the physical. The essential argument here is that the extraordinary progress of science, achieved by restricting explanation to ‘external’ physical processes and causation, supports the metaphysical extrapolation.

The import of inflating the methodological principle into an ontological criterion, is to deny any role to purposes, intentions and appeals to any broader understanding of physical phenomena in terms appropriate to, for example, the aesthetic creations of human persons. Whilst one might say, ‘the deep mathematical physics of the world is beautiful’, this has no serious ontological implications for the ultimate nature of all things other than an observation of how it appears to us.

One result of the primacy assigned to the idea of the physical in this picture results in sharp dichotomy being drawn between the ‘personal’ and the ‘impersonal’.

The ‘impersonal’ world, that of the physical and its causal processes, is promoted to a position of ontological hegemony: physical causes and causal regularity are what ultimately exists or have ‘real’ existence.

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2 Whether in fact the idea of a such a principle does detailed useful work in understanding the actual practices of science is an interesting question. I use it here however, because it features as an important philosophical tool in supporting the metaphysical view I am contesting.
‘Teleology’, ‘persons’, normative standards and consciousness are assigned a secondary status: Whether the causal result of physical processes, preferably reducible to them, or at least supervenient on them, all these phenomena are conceived to be both temporally and logically dependent on the prior existence of the ‘physical’.

One way of understanding this claim is to see it as entailing that before the evolution of the organic life of sentient and sapient creatures, there were no values, epistemological, aesthetic, no normative standards against which anything might be evaluated and no teleology: the universe was simply a churning activity of the ‘physical’; whatever a final theory of physics will determine that state to be.

A natural consequence of finally seeing nothing but empty physicality in the universe has led to it being described as ‘disenchanted’; no meaning, purpose or teleology is to be found among its basic constituents, and hence, it cannot manifest any expressive properties like beauty suggestive of divine teleology and personhood.

I maintain that contrary to the naturalist picture, there is an inclusive and overarching metaphysical framework of the world which provides a place for personhood and its artefacts, ‘physical’ processes and events, scientific methodology, normativity, and teleology from the ground up as equal ontological participants.

Contra the physicalist naturalist, I argue that the idea of an external world scientifically explicable via empirically identifiable causes and the subsequent generation of ‘laws of nature’ necessitates a prior inclusive framework.

As Bruce Gordon maintains,

‘...what science is depends largely on how human beings understand the nature of nature itself’.3

‘Science’ thus cannot provide an explanation of events and relations understood as ‘causal’ and ‘regular’ since they are metaphysical conditions of the emergence of what a ‘scientific’ investigation of the natural means. The critical idea of ‘evidence’ in science for example, necessitates a normative epistemological relation between physical structures and cognitively sapient creatures who can exploit that possibility to gather knowledge. In other words, we must have a grip on what is to count as ‘evidence’, ‘truth’, and their relations before science is possible.

The overall metaphysical alternative I develop thus includes in its scope the idea that teleological and normative properties play a role elucidating what a world fit for the methods of science must look like.

My principal focus will be to assert the metaphysical proposition that anything that comes into physical existence must have a mathematically describable structure.

I should stress the metaphysical range of this proposition. It is a prescription about the logico-mathematical principles that are necessary in order for anything to be counted as existing at all, in whatever form. I explain this fully later on. It does not prohibit the individuality or diversity of life. In fact, it is a prerequisite of being picked out at all as an ‘individual thing’ in the natural world that it shares general features of existence that make it so determinable.

I will argue in tandem with this that anything that has a structure necessarily has an aesthetic characterisation. Because aesthetic judgements are normative, i.e., refer to some standard external to the thing being judged, this proposal, if true, has the profound consequence of implying that the origin of any physical world must have, in direct opposition to naturalist assumptions, at least one normative structure, an aesthetic one.

What the aesthetic character of any extant structure is, however, an a posteriori matter. The uncovering of physics (for which I provide evidence), that the mathematical structures at the base of the natural world are beautiful provokes the question why this should be so.

Reflection on the lives of human persons opens a way to answering this question. We too are a part of the ‘nature’ founded on the same physico-mathematical base. We are manifested as corporeal creatures by it and engage with it via rational and teleological capacities that allow us to purposefully create artefacts that are not the outcome of regular causal processes. Contra ontological naturalism, ‘nature’ I argue must therefore provide a place for teleology that allows for the purposeful creation of novel items that are not the products of ‘laws of nature’.

The argument I offer is not that there are entities that defy naturalistic explanation. Our artefacts, after all, in order to come to fruition must obey the same normative mathematics and aesthetic principles as any ‘physical’ event or object. Nevertheless, our capacities to construct items whose history, purpose and functions can only be fully comprehended in teleological terms is prima facie evidence that there is more to the natural reality in which reflective and teleological creatures like ourselves move than can be accommodated by a reductive naturalism. There is nothing ‘unnatural’ about the physical composition of a violin, but it’s identity, use, meaning, and history are teleologically dependent.
Because beauty when it is displayed in our creations expresses a powerful intent that it should be so, the commonality between our objects and those of the physical, once recognised, can bring us to the experiencing of divine intent manifested in nature.

As Riddley argued,

‘...the artist must be seen as present in his work, much as a person must be seen as present in his behaviour, rather than as separate from it, behind it, or, above all, logically independent of it’.4

That sense is enhanced by the contingent presence of beauty in physics, and the thought that it did not have be so reinforces the idea of normative intent behind and in it. Like all beauty, the beauty at the heart of the physical world produces a desire that is neither contained nor satisfied by the object which displays it, a desire for something that is more than the world in which the object and the observer participate.

When the sense of personhood and the desire evoked by beauty is combined with the thought that any world expressing teleology and beauty cannot be made sense of by a non-personal origin, the idea and experience of an encounter with the world as an outcome of divine creation becomes plausible. Like our encounter with other persons however, there is no final deductive proof. I suggest however that it is nevertheless a rational experience of the world as divine artefact.5

In pursuit of this goal, I examine whether nor not there is any position of epistemological neutrality from which the issue could be finally decided. Neither the naturalist nor the theist can claim from within the world a view that confers this cosmic authority. I nevertheless deny that this is a particular problem for theists. There is no deductive certainty that those I love are persons. The idea however that their corporeality is an obstruction to my certainty that they are so, and that what is required is a deductive proof relating their ‘mind’ to their ‘body’ rather than the latter being a means of the


5 This, of course, raises the question whether all evils, including natural evil, spring equally from divine intent. This question cannot be fully dealt with here. I owe however two responses to the problem within a Christian context to Dr. D. de Pomerai who sums the answers thus: One might assume a traditional Augustinian theodicy of rebellion against God as the source of all evil in a perfect creation... or perhaps see entropy as the natural tendency that finally undoes all the aesthetic beauty of physical entities, except insofar as they are to be redeemed by God.
expression of fleshly personhood is product of the idea that there is a ‘mind-body’ problem, a philosophical view bequeathed to moderns by Rene Descartes (1596-1650).

Analogously, the idea that the physicality of nature requires a deductive proof relating the ‘person’ of God to its manifestation to count as ‘knowledge’ might be similarly thought to be the expression of a particular philosophical view of reality. Conceiving ‘natural’ reality aright may make the presence of God transparent in it. As I show below, at least two theologian-philosophers have argued this to be the case.

**A model of integration**

This is clearly a particular model of how one is to understand relations between theism, aesthetics and the ‘natural’ in mathematical physics. It might loosely be called an ‘integration’ view.

I take the meaning of this term as I use it from the philosopher, and historian of the philosophy of science, Bruce Gordon. His position is articulated in a three-way dialogue between himself, Alister McGrath, Idreos professor of science and Religion at Oxford university, and Michael Ruse, retired, Professor of Philosophy at Florida State University in philosophy of science and evolutionary biology.

In the 2021 book in which the debate occurs, Ruse argues for the view that science and religion represent two autonomous and independent fields as a consequence of which there can be no conflict between them. McGrath insists that ‘dialogue’ between theism and science can be mutually beneficial. Gordon, whilst closer to McGrath, is suspicious of the view. ‘Dialogue’, he writes,

‘...is nice, but it only takes you so far. Moving beyond...notions of mutually enriching conversations to a robust metaphysical integration (Gordon’s italics) of science and philosophical theology is necessary’.

My thesis is an attempt at such an integration turning on the metaphysical pole of a necessarily aesthetically structured universe, the contingent finding of beauty in the formation of its fundamental building blocks, and the response to these structures as reflecting the hand of a creator who intended it to be so: a proper recognition of the world and all its constituents and structures, abstract, physical, personal, and teleological as the creation of an artifex pulcherrimus, a divine artificer.

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8 M. Ruse et. al. Three views...P.16

9 Literally translated, ‘the most beautiful artificer’
Integration and theological aesthetics

Although this discussion is largely conducted in the register of modern analytic philosophy and the problems that naturalism throws up for theism within this tradition, it is not too difficult to locate it within a broad tradition of ‘theological aesthetics’. By this phrase I mean to indicate theological works that deal explicitly with the beauty and love of the divine, and in the Christian tradition, the outworking of that understanding in relation to Christ, creation, and the Trinity. I hope it will already be apparent that the nature of the task as I have outlined for this work has little space for anything like a reasonably comprehensive discussion of these issues.

Nevertheless, ‘a proper recognition’ of the integration between ‘the world and all its constituents and structures, abstract, physical, personal, and teleological as the creation of an artifex pulcherrimus, a divine artificer’ achieved within the context of analytic philosophy is a step, if only a preliminary one, towards a further integration of all these elements into a broader theistic picture or metanarrative of God and reality.

Rather than attempting a summary of this literature in the space allowed by a brief introduction I can better, if still inadequately gesture towards what I mean by this by drawing on two highly prominent theologians and philosophers. Both of these have put beauty at the very heart of their work on God, the nature of being, and the forms of creation as the outcome of the actions of an infinite God. The first of them is Hans Urs von Balthasar (1905-1988), the Catholic philosopher and theologian. His three major works are extensive and are now commonly known in English as The Glory of the Lord: A Theological Aesthetic, Theo-drama: Theological Dramatic Theory, and Theo-logic: Theological Logical Theory. The second author is the American theologian and philosopher David Bentley Hart, whose primary work in theological aesthetics is the relatively recently released The Beauty of the Infinite: The Aesthetics of Christian Truth.

To begin with Balthasar, Louis Roberts in The Theological Aesthetics of Hans Urs von Balthasar gives what is perhaps the best possible summary of his complex and extensive work,

‘Balthasar’s theological aesthetics begins with ‘beauty’…that which appears in the beauty of natural and created forms is the glory of being…It speaks of the mystery of that which transcends and yet inheres in all existents. Consequently, aesthetics

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is not just one department of knowledge, which in relative independence of others constitutes a relatively autonomous discipline. When one sees the beauty of a person, a work of art or a sunset, one is confronted at the same time with the mystery of otherness. This sense of the wonder of beauty, Balthasar believes, is at the root of all serious metaphysical endeavour.'

By the term ‘transcendental’ as one of the foremost scholars of his work Aidan Nichols, Op explains, Balthasar means that which is not confined by any particular but is universal to the very nature of what is it to have being. It is however via our perceptual confrontation with created reality that the universals of created being become available to us. As Nichols succinctly puts it,

‘the perceptible form of an object is the expression, under particular conditions, of its metaphysical form-its essence or nature’.

It is the very bedrock of all being. Balthasar in his own words says the following,

‘No metaphysics of Being as such, and its transcendental qualities, can be separated from concrete experience, which is always of the senses. The True, the disclosure of being in its totality only becomes visible where a particular thing is judged true. The goodness of Being is only visible where one meets with some good thing which brings both the ‘Good’ near and -through its finitude, fragility and relative ‘badness’ causes it to retreat again. And we know that there is beauty from the sensuous experience which presents and withdraws it…in myriad layers’.

The ‘beauty’ revealed in the concrete particulars of experience for Balthasar are manifested as he writes in the ‘form’ or essence of the thing and its ‘splendour’. These two elements have, he maintains, ‘traditionally controlled every aesthetic and which, with Thomas Aquinas, we could term species and lumen…form and splendour’.

‘As form’, Balthasar writes,

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16 A. Nichols, A Key…p.17
17 This reference draws on the Thomist point that any existing thing cannot express the fullness of being since its nature is confined by the limitations of its form (or ‘structure’ or ‘principles’ of organisation).
19 Hans Urs von Balthasar, The Glory of the Lord…p.115
‘the beautiful can be materially grasped and even subject to numerical calculation as a relationship of numbers, harmony, and the Laws of being...form would not be beautiful unless it were fundamentally a sign and appearing of a depth and a fulness that, in themselves and an abstract sense, remain both beyond our sense and vision.’

‘Splendour’ we might think of as reflecting the transcendental universal of beauty which points and elevates beyond itself. It is, maintains Balthasar, an encounter with the ultimate reality of ‘being’ wrapped in beauty, goodness, and truth. It is also found in objects of our own creation from a humble spoon to the glories of music and art, and in ethics, persons, and mathematics.

For Balthasar the transcendent qualities of being, beauty, goodness, and truth, are a holistic trinity through which all being is ultimately expressed, and move us eventually, via analogy, to the love of the triune God and the beauty of Christ.

In this way, the forms taken by creation and revelation are properly grasped and can only be properly grasped when they ‘are viewed as they were designed to be viewed: not as fragments but as a symphonic whole. Die Wahrheit ist symphonisch, ‘truth is symphonic’, is one of Balthasar’s’ favourite expressions’.  

One point pertinent to my thesis to be drawn from this adumbration is Balthasar’s insistence that it is through our sensory capacities that we come into contact with the ‘transcendental’ qualities or determinations of being: the beautiful, the good, and the true. Our perceptual, sensory, intellectual, and imaginative confrontations with ourselves, and the world in which we find ourselves, is thus not an obstruction to experience of the divine but one in which that experience is immanent in it.

Bentley Hart, a theologian, and philosopher of extraordinary range acknowledges that the towering achievement of his own book Beauty and the Infinite... is influenced by Balthasar and Gregory of Nyssa (372-376) amongst others. The book is perhaps best grasped as a Balthasarian symphony rather than a sustained argument. Thinking of his work in this way is true to his attempt to create a participatory metanarrative of God, reality, beauty, creation, and the final goodness of the world.

A major aim of Harts composition is to sustain a Christian response to post-modern and modern philosophies which are underpinned by a suspicion that all claims of metaphysical truth about the ultimate nature of reality are disguised forms of exerting power. These, he believes, have one thread

20 The reader will be cognisant of my assertion that mathematics and structure are transcendental conditions providing the forms via which truth and beauty are manifest.
21 Hans Urs von Balthasar, The Glory of the Lord...p.18
22 A. Nichols, A Key to Balthasar...p.9
of an origin in the separation of objective truth, beauty, God, and reality from world. One consequence of views of this kind is the perpetuation of what Geoffrey Wainwright, Cushman Chair of Christian Theology at Duke University calls an ‘ontology of violence’. ‘Modern and soi-disant philosophies’. He says,

‘remain trapped in...ancient antinomies...that bespeak an ontology of violence; by contrast the gospel offers an ontology of peace, whereby the unity and diversity of creation are embraced “analogically and participatively, redemptively and eschatologically” in the triune God who is manifested and imparted in...concreteness in Jesus Christ’.

As Wainwright notes ‘modern’ philosophers who include Kant and the Romantics are similarly targets for Hart. Modernism shares with post-modernism (here one thinks of Foucault, Derrida, and other representatives of this tradition), although for different reasons, an implicit endorsement of the ‘metaphysics of violence’ via its separation of the ‘unrepresentable’, associated with God and the Infinite from the representable which is associated with the rest of created reality. Kant, one remembers, placed God whom he called the abstract ‘sublime’, outside the possibilities of metaphysics.

Thus, modern philosophers, if they admit a god at all, proscribe the divine from the world and confine the beauty of reality to subjective experience. H-L Kantzer Komline, of Princeton University captures the consequence of the divorce for the modern in the following way,

‘The unrepresentable other seen abstractly as the sublime instead of concretely as the beautiful, is denied any particular reality or being that can be narrated in finite terms. Over against this...Hart makes a bold assertion: the beauty of the ‘unrepresentable, the infinite Other, is visibly continuous with the beauty of this world, and further, its beauty has taken a concrete and particular form. This is the truly good fabric of reality’.

Because beauty is associated with the particular and the concrete it is prior to human perception. Not only this, but the variety of created beauty is a celebration of difference and distance; whose difference reflects and participates in God’s being.


For Hart, the reality of the beauty of being is an outcome of the divine perichoresis in which the members of the Trinity give themselves to each other in continuous love. Beauty in its infinite created variety is a source of goodness for humans in their contemplation of God.

Hart’s end is to recapture, as Komline expresses, it how

‘God’s being is reflected in the world and can be recapitulated in harmonious relationships with God and ... each other: creation, to use a favourite metaphor of Hart’s, consists of variations on the theme of God’s peaceful difference’.

The discord and violence in post-modernism’s (metaphysical denial) of metaphysical truths, and the subsequent consequences for an eternal cycle of violence is thus overcome, whilst the difference between the representable and the unrepresentable embraced by modern metaphysics are all merged into a unifying narrative of God, world, being, beauty, truth, and goodness.

This might serve as a definition of the end point in service of which this thesis is offered.

**Brief summaries of the chapters**

**Chapter 1**

*A preliminary sketch for re-enchanting nature: science, normativity, and metaphysics*

The aim of this chapter has been broadly discussed above. I outline in it an alternative metaphysical conception of the world that unifies the existence of a causally governed natural world with persons, values, and expressive properties. I maintain that the very idea of a ‘natural’ world or ‘nature’ accessible to scientific practice in its various manifestations depends on this overarching picture which shows their various relationships to be part of a basic ontological union between them.

**Chapter 2**

*Structures in mathematical physics: a world of phenomenal and ‘measurable’ beauty*

In this chapter, I move on to give an account of how the idea of ‘structure’ is a metaphysical one, by which I intend the claim that anything that is to come into existence must necessarily have a ‘structure’ in order to exist at all. Continuing and deepening the case made in the previous chapter I show how the basic structures of the physical world investigated by particle physics can be properly understood

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25 H-L. Kantzer Komline...p.39
as uniting subjectivity, normative properties, and mathematical measurement without threat to empirical science.

I do this by showing how the relations between structure, mathematical physics, and aesthetics allow for that possibility. Whilst mathematics describes the objective quantititative dimensions of structures, the expressive properties that they manifest aesthetically open them up to subjective judgement. Despite the subjective requirement the truth aptness of the judgement is not relative to the person who makes it. I claim that there are different but epistemologically legitimate modes of access to basic ‘physical’ structures, both ‘personal’ and ‘impersonal’.

In other words, whilst aesthetic judgments of these arcane structures of basic matter can be referred to their mathematical construction, they are also subject to personal judgement. This does not disqualify them from being real features of the physical world. In fact, I note, the idea of structure is intimately linked to aesthetic features of simplicity, unity, symmetry and so on and judgements about such things are critical to theoretical evaluations of the rightness of a structural ‘order’

Chapter 3

Human artefacts and teleological structure

The structure of the physical world is not the only dimension of existence in which structures, objects, and processes appear. We construct them from what nature makes available to us. I point out that the fact that nature ‘allows’ itself to be manipulated to bring about artefacts to fulfil the teleological aims of sentient creatures is not itself a physical ‘law of nature’. It is rather a metaphysical property of a world that can accommodate rationality and teleology.

I suggest that being structures like any other, our artefacts share the same metaphysical principles with all other structures: they also express aesthetic and normative properties. I show that that the teleology they manifest is shared with that of ‘natural’ objects whose causal origins do not involve human intention: how else is one to describe the beaver’s dam or the spider’s web?

However, whilst biological processes are necessary to the ability of conscious rational creatures to engage with the concepts of teleology and act in accordance with them, they are not sufficient to explain the ontological provenance of teleological and intentional standards.

The conceptual distinction in explanation between regular physical causation and teleology does not support an ontological dichotomy within the metaphysical framework I have advanced any the more than the distinction between what is cognitively required to play chess and the rules of chess indicate a metaphysical dichotomy in that game.
Chapter 4

Universal structures of beauty and their transcendental teleology

Having established the metaphysical foundations of normative properties in the personal and impersonal worlds, particularly aesthetics, in this chapter I discuss the universal character of ‘beauty’, how it contributes to arguments for god’s existence, and the relation between that beauty and divine authorship. I begin by noting that since everything has an aesthetic character, it is to be expected that amongst the very different events and objects that constitute the world, many will be beautiful.

‘Beauty’ as I have shown is associated with theoretical judgements, artistic evaluations, and intuitions of the ‘rightness’ of any structural order which manifests it. Experiences of beauty in the physical sciences, nature and human artefacts often produces existential questioning and yearnings amongst theists and atheists alike provoked by something in its nature which has a psychologically transcendent effect.

Beauty would thus seem to constitute an important area of interest for natural theology. I offer some evidence to suggest this is surprisingly not the case. One reason may lie in the fact that the appeal to ‘beauty’ as producing transcendental desires is, or can be taken to be, entirely phenomenal as opposed to rational, or ‘subjective’ rather than ‘objective’, assuming that these modes of apprehension necessarily have ontological consequences.

Contrary to this collection of thoughts I suggest that the association of structure, artefact, nature, aesthetics, draws one intuitively to personal intent once the components of the broader framework I have developed are brought into conceptual play.

That an artefact and an object of nature share their ontological heritage weakens the idea that objects of nature cannot display as part of their identity the personal hand of divine creation. It does so, because it intimates that a way can be found to integrate teleology, the normative, and the personal into the conditions of the existence of ‘physical’ objects thereby bringing them within the scope of teleological intent. This having been accomplished it is a short step to implicate divine intentionality.

The language of divine artistry interpolates itself because it alone can encompass the presence of the personal and the presence of the purely physical and causal in the same metaphysical and ontological landscape that is our world. Given that all the objects of human life instantiate the teleological, when we find beautiful structures fundamental to the existence of all physical being lurking in the aesthetic thickets of the natural, it is a spontaneous inclination to feel the presence of a personal creation.
Chapter 5

A metaphysically designed world: teleology and the personal in arguments for god’s existence

In this chapter I aim to defend and apply the notion that teleology and divine personhood lie at the uniting heart of an ultimate conception of the world. Because this idea invokes the concept of intentional design it can, wrongly construed, appear as an explanatory hypothesis in competition with the assumptions of scientific explanation and methodology.

I reject the idea that it is and argue that, properly positioned, in relation to creation and its metaphysical structures, it can elicit characteristic and appropriate responses to the presence of personal life and agency.

I attempt a number of related things in what follows. All of these are underpinned by the notion that arguments for and against God’s existence that try to provide deductive proof cannot in principle be resolved by finding incontestable proofs on the one hand and irrefutable refutations on the other.

Arguments between atheist naturalists and theists often turn on a claim of the experience of the personal in the natural and broader world. Whether someone can be brought to this experience by rational proof alone is unlikely.

The central pivot on which this turns is the observation that the sentient personhood of another is not dependent on first establishing unassailable criteria of identification. The personhood of another is established in mutual engagement with them. I briefly discuss a model of the engagement of god’s personhood in nature by Michael C. Rea26 and show how my conception of the artefactual conveyance of purpose and meaning which ‘purely’ physical and human creations allow, can facilitate this engagement.

Chapter Six

Ultimate answers: meaningless, impersonal, or personal

In this chapter I argue that no conception of a ‘natural world’ that excludes the teleological and the personal from a metaphysical framework could provide an ‘ultimate’ explanation for the fact of anything existing at all or its coming into being. Furthermore, I contend that the even the inclusion of abstract entities, such as those of mathematics or Platonic Universals into that ontology would not be sufficient for that purpose since they are causally inert, atemporal and not ontogenic.

I compare ‘impersonal’ accounts of ultimacy with ‘personal’ ones and show how recourse to the ‘personal’ fulfils the metaphysical need I have identified to explain the presence of normativity, teleology, and aesthetic properties as base ontological necessities.

I devote a section of this chapter as a consequence to discussing the nature of ‘natural theology’, of which my argument is an example when rightly conceived. As might be expected, I suggest that if ‘Natural theology’ begins from the premise of accepting the ‘personal’ and ‘impersonal’ metaphysical duality of the world that I have been concerned to undermine, then it faces problems that are predetermined by that position: primarily a commitment to the primacy of the ‘impersonal’ understood as the territory from which it must begin its work.

That position having been implicitly (or explicitly) adopted certain consequences follow such as the view that the existence of God is a scientific hypothesis, or the existence of God offers a ‘better’ explanation of the data of the world than other ‘theories’: this is a confusion resulting from conflating method and metaphysics.

The understanding of the world as ultimately the outcome of divine personhood is not a matter for empirical decision: it is a matter of formulating a view of the world which allows for the experiential emergence of divine personhood in the natural. Whilst one might be guided rationally to that possibility there can be no deductive proof of it. The acknowledgement of the personhood of another emerges in the engagement of oneself as a person with others whether human or divine. It does not follow from prior deductive conviction.
Chapter 1

A sketch for re-enchanting nature: science, normativity, and metaphysics

**Summary:** In this chapter I contest the view that the achievements of the modern physical sciences have ‘disenCHANTed’ nature. The ‘disenchantment’ in question derives from a principle of scientific practice that requires no reference be made to divine or personal agency. ‘Expressive’ and normative properties such as the aesthetic are also excluded because their detection and evaluation involve personal experience and judgement. The world of ‘physical nature’ is thus presumed to be barren of anything that might show it to be the outcome of creative intent and value.

I outline an alternative metaphysical conception of the world that unifies the existence of a causally governed natural world with persons, values, and expressive properties. I maintain that the very idea of a ‘natural’ world or ‘nature’ accessible to scientific practice in its various manifestations depends on this overarching picture which shows their various relationships to be part of a basic ontological union between them.

**Overview of the chapter**

The central idea of the following chapter stands in opposition to the framework of a modern understanding of the ‘natural’ as a place of causal events ultimately divorced from teleological concepts like ‘purpose’ and expressive properties like aesthetics.

The metaphysical picture I am concerned to undermine conceives objectively occurring and uniformly repeating physical events as describing the ontological entirety of the cosmos: they answer to no final purposes and no other normative judgements. ‘Normativity’, the judgement of an event, object, or property as meeting or failing to meet some standard exterior to any intrinsic properties of these things themselves, has no fundamental place in this final picture of the natural world.

A variety of views of what ultimately exists derive from the basic modern schema. Because the methods of the sciences proceed ‘etsi deus non daretur’—‘as if god did not exist’, the conclusion of most of these positions is to argue that the natural sciences, particularly physics, are the supreme arbiters of the basic ontology of ‘reality’.

Other ‘expressive’ properties which might indicate intention or purpose like those of the aesthetic and the ethical, for example, which are open to normative evaluations like ‘this is ugly and could have been more beautiful’, are also excluded. If they have an explanatory or ontological status at all, they are
only granted it insofar as they are confined to the ‘subjective’ lives and aesthetic of human persons and their conceptual practices.

Two distinct worlds evolve from the impasse that consequentially develops between the ‘human’ world and the ‘natural’ one: the ‘personal’ and the ‘impersonal’. From this distinction emerges metaphysical ‘naturalism’: the assignment of ontological priority to the latter.

The world is thus taken to be ‘disenchanted’: no evidence of ‘meaning’ or ‘purpose’ is to be found amongst its primary ontological constituents. Along with the discarding of these teleological ideas, the possibility of a ‘designer’ ultimately responsible for the ultimate shape, functioning and existence of natural things expressed through their structures is similarly dismissed.

I oppose this view. I suggest it is metaphysically, not empirically derived, and cannot escape requirements to justify itself in metaphysical terms: an exercise in normative evaluation. Its metaphysical provenance opens it to metaphysical critique. The criticisms I develop consequently form the basis of an alternative metaphysical understanding of the natural world.

As part of this exercise, I demonstrate that the methods of science themselves assume various normative standards which cannot therefore be explained by any science. Amongst other things, for example, theories depend on the normative requirements of ‘evidence’, the epistemological bedrock of scientific activity.

All this is in preparation for the following chapter. I give a brief summary of its content here, to orient the reader towards the goal it will aim at. The burden of my view in the later chapter rests on the metaphysical principle that anything which can be said to exist must come in some structural form. Structures, for example, must have parts and wholes, consist of individual elements in some relation to each other, be subject to change, mathematically describable, and have aesthetically expressive properties accessible to normative judgement. This prepares me for the case that aesthetic judgements can be contributors to the representational truthfulness of any theory in the primary physical sciences. I provide evidence in that chapter that mathematical physics uncovers beauty in the basic structures of the physical world.

Part 1

‘Disenchancing’ nature

The English word ‘enchanted’, deriving from the Latin ‘in’ and ‘cantare’, ‘to sing’, is defined in various dictionaries as ‘filled with delight’, ‘being charmed’, ‘being placed under a spell’, ‘bewitched’ or ‘fascinated’.
The word has come to be associated with a particular relation to nature that humanity, at least in a Western tradition, is taken to now be lost. As its origins suggest it conveys a picture of a natural world whose doings are the subject and outcome of mysterious forces hinting at strange and mythical creatures, purposes, and gods, populating the hinterlands of natural events.

James Hannam, a physicist who specialises in the history of science, describes the phrase ‘enchanted nature’ as deriving from the Christian worldview of the European era before the growth of what we now call the empirical sciences. The essence of this is the idea that,

‘...everything and everybody had a purpose. Nothing just happened. Nothing existed purely for its own sake’...The ultimate governor of the universe was god and he endowed everything with a reason for its existence’.27

There is a patent overlap between this understanding, God and ‘teleology’, the language of purposes, intentional agency, awareness, and personhood. Understanding nature and its structures through a teleological lens suggests that like an artefact of human origin, the shapes, patterns, and identities of physical objects and events can be interpreted as bearing the stamp of divine design: the structures of nature are intelligible because they are the outcome of intentional construction.

At least in the Judeo-Christian tradition the relation of God to world has been minimally understood to involve some idea, however fraught its theological and philosophical explication, of a divine personhood from whom creation and its functioning emanates: the divine origins of nature and immanence of god’s presence providing the reason of all things including aesthetic attraction and causally explicative events.

Hannam contrasts this picture with the emergent modern secular ‘naturalistic’ world view in which nothing has a purpose.

‘The universe just is and has no guiding hand. We do not need to look for a conscious reason for anything to know how it works. In fact, any such explanation involving a purpose is scientifically illegitimate. ‘Nature’ follows laws that we can describe mathematically...we live in an impersonal universe that is unimaginably old and vast, on a planet orbiting an ordinary star’.28

27 J. Hannam, God’s Philosophers...p.34
28 J. Hannam, God’s Philosophers...I quote Hannam here because, although this opinion is widely known and discussed in many articles and books, he distils it to its essence, p.34.
This compelling picture has come to contribute to what has been called the ‘disenchanting of nature’. It is traditionally ascribed to the period around the 17th century and the growth of contemporary science. The phrase appears to owe its origins to the sociologist Max Weber.

Ejecting ‘final causes’ from natural philosophy

It has not always been thus in the canon of Western philosophy: the most prominent of the classical Greek philosophers, Aristotle and Plato did not make distinctions between understanding nature, teleology and persons in the manner that is now widespread in Western culture. Mats Wahlberg summarises the dominant pictures of the Greek philosophers as follows,

‘The nature of Plato and Aristotle was a meaningful order. Things were seen as embodying forms or ideas and existed in order to express those ideas.’

For the Aristotelian, for example, philosophical analysis provided a series of principles that could be deployed to explain the nature of nature (or physis) in one unifying doctrine. Anything could be understood in virtue of four principles or ‘causes’, the material cause: ‘that out of which’ something

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is constructed; the *formal* cause: the ‘essence’ or principle of organisation; the *efficient* cause: that responsible for the ‘motion’ or change of an object; and the *final* cause; the end, goal, or purpose of the object, or what it is good for.\[^{32}\]

These principles bound all things together into different forms of organised ‘matter’ each kind with its own ‘essence’ and purposes. The behaviour and nature of inanimate objects and sentient life, including ourselves, the ‘rational animal’, could be captured in terms of these four causes.

In an arresting image which he exploits in his book, *Science and Spirituality: Making Room for Faith in the Age of Science*, Michael Ruse\[^{33}\], a philosopher of science and a naturalist with a strong interest in the possibility of religious belief, divides the ancient Greek and contemporary pictures of the world as the difference between the world as ‘organism’ and the world as ‘machine’.

As he makes clear both Aristotle and Plato, for example, shared the idea that all things functioned like ‘organisms’ each one of its kind having an ‘essence’ or purpose towards which its ‘essential’ nature moved it. The ultimate purpose or the ‘final cause’ of a thing thus governed the arrangement of its properties and behaviour.

During the long course of the evolution of science, ‘final causes’, ‘purposes’ and the array of concepts associated with them were gradually ejected from any understanding of the cosmos.

‘Nature’ emptied of ‘final’ causes (purposes) no longer available as conceptual tools for the understanding of ‘physis’ or ‘nature’\[^{34}\], also brought about a separation of the person, understood as a rational, teleological agent from the ‘natural’ world.

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\[^{34}\] The word ‘*physis*’ is the pre-Socratic Greek word for ‘Nature’ deriving from the Latin, ‘*natura*’. Aristotle used the word in one of his formulations to distinguish between those things originating from human activity, ‘*techne*’, and those things whose ‘essence’ gave rise to then ‘naturally’. This is a distinction I will discuss in Chapter 3. See, A. Dunshirn: Physis, in: Kirchhoff, Thomas (ed.): *Online Encyclopedia Philosophy of Nature / Heidelberg University Press*, (2019) https://doi.org/10.11588/oepn.2019.0.66404
The slow ejection of ‘final causes’, teleology, and finally the divine from the natural was, in part, conciliated by the loss of credibility of this all-embracing philosophy of the Aristotelian concept of the cosmos that had come to dominate natural philosophy.

As Peter Harrison remarks,

‘In the sphere of natural philosophy, the Aristotelian understanding of qualities, essences and ends as intrinsic properties of natural bodies was...subjected to searching criticism. Change in the natural world began to be understood in terms of laws of nature that were thought to operate externally on inert particles of nature’.\(^{35}\)

Wahlberg elaborates the growth in the conception of the understanding and explanation of nature that this involved,

‘In the 17th century... the idea of a meaningful order (in nature), was put under pressure by the rise of the new science and came increasingly to be seen as an anthropomorphic projection onto nature of a meaning and order that are not to be found there. In order to achieve a correct understanding of nature such projections must be avoided. The vision of a meaningful order gave way, eventually, to a view of the world as a “domain of ultimately contingent correlations to be...mapped by empirical observation”’.\(^{36}\)

Teleology and values are thus to be eliminated from the natural world for good methodological reasons but also for good ontological reasons.

By the end of the 18\(^{th}\) century the Newtonian picture had triumphed. Alexander Koyre expresses the victory trenchantly:

‘The Newtonian God reigned supreme in the infinite void of absolute space in which the force of universal attraction linked together the atomically structured bodies of the immense universe and made them move around in accordance with strict mathematical laws. Isaac Newton’s three laws of motion, their simplicity, range of explanation, absorption of the Keplerian laws of motion of the planets,'
and the new mathematics of calculus delivered an opening of the universe to mathematics of extraordinary descriptive and predictive power’.\(^3^7\)

Despite Newton’s diffidence in offering a physical explanation for gravity, and his own theological attachments, his work yielded a cosmos contained within a framework of absolute time and space, that operated with a mechanical certainty. This picture helped open one way to an understanding of how human thinking and agency come to be thought of in relation to the natural world, man, and God, nicely captured by E. A. Burtt in his classic *The Metaphysical Foundations of Modern Science*.

He describes the separation of man from nature, and consequently from God as a consequence of the ‘modern conception’ of nature:

‘...instead of causal explanation in terms not unsuited to a metaphysics which regarded man as a determinative part of nature, and a link between man and God, we now, after his banishment from the real world, explain causality solely in terms of forces revealing themselves in the mathematically expressible motions of matter itself’.\(^3^8\)

Wahlberg summarises the extrusion of teleology and the personal nicely,

‘The process of disenchantment...is a...cleansing of our world picture from anthropomorphic projections. When everything tainted with human subjectivity is removed from the picture, what is left is the world as it is in itself...Reason, intelligible structure, logos, and value, belong on the subject side of the subject/object divide’.\(^3^9\)

Modernism thus achieves a decisive dichotomy, making it possible to conceive of a mechanistic world\(^4^0\) which requires at no point in its conception, sustenance, or explanation, reference to the teleological, let alone the personal, and at an even further distance, the divine.

‘Science’ has made the progress it has made from that time by continuing to exclude the operations of all human and supernatural rationality and personhood from the underpinnings of all nature.

\(^3^9\) M. Wahlberg, *Reshaping Natural Theology*, P.54.  
\(^4^0\) The word ‘mechanism’ as I intend it to be understood here is not restricted to the technical idea of a ‘machine’ but also embraces the broader conception of any natural substance or property, the understanding of whose function makes no reference to ‘spiritual’, ‘vital’, or personal forces.
‘The entire world’, as the Kantian Scholar Robert Hanna expresses it, ‘including living organisms, animals, human beings, and persons—operates according to non-teleological, mathematically-physical principles alone’. 41

I take it, that this description, which is not Hanna’s own conviction, is intended to admit into the pantheon of ontological properties essential to the world’s constitution only those which are non-phenomenal, impersonal, and perspectiveless: expressive properties like those of the aesthetic which clearly involve phenomenal experience for their appreciation, satisfy none of these criteria and are excluded from the basic ontology of the universe.

Reasons for scepticism about re-enchantment

From this perspective to try and reenchant the natural, as I want to do, is to continue to insist that the physical world external to us manifests primary properties such as the aesthetic and thus be compelled to re inject normativity into nature. The first immediate objection that arises to this is the thought that if the world external to us did express such qualities as goodness and beauty as part of its physical make up, then the detection and evaluation of those properties would surely feature in at least one basic science of the physical. The burden to provide evidence for any such assertion would be placed on the protagonist of any such view.

Another objection arises from a necessary feature of the methodology of the natural sciences: even if aesthetic properties and other evaluative dimensions were present in the natural world, this would anyhow close them off to scientific investigation because they would not be open to objective measurement, the fundamental basis of scientific method. As physicist Jane McDonnell succinctly expresses it,

‘Scientific theories are supposed to be objective, and beauty is a subjective criterion’. 42

To judge the physical events of the natural world according to some external norm provided by say aesthetics or ethics might imply that their causal functioning is governed by some external aim or ‘final purpose’ towards which they are directed and succeed or fail to attain.

In the world of causal regularities, there is no such conception: ‘failure’ is simply the outcome of a complex interrelationship of causation with outcome x rather than usual outcome y. To say ‘y “ought” (indicating a ‘normative’ standard) to have happened is, in the scientific context, is just to say that the

normal outcome of a set of events has been interrupted by a causal event that is not a regular member of the usual set of causal events constituting the sequence. The common use of ‘ought’ in this context is simply a useful shorthand heuristic not an indication of a normative judgement.

Normative properties are also intimately linked with the concept of design. It is where they have their natural conceptual home. ‘Design’ suggests a working towards a particular end (a ‘final cause’) the achievement or non-attainment of which can be judged against, for example, some standard of ‘beauty’. Ethics similarly invokes patterns of behaviour and thought which ought to form the ends towards which we act and in virtue of which our acts are evaluated.

In this sense, both aesthetics and ethics participate towards maximising and giving value to that which they govern. Nothing in nature is ‘designed’, the natural sciences assume, so the judgements, for example, that ‘it could have been designed better’, ‘it was designed for this purpose or that’, ‘the structures of mathematical physics are intentionally beautiful’, or ‘the structures of physics were rationally constructed to be understood’ and a host of similar claims have no ontological purchase, other than as recognised anthropomorphic shorthand for causal descriptions and functional observations.

The aesthetics of nature: ‘beauty’ naturalised?

Despite these cautions that issue from the understanding of science and ontology that I have sketched, we nevertheless find it difficult to separate out many of our phenomenal experiences of the natural world from our scientific and theoretical understanding of natural events. Aesthetic reactions to the external world are common to our day-to-day perception. Even scientists across a range of disciplines are often unable to restrain aesthetic responses to their findings outside the strictly formal context of academic communication.

An explanatory burden falls on the physicalist naturalist as a consequence: how to account for the aesthetic effects of natural world on us in all its manifestations and the place aesthetics plays in human lives and creations. The intuitive modern answer to this is that if aesthetic properties are not extant in a universe absent of any sentient life, then they must belong to, or be somehow causally dependent on, the internal experience of appropriately equipped organisms like ourselves.43

‘Naturalist’ explanations of aesthetic experience are consequently sought in the life of human persons in the domains of sensory awareness, cognition, perception and affect as investigated by the psychological and cognitive neurosciences. The task of these disciplines is understood as twofold: to

explain the ontology of aesthetic properties as an outcome of human neuropsychological structures, and how they are generated by the ‘information processing’ of cognitive and affective mechanisms.\textsuperscript{44}

Why these mechanisms develop and why they are important to human life are often argued to be discerned through understanding evolutionary processes in which aesthetic experience is tied to survival or an epiphenomenal \textit{spandrel} of some such outcome.\textsuperscript{45}

One might call this a modified ‘naturalised’ Kantianism: Whilst there might be assignable aesthetic properties of things that emerge from how we categorise and experience the objects and properties of the world about us, they reveal nothing of the things themselves.\textsuperscript{46} Common expressions of aesthetic pleasure occasioned by natural beauty are explained by various evolved cognitive mechanisms serving other psychological purposes: they might be associated with features of the environment that serve the ends of survival, the sparkle of sun on water for example, and thus provide a useful cognitive heuristic for categorising very different useful natural items.

From this perspective, even universal agreement about what is beautiful and what is not, would not support the idea that aesthetic properties are intrinsic to natural things. Even if it were the case, which it is clearly not, that every person agreed on what was beautiful and what not, from the evolutionary point of view that regards aesthetics as purely dependent on the ‘subjective’, this would \textit{still} not be evidence for the objectivity of beauty. Rather an evolutionary explanation would be developed to account for the commonality of subjective agreement that located the perception of aesthetics entirely within the species.

The conviction with which we express the judgement that ‘x is beautiful’ would at best ‘be true’ for all human beings, if it is, because to encounter x as a ‘beautiful’ thing would simply indicate a subjective mode of apprehension common to \textit{all} evolved human persons to which we give the name ‘beauty’. ‘Aesthetics’ on this view still has its ontological home in the interior ‘subjective’ experience of sentient persons and not in the impersonal world of the ‘objective’.

The division between the ‘subjective’ and the ‘objective’ also has consequences for how the artefacts and aesthetics of human activity are to be understood. Without the human social life surrounding it, no object or artefact that is an outcome of human agency is supposed to have aesthetic value or any

\textsuperscript{44} G. Currie, M. Kieran & H. Meskin, eds., \textit{Aesthetics and the Sciences of the Mind}, O.U.P., Oxford, (2014), contains a series of essays debating the relative contributions or otherwise of the cognitive sciences to questions in aesthetics.

\textsuperscript{45} I discuss this in detail in a later chapter.

other expressive property as a matter of its intrinsic constructive properties. Its ultimate identity is simply a concatenation of physical elements aggregated together.

For this reason, and the importance that music, art, literature, buildings, and other artefacts play in human life, theories of aesthetics are largely concerned with the objects of human creation. Here, it is straightforward to see, created objects are intended by their authors to express certain meanings. Familiarity with the author, painter, builder or architect and their culture, times and traditions allow us to adjudicate the aesthetic properties of a piece of work. The symbolic ‘meaning’ of such works and their aesthetic appeal, however these are to be understood cannot, so it is thought, derive from the purely physical properties of the object; these are the preserve of the physical sciences and their methods alone.

If recognising the hand of the divine in nature requires the detection of personal qualities, or properties like beauty expressed in natural structures, then where are these to be sought in terms of causal forces revealing themselves in the ‘mathematically expressible motions of matter’, it may be justifiably enquired. Nature can be described and explained as doing what it does without any such teleological commitment to anything associated with the cognitive and affective life of human persons let alone a divine personage. In the next sections I begin to unravel the foundations of this naturalist picture of aesthetics and nature.

**Ontological naturalism and dualistic metaphysics**

The sundering of the teleological, the normative and the personal, from the natural world and its explanatory forces results in two distinct worlds, which manage to operate in tandem but whose ontological and epistemological links remain mysterious if traversable at all.

Robert Hanna sums this up precisely,

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‘...the fundamental problem...is how to reconcile two...seemingly incommensurable...metaphysical conceptions or ‘pictures’ of the world. One the one hand the non-phenomenal...mechanistic, objective, value neutral and amoral metaphysical picture of the world delivered by pure mathematics and the fundamental natural sciences...on the other...there is the subjective, phenomenal, teleological, value laden, person-oriented, and moral metaphysical picture...yielded by the conscious experience of rational human beings’.50

From this separation arises philosophically fertile dislocations. Human consciousness, and its concerns are radically sheared from the physical world at the same time as humanity is incarnate in that world. The mind-body problem is the philosophical expression of the disjunction,51 as is the apparent chasm bequeathed to us by David Hume52, the ‘fact-value’ dichotomy, or the problem of normativity in the natural world.53 The debate about where to locate moral ontology, if anywhere at all, is another example of this division, as is the consignment of aesthetic ontology to the interior of the subjective ‘mind’, or the restriction of ultimate moral authority to its emergence from the community of Homo sapiens.

The overall picture of the world that this presents us with presses a fundamental question; where are consciousness, subjectivity, teleology, moral ontology, aesthetic appreciation, reason, thought,

50 R. Hanna, Kant, Science... p.8
51 It is worth noting that for the ancients the concept of ‘consciousness’ as a unique ‘stuff’ would not have been comprehensible. Aristotle, for example, did not suppose such ‘stuff’ to be the defining feature of humanity. His definition of the distinguishing feature of man as a ‘rational animal’ locates Homo sapiens as an inhabitant of the natural world describable within his four causes. For a wide-ranging discussion of different Greek models of mind see, A.A. Long, Greek Models of Mind and Self, Harvard University Press, U.S.A., (2015). In a fascinating discussion the German classicist, Bruno Snell points out that the idea of a unified body was not obvious to pre-classical Greeks who thought in terms of different bodily parts. So even the concept of a unified human corporeality is an achievement of human thought, B. Snell, The Discovery of the Mind in Greek Philosophy and Literature, Dover Publications, New York, (1982)
Also see P.Millican, Hume’s Fork and his theory of Relations, Philosophy and Phenomenological Research Vol. XCV No. 1, July 2017. Millican argues that the discussion of Hume’s fork in Hume’s Enquiries is a simplified one. The original distinction he says, is dealt with more substantially in Hume’s previous work the Treatise but is nevertheless a poor reworking of Locke’s theory of relations.
53 The most obvious objection that has been raised to Hume’s distinction is to ask on which side of his ‘fork’ it falls. It is itself not a deductive truth nor one garnered from sensory exposure to the world which are the only possible truth claims Hume allows. Why then is it an acceptable principle of how things are and what is to count as knowledge? For a wide-ranging discussion of the ‘fact-value’ dichotomy that supports my contention see H. Putnam, The Collapse of the Fact/Value Dichotomy and other Essays, Harvard University Press, (2002). Putnam makes the valuable point that a distinction is not a dichotomy.
meaning in language and all that go along with them, to find their place in the broader scheme of reality? 54

If that place is entirely defined by some version of physicalist naturalism that admits into the ultimate ontology of the cosmos only what the physical sciences legitimate, then the apparent features that characterise our existence as persons will be ultimately excluded, reduced, or supervenient on one or other of the items of the naturalist scientific disciplines, and the assuaging of our need for purpose and meaning will only be generated from within our own cognitive resources.

At best perhaps teleology and all the apparatus of human consciousness and life fit into the physical scheme of reality as emergent, supervenient, or properties of the special human ‘sciences’, which are dispensable when it comes to a final accounting of the ultimate constituents of the universe. In this conception teleology, expressive properties, value and all the rest are extrusions that emerge with human and animate life. If conscious life were to disappear, then so would worlds of value and meaning.56

David Papineau, a prominent philosophical naturalist is clear that all natural phenomena are physical, and all events are ultimately explicable by the laws of physics. His assertion is reflective of a widely held opinion in philosophy and general intellectual culture. The Introduction to a volume entitled, How Successful is Naturalism? expresses it this way,

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54 L.R. Baker, Saving Belief: A critique of Physicalism, Princeton University Press, New Jersey, USA, (1987) argues against a wide range of physicalist conceptions that properties of mind fundamental to human personhood and mindedness including teleological aspects like ‘belief’ and so on, and the intentionality of thought, are reducible to any physical structures. Included amongst her targets are prominent naturalists such as Jerry Fodor and Daniel Dennett.

55 This is not to say that any of these relations will include all the phenomena. Some may bear a particular type of dependency on different forms of the physical and so on.

56 The book length case in defence of Teleological Realism is S. Sehon, Teleological Realism: Mind, Agency, and Explanation, M.I.T. Press, Cambridge MA, U.S.A. (2005). Sehon defends the idea that we commonly explain human behaviour by citing the reason or purpose for it. Such explanations he argues are absolutely essential to how we understand human agency: a teleological citing of the goal of any behaviour is not a causal antecedent of the behaviour in question in any physicalist/naturalist sense of that word.

The relation between the logic of reason in teleology and causality in ‘nature’ is a source of contention in Philosophy. A classic paper published in the middle 20c has been the source of much discussion: Donald Davidson argued in this work that primary reasons for action could be described in terms of ‘belief’ or ‘physical’ events, the events in question holding independently of either description: D. Davidson, Actions, Reasons, and Causes, in, The Journal of Philosophy, pp.685-700, Vol.60, issue 23, Nov.1963. A book published 50 years after the paper has a series of articles discussing the plausibility of this claim, G. D’Oro & C. Sandis, eds., Reasons and Causes: Causalism and anti-causalism in the Philosophy of Action, Palgrave MacMillan, London, (2013)

naturalism is not only the most accepted creed amongst analytic philosophers but a widespread view throughout contemporary culture’.  

The prominent naturalist philosopher of mind, Jaegwon Kim, opines,

“If current philosophy can be said to have a philosophical ideology it is unquestionably...naturalism...Philosophical...naturalism has...constrained...philosophy as its guiding creed for much of the twentieth century.”

Ontological naturalism as a deduction from science

Understanding the relation between the natural sciences, the personal, teleology and the divine through the lenses of ontological or physicalist naturalism with the attendant suspicion of those three categories does not however follow automatically from the sciences of nature. A way to approach an alternative conception is to begin by drawing a distinction between scientific methodologies and metaphysics.

Philosophers of science and those interested in relation of the natural disciplines to the divine sometimes distinguish between ‘methodological naturalism’ (MN) and ‘ontological naturalism'(ON). Whilst MN does not need to be formally embraced by practising scientists it is intended to indicate that scientific theory and practice is successful when it excludes ‘supernatural’ forces and teleology.

The exclusion of teleology and ‘supernatural’ forces from the investigative and theoretical practices of the sciences (MN), however must be distinguished from a metaphysical interpretation about what such an exclusion might mean for the ontological character of the world.

In the words of Peter Harrison, a former Idreos Professor of Science and Religion at the University of Oxford, ontological naturalism,


60 P. Harrison & I.H Roberts, eds., Science without God? Rethinking the History of Scientific Naturalism, O.U.P., Oxford, (2019), has many interesting chapters re-examining the history of naturalism. One message to draw from the chapters is that the historiography of scientific naturalism is not a slow and necessary rejection of God from the natural world as a matter of scientific and philosophical progress. Peter Harrison’s opening Introduction locates the history in the context of current debates about naturalism and its relation to the modern sciences. It serves as a good introduction to many issues that I have not been able to deal with here.
‘...is...the position that goes beyond a mere methodological stance to assert that in reality there are no supernatural agents or forces, and that natural sciences have the potential to explain everything’.  

We should be careful to distinguish however between two ideas of what the metaphysical rejection that characterises ON involves. On the first, ‘supernatural forces and agents’ might be taken to be mysterious spiritual forces that operate like the forces adduced in physics that bring about movement and change. This is in essence a magical property ejected from the physical world by the natural sciences. The second idea relates more closely to the picture of a human creator constructing something novel.

The theist need have no qualms about accepting the first as a valuable epistemological move towards scientific knowledge of the physical forces of the natural. Why the distinction I have made is important is revealed in a comment by Brendan Larvor in his article ‘Naturalism’.

‘We live in a “disenchanted”, that is to say, magic free world, not just because we say so, but because our society runs on effective efficient natural causality’.  

It is clear, I suggest, that he thinks accepting a theistic view of the world commits the believer to the presence of magical forces. He is conflating the distinction between two different conceptions of the relation of God to the physical universe.

The second conception with which I am largely concerned is not vulnerable to Larvor’s criticism. The idea of a divine ‘supernatural’ actor in this latter picture, is closer to the idea of a person with teleological agency, related to the creation of all ‘reality’ as an agent to artefact. However that idea is to be understood it is not, or should not, be understood as the idea that God as a personal agent is equivalent to an extra force inside the universe.

In more developed philosophical and theological ideas, the coming into existence of the entire cosmos in its intricate causal and physical functioning is the outcome of a divine creative agency. In a traditional theistic tradition, for example, God is the ‘primary’ cause of the existence of the cosmos in all its physical forms, shapes and rational intelligibility, and the cause of that in virtue of which they continue to exist and function as ‘secondary causes’.

The ontological inference from MN to ON that Harrison discusses has the effect of excluding the second conception of what constitutes ‘reality’ as well as the first. It has another consequence,

61 P. Harrison, Introduction, *Science without God...* p.3  
however, that of also excluding what seems, at least to human beings, an indispensable set of interlinked teleological concepts, such as ‘purpose’, ‘agency’, ‘rationality’, and value as real phenomena of the world as encountered by us in it, and necessary for the identity of anything to count as a self-conscious, reasoning person with teleological agency in the world.

The ontological inference also has the curious unintended effect of excluding any definition of scientific activity as ‘the purpose of gaining knowledge about the physical world’. Since epistemological purposes are teleological, the definition assumes that the ‘purpose of gaining knowledge’ expresses a real phenomenon and legitimately explains why persons engage in scientific activity. This alone should provide reason for metaphysical caution.

To question the metaphysics of ontological or physicalist naturalism is to enquire whether an alternative metaphysical framework can be derived into which the personal, teleology, normativity, science, and the natural world can fit as ontologically essential to any conception of a natural world in which physical objects appear and can be understood through empirico-causal lenses. In other words, without any ontological conflict between the personal and the impersonal worlds.

Ontological naturalism despite its claim to reflect a metaphysical reality deriving from the hard natural sciences might, if such a picture is available, be seen to leave out something about that reality. It may even be that what it leaves out is necessary for the possibility of science itself, the characterisation of what sort of thing the world would have to be, to be suitable for empirical investigation.

To choose one of many examples of a metaphysical necessity: in order to underpin what is meant by a ‘law of nature’, the conceptual link between physical regularity and causal relation must first be grasped. Since this is a prior requirement of understanding physical events, it imposes a normative requirement on the possibility of the idea of a scientifically investigable nature.

**Metaphysics, ontological naturalism, and science**

An initial response might be to deny the coherence of the idea of an alternative metaphysical picture whose claims about ontological ultimacy are not answerable to physics, or some collection of the natural sciences. Physicist and priest, John Polkinghorne, in his introduction to a book concerned with mathematics and meaning, has this to say in response to that claim,
'Anyone who outlines a world view circumscribing the scope of reality, whether it is narrowly or capacious conceived is making a metaphysical assertion as surely as they are using prose to make their assertions.'

In other words, the thought that claims about ontological ultimacy can only be answered by the sciences is itself not a scientific claim but a metaphysical one.

Metaphysics as Polkinghorne’s comment implies, is an attempt to attain the,

‘...true ultimate explanation of the most general features of the world that we inhabit’.

At least, as Timothy O'Connor points out, this has been its traditional role. It is the rational effort to attain a picture of what kinds of things, such as substances, events, properties, and even kinds of explanation and relations ultimately exist in and of the world insofar as we can intellectually know it. Metaphysics thus conceived includes the sciences as part of its subject matter.

A Christian theologian and philosopher can also accept this description. Andrew Davison’s 2019 book entitled, Participation in God: A Study in Christian Doctrine and Metaphysics offers early on, a definition of metaphysics with which even the non-theistically inclined might willingly concur,

‘The business of metaphysics’, he proposes, ‘is to offer an account of the nature of the world, and especially of its fundamental structure at the level of being’.

Another Christian philosopher, Keith Ward uses the word to mean,

‘...a general account of the nature of reality and the place of human beings within it’.

It is probably an intuitive starting point at least in a Western tradition to include in these definitions the aim that the desired description of the ultimate nature of being will unify all the phenomena of the world within its explanatory scope.

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67 A locus classicus for an opposing view is John Dupre, The Disorder of Things: Metaphysical Foundations of the Disunity of Science, Harvard University Press, (1995). Dupre argues that the state of different scientific disciplines supports the view that a unitary science is out of the question and develops a metaphysics to accompany this view.
Many authors, both philosopher and others have pointed to the fact that any appeal to the epistemological and metaphysical hegemony of the natural sciences is itself a metaphysical position. R.N. Williams characterises the epistemological claims of what he terms ‘scientism’;

‘sientism ‘makes metaphysical claims…(it) assumes and requires a naturalist materialist metaphysics’. 69

Taliaferro et.al. similarly suggest this is so for the following reason,

‘The claim that the physical or natural sciences should be our primary starting point is itself a philosophical claim ...if we claim that these ways of knowing reality are the only or best methods for doing so, we are making claims about physics, chemistry and biology from a perspective external to those disciplines. This is a philosophical claim about science not a scientific claim about science’. 70

As E. Feser argues, ‘scientistic propositions’ are refuted the moment they are stated because they are themselves

‘...metaphysical positions that could only be justified using metaphysical arguments’. 71

The collective weight of these considerations supports the role of the need for a perspective out with the sciences that can participate in the quest to outline ‘the most general features of reality’. It admits requirements for general features of the world that are not encompassed by the sciences but are necessary for them.

The metaphysical idea of a ‘scientific’ nature

One result of all these observations is that the idea of ‘nature’ or different ‘natures’ as describing a world external to us that can be understood scientifically is an outcome of a particular general way of

71 E. Feser, The Last Superstition: A refutation of the New Atheism, St Augustine’s Press, South Bend Indiana, (2008), p.84
72 R. J. Snell & S.F. McGuire eds., Concepts of Nature: Ancient and Modern, Lexington Books, Maryland, U.S.A, (2016), as the title suggests, is an historical overview of how human beings have understood or come to a conception of ‘Nature’. A particular issue they are concerned with is how the modern concept of a ‘causal’ nature has extruded the idea of an order of ‘natural value’ in virtue of which human beings could seek not only a moral identity but normative guides to action.
understanding the world. It is not a product of ‘science’, but rather a precondition of it.\textsuperscript{73} The harmony between scientific practice and world that is epistemically productive now seems to our scientific culture a ‘natural’ way of comprehending nature. The harmony however is not an \textit{a priori} given of human sense and cognition.\textsuperscript{74}

The characterisation of an aspect of a part of world as ‘nature\textsuperscript{75}, a realm of non-personal, yet intelligible and structured uniform events is a basic prerequisite of contemporary science\textsuperscript{76}. Understood in this way ‘nature\textsuperscript{77} is a philosophical achievement, the outcome of a confluence of philosophical change, technical, and mathematical development.\textsuperscript{78}

In her extensive philosophical investigation of an ‘expansive’ naturalism (which I discuss below) Fiona Ellis, puts it this way,

\begin{quote}
\ldots science provides a framework for learning the rules by which nature operates...\textit{(nature is seen) as...events...which belong to the realm of “natural-}
\end{quote}


\textsuperscript{75} I take it here, that despite the difficulties in defining ‘nature’, there is an immediate sense in which this term acts super ordinately to distinguish arenas of investigation examining those parts of the world which we consider to be, in some sense of this word, ‘external’ to us. Of course, ‘we’ are corporeal creatures and to the extent that the disciplines such as biology and the various neurosciences concern ‘us’, the distinction is less clear, but even here, there is a distinction to be made between these disciplines and those such as moral philosophy, literature and history, poetry, and so on. A distinction does not imply a dichotomy, however.

\textsuperscript{76} It is sometimes supposed that the suggestion that a world could be ‘chaotic’ would undermine this position. A world which is ‘chaotic’, however, is a world which must be structured in such a way as to provide for the ‘chaotic’ nature of its existence. The questions surrounding this area concern causation since ‘chaos’ will have its own causal structure that brings it about. It engages such problems as whether ‘causation’ is necessarily deterministic and so on. This encompasses metaphysical and empirical points. As is by now common knowledge some simple equations, reiterated, will produce a ‘chaotic’ result whose structure is not immediately perceptually apparent but is described by the mathematics. To put it another way, ‘chaos’ is another form of being, and any form of being that is not the divine, must have some description to which it is answerable.

\textsuperscript{77} O. Gal, \textit{The Origins of Modern Science: From Antiquity to the Scientific Revolution}, Cambridge University Press (2021) is a recent book on the development of science amongst very many others. R. Wagner & A. Briggs, \textit{The Penultimate Curiosity: How science swims in the mainstream of ultimate questions}, OUP, Oxford, (2016) is an empirical and intellectual history providing evidence for, as its title suggests, the development of theory, method and thought about nature as receiving its first urge from what might be called transcendental urges to understand the world in which human beings have found themselves.

\textsuperscript{78} As an example, the development of calculus in mathematics by Newton (and Leibniz), allowed, for the first-time, measurement of change in motion, the area under a curve, and so on. A further example is given by the Oxford philosopher, Anthony Quinton, who argued that one of the groundworks for the development of science was the theistic image of a ‘nature’ rationally constructed by a divine mind. Because human beings shared that rationality, they were able to penetrate and explain its causal interior.

Quinton argues, that ‘science’, in the way we have it today, failed to develop in the long rich tradition of ancient Chinese culture, for example, because their metaphysical picture of the of the natural did not include the idea of a rationally structured interior, A. Quinton, \textit{From Wodehouse to Wittgenstein: Essays (Lives and Letters)}. Carcanet Press, (1998)
scientific intelligibility”, and one of the paradigmatic ways in which natural science makes things intelligible is by subsuming them under natural laws’. 79

Nicholas Maxwell’s observation describes how we get to the position that Fiona Ellis articulates. I quote him extensively since he clearly describes the movement from metaphysics to methodology, a position which forms the general backbone of my argument as it develops to critique naturalism.

‘If science is to be possible at all, some kind of assumption must be made about that of which we are most ignorant: the ultimate nature of the universe...it is above all here that it is vital that we make as good an assumption as possible, one which does the best justice to the nature of things. For it is this basic cosmological assumption that will determine our methodology, what kinds of theory we are prepared to consider (Maxwell’s italics).

If, for example we believe a society of gods governs the natural world according to whim, then in seeking to improve knowledge and control over natural processes, then it will be entirely rational (relative to this belief) to adopt such methods as ...sacrifice, oracles, omens (and so on). If we believe a pattern of physical law governs natural processes, quite different methods will be adopted, namely those of putting forward precise hypotheses concerning possible laws governing phenomena to be tested against observation and experiment. Metaphysics determines methodology.... A bad basic metaphysical conjecture, hopelessly at odds with the basic nature of the universe, will lead to the adoption of an entirely inappropriate set of methods’. 80

For theoretical science and the appropriate methodology to be possible we need to carve metaphysics at the right joints. We do not just perceptually encounter ‘nature’ and thereby accept the causal independence of nature from the personal and the animate and the possibility of an experimental and mathematical science.

Maxwell makes that clear and it is evident from anthropology, cultural history, the multi varying conceptions of ‘nature’ in different societies at different times, and the history of the development of the natural sciences over centuries. Without the idea of impersonal forces and events constituting

intelligible physical structures to be intellectually unearthed from the perceptual appearances present to our senses, there could be no science.

A commitment to the appropriate concept of nature and the methods that flow from it, provision us with an intellectual framework to which we ought to be committed if we want scientific progress. The words ‘ought’ and ‘commitment’ should not escape our attention. They indicate a recognition that the world of nature conceived as a contingent realm of independent forces rationally penetrable, mathematically and empirically investigable, is fundamental to any scientific theory, and involves a normative commitment to a particular way of seeing the world external to us.

Discussing the application of mathematics to the natural world, for example, the particle physicist S.M. Barr writes,

‘The scientific revolution, as well as the modern science to which it gave birth, was characterised not only by a happy marriage of mathematics and experiment but also a different way of looking at mathematics and its application to the world’.  

Prior to this advance, mathematics was understood as usefully descriptive but giving no real insight into phenomena and their underlying causes: that was the job of ‘Natural philosophy’.

So, even the application of mathematics as a productive tool in explaining natural events is an achievement of the intellect in coming to see that the ‘natural world’ is structured in such a way that those structures obey certain principles of logic-mathematical organisation.
Part 2

Normativity and science: a critique of naturalism

Any attempt to introduce normative properties, aesthetics and matters of value back into the ontology of the natural world must begin by examining ontological naturalism. As I have discussed, the central proposition defended by most naturalists holds that the only warranted knowledge of ontology is that adjudicated by the sciences.

The epistemological assumption most commonly advanced is the view that science has all the answers to the origins and nature of the universe, including those features of it that can account for its own success. Whatever way the natural world is to be understood the methods of the natural sciences are the only means to warrant any truth claims about ultimate reality.\(^84\)

deco et.al. explain this as follows.

‘The methodological or epistemological scientific naturalist holds that it is only by following the methods of the natural sciences-or, at a minimum, the empirical methods of a posteriori enquiry-that one arrives at genuine knowledge’.\(^85\) \(^86\)

It is, as Lydia Jaeger argues

‘...the disposition that seeks an explanation of the natural order within science itself’.\(^87\)

A closer look reveals the metaphysical implausibility of the thought that any explanation of the success of the methods of science can be derived from the sciences themselves. If the success of those methods implies prior conditions, then the limiting of reality to what can be revealed by those methods alone, will be insufficient to encompass the totality of that reality.

Some naturalists have in fact recognised or accepted that recourse to normative standards is a necessary component in developing anything like a comprehensive grasp of the place of science in the world.\(^88\) They have not however expanded that comprehension to include any idea that nature and its

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\(^86\) J.B. Onyango Okello, *A History and Critique of Methodological Naturalism: The Philosophical Case for God’s Design of Nature*, Wipf and Stock, (2016), offers a comprehensive account of varieties of MN,


intelligible contents may exist, be intelligible, and display normative properties as a consequence of intentional creation. I discuss this more ‘liberal’ or ‘expansive’ naturalism further on.

I begin a closer critique of the central obligation of naturalism to empirical science by examining the position of Gregory Dawes, a naturalist philosopher who has a particular interest in theist claims. He is of interest because he attempts to incorporate ‘supernaturalism’ and the existence of God into scientific methodology, asserting that the proposition that ‘God exists’ should be treated like any other explanatory hypothesis available for empirical test. It is one he thinks the hypothesis fails.

I criticise his view exposing his unintentional attachment to normative judgement and aesthetic criteria. His case is outlined in two publications. The first is a book length treatment entitled ‘Theism an Explanation’. The second is an important paper in the theological literature entitled ‘In Defense of Naturalism’. I concentrate on the paper since it effectively summarises the main argument presented in the book.

My critique of Dawes leads to a consideration of the second form of naturalism, the more ‘relaxed’ or ‘liberal’ version. Under pressure from the sorts of criticisms I offer of Dawes’ view, the ‘liberal’ acknowledges necessary cognitive relations between the physical world and persons who bring it within their cognitive and empirical purview. That need however cannot be satisfied by any naturalist metaphysics. This is a theme that will run throughout the rest of this thesis.

**Gregory Dawes: inferring ontology from method**

In the next few paragraphs, I briefly summarise Dawes’ argument to orient the reader to the more substantial analysis that follows. His paper begin a by making a preliminary distinction between Methodological Naturalism and Ontological Naturalism. The principal motivator of Naturalism, he conventionally notes, is to exclude reference to the supernatural and intelligent purposes (teleology). He rightly argues that the physical sciences have achieved much by proceeding as if it were the case that there were no such forces or intervention in the fundamentals of the Natural world. This is what I have previously discussed: the principle of Methodological Naturalism (MN). It is a distinction originally made by the Christian P.de Vries in 1986.  

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91 S. Goetz and C.Talioferro, *Naturalism*, W B. Eerdmans Publishing Company, Grand rapids Michigan, USA, (2008) call the first version I am discussing ‘strict’ naturalism. There are a variety of terms that appear in the literature, but all concerned to convey much the same point.  
MN entails only that the operations of science may not appeal to supernatural entities and their putative properties in any scientific theory or explanations of the natural physical world and its processes. The appearance of the divine in any scientific accounts of the natural world is ruled out as a matter of declared procedural principle and has proven productive. It prohibits, for example, an appeal to the ‘God-of-the Gaps’ argument: the argument that tries to find a space for divine intervention in the world where science has so far failed to give an intrinsically causal explanation.

Dawes again rightly maintains that this is a methodological decision that does not commit one to Ontological Naturalism (ON), the thesis that all that can be ultimately said to exist is the physical, however this latter term is to be understood. He therefore restricts the use of the term ‘naturalism’ to Ontological Metaphysics. It seems plausible that MN and ON offer a useful distinction rather than a dichotomy that all participants in the debate who are sympathetic to the vast achievements of the natural sciences will be happy to accept.

Because he wants to exclude Metaphysical speculation from Method, Dawes outlines what he calls a Procedural Methodology. This makes the sciences dependent on what he calls ‘publicly available evidence’. This he supposes has no metaphysical entailments. Nevertheless, he argues, that the historical empirical weight of the evidence accumulated by proceeding etsi Deus non daretur contributes to a supposition in favour of Ontological Naturalism.

I contest his separation of metaphysical involvement from procedure. The general critique of his position is that outlined by Maxwell above suggesting that methodology will follow from the metaphysical assumptions made about what ultimately constitutes the cosmos. Following Maxwell’s line of thought I maintain that the metaphysical features which characterise the ontological presentation of the natural world also allow for the procedures and methods of science that investigate them.

Dawes as I hope to show, ironically, and unintentionally, agrees with the general idea that assumptions must be made about the broader metaphysics within which science must operate when deciding between theories that go far beyond his procedural principle. I demonstrate that far from offering a thesis that provides for a conception of the ‘divine’ or ‘supernatural’ as a scientific hypothesis open to falsification, he in fact opens the question of the place of aesthetics in our understanding of the

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94M. Boudry, S. Blancke & J. Braeckman, How not to attack Intelligent Design: Creationism: Philosophical misconceptions about Methodological Naturalism, Foundations of Science, 15(3), 227—244, (2010), and N. Shanks, God, the devil, and Darwin: A critique of intelligent design theory, Oxford University Press, Oxford, (2004), are amongst those who have discussed similar versions of naturalism to Dawes.
entities constituting the deep structures of mathematical physics, and the possibility that these properties express a divine signature.

I now turn to Dawe’s argument in more detail.

Dawes suggests that the MN/OM distinction is normally maladroitly drawn, and that this has malign consequences for the proper understanding of the claim for Ontological Naturalism. He opines that this leaves it open to the accusation that MN, in fact, imposes the metaphysical requirement that natural processes are to be explained only by reference to other such processes prior to the science, thus eliminating a priori potential theistic explanations by definitional fiat.

Some authors, he suggests, such as Johnson think that this is not a coincidence, ‘for scientific materialists (or physicalists)’, he says Johnson maintains,

‘...the materialism comes first; the science comes thereafter. We might more accurately describe them as materialists employing science’. 95

This is a criticism with which the theist has much sympathy.

Whether or not this is the case, Dawes argues that the MN distinction as it is commonly drawn involves a confusion between a Method of Enquiry and the Metaphysics of Naturalism. He proposes that MN is better clarified as an epistemological requirement of scientific procedure.

He raises W.V. Quine’s96 definition as an example of the confusions that arise when the distinction is not made sharply in these terms. Quine he says,

‘...defines “naturalism” as the renunciation of the idea of a first philosophy, somehow prior to empirical enquiry. It ‘insists’ that the only means we have of figuring out what the world is like is our experience of the world and our explanatory theories about it.’ It follows that if we want to discover what kinds of things exist, we should look to what our best scientific theories are telling us, whatever that may be (author’s Italics).’ 97

Commenting on Quine’s definition, Dawes offers the following justification and description of his own reconstitution of the methodological principle.

95 G.W. Dawes, In defence of naturalism...p.5
96 C. Hookway, Quine, Key Thinkers, Polity Press in association with Blackwell Press, Oxford, (1988) is an excellent and comprehensive introduction to Quine containing an outline of Quine’s naturalism.
97 G.W. Dawes, In defence of naturalism... p.8
‘It is unhelpful to describe (the) procedural requirement as a species of naturalism since the term is potentially misleading. *All this procedural requirement demands is that any proposed explanation should be testable against a body of evidence that is accessible to any capable observer.* In the natural sciences, this corresponds to the idea that an experiment should be replicable. But the kind of evidence required is not limited to the experimental data typical of the natural sciences. It could also be archaeological or documentary data to which historians customarily appeal.’

As he concludes,

‘It is therefore a mistake to say that for science to be science, it can by definition pursue, identify, and entertain only natural causes. What we should say is that for science to be science, by definition ‘can pursue, identify and entertain’ only those causes whose existence can be argued for on the basis of publicly acceptable evidence. This procedural requirement is the *only* non-negotiable commitment of…the sciences’.

As Dawes admits, and is happy to do, the procedural requirement does not entail an a priori commitment to a materialist or physicalist metaphysics. In fact, he suggests that it involves no commitment to *any* metaphysics. Divorcing the procedural requirement from metaphysical Naturalism allows him, he thinks, to bring potential theistic explanations of natural phenomena within the scope of investigation that would qualify them as ‘scientific’ theories.

He exemplifies this by reference to Intelligent Design Theory (ID). Noting a U.S. Court judgement against a School Board that had sought to include ID into the curriculum, he describes how the presiding judge justified his ruling on the grounds that

‘ID violates the centuries old ground rules of science by invoking and permitting supernatural causation’.  

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98 G.W. Dawes, *In defence of naturalism*... p.8  
99 G.W. Dawes, *In defence of naturalism*... p.14  
100 G.W. Dawes, *In defence of naturalism*... p.12
Whilst acknowledging that this hands the opponents of ID an immediate victory, he nevertheless poses the question,

‘What if appeal to a Divine agent were the best available explanation of a set of puzzling phenomena? ...’\textsuperscript{101}

Crucially, he then claims that there are

‘...commonly accepted lists of explanatory virtues, such as scope, explanatory power and simplicity, or testability, ontological economy and informativeness...if a range of explanations positing a Divine agent could be shown to exhibit such qualities, to a greater degree than other proposed explanations...then scientists ought to accept (them)’.\textsuperscript{102}

As I draw attention to further on, the admission of virtues into theoretical decision making is a crucial one of whose consequences he seems unaware. But having made his distinction, Dawes carries on by noting that most modern scientists (and others, including for example, historians), do in fact have a working ontology, which includes a set of assumptions about what is likely to exist. This set of metaphysical assumptions involves a commitment to the view that the functioning of every element of the natural world will be brought under the explanatory purview of purely naturalistic and physicalist assumptions: They will exclude Divine agency. He suspects that this is the source of the confusion.

After all, he asks, ‘What does Methodological Naturalism entail?’, and answers,

‘...that we investigate the world etsi Deus non daretur: as if there were no supernatural causes’.\textsuperscript{103}

‘...this means investigating the world as though ontological or metaphysical naturalism were true’.\textsuperscript{104}

Although the formal outcome of his distinction between procedure and metaphysical naturalism thus yields a potential place for theistic explanation, the devil is in the last line of his quote in the above paragraph. It might be recalled that the title of his paper is ‘In Defense of Naturalism’ and in his last

\textsuperscript{101} G.W. Dawes, \textit{In defence of naturalism...} p.13
\textsuperscript{102} G.W. Dawes. \textit{In defence of naturalism...} p13
\textsuperscript{103} G.W. Dawes, \textit{In defence of naturalism...} p11
\textsuperscript{104} G.W. Dawes, \textit{In defence of naturalism...} p.11
sections he devotes himself to defending the view that ontological naturalism is in fact the correct metaphysical stance to adopt.

The details of this need not concern us here but it involves appeals to the successes of the sciences which have pursued their enterprises based on naturalistic assumptions, and he is confident that no theistic explanations can or will achieve similar predictive or explanatory success. It is hard to forebear noting that this is itself a faithful acquiescence to ontological naturalism.

Normativity, science, and ‘expansive’ naturalism: the case for a non-physicalist metaphysics

Dawes fails to see that the demand that scientists ought to adhere to methodological naturalism is a normative demand. He also fails to see that what gives the demand its normative force is an external epistemological standard which cannot plausibly derive from the natural sciences themselves since it is a prerequisite of anything that is to count as a scientific judgement. Wherever these standards are to be found there must be a broader picture which can account for the explanatory efficacy of MN. It is the normative demands of those standards that the scientist should obey.

It is at this crucial point that his account fails. To understand why this is so, I look more closely at the idea of ‘evidence’ and normativity. Slagle reminds us of the importance of the normative claim,

‘Normativity...is “shouldness” or “oughtness”. If we should do something, or if we ought not to do it, we are employing a norm, a standard to be met. Normativity’s most visible face is ethics, but it has reverberations throughout philosophy: in logic, aesthetics, ...and epistemology...’  

Let me draw attention to Dawes’ claim which appears above once more,

‘It is... a mistake to say that for science to be science, it can by definition pursue, identify, and entertain only natural causes. What we should say (a normative requirement! Current author) is that for science to be science, by definition ‘can pursue, identify and entertain’ only those causes whose existence can be argued for on the basis of publicly acceptable evidence. This procedural requirement is the only non-negotiable commitment of...the sciences’.  


107 G.E. Dawes, In defence of naturalism ... p.14
Dawes means to acknowledge here that beliefs, final causes, and normativity might be identified as ‘causes’. He is, I think forced into this position because, as he says, he wants to include such things as archaeology, history and so on into the ‘scientific’ disciplines qualifying as they do as evidence based.\footnote{B. Larvor, Naturalism…presents the case for the admittance of objects of human activity explained via meanings and purposes that fall out with the natural sciences but nevertheless, he argues, are fully explicable within a humanist naturalism.}

This is a substantial concession: He seems to fail to recognise however that the inclusion of teleological concepts into the explanatory ambit of scientific hypotheses is opposed to ontological naturalism or stretches so wide as to empty it of the decisive contribution to ontological judgements that it wants to make.

Either this or he is trying to widen naturalism to include teleology and teleologically based explanations into the realm of scientific hypotheses, or both, because he also wants to include the question of divine action in the world as a potential hypothesis and not exclude it by fiat i.e., only by admitting strictly physical hypotheses to begin with. He thinks by doing this he can avoid the charge that he has levelled at materialists/physicalists: that they themselves begin with physicalism rather than coming to it as a consequence of scientific investigation and ‘publicly acceptable evidence’.

The question is why Dawes’ concession is so critical. Let me begin by redrawing attention to his claim about evidence,

‘… science’ can… entertain’ only those causes whose existence can be argued for on the basis of publicly acceptable evidence. This procedural requirement is the only non-negotiable commitment of…the sciences’.\footnote{G.E. Dawes, In defence of naturalism … p.14}

‘Publicly acceptable evidence’ is presumably efficacious in deciding the truth or otherwise of a hypothesis. I take it that this is depends on how adequate the evidence is to causally explain a hypothesis.

As Jim Slagle points out a problem faces any metaphysical naturalist at the very nexus of this assumption. As Slagle says,

‘The only obvious norm available in naturalism is causality’.

This yields a problem of substantial magnitude because if causality is the only epistemic criterion on which a judgement rests, then
‘...causality is insufficient to function as an epistemic norm...(because) false beliefs and fallacious reasoning are ‘caused’ just as much as true beliefs and veridical reasoning’. 110

The force of this criticism lies in the fact that science relies on some conception of truth that involves normative judgement i.e., we are to appeal to some concept of what is true and what is false to judge that x is the case. That the finding of x in an experiment disproves our hypothesis, is predicated on a normative relation between the ‘evidence’ and the hypothesis. 111

If judgements about ‘evidence’, whether privately made or before the arena of public judgements, are themselves ‘caused’ in the requisite efficient causative sequence, then the possibility of scientific judgement itself collapses: the language of justification in terms of some criteria external to the practice of the science will simply collapse into a causal sequence itself without any normative force.

Naturalism, at least in its most stringent forms, cannot allow the intrusion of reference to the normative world of truth because it allows only for causal relations. 112 To say that false beliefs and true beliefs are ‘caused’ in the requisite determinate sense, evacuates from them the idea that it is their perceived truth or falsity relative to some criterion of truth that the individual considers before choosing the one that is true. He chooses that, if he does, because ‘truth’ is a value and a standard to which he wants his scientific endeavours to conform.

A second group of ‘expansive’ or ‘liberal’ naturalists acknowledge this need. John McDowell113 and David Wiggins114 have been at the forefront of these efforts. McDowell argues for the necessity of

110 J. Slagle, The Epistemological Skyhook... p.96
111 The philosopher Karl Popper held the view that a scientific hypothesis could not be proven true but could be proven untrue by an experimental result that falsified it. Discussions of Popper’s principle are widely discussed. A good introduction is Bryan Magee, Philosophy and the Real world: An Introduction to Karl Popper, Open Court Publishing, (1985). The original work in which Popper’s claim appears is K.Popper, The Logic of Scientific Discovery, Routledge Classics, 2ed., London, (2002). My assertion above is not meant to confirm or infirm this view. It is intended by way of illustrating a general principle about the relation of normativity to evidence.
112 I am simplifying many highly complex positions. W.V. Quine, for example, admitted into ontology whatever was required for science to make progress. Both mathematics and predicate logic he considered necessary to form scientific hypotheses. Epistemology was reduced in the Quinean scheme to a matter of sensory engagement with the external world. (See Hookway, Quine...). See also, G. Harman & E. Lepore, eds., A Companion to W.V.O. Quine:115 (Blackwell Companions to Philosophy), Wiley-Blackwell London, (2014) Despite this, Slagle’s point still seems to stand. Any naturalism, it seems plausible to must rests its roots on a normative claim, the primary one being, ‘One ought to view the ultimate nature of existence through x or y or z naturalist conceptual spectacles’.
incorporating normative values that underpin epistemology, ethics, and aesthetics into a broader conception of ‘nature’.\textsuperscript{115}

John McDowell is one of the most prestigious philosophers of the 20\textsuperscript{th} C. His work initiated a debate on a number of issues central to our conception of the world, our place in it, epistemology, and world. His book, \textit{Mind and World}\textsuperscript{116}, is now recognised as a classic. One of the best summaries of the subtle, long, and complex argument of this work was given in a review of a book containing a series of articles, both for and against, that appeared in N.H. Smith, \textit{Reading McDowell on Mind and World}\textsuperscript{117}, by A.C.Genova\textsuperscript{118}. In the first page of his review, he gives an excellent summary of the philosophical picture that McDowell wishes to combat. I quote extensively since his account cannot be bettered by me.

‘With the advent of the new science and the epistemological turn to a theory of representational perception beginning with Descartes, a certain picture of experience emerged. We now had the perceiving subject on one side and the disenchanted world on the other, and experience was now construed as both an externally caused effect on our sensibility and an occurrence having epistemological relevance for empirical belief. But how can this be?

It appears that there is an incommensurability between the normative space of reasons...and the scientific domain of blind causal relations (nature). How can experience be a passive receptivity while also having rational relations to belief? But for McDowell, this is a wrong picture productive of a pseudo-problem... he wants to dissolve the pseudo-problem.

The (traditional) philosophical responses to this pseudo-problem yields two successive misguided dilemmas. The first is reflected in the oscillation between coherentism and the Myth of the Given. The former acknowledges an irreducible dichotomy between ... rational relations ... and the causal relations of nature... and opts for what McDowell characterizes as


\url{https://ndpr.nd.edu/reviews/reading-mcdowell-on-mind-and-world/}
a frictionless system of normative relations among beliefs (only beliefs justify beliefs), thereby avoiding the problem but at the cost of no objective, external constraints—a disconnect between mind and world.

The latter construes experience as foundational, given that it has a non-conceptualized content in virtue of which it can somehow warrant empirical belief, thereby again avoiding the puzzle, but now, for McDowell, we have a desideratum that cannot be satisfied. This situation can (and has) given rise to a second dilemma as embodied in the competing options of “bald naturalism” and “rampant Platonism”.

The former either dispenses with (rational) talk entirely (eliminativism) or pursues a reduction/redescription of such folklore talk (we may think of this as incorporating teleology: Current author) in terms of purely scientific discourse, a hopeless project. The latter posits an ontologically transcendent, sui generis space of reasons separable from nature."\(^{119}\)

McDowell’s unpicking of the various elements of this picture are far too detailed to even begin to outline here. However, I hope it will not be a travesty of his position to recall Genova for a summary that captures the essence of the critique which I have embraced in this chapter

‘The (muddle) is due to a false picture shared by all of the above—the confused scientistic notion that nothing natural (including sensibility) can be shaped by sui generis conceptual capacities because nature is exhausted by the realm of law. But this is a dogmatic superstition...McDowell construes experience as an inextricable combination of passive receptivity and (conceptuality) wherein external states of affairs can be directly presented.

Experience is already conceptually informed; (the space of reasons) extends all the way out to the world—it is unbounded. Experience has conceptual content as a natural phenomenon. Thus, we recapture the correct picture via a modest re-enchantment of nature’.\(^{120}\)

The end point of this endeavour has the consequence of bringing together the world, our normative relation to it, and the ‘naturalness’ of our rational relations to it. Within this broader picture is

\(^{119}\) A. C. Genova, Review...pp.2/3

\(^{120}\) A. C. Genova, Review...pp.2/3
incorporated our conscious normative responsivity to scientific ‘evidence’; how we are able to be normatively and rationally be responsive to evidence.

So, we can agree with Dawes that ‘evidence’ is critical to theory but demonstrate that the concept of ‘evidence’ which Dawes mobilises as the distinguishing feature of MN is not immune from the need for an expanded picture of what is required for an acceptable naturalism.\(^{121}\)

Every contributor to the discussion about science is likely agree that the following injunction is a distinctive feature of the sciences: The principle that laws, and theories, \(ought\) to be accepted and rejected solely with respect to the justice they do to the evidence. As I argued earlier, the application and understanding of \(this\) treasured idea require reference to concepts that are not themselves subject to potential scientific verification because they participate in understanding in \(what\) such verification consists of.

‘Evidence’, as McDowell maintains, ‘represents’ the world as being a certain way. He points out that there is a difference between a lawful causal relation between objects and the relation of ‘representing’. Smoke is caused by fire, but fire does not ‘represent’ smoke. As Mats Wahlberg describes McDowell’s position,

‘...when we say that a belief is justified based on certain evidence, what we are talking about is a \(normative\) relation between the evidence and belief. By saying that the evidence justifies the belief we are not just saying that the evidence has \(caused\) us to have the belief (as the fire causes the smoke). We are saying something more, viz. that given the evidence one \(ought\) to have the belief.’\(^{122}\)

**Aesthetics and normativity in science**

‘\(Ought\)’ involves a recommendation that steps away from factual description and \(prescribes\) the application of certain value \(for\) something to \(count\) as accurately representing some feature of the world. Hilary Putnam, the Harvard logician and philosopher of science, argued that

‘...epistemic values, such as ‘coherence’, ‘plausibility’, ‘reasonableness’, ‘simplicity’, ‘elegance’, ...are pre-supposed in the activity of selecting scientific theories’.\(^{123}\)

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Amongst these values are aesthetic judgements. Aesthetic judgements, as are the others, are normative; their deployment requires reference to some prior standard of what is to count as a ‘beautiful object’ and what is not, and all the options, even the ‘hazy’ and ‘vague’ ones, in between.

Every single one of Putnam’s presuppositions carries a demand for an evaluation understood either in respect of mastery of the application of a concept or/and simultaneously with some idea of what, in each case, is going to count as a positive or negative evaluation of the feature in question.

Curiously, the reader will recall, Dawes himself admits that there are ‘commonly accepted lists of explanatory virtues’, ‘Virtues’ of course are not only distinctly normative but implicitly commendatory. Amongst those he lists, the reader will recall are ‘scope, explanatory power and simplicity, or testability, ontological economy and informativeness’. Not only are these criteria offered as a list of demands that ought to be followed in decision making, but most of them involve an explicit appeal to principles that could imply, at least, that the structures of nature might be characterised by the qualities they invoke, ‘ontological economy’, ‘simplicity’ and so on.

My suspicion is that, like many who have absorbed the personal/non-personal distinction and its accompanying doctrines, such as the ‘fact-value’ distinction, and the subjective/objective epistemological distinction, it seems entirely intuitive that such things as ‘aesthetic properties’, ‘truth’ and other such characteristics of theory evaluation, ‘ontological simplicity’ etc. are not properties of the intrinsic structures of ‘natural world’ as the Two World metaphysics assumes.

As I have suggested however, normative properties are in fact conditions on anything appearing as an ‘intelligible structure’ available for scientific investigation. Insofar as this is the case then any natural structure open to empirical investigation will necessarily display them. Aesthetic properties, for example, I will suggest, are a necessary to the appearance of anything as a structure. What aesthetic properties the natural world manifests is a matter for empirical investigation, but that they display such properties at all, and do display them for empirical investigation is a metaphysical necessity.124

124 F. Ellis...God, Value, and Nature, is a sustained defence of the idea that we should reject reductive naturalism in favour of the more ‘expansive’ naturalism of McDowell and David Wiggins. She argues that ‘expansive’ naturalism is a move towards the idea of God, but it allows us to be both naturalists in respect of empirical science and theists, there being no logical incompatibility between these two. This is my position. Ellis, however, offers a comprehensive and detailed book length philosophical examination of naturalism and ‘expansive’ to which I am not able to do full justice here
‘Imaging’ the world: theory as structural representation

The sorts of considerations raised by McDowell and others helps motivate a shift from the idea that normative features such as aesthetic properties could only be ‘subjective’ in nature, having no bearing on the proper relation between a theory and reality, nor on the nature of that reality itself.

Some contemporary authors have begun to recognise that how theories are developed in science bear many important relationships to how artistic creations emerge from the plenitude of human creative faculties, including structural and mathematical imagination.125

A recent work exploring the richness of this relationship is Tom McLeish’s book, The Poetry and Music of Science: Comparing Creativity in Science and Art.126 One subsection of his chapter 3 is entitled ‘mathematical-theory painting’. This heading alone is evocative in the picture it creates of mathematical attainment involving reference to the normative features of artistic creation in mathematical proof: it invokes the idea that formulating a proof in mathematics is sometimes as much a business for mathematicians as a finding a satisfactory structure to proof via creative processes as is the straightforward business of logico-mathematical analysis.

The place that ‘subjectivity’, ‘beauty’, ‘imagination’ and so on have in the sciences has typically been restricted to the development of initial ideas and hypotheses127. It is encapsulated in Logical Positivist philosopher Hans Reichenbach’s famous division between the ‘Context of Discovery’ and the ‘Context of Justification’. 128

In this classic picture, the two contexts of scientific activity are differentiated by the supposed arrationality of the former and the rationality of the latter. Intuitions, imagination, ‘leaps of faith’, a preference for the beautiful and all manner of cognitive and evaluative phenomena may be factors in the generation (The Context of Discovery) of hypotheses and experimental tests. Their final appraisal and assessment in the Context of Justification, the province of rigorous empirical method and experiment, bears no important relationship to this ultimate satisfying of epistemological verity by method. Whether the boundary between these two distinctions, is a clear dichotomy rather than a useful methodological distinction is cast into doubt by works such as McLeish’s.

The shift at least of the importance of factors such as those involved in creation must be also associated with the idea of structure in its broadest form, including the structures of mathematics.

127 Kekulé’s structure for benzene, for example, is reputed to have come to him in a dream.
This is a question I take up in the next chapter. Although I cannot fully pursue the idea here, it is probably not a coincidence that the growth of interest in creativity in Arts and Science is also associated with shift in the middle and late 20c away from ‘positivism’ in the philosophy of science\textsuperscript{129} from which Reichenbach’s distinction contributed.

‘Positivism’ essentially asserted that if anything were to count as ‘scientific’ knowledge, it should be possible to display it in the form of a deductive argument with empirically verified premises leading to a deduced conclusion expressed in formal logic. ‘Theories’ are thus understood as sets of logically related propositions, enabling their assessment for truth or falsity. It is in essence to distil scientific theory into a deductive form to provide analytic clarity to the epistemological claims of the natural sciences.

The shift away from this picture of scientific knowledge involved amongst many developments, the model-theoretic approach to understanding science, versions of which advanced the idea that theories were ‘representations’,\textsuperscript{130} or attempts at modelling parts of nature.

Whilst the positivist hope embodied the ideal of a set of abstractly defined logical relations on the basis of observational premises, the general concept of ‘representation’ engaged a fuller range of properties of theories congruent with human intellect, imagination, and perception in the cognitive engagement with a ‘natural world’.

Ivanovna and French\textsuperscript{131} describe the primary change from the syntactic approach of positivism.

> ‘How theories represent the world became the central question, with many commentators drawing analogies with the representational nature of artworks and scientific theories explicitly compared to such artworks’.\textsuperscript{132}

Naturally, these developments have seen an increasing focus on aesthetic properties and their relation to theories, the properties of the world that such representations may reflect, and the relation of truth to aesthetic value.\textsuperscript{133} This engagement with aesthetics is in the context of a wider acknowledgement of the place of value and normativity in the constructions of scientific activity.


\textsuperscript{131} See penultimate reference.

\textsuperscript{132} M. Ivanova and S. French, The Aesthetics of Science... P.109

\textsuperscript{133} O.Bueno, G.Darby, S. French & D. Rickles, eds., Thinking about Science, reflecting on Art, Routledge, Taylor & Francis Group, London, (2018) contains a series of articles on, amongst other things, shared properties of representation in art and science and how these are to be understood.
If this is right then the natural relations between mathematics, structure, and aesthetics, enter as metaphysical participants in describing what constitutes the propensity of the natural to be ‘the natural’, visible to empirical investigation, and rationally intelligible. The object of scientific investigation is a structure normatively bound by the aesthetics it expresses. What makes it conceptually and perceptually available to human subjects are the theoretical representational structures which bear mimetic normative relations to the physical events and relations they are attempting to discern.

This is nicely illustrated by a (common) visual picture of one of the great achievements of physics: the Scottish scientist James Maxwell’s equations describing the unity of electricity and magnetism in wave form. The illustration below exemplifies a representational form of the theory.

James Clerk Maxwell’s electromagnetic wave

The representation of Maxwell’s equation involves both visual and abstract components brought together by the imagination to create an artefactual object which has a scientific purpose. Whilst it might be thought that the visual representation is only analogous in form, it clearly shares with Maxwell’s theory and equations structural features that transcend both of these and are those in virtue of which the analogy can be scientifically instructive.

So, for example, it is clear that certain statistical shapes repeat in a pleasing fashion, that they represent two different kinds of movement satisfyingly orthogonal to each other but united in the
direction of flow. What is less obvious in the visual display is the extent to which shapes, and structures considered in their purely physical dimensions might also exercise a restraint in what analogically or representationally can be physically displayed. Not any physical shape will do in other words. One cannot represent ‘chaos’ for example by the Maxwellian representation above.

As this example demonstrates, by a happy isomorphism human cognitive abilities like perceptual and abstract imagination, otherwise rejected by the propositional stricures of positivism, become detectors and analysts of aesthetic and other structural elements.

In the following chapter I suggest that the structures of nature at the most basic levels of mathematical physics do indeed express aesthetic qualities. In fact, I argue that it is a metaphysical principle of anything that exists that it has structure, and that ‘structure’ is not metaphysically decomposable from its expression of some aesthetic property.

Both of these requirements I suggest engage normative evaluation from physicists that can contribute to theory assessment. I present the case and evidence for the empirical manifestation of ‘beauty’ in these depths of the physical. This is a first step towards reunifying teleology, normativity, and the personal with the impersonal.

I end this chapter with a quote from the historians of religion and science, Brooke & Cantor. In a chapter of their book, *Reconstructing Nature: The Engagement of Science and Religion*, they aver that,

‘...an uncovering and appreciation of beauty in the scientist’s construction of nature have been prominent goals of scientific enquiry, with edifying... effects... edifying because it helped to bring out harmonies and beauties in nature that might have otherwise been missed.’

The world of beautiful sub-particles and forces found by physics to make up the basic physical ontology of the world are empirical affirmations of this assertion. I justify and expand this conclusion in the next chapter.

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Chapter 2

Structures in mathematical physics: a world of phenomenal and ‘measurable’ beauty

Summary: I offer an account in this chapter of how the basic structures of the physical world investigated by particle physics can be properly understood as uniting subjectivity, normative properties like aesthetics, and mathematical measurement, without threat to empirical science.

Overview of the chapter

The general idea of ‘structure’ I aim at defending in this chapter, is a metaphysical prerequisite of anything coming into physical (or abstract) existence. The idea has evolved into a sophisticated and full-blown programme in the philosophy of science known as ‘Structural Realism’. This is a view postulated early on in the 20th C. by, amongst others, the British physicist Sir Arthur Eddington who held that mathematical structures constituted the base elements of the world.135

The properties of mathematical structures, which are often held to be acausal, abstract, and outside space-time, coupled with the views of physicists who hold them to be fundamental, presents a problem for philosophical naturalists. The ‘physicalist’ naturalist would like reality at base to consist of objective, measurable, physical, and preferably observable properties in regular causal relations and possessed of no interesting expressive or normative features. At the very least a problem is created for what is meant by ‘physical’ by the fundamentality of mathematics in particle physics.

I offer an account of the relations between structure, mathematical physics, and aesthetics that allows for a conception of fundamental ‘physical’ reality that can incorporate expressive and hence normative features: whilst mathematics describes the objective quantitative dimensions of structures, the expressive properties that they manifest aesthetically open them up to subjective judgement.

Despite the subjective requirement, and the variance it can introduce, the truth aptness of the judgement is not relative to the person who makes it. The reason for this is despite an essential feature of any aesthetic experience being a phenomenal one, aesthetic properties are necessary for anything to be a structure. I claim that there are different but epistemologically legitimate modes of access to the aesthetics of structures, both ‘personal’ and ‘impersonal’.

In other words, whilst aesthetic judgments of these arcane structures of basic matter can be referred to their mathematical construction, they are also subject to personal judgement. This does not disqualify them from being real features of the physical world.

They can be experienced and used for theoretical judgements by a mathematical physicist fully acquainted with their discipline and with a high degree of cognitive and imaginative sensitivity to aesthetic features manifested in the structures of mathematics and physics. I give a simple example of this in geometric practice: a particular ratio of a piece of a rectangle to the whole rectangle is often the ground of aesthetic responses of beauty. I use this example to flesh out a working epistemology.

This I argue involves an appreciation of how the various components of structure such as ‘symmetry’, ‘unity’, ‘simplicity’ are arranged so as to produce an aesthetically pleasing theoretical order. ‘Order’ in this sense is an important element in theory evaluation. I offer two examples of this in practice: the first demonstrates the important function that symmetry plays in the theories of physics. The second discusses the Nobel prize winning physicist P.A.M Dirac who asserted that it was more important to have beauty in one’s equations than it was for them to agree, initially, with experimental findings. The interest in Dirac is that he explicitly used the term ‘beauty’ to refer to the phenomenology of its experience as a guide to the likely truth of a theory.

I provide many examples of physicists and mathematicians who have made it explicit that they find ‘beauty’ in the basic structures of nature. I give a very brief adumbration of how Einstein’s theories of relativity are seen by many as profoundly beautiful.
A world of structures

The 1998 Darwin Lectures at the eponymous Cambridge University College, gave rise to a collection of articles published by the press of that university entitled, ‘Structure in Science and Art’. In her opening discussion of the title, Wendy Pullan introduces the topic as follows,

‘Bridges and buildings, DNA and the periodic table, flora and fauna, machines and circuits, human beings and the societies of which they are part, even thoughts and ideas—all of these can be understood as particular structures that are part of the world and our experience of it’. 136

One deep thread of the etymology of the word ‘structure’ and hence ‘construction’ ‘is the word ‘structura’ in Latin, a ‘putting together’. The concept of structure is as old as at least Western Philosophy and science. Mullan notes this and goes on to expand the idea,

‘...certain words spring to mind: organisation, arrangement, connection, orientation, framework, and order...’137

One may develop this point into an apriori principle and argue that the concept of ‘structure’ is fundamental to any conception of a world that can be experienced, is contingent, and investigable. Of course, the term is associated with a number of auxiliary metaphysical concepts. Thus, there may be certain ways in which the relationships between the parts and wholes of a structure are necessarily conceivable; no structure, for example could exist as a whole before its parts came into existence, or the ‘whole’ may have unique properties that are not a simple sum of those of the parts.

Again, functions, shapes, dimensions, and causal processes have to obey some law of mathematics to form a logically possible structure. All these modal suggestions are of a piece with the assumption that any world must instantiate certain dictates of metaphysical possibility to have any existing physical forms, whatever they might finally be agreed to be.

We should be careful not assume however, as Pullan points out, that concepts like ‘order’ and structure delineate fixity, rigidity, inflexibility, and completeness,

137 W. Pullan, Introduction... p.1
‘...structure can be open and dynamic, a matter of structuring as much as structure’.\textsuperscript{138}

One important reason for this is that the world is one of constant change and causal activity, and the business of the sciences is the theoretical representation and explanation of the functioning of the structures in virtue of which this activity occurs: Consider for example the case of Water which is composed by oxygen and hydrogen in polymeric forms, such as (H2O)2, and (H2O)3. These elements are in a state of constant structural formation and dissipation. They separate and reform constantly. The manner of this process is such as to give rise to the familiar macroscopic properties of water.

I paint the general point with the broadest of brush strokes but is certainly shaped enough to characterise the rough metaphysical outline of one aspect of the natural and physical world.

David Pettifor and Alan Cottrell in their chapter ‘Models of Structure’\textsuperscript{139}, in the aforementioned book, offer the view that all of the sciences can be seen in terms of three main types of structure: the \textit{cosmological}, or gigantic; the ‘\textit{miniscule}’ dealing with basic particles; the \textit{highly complex} inclusive of the many disciplines such as biology, geology, condensed matter physics, chemistry and so on, and the ‘social sciences’ or those that explicitly concern the institutions of human life and mindedness, exemplified by economics, psychology, and other disciplines.

Of course, what the relations are between these various disciplines is a complex and contentious issue. For my purposes, the Cottrell & Pettifor distinction, whether it stands as it is or requires refinement, is a viable initial distinction and supports the general assertion that ‘structure’ is essential to manifestation of anything which might be said to physically exist and be the subject matter of a science.

\textbf{The necessary aesthetic character of structures}

If these philosophical proposals are plausible one necessary consequence follows from them. Carol S. Gould describes it thus:

‘...if one accepts the existence of any world, then...the existence of at least one aesthetic property must be granted: the world must exemplify some arrangement

\textsuperscript{138} W. Pullan, \textit{Introduction}... p.1.

of its constituents and any arrangement of features must satisfy some aesthetic predicate’. 140

Hence my insistence that the broad concept of structure is also necessary. 141

A first response to such a suggestion might be that whether or not this is the case is a matter for empirical exploration, not metaphysical declaration. In particular, since it is a proposal about the structures that determine the nature of the things around us, the sciences of nature might be considered the obvious best arbiters of whether or not they express beauty. Aesthetic properties like any postulated characteristics of the physical world and its various shapes are contingent, so this argument might run. They need not exist contrary to Gould’s assertion, and whether they do or not is an empirical matter.

A proposal of this sort confuses two issues of substantial importance: Gould’s point is not that the metaphysical priority asserts what aesthetic features any structure must express, but that anything which has a structure, and the world does consist of structured things, must in virtue of those structures manifest some aesthetic properties.

What these are is a matter for the structure of the kind of thing or event to which they are attributed. That determination is, a posteriori, reserved for empirical observation or experience of the thing in question, whether it be abstract or ‘substantial’. Thus, whether or not the ultimate structures and processes of, say biology or particle physics turn out to be ‘ugly’, ‘pretty’ or ‘aesthetically indifferent’ is a question for the theories of the disciplines concerned.

Similarly, whether or not a mathematical proof is elegant or not is often a matter for mathematicians who might be the only people in a suitably informed position to judge. Whether or not any abstract or perceptible structure has some aesthetic character, however, is not a matter for any discipline. It is a prerequisite of there being any organised matter or abstract object or process of any kind for them to investigate in the first place.

The philosopher Eddy Zemach describes the empirical situation in the following way

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...‘even if a description of reality as it is did not include any predicate of our present science, it cannot fail to include aesthetic predicates’.  

As he goes on to say,

‘If it has some nature, it has a character and structure...’.

In other words, should every current scientific theory we have fail, whatever it was that replaced them would still of necessity have aesthetic features.

There is something fundamental, in other words, to any aspect of a world, in whatever form the nature of its existence takes, that is inescapably aesthetic, and which will have parts arranged in certain ways that contribute to the evaluative aesthetic judgement they elicit. This might, if true, be expected to include those structures that feature in any scientific theory.

In the previous chapter I noted that the ontological naturalist Gregory Dawes admitted certain predicates of a distinctly aesthetic character into those theoretical virtues required to discriminate theories. When we list some of these, it becomes clear that there are natural conceptual relationships between them and the idea of a structure: ‘Unity’, for example, suggests the bringing together of a number of parts into one overarching framework, ‘harmony’ is at once a mathematical description of the aesthetics of music, and in another guise the peaceful working together of disparate components, whilst ‘symmetry’ means the unchanging relations of certain parts to each other under particular transformations: a rotated circle, for example, stays the same.

The conclusion to be drawn from this proposition is that various aesthetic features will show up in all aspects of the world (or in any artefactual structure). If so, then a discussion of beauty in natural events as they occur in any one discipline concerned with the natural world, will involve an engagement with that discipline to work out the aesthetic features associated with it and their role in the theories of that discipline.

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142 E.M. Zemach, Real Beauty, Midwest Studies in Philosophy, XVI, (1991), p.262. He also offers a full-length book in philosophical defence of the idea that aesthetic properties are real properties of things against opposing views emerging from Subjectivism, Non-cognitivism, and Relativism. All these positions are well established across a range of philosophical questions including ethics, the perception of reality, and truth, and in one way or another deny the existence of, or availability of, objective properties or objective truth in different or all domains of philosophical interest: E.M. Zemach, Real Beauty, Penn. State University Press, PA, USA, (1997)


Aesthetics and physical foundations

There are philosophical and theological reasons for particularly hoping that beauty will be one of the characteristic features that underlie the structures of the natural world. The discipline associated with forces and elements that constitute the entirety of the world as it presents itself to us is physics. The discovery of beauty in this discipline and hence the universe, will provide empirical evidence of aesthetic normativity as a contribution to the very nature of the structures under investigation.

As I have argued, all structures are of necessity aesthetic in their composition. Should it be the case that physics evinces beauty as a matter of empirical discovery, then such a finding would lay a persuasive base for any claim that the heart of the world manifests something other than brute causation and empty physicality.

The range of the structures dealt with by physics is vast. In what follows I want to give some indication about the branches of physics which my forthcoming discussion on the relations between mathematics, aesthetics, structure, and metaphysical necessity will cover. Clearly within each of these branches how these relations are outworked will be locally dependent, but that they can have any existential form at all, as I have claimed, is metaphysically dependent on the principles I will enunciate.

In concurrence with this task, I offer reasons why the subject matter of beauty physics plays an important part in opposing reductive naturalism and providing an expanse which covers creation, God, and reality.

Physics is commonly defined as the science that deals with matter, energy and their interactions and the physical properties and phenomena of various systems.

There are many interdisciplinary fields that are connected to physics as might be expected by the fundamental nature of its purpose. Such areas include quantum computing, concerned with quantum-mechanical computational systems, biophysics - the study of the physical interactions of biological processes and astrophysics, physics in the wider universe concerned with the interactions and properties of the celestial bodies of the heavens. There are probably over 17 interdisciplinary fields involving physics with increasing numbers as the sciences in general expand.

The generally accepted main branches of physics begin with Classical mechanics (what we would now call ‘Newtonian’ mechanics): models of the operations of forces on bodies including Newtonian Laws of Motion and the Hamiltonian-Legrangian equations. Thermodynamics and statistical mechanics is that part of physics concerned with energy exchange in microscopic systems which take as their base the laws of thermodynamics which postulate that energy is exchangeable between systems as heat or work. Electromagnetism studies the behaviour of electrons, magnetic fields, and interactions of light,
the most well-known of whose explanatory equations uniting light and electricity are those of James Clerk Maxwell (Scottish mathematician and scientist, 1831-1879).

Relativistic Mechanics is largely concerned with the Theories of Special Relativity and General Relativity. The latter takes its name from Albert Einstein whose 1905 theory of that name resolves an inconsistency between Maxwell’s equations and Classical Mechanics. To do this Einstein unified space and time into a frame-dependent concept of spacetime. General Relativity was the theory introduced by Einstein in 1915. It unifies special relativity, Newton’s Laws of gravitational motion, with the insight that gravity is geometrically described by space-time curved by the energy/matter within it.

Quantum Mechanics, Atomic Physics, and Molecular Physics investigates atomic and sub-atomic phenomena and systems and their various interactions. The observation that all forms of energy are released in ‘quanta’ or discrete bundles, or units, forms the basis of the theory. Quantum theory only allows for a statistical calculation of the location and or properties of sub-atomic particles. Electromagnetic radiation, example, emitted or absorbed by an atom has only certain frequencies (wavelengths). Quantum theory shows that these are associated with different energies of light quanta (photons). De Broglie (a Catholic priest) showed in 1924 that light can combine or manifest particle properties and wavelike properties. The Schrödinger wave equation is the Newtonian equivalent of quantum theory predicting the behaviour of a dynamic system. Schrödinger’s equation uses a mathematical wave function to predict the probability of finding a particle in a given location. Other developments in this branch include such esoteric items as quantum gravity, and quantum field theory concerned with interactions between charged particles and electromagnetic fields.

This brief listing does not contain all of the branches of physics. Condensed matter physics, for example, investigates macro and microscopic properties of matter particularly those emerging from electromagnetic forces between atoms as solid and liquid phases of matter, whilst Cosmology, which studies the origins of the universe, and its development is studied by both physicists and astrophysicists.

I have not of course, in such a short space been able to cover every area of this enormous discipline, but I should end by mentioning String Theory, essentially a mathematical proposal that attempts what some have supposed to be the ultimate goal of physics, a Grand Theory of Everything, combining in particular general relativity and quantum mechanics. As I discuss towards the end of this chapter, at least one physicist has thought that the concentration on mathematical beauty that String Theory involves, misleads physics by pointing it away from experimental investigation.
My brief excursion into the domains of physics should nevertheless be sufficient to alert the reader to the substantive breadth of my proposals about the metaphysical relations between aesthetics, metaphysics, and the natural structures of the world. Let me now list some of the reasons that underpin this substantial claim. Firstly, it is paradoxically physics that challenges the claim of reductive naturalism, such as that advanced by Dawes and others, that all the items and properties of the world either reduce to, are supervenient on, or ‘realise’ other manifestations of the physical where this excludes normative and expressive characteristics.

The problem that is normally taken to be the one that naturalisms of this form have to answer are those associated with consciousness, intentionality, and teleology: that being, as I have already discussed, how to fit properties and abilities into a physical world that by naturalist definition excludes them other than, at best, being dependent on the physicalist base. The most famous of these organises the landscape of ultimate existence into the problem of the relation of two kinds of stuffs the ‘mind’ and the ‘body’.

There is another problem however from within physics itself that generates a substantial and perhaps more serious difficulty for ontological naturalists. It is this: Basic or fundamental physics is deeply mathematical.

Despite the almost intuitive appearance this assertion now has, it was not always thus. Aristotelian natural philosophy conceived mathematics to be the business of its own discipline and separate from the activity of observing the natural world and drawing principles of general explanation from those observations. The development of the application of the theoretical application of mathematics to the natural world and physics came later.145

The Merton Calculators, for example, a group of fellows of the eponymous Oxford College were part of a general movement including the university at Paris from the late 13c to the 14c who began to develop ways of ‘using the idea of a mathematically universal law to understand the physical world’146.

Thomas Bradwardine, for example, a fellow, then Professor of Divinity, Chancellor of Oxford and Archbishop of Canterbury at the end of his career, wrote this about mathematics,

145 M.E. Hobart. The Great Rift: Literacy, Numeracy, and the Religion- Science Divide, Harvard University Press, Cambridge, Mass. USA, takes the view that the development of mathematics and symbolic representation caused a ‘rift’ between science and religion. He thinks that this development represents two different ways of seeing the world.

‘(it) is the revealer of every genuine truth...it knows every hidden secret and bears the key to every subtlety of letters. Whoever then has the effrontery to pursue physics while neglecting mathematics should know from the start that he will never make his entry through the portals of wisdom’.\textsuperscript{147}

Galileo Galilei who developed ways of measuring amongst things velocity and acceleration famously wrote,

‘Philosophy is written in this grand book, the universe, which stands continually open to our gaze. But the book cannot be understood unless one first learns to comprehend the language and letters in which it is composed. It is written in the language of mathematics, and its characters are triangles, circles, and other geometric figures without which it is humanly impossible to understand a single word of it’.\textsuperscript{148}

Some contemporary physicists and mathematicians\textsuperscript{149} have proposed that the basic structures of the universe are mathematical, a pronouncement which throws the physicalist enterprise of casting the ultimate ontology of the world into a model of physicalist entities into serious difficulty. \textit{Whatever} the correct assignation of mathematics is to the fundamental nature of the physical world, the necessity of the description of those events in mathematical terms provokes a crisis for the philosopher who wishes to garland events conceived as ‘physical’ with the accolade of ontological fundamentality.

The problem is this: Since mathematical entities, however conceived, are held to be acausal, outside space-time and non-mental, how physics can be claimed, at one and the same time as evidence for the assertion that the universe has no basic ontological space for non-physical domains is at best problematic and at worst a contradiction deriving from the arguments own empirical base.

\textsuperscript{147} A.G. Molland, The Geometrical Background to the Merton School, \textit{The British Journal for the History of Science} vol.4, no.2 (1968), p.110


G. Farmelo, \textit{The Universe Speaks in Numbers: How modern Maths reveals Nature’s Deepest Secrets}, Faber & Faber, London, (2019), is a sustained defence of the view that contemporary mathematical physics, in the tradition of Newton, is as central to our understanding of deep reality as it was then against some modern commentators who think that physics has ‘lost its way’ in mathematical fantasies that bear minimal contact to physical reality.
If the ultimate ontology of the natural world is mathematical structures, then the physicalist case is placed, to say the least under severe strain. Susan Schneider\textsuperscript{150} who has advanced this case in a paper called ‘Does the Mathematical Nature of Physics undermine Physicalism?’, calls this the Problem of the Base. It provides prima facie difficulties for an ontological naturalism that insists on a reductive physicalist base on which everything must rest.

The second reason for taking the domain of physics as the primary arena for beauty is this: Cosmology and particle physics are united around the theory that the universe (including space-time) emerged some 13.8 billion years ago. About one trillionth of a second after its emergence all four of the known forces of the universe (gravity, electromagnetism, the weak and strong nuclear forces) had come to fruition, behaving much as they do today. \textsuperscript{151}

The universe at this point teemed with particles such as gluons and quarks and other forms of matter. After another millionth of a second, the universe had cooled further, and quarks and gluons began to ‘glue together’ forming the first protons and neutrons. A few hundred thousand years later saw the emergence of stars, atoms, substances such as hydrogen and so on, then organic life, and then sentient conscious life.

A third reason is that the closeness of physics to metaphysical considerations means that it is in this arena that the intellectual struggle to determine the most basic foundations of what constitute the physical nature of reality engage. A number of findings in physics merge as metaphysically testing for the physicalist here. The nature of the physical identity of any natural object or process, for example: Findings that light can behave as two different kinds of structure, a string of particulate photons or a wave under different experimental conditions strain our best conceptions about the criteria of what constitutes natural identity.

Quantum theory explains the behaviour of subatomic particles in ways that cause great difficulties in characterising the ‘stuff’ of which they are constituted to which the mathematics refers; are they sudden fluctuations in fields? Can such a category count as one which sorts items into individuals? What does it mean for the very idea of a particle?

\textsuperscript{150} S. Schneider, Does the Mathematical Nature of Physics Undermine Physicalism? \textit{Journal of Consciousness Studies}, 24, no.9-10, (2017)
\textsuperscript{151} There are a vast number of books on ‘big bang theory’ both for mathematical physicist, the non-physicist scientist, the informed layman, and those with no knowledge of big bang theory at all. Of the recent books of quality available to the non-mathematician and physicist dealing with the immediate (a few seconds) origins of space time and its ingredients is D. Hooper, \textit{At the Edge of Time: Exploring the Mysteries of our Universes First Few Seconds}, Princeton University Press, Princeton, New jersey, USA, (2019)
Indeed, it is points such as these that seem to persuade many theoreticians in this area that the ultimate nature of the universe is mathematical.

The overall question that these observations provoke is ‘how are we to conceive of the general relations between mathematics, the physical universe, structure, and aesthetics?’ The first and obvious starting point is to adumbrate how physics understands the place of structure in its comprehension of the particulate world and the determinate relation between mathematics and that understanding.

This is a topic of vast interest and wide discussion and opinion. It is fundamental to our ultimate grasp of the nature of the world, and yet it remains unresolved. The common way of referring to the problem is via a paper by Eugene Wigner who summed up the central dilemma in the heading of his paper, ‘The Unreasonable Effectiveness of Mathematics in the Natural Sciences’.

I take from this heading the justification for assuming that at some bare minimum all are agreed that, firstly, mathematics does encompass some basic relation to the structural nature of fundamental things, at least it is our best option. The physicist Murray Gell-Mann, who won the Nobel Prize for postulating the existence of ‘quarks’, the ultimate building blocks of the physical world, put it this way,

‘...how can it be that writing down a few simple and elegant formula...can predict universal regularities of nature?’ I take it that all must agree that whatever the ultimate ontology with which mathematics is engaged, there will be some sense in which structures will be involved.

Aesthetic emergence and the origins of the universe

Are there any metaphysical claims we can make about the coming into existence of these forces and structures of the universe that are consistent with any empirical discovery about their contingent natures? Particularly are there any a priori proposals that can be made which unite what Zemach and


\[154\] Not everyone is agreed that the universe is structural-mathematical in some sense of that phrase. Stephen Wolfram, who created the symbolic language Mathematica, argues that the universe only looks mathematical. He suggests for example, that not everything can be given a mathematical description. Complex phenomena like biology and weather turbulence he suggests have no descriptive mathematics: S. Wolfram, *A New Kind of Science*, Wolfram Media, Illinois, U.S.A.
Gould have asserted about the relation between aesthetics and structure, the sciences of the early universe and mathematical physics? I outline an argument which suggests there are.

1) Assume that everything that comes into existence, including of course, space-time, has a structure
2) Assume that either every structure that comes into existence is mathematical or that every structure that comes into existence has some mathematical description
3) Assume everything that has a structure necessarily has an aesthetic description
4) Everything that has an aesthetic description can be normatively assessed (evaluated) (i.e it can be judged according to some standard exterior to itself)

Conclusion: Every structure that comes or came into existence must have a mathematical description or be a mathematical structure and have at least one normative property, an aesthetic one.

The vast import of this is that, if so, the physical world at the point of the emergence of space-time and matter, had as a necessary feature of the possibility of its emergence, at least one expressive property open to aesthetic evaluation and judgement.

The topic matter of particle physics which happens to concern the earliest physical components of the universe must then include at least one normative property, the aesthetic one, amongst its theoretical activities. The empirical question is what kind of aesthetic property, beauty or ugliness or versions thereof?

If not only are aesthetic properties necessary features of the origins of being itself, but if the first manifestations of the physical are, in fact, beautiful, this should give pause for ontogenic thought: why should this be so and how? Even if the claim that mathematical structures not ‘stuff’ represent the ultimate ontology, these structures will still have an aesthetic character, and they will still be beautiful.

I begin to build a case for these assertions in the next section. The first step is to establish the plausibility that structures are ontologically fundamental, before proposing an account that unites structure, mathematics, aesthetics, and the epistemological accessibility of structures to us in virtue both of their mathematical construction and their aesthetic expressiveness.

**Structural realism and mathematics in physics**

The British physicist and Quaker, A.S. Eddington (1882-1994) who provided one of the early confirmations of Einstein’s general relativity theory by his demonstration that light does indeed bend in the presence of a large mass, held the view that
‘...the investigation of the external world is a quest for structure rather than substance. A structure can best be represented as a complex of relations and relata...’.\textsuperscript{155}

In his magisterial book\textsuperscript{156} on the relation between Eddington’s science and his Quaker convictions, Matthew Stanley comments on the work in which this quote appears by stressing the basic point,

‘He (Eddington) had made his argument for the structural basis of physics before, but this time it was inextricably woven into his physical reasoning and mathematical deductions. It was not merely an interpretation layered on top of physics. It was wholly integral to the science. \textit{Structural considerations made the laws of physics inevitable}.’\textsuperscript{157}

In contemporary mathematical physics it is commonplace to talk about a ‘structure’ posited by some theory; Einstein’s special relativity theory is a theory about space time structure. The structure of space time in Special Relativity is said to be ‘Minkowskian’ after the mathematician who derived a set of equations to describe it.

This position has developed into a view in the philosophy of science called \textit{structural realism}\textsuperscript{158}, one that argues for structure as the fundamental ontology of the world. J. Worrall\textsuperscript{159}, who is conventionally taken to be the \textit{classicus locus} for contemporary structural realism, developed the view

\textsuperscript{156} M. Stanley, \textit{Practical Mystic: Religion. Science and A.S. Eddington}, University of Chicago Press, Chicago, and London, (2007). Interestingly, Stanley considers that Eddington’s Quakerism and its commitment to the idea of ‘seeking’ (Quakers originally identified themselves as ‘Seekers’), provided him with a theoretical value that stressed an openness to theoretical and methodological exploration thus preventing an attachment to one theory or method as sacrosanct.
\textsuperscript{157} M. Stanley, \textit{Practical Mystic}...p.182
\textsuperscript{158} As one might expect, variants of structural realism have mushroomed. The two basic divisions are between those who argue that ‘relations’ are the primary ontological features of structures and those who want ‘individuals’ to be the primary ontological elements of structural realism. Again, a distinction is made between ‘ontic’ structuralism, those who claim ontological fundamentalism for structures and ‘epistemic’ structuralism; the view that all we can ever know are structures. The literature on these issues and variants is now highly sophisticated. A good overview is given by the Stanford Online Encyclopaedia, Ladyman, James, "Structural Realism", \textit{The Stanford Encyclopaedia of Philosophy} (Winter 2020 Edition), Edward N. Zalta (ed.), \url{https://plato.stanford.edu/archives/win2020/entries/structural-realism/}
\textsuperscript{159} J. Worrall, ‘Structural Realism: The Best of Both Worlds?’, \textit{Dialectica} 47, (1989) is the locus classicus for this view. In later years it has been particularly developed by Steven French and James Ladyman, see, for example, a full defence of this view in book form, S. French, \textit{The Structure of the World: metaphysics and Representation}, Oxford University Press, Oxford, (2014) & J. Ladyman, ‘What is Structural Realism?’, \textit{Studies in the History and Philosophy of Science} 29, 1998, 409-424.
in response to the conflict between Realism and Anti-realism. To understand the basic claim of ‘structural realism’ we have to understand the problem it tries to meet.

Anti-realists about physics hold that the discontinuities of theory change in physics do not provide evidence for a ‘scientific image’ of an underlying ‘physical’ or ‘natural’ reality uncovered by physics. ‘The quantum image, for example, of the world is totally different from the classical image of the world’.\textsuperscript{160}

We cannot rationally guarantee of any theory in physics that it has finally uncovered an independent reality: This is known as the problem of meta-induction - most theories have been superseded so relying on inductive evidence to bolster the case that physics slowly uncovers something called ‘reality’ is suspect. \textsuperscript{161}

On the other hand, the provision of scientific explanations seems to provide useful, productive, and empirically supported means of manipulation of the external world about us, which does suggest the uncovering of a reality independent of us. This is commonly referred to as the ‘No Miracles’ argument, which is intended to imply that without the notion that science deals in an external reality its success would be ‘miraculous’.

Many of the great achievements of physics seem to involved progress in uniting different phenomena in mathematico-theoretical advances; the bringing together of the movements of the objects of the heavens with the movements of the objects of the earth and the earth itself\textsuperscript{162} (Isaac Newton, 1642-1726), light, electricity, and magnetism into one set of equations (James Clerk Maxwell, 1831-1879) and Albert Einstein (1879-1955), in one of his great achievements, the unity of space-time and gravity. The project still continues in the attempt to unite the standard model of physics with that of the strange quantum behaviour of the very small.

Both anti-realists and realists can agree that mathematics provides continuity. Despite the example of the quantum image of reality differing from that of our classical Newtonian picture of the world

\textsuperscript{160} G.V. Coyne & M. Heller, A Comprehensible Universe: The Interplay of Science and Theology, Springer- Verlag, New York, (2008), p.14
\textsuperscript{161} K. Parsons, It started with Copernicus: Vital Questions about Science, Prometheus Books, N.Y., U.S.A., (2014) is amongst many who discuss these issues. See particularly, Chapt. 6, Mysteries of method, pp. 247-301, which includes a list of further readings, also see Chapt. 5, Truth or Consequences.
\textsuperscript{162} It had been a staple of ancient thought, including Aristotle, that the heavens moved in perfect spheres, whilst movements on earth were corrupted. It was the genius of Johannes Kepler to unearth another form of beautiful movement in the heavens, that of the ellipse. It was a part of Newton’s genius (and that of the oft forgotten Hooke), to understand all these movements in a few basic equations that united them including gravity. For an interesting discussion of Newton and what he owed to previous students of the Heavens, including his contemporary, Robert Hooke, see J. Gribbin & M. Gribbin, Out of the Shadows of a Giant: Hooke, Halley and the Birth of British Science, William Collins, London,(2017)
‘...there is a smooth transition from the mathematical equations of quantum physics to the mathematical equations of classical physics’.\(^{163}\)

Since mathematics describes structures and since there appears to be continuity in mathematical structures between the images of the physical world as proposed by early and late theories of physics, the Newtonian world versus the quantum one, for example, then as Coyne and Heller present the case,

‘If mathematics is a “science of structures and their morphology”, and if the essence of physics consists in applying these structures to investigate the world, an unavoidable conclusion is that successive physical theories disclose, step by step, the structure of the world...since this structure is a system of various sub-structures, one could say, analogously, that physics is a “science of the world structure and its morphology”’.\(^{164}\)

One problem that immediately arises is the following: if mathematics does provide the continuity between different theories that is claimed for it and does therefore represent to us the fundamental patterns and structures of the world, how are we to account for the observation that any given physical theory may admit of two, or several mathematical formulations. For instance, the ‘wave formulation’ of quantum theory created by E. Schrodinger and the matrix formulation of Heisenberg are two different mathematical ‘pictures’ of the same theory. There is a way, however, of conceiving this issue that accommodates it.

Ladyman outlines one solution to this problem thus,

‘...we have various representations which may be transformed or translated into one another, and then we have the invariant state under such transformations which represents the objective state of affairs’.\(^{165}\)

In fact, as I shall later exemplify, at least one physicist has thought the discriminating factor between such a choice is the aesthetic properties manifested by the mathematical options.

Ladyman’s conclusion is supported by Jill North\(^{166}\) who offers an able assaying of what the relation of the ‘stuff’ of physics is to the mathematics. I quote sufficient of her description to orient the reader.

\(^{163}\) G.V. Coyne & M. Heller, *A Comprehensible Universe*...p.141

\(^{164}\) G.V. Coyne & M. Heller, *A Comprehensible Universe*...p.141

\(^{165}\) J. Ladyman, *What is Structural Realism*...p.409

'Structure comprises the objective, fundamental, intrinsic features, the one that remain the same regardless of ...conventional features of description...we can learn about structure by looking at the invariant quantities...It is part of the structure of the world, according to a theory of physics, that it contain at least the amount of stuff needed to state the theory in an objective, coordinate-independent way- in a way best suited to representing the nature of the world apart from our descriptions of it'.

Given the apparent independence of mathematical calculation and proof from the world of empirical and experience dependent truth, an issue arises as what makes the application of mathematics to the natural world comprehensible. Another way to express this is to ask what the world must be like if it is to be describable by mathematical physics. The evidence, to be clear, overwhelmingly supports the idea that it is so. What in the light of this is the relation between mathematical description, ‘stuff’ of the world and aesthetics?

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167 J. North, *The Structure of Physics*...p.66
Part 2

The structural beauty of mathematics and aesthetic evaluation

I start in the next paragraph to consider one way in which mathematics and the structures of physics may be related that unites them. My purpose in doing this is to provide a plausible account of this relation that can allow the properties of the world of physics to express aesthetic qualities without threatening the ‘objectivity’ of method or causal exteriority of the sub-particulate world.

It is also to open up that world as a consequence to two forms of appreciation: a personal and ‘subjective’ experience of beauty that can nevertheless disclose objective features of a structure which are also subject to objective measurement: the structural properties of beauty, such things as the symmetry and simplicity of part whole relations.

An Aristotelian conception of mathematics and structure

A contemporary mathematician and philosopher of mathematics has introduced an interesting conception of the relation between world, science, and mathematics. In his book, entitled An Aristotelian Realist Philosophy of Mathematics\textsuperscript{168}, James Franklin calls mathematics the ‘science of quantity and structure’, which is in fact the subtitle. Franklin is concerned to defend the interesting idea that mathematical properties are real properties of structures as much as features such as dimension, shape and so on.\textsuperscript{169 170}

A structure, he writes is

\[ \text{‘a set of abstract entities with relations between them ... a property } S \text{ is largely structural if and only if, ‘proper parts of particulars having } S \text{ have some properties } T... \text{ not identical to } S, \text{ and this state of affairs is, at least in part, constitutive of } S’.} \]

This definition he brings to bear on an example. Consider, he asks us, the property of


\textsuperscript{169} Franklin recognises difficulties with his view that will have to be met, the problem for example of ‘uninstantiated universals’ described by mathematics, in essence structures which do not exist. Another kind of problem is that of ‘infinity’. It is by no means clear how infinity stands in relation to physical instantiation. He addresses some of these issues in the following paper, J. Franklin, Uninstantiated properties and semi-Platonist Aristotelianism, The Review of Metaphysics, 69.1, Sept. (2015)

\textsuperscript{170} Michael D. Resnik is another philosopher known for defending the position that mathematics has a factual subject matter. He calls it the ‘science of patterns’. In so doing he also commits himself to a structuralist philosophy of mathematics and argues additionally for mathematical realism, the view that the patterned structures he defends exist: M.D. Resnik, Mathematics as a Science of Patterns, O.U.P., Oxford, (1997).
‘...being a certain tartan pattern’. To be a tartan pattern parts (colours) must be *arranged in a certain way*...Plainly the reference in such examples to the parts having colours...make such structures not appropriate as objects of...pure mathematics at least. Something more *purely* structural is needed’.

What he is showing, or attempting to show, is that for something to be a suitable object for mathematical description, it must have properties that suit it to mathematical description. Properties, put another way, that can serve as suitable referents for mathematical terms and functions.

‘A property is purely structural if it can be defined wholly in terms of the concepts same and different, and part and whole (along with purely logical concepts). In short, a purely structural property is one that can be defined in terms of Mereology and Logic’.

Since a structural property can only be defined in these terms, the substances of physics (or any other object, and here I mean to use the word ‘object’ as referring to both ‘natural’ and ‘artefactual’ objects), then ‘physical’ objects must have structural properties of this kind.

This is open to debate, like all philosophical attempts to unite mathematical entities to ‘real’ world entities. For my purposes, however, it has the advantage of sketching the possibility of a metaphysical unity between structure, aesthetics, and mathematics.

Having issued this caveat, it is also important to note that Franklin’s definition of structure *per se* is not controversial. Max Tegmark, for example, a well-known physicist, and cosmologist is a realist about relations and structure like Franklin.

Tegmark is largely in agreement with the definition, but he is a *Platonist*, so unlike Franklin, he thinks that mathematical entities have a separate existence to the physical entities they describe:

‘A mathematical structure’ is precisely this: a set of abstract entities with relations between them... modern mathematics is the formal study of structures that can

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171 J. Franklin, *An Aristotelian Theory...*p.56
172 J. Franklin, *An Aristotelian Theory...*p57
173 S. Shapiro, *Thinking about Mathematics: the philosophy of mathematics*, O.U.P., Oxford, (2011) engages the fundamental questions in mathematics providing a detailed introduction to each and an accompanying critique. He is concerned with the subject matter of mathematics, i.e., its ontology, semantic questions, such as the meaning of mathematical statements and their relation to truth, epistemological issues; how is mathematics known? What is a proof? Does mathematics involve observation or simply mental manipulation and so on.
be defined in a purely abstract way ... we don’t invent mathematical structures-we discover them and invent only the notation for describing them’.

Tegmark is representative of one pole of the ontology of mathematics, the Oxford mathematical physicist, Roger Penrose, the Nobel Prize winner, an exponent of Platonism is another representative of the same school. He writes,

‘...my sympathies lie with the Platonist view that mathematical truth is absolute, external, and eternal, and not based on man-made criteria; and that mathematical objects have a timeless existence of their own, not dependent on human society nor on particular physical objects’.\(^{174}\)

Another pole has views which circulate around the idea that mathematics is an outcome of a kind of human conceptual engagement with the world and is ultimately a creation that enables a particular functional interaction with it, what has been called the ‘constructivist’\(^{175}\) position.

Franklin’s view, as its title indicates, shares an Aristotelian heritage in its desire to bring together the ‘universality’ of ‘abstract’ collective concepts with the individual objects which they gather together under their nomenclature. He thus tries to carve a path between Platonism and Nominalism.

Platonism is accommodated by allowing mathematics to operate with universals in the shape of mathematical equations and the entities with which they deal. Nominalism he deals with by taking the essentially Aristotelian view that universals are embodied \textit{in} particulars, in this case the mathematical properties of structures which determine them to be the structures they are. No doubt his position is as controversial as every such effort is in the philosophy of mathematics.

His view is attractive because it conforms to a logical intuition that any structure which could not be described by some suitable mathematical formulation would be barred from existential instantiation in any possible world. The illustrations of Escher which are illusions of non-mathematical possibility created by perceptual manipulation are an evocative illustration of this metaphysical principle.


\(^{175}\) Marcus du Sautoy, professor of mathematics at the University of Oxford, has united the constructivist and realist positions in the following way: Structures, he says, describable in mathematical language, exist independently of us. This is the \textit{realist} component. The mathematician, on the other hand, chooses which from among these are to be called \textit{mathematical} structures. This is the \textit{constructivist} component. This could be misleading however and depends on what he means. All possible structures have presumably a mathematical description. See M. du Sautoy, Exploring the Mathematical Library of Babel, in \textit{Meaning in Mathematics}, ed. John Polkinghorne, Oxford University Press, (2011)
I cannot properly enter the debate about the ontology and explanatory efficacy of mathematics here. This does not however affect my case to any marked degree. Whatever the case, it is reasonably clear that all parties recognise that mathematics is the ‘language’ in which the possible physical structures of the world are formulated.

**The availability of structures to mathematical description and cognitive representation**

The force behind Franklin’s claim ‘that mathematical entities can be literally exemplified in the world’\(^{176}\) for my purposes is evident: if a set of properties described mathematically are instantiated in the structure they describe, then as well as being open to logical and mathematical reasoning, they are open to imaginative, abstract, or visual perception by an observer perceptually and cognitively equipped for that task, the expert mathematician or mathematical physicist.

This conclusion has some experimental backing in the cognitive psychology of representational processes. Cooper and Shepherd, for example, showed that a subject shown a complex 3\(^{rd}\) structure could then manipulate an internal representation of it, to decide whether a photographic object was the same one initially presented but rotated to present a different 3\(^{rd}\) view.

The subject had to decide from a number of photographs which ones were the original object. This intimates not only a complex capacity for structural representation but the ability to draw complex conclusions about the relations of the structure via abstract internal imaging.\(^{177}\)

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https://doi.org/10.1016/8978-0-12-170150-5.50009-3
Examples of images used in the Lindsay and Shephard series of experiments.

Like Einstein or Kepler, a scientist may be fortunate to be blessed with a visual or abstract imagination that can conceive of different possible structures and judge them according to their conceivable or inconceivable plausibility. That imagination will coincide where it correctly discerns structural arrangements with potential mathematical descriptions of it. Amongst the structural features they may internally utilise to accomplish this end are aesthetic values.

**An epistemic model of dual access to structural aesthetics**

I want to develop this idea by a relatively simple example of how it might work. The purpose of what follows is to outline the general form of a credible appreciation of beauty in two ways that unites the ‘subjective’ and the ‘objective’ as epistemological tools that exploit different human faculties to the same scientific and ontological ends.

I am relying here on the understanding which I develop that the phenomenal experience of beauty can yield objective truths about aesthetic properties. Our ‘subjective’ responses, in other words, contrary to common opinion, can carry truth evaluable content about the aesthetically expressive properties of a structure. 178

I start by considering how, if a person wishes to create something of beauty, something of the relations of the structure being created and how to attain ‘beauty’ using them must be understood.

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It has long been known, for example, that there is a connection between beauty, proportion and mathematical symmetry known as the ‘Golden Mean’. Architects, artists, and others have for many hundreds of years understood that a certain geometric ratio between the height and width of a rectangle is one which is most aesthetically satisfying. Rectangles constructed in such a way that do not meet this ratio typically attract aesthetic epithets such as ‘too squat’, ‘too narrow’ and so on.

If an artist, architect, or anyone engaged in the production of an artefact wishes to produce for some purpose a work that is discordant, then his construction will accordingly violate the mathematical principle, but if he wishes to produce something that induces feelings of perceptual satisfaction and exclamations of its beauty, he will obey the principle.

Escher’s work explicitly manipulates what is mathematically impossible with tricks of perceptual geometry to create the discordant impossibility that one is perceiving what is not possible. It does not follow, of course that an artist or artisan be familiar with the mathematical ratio. All that is required is that he recognises it as pleasing and works towards it.

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Whilst one might perceive a pattern in nature or one designed by an artist or artisan, \textit{without} being affected by the aesthetic shape of the structure, the perception of the beauty of the design \textit{requires} qualitative and emotive experiences. Someone who could make an \textit{inference} to beauty based on, for example, structural design characteristics, might be said to have correctly and rationally identified that something with symmetry, for example, was counted by others as beautiful but not \textit{detected} it himself via the experience of \textit{its} beauty.\footnote{Someone bereft of the capacity for aesthetic responses may \textit{not} be able to pick out something beautiful by experiencing it. Nevertheless, they may master other ways of detecting beauty. They may, for example, have learnt that structures which obey the principle of the \textit{golden mean}, a ratio shared by some geometric structures, are generally those which most observers call \textit{beautiful}. Similarly, a mathematician, similarly aesthetically ill disposed, may nevertheless recognise that certain features of equations, their simplicity but expansive explanatory properties, for example, may be those which her colleagues are inclined to call \textit{beautiful}. It also seems possible that those mathematicians equipped to make good aesthetic distinctions might use this ability to increase the brevity of mathematical decision making in certain circumstances.} He would have used the features of its \textit{design} to make this judgement.

\textbf{Michelangelo’s Sistine Chapel showing use of The Golden Mean Ratio}

![Michelangelo’s Sistine Chapel showing use of The Golden Mean Ratio](image)

Something about the beauty \textit{in} the thing itself might be said to be left out in this case. Someone entirely incapable of experiencing the beauty of something, might be thought to lack what is most essential to beauty itself, that is its power to provoke the qualitative response I have discussed. If the beauty is real, then he also has been unable to access part of the reality of the structure he is observing.

It is thus perfectly possible for the mathematician or scientific theorist to technically exploit such features as ‘symmetry’ or ‘simplicity’ in making theoretical decisions without experiencing the full
range of aesthetic responses that those features make available to cognition, perception, and emotion.

The congruity between the ‘structure’, the description and these responses means that for those who are suitably cognitively, educationally, and culturally equipped such experiences are available for theoretical use. They are provided, as it were, with two theoretical ways of accessing the shape of a structure.

**Structural integrity, truth, and beauty**

There is a common experience of the ‘rightness’ of a particular structure that extends through reasoning, the physical, the abstract and even the historical and the personal. ‘Harmony’, ‘unity’, ‘proportion’, ‘symmetry’ and groupings of concepts associated with the use of these words are common features assigned to positive aesthetic evaluations across a range of domains, despite the substantial variation of their use in the context of human affairs.

They are frequently exploited when someone is trying to offer some description of an object or event that has stimulated an experience of beauty. This is displayed in the example given above of someone describing a rectangle as ‘ugly’ or ‘squat’ which does not obey the golden ratio but who does not have mastery of the necessary equation that describes the relation precisely.

The Nobel physicist Werner Heisenberg (1901-1976), tried to explain the idea of the relation of aesthetic parts and whole in physics in an article entitled, *The meaning of beauty in the exact sciences*.\(^{182}\) There, he defined it as the

‘...proper conformity of parts to one another and to the whole’

To explain what he means he cites Newtonian mechanics, with parts being

‘...individual mechanical processes’ and the whole, ‘the unitary principle of form which (the) processes comply with, and...(which) was mathematically established by Newton’.\(^{183}\)

It is thus not a coincidence that traditional classical metaphysics incorporated in the experience of beauty a strong sense of the *rightness* of things, itself indicating ‘truth’. The best known of these is the Platonic order: to properly grasp the true nature of reality is to become acquainted with the order of

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183 W. Heisenberg, *Across the Frontiers...p.174*
abstract universals at the apogee of which sits the form of goodness, truth and beauty ordering the universals beneath it into a perfectly harmonious structure, each occupying its appropriate place.

Platonism is not a necessary consequence of the recognition of the sense of something being rightly ordered. Shorn of Platonist adornments the idea of an ‘ordered’ structure offers a different conception of how a theory might fit together and its representational capacities ‘mirror’ effectively the structures it attempts to articulate.

Here, aesthetics may have a particular role to play, the greater the aesthetic merit of a given structure, the greater the sense that its parts are maximally ordered. Indeed, maximal order might be coincident with the greatest beauty available to it to manifest.

Henri Poincare (1854-1912), the French mathematician and theoretical physicist tried to articulate the nature of beauty in his discipline in this kind of way.

‘I am not speaking...of the beauty of qualities and appearances...What I mean is that more intimate beauty which comes from the harmonious order of the parts, and which...intelligence can grasp’. 184

He proposes that the purpose of science is to

‘...offer...(an)...understanding of the relations between phenomena...scientific theories offer a ...manner of bringing together facts which appearances separate...(it is in that) harmony that our theories find beauty’. 185

Nicholas Maxwell’s argument which deals with ‘simplicity’ suggests a role for aesthetic judgements when faced with a choice between different theories which can do the same job in theory evaluation.

How and why could ‘simplicity’ be useful? Maxwell points out that it is possible to construct endlessly many theories which agree precisely with some favoured postulated theory but disagree, ‘in arbitrary ways, for different unobserved phenomena’.

185 M.Ivanova, Poincare’s Aesthetics...p2585
This means that no theory is ever logically conclusive.

‘If empirical considerations alone govern theory choice in science...on what
grounds are these infinitely many rivals to accepted theories are to be rejected,
independently of, or even against theoretical considerations?’.

As he says, a traditional answer has been to make recourse to simplicity, unity, explanatory depth and so on as distinguishing criteria of a successful theory. These principles he notes are made in addition to empirical requirements. As he then contends,

‘In rejecting theories that violate requirements of simplicity, however empirically successful, science, in effect, makes a persistent substantial assumption about the world independently of empirical considerations, to the effect that the phenomena occur as if exhibiting simplicity. This violates the central tenet of empiricism that no such assumption must be made in science as part of knowledge’.

What holds true for ‘parsimony’ can hold true for aesthetic structural features with modifications to suit their individual properties, even perhaps ‘beauty’ as the phenomenal outcome of an experience of the maximal order of a structure.

The aesthetic judgments associated with all this may be in the end an attainment of normative intuition rather than the end of a chain of reasoning itself. This does not assign the possibility of accurate perception and judgement of aesthetic order and its component structures to the variability of subjective experience without further ado.

The axiomatic foundations of mathematical proofs and formal logic, for example, rest ultimately on the grasping of certain initial truths. A teacher can only present examples and say, ‘this is how you ought to reason if reasoning is what you want to do’. There are no further principles to grasp that can

186 N. Maxwell, Understanding scientific progress...p.3
187 N. Maxwell, Understanding scientific progress...p.3
188 I discuss structure, objectivity, and subjectivity and their relation to ‘beauty’ in a later chapter considering what is we mean when we talk about ‘beauty’.
189 I am not making the mistake of suggesting that logical relations are created by us. I am simply pointing out that whatever accounts for the necessity, the ‘hardness’ of logic, we have to grasp its fundamentals before we can deduce anything.
190 The truth of the propositions should not be confused with the psychology of coming to see that they are true.
191 G. Engler, Aesthetics in Science and Art, British Journal of Aesthetics, Vol 30, no.1, (1990) says the aesthetic experience of the scientist is both ‘perceptual-intellectual’ and ‘sensuous-emotional’... which it is very hard to differentiate’. He is less interested in the contribution of this experience to theory evaluation, but the question of the exact nature of the experience, if such precision is attainable, is an interesting one.
illuminate further what reasoning in this context is. At some point, the student will simply have to see, ‘this is how one goes on’, \(^{192}\) and manifest it in their dealings with the principles in question.

To experience the beauty of a ‘deep theory’ of physics, for example, is perhaps, to grasp or perceive something of the rightness of an order of things in response to the properties of its structure. At some point the only answer that the percipient physicist can give is ‘this is the right order of things.’ The weight to be assigned to judgements exploiting one or another aesthetic quality will range across different variables according to discipline, sub-discipline, subject matter, its relations to other theoretical variables and so on.

When to accept that a theory is to be appropriately dismissed or accepted is a long and difficult question perhaps, but whether or not this rests ultimately with the community of scientists, the individual, or involves a period of turbulence and theoretical conflict, it seems that ultimate theory evaluation does not rest on any algorithmic procedure. Despite therefore the hardness of discerning real beauty and a reliance on qualitative assessment, like the use of other values in theory decision making, this does not single ‘beauty’ out as of no theoretical utility.

The mathematical physicist brings his range of aesthetic appreciation to his work, in which the nature, order, and aesthetics of the structure ‘leap out’ at him. He becomes, one supposes, like the art critic who can place a style of painting immediately within one school, time, or culture. \(^{192}\) It is precisely here that we see the conceptual uniting of the metaphysical structure, the empirical nature of the aesthetic property, and the availability of normative judgements as theoretical tools for the practising scientist.

**Aesthetic judgements in mathematical physics: case examples and discussion**

Is it a problem that a particular skill which relies on subjective honing rather than objective measurement to detect an aesthetic property is required in a scientific context? Not at all. As I made clear, the correctness or otherwise of such an attribution is dependent for its confirmation on the ‘actual’ structure as eventually revealed by the evidence.

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\(^{192}\) Ludwig Wittgenstein, the 20c philosopher argued that there was no ‘fundamental meaning’ which a student had to, or might grasp, in order to learn what it is to ‘follow a rule’ whether of mathematics, language, or logic. In simplified essence he thought that there was no magic ‘semantic internal event’ which could be ‘switched on’ by the ‘right’ explanation to finally illuminate the ‘meaning’ of the rule. The student’s grasping of a rule is evinced in his being able to use it. He offered all sorts of examples to illustrate the view. A large literature has arisen on this issue and bears on fundamental questions in cognitive psychology and neuroscience. B.Rundle, Chap. 5, Meaning and Understanding & R.L. Arlington, Chap. 6, Following a Rule, in, H-J. Glock, ed., *Wittgenstein: A Critical Reader*, Blackwell Press, Oxford, (2001) provide good, opinionated summaries.

I want to exemplify these claims in practice\textsuperscript{194}. The first example I present, discusses a property that lies at the heart of fundamental physics; the feature of ‘symmetry’. It is important to distinguish two things here: Firstly, it may be the case that symmetry is a feature of structures that tends to elicit an experience of beauty, but it is not in itself identical to beauty. It also illustrates the epistemological congruence I described in the ‘golden ratio’ explication. The first example illustrates these points.

The second example discusses a well-known mathematical physicist of genius who made the explicit claim that the ‘beauty’ of a theory was fundamental to its truth (P.A.M. Dirac, 1902-1984, Nobel prize). As I shall show he stressed the ‘beauty’ of a theory as revealed in phenomenological experience rather than any of its constituent elements.

Discrimination at this level suggests a profound grasp of all the aspectual presentations of structural realities governing sub-particle (and other) processes that may only be truly available to extensive immersion in the mathematics and theories of the discipline.

The first example is drawn from a work by the Quantum Physicist Andrew Steane of Oxford University. In his 2018 book, Science and Humanity: A Humane Philosophy of Science and Religion\textsuperscript{195} he discusses and exemplifies what in essence exemplifies two modes of access to the properties of structures that I have just discussed.

He makes his example usefully accessible to the non-physicist, and wants to as he puts it

‘... explore how it can be that different areas of scientific discourse do not replace one another but still connect with one another...’.

‘This is’, he says, referring to the last quote,

‘...not just a question about the human activity called “scientific discourse”. It is a question about the nature of the physical world, and it...arises in the area of science which is my own area of expertise...fundamental physics’.

The question with which he deals is the relation of ‘symmetry’ to physics and equations describing forces.

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One of the fundamental features prominently associated with the successes of modern physics is the importance of the principle of symmetry. ‘Symmetry’ of course is fundamental to all forms of physical and abstract structures. Every and any structure can be judged by its symmetrical form one way or another. In philosophical terms the existence of any structure is logically dependent on it having the property of symmetry. It is also fundamental to a certain conception of classical beauty and the Arts in general.

In what follows I quote extensively from Steane. He builds his argument from basic premises, so it is accessible to the non-physicist.

His assertion is that principles of symmetry

‘...when brought to bear with...mathematics yields rich and powerful insights into many physical phenomena’.

The term symmetry principle, he says, is one which states that,

‘...certain types of change should not make any difference to what is going on in some physical behaviour’.

There are many forms of technical symmetry including such things as ‘rotational symmetry’ which an object such as a circle may be said to possess, because its shape and relations do not change when it is rotated about its axis. A crystalline solid, which does not change when it undergoes a mirror reflection is said to be ‘mirror symmetrical’.

‘One can’, he points out,

‘...have symmetries of more abstract things, such as equations and laws of motion. An equation that describes particle collisions, for example, might have some form of symmetry. If it does not matter if you reflected the particle trajectories (i.e., The equation comes out the same), for example, then we say the equation has mirror symmetry.

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196 This point is about the logical relation of a composing entity, to the identity of some object A. Briefly sketched it says that any structure, to have an identity as a structure, must bear some relation to a principle of symmetry. A splash of colour, for example, is either symmetrical or asymmetrical with reference to aspects of the colour itself across the area of the ‘splash’. Differences in colour are dependent on the structure in virtue of which they are differentiated, and, in which they differentiate the structure.

197 A. Steane, Science and Humanity...p.24
198 A. Steane, Science and Humanity...p.23
If the equation need not mention the location of other things not involved in the symmetry, then we say the equation has ‘translational symmetry’. The term indicates that it would not matter if one moved or translated all the particles form one place to another, by the same displacement: the equation remains the same, and therefore so does the behaviour it describes\textsuperscript{199}.

His example is concerned with an aspect of translational symmetry.

‘A car engine functions the same way, no matter where the car happens to be. If you drive...around China, it does not matter how far you are from the Eiffel tower...all that matters to the functioning of the car is the local gradient of the road and the local air temperature...and things like that. The position of unconnected objects such as...trees do not make any difference. This is an example of the symmetry principle called ‘translational invariance’. The workings of the engine do not change—they are invariant when the location of the car is...‘translated’ from one place to another’.\textsuperscript{200}

\textit{An example of ‘translational symmetry’: 1 triangle moved to 4 different positions.}

\textsuperscript{199} A. Steane, \textit{Science and Humanity}...p.23
\textsuperscript{200} A. Steane, \textit{Science and Humanity}...p.24
He then considers a kind of objection which may be made by the pragmatic working scientist. ‘Suppose’, Steane tells us,

‘An engineer looks into the functioning of the car engine. He will use, for example, Newton’s laws of motion (such as acceleration is proportional to the force), and various laws of chemistry describing the burning of petrol). He might never make explicit use of the principle of translational invariance’.

So, the engineer might claim that all we need is the

‘...equation of motion: force causes the cylinder head to accelerate, and the force is given by the formula for pressure in a hot gas...all we need to do is to find the solution, for given starting conditions and we have everything...translational symmetry...is completely irrelevant. It has no role at all. It does not add anything’.

Is the symmetry principle an afterthought? The engineer might go on to assert that the equation of motion describes the sequence of cause and effect, and the symmetry principle makes no difference to the predictive power of the equation...symmetry is simply a consequence, a property the equation happens to have. It could have turned out another way...’

What is Steane’s reply to this perfectly reasonable (so it seems) objection. ‘What this reaction has failed to grasp’, he begins,

‘...is that the symmetry principle already makes its contribution before we...discover the formulas and equations, because it places conditions on what sorts of equations could make sense (Steane’s italics)....Symmetry principles play an important role because they amount to meta-laws which express higher level principles that basic laws of motion must respect if they are to make certain types of sense. They are of extreme practical importance in physics...what is at the heart of this, is not merely that symmetry is helpful to us (it helps us to formulate correct physical models, but also that symmetry gives us deeper insight into what we find (Steane’s italics)’.

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201 A. Steane, *Science and Humanity*...p.24
203 A. Steane, *Science and Humanity*...p.25
The pragmatic engineer, having heard the argument, might accept the importance of the symmetry, but say that it is nevertheless an overall property following from the equations. Steane’s riposte is to point out that the symmetry with which we are dealing is not posterior to the equations but prior to them.

‘As soon as we focus our attention on the car engine and consider it can be described in and of itself, then we have already assumed the symmetry called translational variance…even as soon as you suppose that there is an equation for the car it must have this symmetry…the symmetry principle is not an effect coming from a microscopic cause…nor is it a pleasing or helpful thought’. 204

The physicist and theist, Stephen M. Barr, concurs and points out that principles of symmetry are at the heart of all modern physics,

‘…every one of the four basic forces of nature - gravity, electromagnetism, the strong (nuclear) force, and weak (nuclear force)- is based on principles of symmetry…(to) say that these forces are ‘based’ on symmetries, we mean several things…profoundly, the very fact that there are such forces in nature is a consequence of these symmetries…the characteristics of these forces are controlled by their symmetries…the structures of the mathematical laws governing these forces is to a large extent determined by their underlying symmetries (present author’s italics). 205

This is a position supported by the contemporary Oxford mathematician Marcus du Sautoy who opines, ‘the symmetries of a structure often reveal secrets about how it behaves’. 206

My second example is that of P.A.M. Dirac, Nobel prize winning physicist. He earned this shared distinction in 1933 for ‘his discovery of new fertile forms of the theory of atoms and for its application’ as the award explained. 207 His equation, see below,
‘...combined relativity and quantum mechanics in (his) equation, which provides a
natural description for the spin of an electron, and which led to the prediction, by
Dirac himself, of the existence of anti-matter’.

Dirac, as philosopher of science H. Kragh notes,

‘...often stressed that predictive ability is not enough for a physical theory. He
increasingly turned to the view that scientific understanding must include criteria
such as beauty....’.

Dirac was clear about his own commitment to aesthetic value, and he also believed that Einstein made
similar use of aesthetic criteria. Dirac was committed to the mathematics of Einstein’s Theories of
Special and General Relativity (SR and GR) because he saw the beauty of the theories in the
mathematics that gave them expression. He wrote about SR that,

‘We owe it to Einstein ...that one needs to have beauty in mathematical equations
which describe fundamental physical theories’.

During Einstein’s development of GR, Dirac argued that he

‘...was not trying to account for some results of observations. Far from it. His entire
procedure was to search for a beautiful theory...Somehow, he got the idea of
connecting gravitation with the curvature of space. He was able to develop a
mathematical scheme incorporating this idea. He was guided only by the beauty
of these equations...the result of such a procedure is a theory of great simplicity
and elegance in its ideas’.

Dirac made his position on beauty clear in a paper he published in Scientific American in 1963 entitled
‘The Evolution of the Physicists picture of Nature’. This occurs in the context of his discussing the
work on Bohr’s picture of the atom around 1920. Bohr had proposed that electrons moved around

209 H.Kragh, *Paul Dirac*...p. 28
the nucleus in well-defined orbits, every now and then jumping from one orbit to another. As Dirac says,

‘We could not picture how the jump took place. We just had to accept it as a kind of discontinuity’.\textsuperscript{213}

The discovery that helped to make sense of this was the discovery of Quantum Mechanics in 1925, in particular the work of two men, Heisenberg and Schrödinger, who approached the problem from different angles.

Heisenberg cleaved closely to experimental evidence about different wavelength spectra associated with energy release from ‘jumping’ electrons from one energy level in an atomic structure to another. He discovered that the evidence could be fitted into an extant mathematical procedure known as Matrix Mechanics. Schrödinger, on the other hand, at least on Dirac’s view, and according to Dirac he had discussions with Schrödinger about his equations,

‘...worked from a more mathematical point of view, trying to find a beautiful theory for describing atomic events’.\textsuperscript{214}

Schrödinger, he says, told him that when he first derived the equation, he applied it to the behaviour of the electron in the hydrogen atom and found the result was not accommodated by his equation. This dismayed Schrödinger and delayed publication of his work. Later work cleared up the discrepancy.

It is what Dirac goes on to say that is of interest here.

‘...there is a moral to this story, namely that it is more important to have beauty in one’s equations than have them fit experiment...It seems that if one is working from the point of view of getting beauty into one’s equations, and if one really has a sound insight, one is on a sure line of progress...if there is not complete agreement between the results of one’s work and experiment...the discrepancy may well be due to minor features that will get cleared up with developments in the theory’.\textsuperscript{215}

His biographer, Helge Kragh, notes that the development of his strongly aesthetic view of mathematics date to a period after 1935. Dirac came to believe that the laws of nature are ‘characterised by a high degree of mathematical beauty.

\textsuperscript{213} P.A.M. Dirac, \textit{The Evolution of}...p.46
\textsuperscript{214} P.A.M. Dirac, \textit{The Evolution of}...p.47
\textsuperscript{215} P.A.M. Dirac, \textit{The Evolution of}...p.47
“As time goes on”, he wrote in 1939, “it becomes increasingly evident that the rules which the mathematician have chosen are the same as those which nature has chosen”.

I ask the reader to recall my discussion of Franklin’s Aristotelian philosophy of mathematics during which he urges that mathematics is the ‘science of ‘quantity and structure’.

Another resonating theme, for my purposes, is what Dirac thought mathematical beauty was. As Kragh says Dirac did not define the concept nor did he think it was necessary.

’(It) is a quality which cannot be defined, but which people who study mathematics have no difficulty in appreciating’.  

Kragh’s own view of Dirac’s claim is contained in his biography,

‘The main problem is that beauty is subjective and cannot serve as a commonly defined tool for guiding science’.  

In the essay previously referenced he explicates this,

‘...rather than accepting a theory is correct because it is mathematically beautiful, one can argue that it is attributed mathematical beauty because it is empirically correct’.  

This, I noted earlier is a commonplace of contemporary thought. Kragh ignores the possibility that a theory might indeed come to be seen to be beautiful based on its empirical success, but this may be an *aperiori* discovery of a previously unnotic aesthetic quality. He assumes that it must be the case that coming see the beauty in something invalidated by coming to see it *after* it is confirmed by experiment. Many things can be true of theories after their confirmation. It may be for example that the theory has a wider range of application than initially recognised.

It is not inconceivable however, that if beauty is associated with the ‘rightness’ of a theory, that appreciation of it might grow through the realisation of its explanatory power. This is not to argue that this is necessarily the case. Mistakes are often made about theories and scientists have often clung to the truth of a theory on slender grounds, but that the recognition of beauty sometimes occurs after acceptance is not a *prima facie* reason for ruling out the idea that something is, in fact, beautiful.

216 H. Kragh, *Seeking Beauty*...p.30
217 H.Kragh, *Seeking Beauty*...p.31
219 H. Kragh, *Seeking Beauty*...p.31
The somewhat casual dismissal of Dirac’s claim by Kragh is more indicative of his being governed by the dualistic metaphysical picture which I contested in the earlier chapter. Kragh thinks beauty must be ‘subjective’ and therefore ruled out of serious theoretical consideration tout court.

In any event it is a curious claim because he gives no alternative as to why Dirac persisted in believing in the theoretical power of the equation in the face of substantial empirical doubt. Dirac was a man completely absorbed in his discipline to the exclusion of all else. It seems highly likely that he did not assign such a stringent judgemental role to beauty without considered cause.

His claim was this,

‘There are occasions when mathematical beauty should take priority over agreement with experiment’. 220

His reasons for saying thus are outlined in his 1980 paper,

‘The foundations of a theory are, I believe, stronger than what one could get simply from the support of experimental evidence. The real foundations come from the great beauty of the theory’. 221

J. McAllister suggests that he believed that if the aesthetic features of a theory were such as to warrant great confidence in that theory, then one should, as McAllister pithily expresses it,

‘…meet a prima facie unfavourable empirical result by abandoning the theory itself or alternatively, doubting the auxiliary hypotheses which accompanied the theory in its trial’. 222

Dirac made this quite explicit.

‘…suppose a discrepancy …appeared, well confirmed between the theory and observations…should one then consider the theory wrong? the answer to the last question is emphatically no. Anyone who appreciates the fundamental harmony connecting the way nature runs and general mathematical principles must feel that a theory with the beauty and elegance of Einstein’s theory (for Example), has (Dirac’s italics) to be substantially correct’. 223

220 H. Kragh, Seeking Beauty…p.31
221 P.A.M. Dirac, The Evolution of…pp.47-48
223 Quoted in J. McAllister, Dirac and the Aesthetic evaluation…p.95
One reason that Dirac may have had for his conviction of the theoretical use of beauty was a distinction he made between aesthetic beauty in the Arts and that in mathematical physics, ‘Mathematical beauty’ he wrote, ‘...is the same in all countries and at all periods of time’.224

According to Dirac, mathematical beauty is mostly objective and epistemically accumulative. Mathematics advances, in the view of Jane McDonnell, with a ‘timeless beauty linked to ideas of simplicity, symmetry, generality and truth’.

**Dirac’s equation**

I want to end this section with a simplified version of the Dirac equation indicating how each of the factors mentioned by McDonnell are on display.

Dirac’s work in 1927 was motivated by concerns about the incompatibility of Einstein’s special theory of relativity with contemporary versions of quantum mechanics. At its most elementary the problem was to describe the motion of the electron and the atom as consistent with relativity since the Newtonian model broke down in describing the behaviour of micro-phenomena. What was necessary was to incorporate space-time as an additional factor. In the words of Farmelo, ‘Dirac pondered a simple question: what is the simplest mathematical description of a particle consistent with both theories?’225

Dirac’s equation for an electron moving in an arbitrary electromagnetic field can be formulated in many ways. Sir M. Berry of the H.H. Wills Physics laboratory of Bristol offers Dirac’s original formulation below (photographs of Dirac’s original publication are to be found in Berry’s paper referenced below).226

\[
[p_0 + ecA_0 + \alpha_1(p_1 + ecA_1) + \alpha_2(p_2 + ecA_2) + \alpha_3(p_3 + ecA_3) + \alpha_4mc]\psi = 0
\]

What the symbols denote:

1. \(p_0 = i\hbar/c\partial t\) (the energy operator)
2. \(e\) is the charge on the electron
3. \(A_0\) is the scalar potential associated with the electromagnetic field
4. \(c\) is the speed of light

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226 M. Berry, Paul Dirac: The Purest Soul in Physics, History/feature, Physics world, 1-7, (Feb), (1998), Dirac’s equation, p.5
5. \( \alpha \) are 4x4 matrices derived from the Pauli matrices
6. \( p_1 = -i\hbar \frac{\partial}{\partial x} \) is a momentum operator \( (p_2 = -i\hbar \frac{\partial}{\partial y}, p_3 = -i\hbar \frac{\partial}{\partial z}) \)
7. \( A \) are the three components of the electromagnetic vector potential
8. \( m \) is the mass of the electron
9. \( \Psi \) is the wavefunction of the electron.

The wavefunction \( \Psi \) is a 4x1 column vector (also known as a spinor) and each element is a function of space and time, representing the spin state (up or down) of the electron and the associated positron solution...the equation was able to explain the results of all of the experiments at the time, to explain the origin of electron spin and to predict the existence of antimatter.\(^{227}\)

In order to try and make the equation minimally accessible, the version I next display is owed to Graham Farmelo, fellow of Churchill College Cambridge, and Dirac’s biographer in his book *The Universe Speaks in Numbers*...

\[
(p_0 - \alpha_1 p_1 - \alpha_2 p_2 - \alpha_3 p_3 - \alpha_4 mc) \psi = 0
\]

What the symbols denote:

1) \( P_0 \) denotes the energy of an electron with mass \( m \)
2) All the other \( P \) symbols represent the momentum of the particles in three dimensions of space
3) The \( \alpha \) symbols represent the ‘Dirac Matrices’ each of them consists of a square array of 16 numbers
4) \( \Psi \) encodes a mathematical object known as a ‘spinor’. This object describes the behaviour of the electron.

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\(^{227}\) M. Berry...p.5
A Visual representation of a spinor

(A simple way of grasping the image of a spinor is to envisage it as a spinning top being rotated through 360 degrees. A highly simplified way of relating it to Dirac’s equation is to see the ‘top’ as the particle and the circles as the generation of electromagnetism)

With his equation Dirac explained why an electron has a spin and why it has an associated magnetic field, thus uniting Maxwell’s waves with the quantum behaviour of particles. Later Dirac predicted from the mathematics alone the existence of an anti-electron which had the same mass but an opposite electric charge. The prediction was later confirmed experimentally.

Each of McDonnell’s criteria, ‘timeless beauty linked to ideas of simplicity, symmetry, generality and truth’ are instanced here by the equation. In order to see how this is so, we need to step back and ask how mathematics in general exemplifies the criteria.

Mathematics one might say presents us with a rigorous language whose various manifestations are underpinned by logical precision and precise manipulative and deductive forms. The truths that proceed from mathematical conclusions are always valid if the deduction is logical, in other words, ‘true’ (note that ‘validity’ is separate from ‘soundness’).

Consider a simple example: 10/2 (=5) > 6/3 (=2). (This could also be expressed in definitional logical form that held for any numbers that stood in the same relations). The logical-mathematical truth has

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228 Slawekb at English Wikipedia - CC BY-SA 3.0
a non-spatio-temporal beauty that is indeed ‘timeless’. It is also symmetrical in the sense that it holds true wherever and whenever it is pronounced and when it is not. It is thus perfectly general and universally true.

Put another way, many mathematical equations are always beautiful on these criteria. As I have suggested all natural structures manifest mathematical forms as intrinsic to their being instances of natural items at all, but not all possible beautiful equations are instantiated in the physical world.

Many potentially beautiful perceptible (and abstract) items do not, perhaps never, come, or will come to existential fruition. Put in more technical terms, whilst every particular instantiates universals, not all universals are instantiated. As I have argued however, if a structure, abstract or otherwise, is instantiated it is a condition of that possibility that it ‘obey’ the mathematical logic of any possible structure and that it have some aesthetic description.

When we turn to Dirac’s equations, we see that he has accomplished two extra-ordinary achievements. Firstly, he has uncovered mathematical structures of the most intricate, symmetrical, and complex forms and united them in harmony. Secondly, he has brought together two apparently disparate theories that rest on different ideas of the nature of basic physical forces and particles. Thirdly, in bringing them together in a beautiful mathematical form he has simultaneously displayed the beauty intrinsic to the existent structures and processes themselves.

What physicists say about theoretical beauty

Many physicists and mathematical physicists involved in the investigation of the behaviour of the basic constituent forces and particles of the natural world have often appealed to aesthetic principles in justifying their selection of theories. It is hard not to at least acknowledge the possibility that their deep acquaintance with the practice and outcomes of their theoretical work may not have brought them face to face with an empirical reality which escapes measurement precisely in virtue of its normative nature, but is, contrary to the contemporary zeitgeist, ontologically objective despite that.

Consider the following observation by Nobel Laureate, Subrahmanyan Chandrasekhar, in his article ‘Beauty and the quest for beauty in science’. He begins his exposition by suggesting that

‘...all of us are sensitive to nature’s beauty. It is not unreasonable that the natural sciences’ share some aspects of this beauty.’

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230 S. Chandrasekhar, Beauty...p.57
The Nobel prize winning physicist, Steven Weinberg in a much-quoted sentence in his book *Dreams of a Final Theory* says,

‘...we are discovering laws that are becoming increasingly coherent and universal, and beginning to suspect that this is not merely an accident, that there is a beauty in these laws that mirrors something that is built into the structure of the universe at a very deep level’. 231

Weinberg opens the second chapter of his book with the observation that ‘scientists have discovered many peculiar things and many beautiful things’. 232


The editors of a Special Issue of *Philosophia Mathematica* entitled ‘Aesthetics in Mathematics’ begin their introduction to the journal,

‘...mathematicians often appreciate the beauty and elegance of particular theorems, proofs and definitions, attaching importance not only to the truth but also to the aesthetic merit of their work...Others regard mathematical beauty as a key motivation driving the formulation of mathematical proofs and even as a criteria for choosing one proof over another(present author’s italics)’. 238

The explanatory power of mathematics in physics has added to the compulsion felt by many theoretical and mathematical physicists to ascribe beauty to equations and mathematical processes. D. J. Gross, the physics Nobel prize-winner for 2005 devotes a section of his address to this issue,

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‘...for the fundamental Laws of physics, we need deep mathematics and as we probe deeper to reveal the ultimate microscopic simplicity...we require deeper mathematical structures. These structures are not only deep but...also... beautiful and powerful’.

Nobel Theoretical Physicist Frank Wilczek’s comment on the Dirac equation that it was ‘achingly beautiful’ appears to have been prompted by the link between its simplicity and explanatory scope and its ‘deep structure’.

Chandrasekhar averred that in the light of associations such as that of symmetry, mathematics, and theory,

‘...since the pursuit of the empirical disciplines has been associated with the uncovering of natural processes that explain observed phenomena, there has been a strong association of beauty with truth’.

Neils Bohr, P.A.M. Dirac, Albert Einstein, W. Heisenberg, T.D. Lee, GM. Gell-Mann, and H. Weyl are just few amongst many other examples of notable Nobel physicists who have made similar declarations.

In a paper entitled, *Einstein and the most beautiful theories in physics*, Gideon Engler makes the case that, despite some theories eliciting disagreement as to their beauty,

‘There are two fundamental theories for which such a difference of perception is inconceivable. These are Einstein’s Special theory of Relativity and The General Theory of Relativity...scientists unanimously praise these theories for their beauty to the highest degree’.

Engler has looked in detail at Einstein’s use of aesthetic criteria in The Special and General theories of Relativity. A small literature surrounds this issue. Whatever the intricacies surrounding the discussion, the debate suggests it is at least plausible that Einstein’s references were not simply emotive or metaphorical in nature but represent genuine constraints on theory. One of Einstein’s biographers Steve Gimbel suggests that

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239 D.J. Gross, p.8372
241 Chandrasekhar, *Beauty...* pp.57-62
‘...for Einstein, beauty was a mark of truth, and unity and coherence were a mark of beauty...so he worked to unify all of physics into a single comprehensive set of equations’.

It is as MacDonnell suggests, ‘difficult to kill off a beautiful theory’.

She evidences the development of the Standard Model of Particle Physics ‘which is formulated in terms of the Yang-Mills Gauge Theory (1954)...a beautiful theory based on non-abelian symmetry groups’.

It is not necessary to be fully acquainted with the technical details here. Suffice it to say that early experimental failures showed that certain bosons (sub-atomic particles) have mass, but the Yang-Mills equations only ‘worked’ on the assumption that the bosons were massless. Further problems arose in applying the theory because it predicted the existence of quarks and they had not yet been observed. The situation was resolved only in 1973 with the theory essentially intact.

She conveys her conviction that some mathematical physicists bring to the question of beauty as a potential arbiter of theoretical aptness in the following way:

‘A beautiful mathematical theory will win out ultimately, though not necessarily in the short term. An ugly theory which manages to explain a seemingly unrelated phenomena and to explain the experimental data will win out...though not necessarily in the short term, allowing us to uncover deeper phenomena, but can only ever be a steppingstone. Mathematical beauty is a better guide to ultimate truth and there are occasions when we need to keep working on a beautiful theory, even when it does not agree with experiment, in order to learn what it is trying to tell us’.

There is at least enough plausible evidence here in all of this to support the hypothesis that mathematical physics reveals that beauty participates in composing the micro-structures of the physical. As I have asserted, all structures have some aesthetic properties, as a matter of metaphysical

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245 J. McDonnell, The Pythagorean World...p.19
246 J. McDonnell, The Pythagorean World...p18
248 J. McDonnell, The Pythagorean World...p20
necessity, but that the basic structures of the physical are beautiful rather than otherwise is a matter for empirical discovery.

In Dirac’s case, for example, his cleaving to the predictions of his equation on the grounds of its aesthetic appeal was finally vindicated in the face of experimental dubiety. The history of attempts to develop watertight features discriminating a ‘science’ from a ‘non-science’ in any event shows that no such ultimate criteria are probably available, so that what one might call the procedural skills of a good scientist end up being an important participatory element in any such decision.

Is mathematical beauty leading physics astray?

S. Hossenfelder, a contemporary physicist, believes that the concentration on beauty has led physics astray. Indeed, her book is entitled *Lost in Math: How beauty leads physics astray*. She has defended her view in a number of online and other publications including an accessible paper entitled, *Beauty is Truth, truth is beauty, and other lies of physics*. It is not possible here to develop a full critique which in any case demands an extensive familiarity with the physics and is in part an empirical disagreement that will be resolved by physicists. What I hope to briefly do accomplish here is place her criticisms in context.

Firstly, Hossenfelder’s complaints are directed against what she says has ‘become accepted practice to prefer hypotheses that are aesthetically pleasing’. She is primarily concerned with research programmes involving ‘supersymmetry, the multiverse, and grand unification’, which, she maintains, have involved 40 years of experiments which have ‘found no evidence to support these beautiful ideas…and (no) major breakthrough in the foundations of physics’. Some hypotheses she points out even escape potential experimental confirmation or infirmation. As she says, ‘multi-verse theories are safe from experimental test because they are in principle unobservable.

She lists three specific ‘criteria of beauty: simplicity, naturalness and elegance’. It is important to note that her objections are confined to these three aesthetic criteria which she argues have come to dominate contemporary thought in physics. It is possible to argue with the definitions she offers of each of these criteria, but Hossenfelder suggests that they derive from the most fundamental theories

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252 S. Hossenfelder, *Beauty is Truth…* p.2
253 S. Hossenfelder, *Beauty is Truth…* p.2
254 S. Hossenfelder, *Beauty is Truth…* p.2
255 S. Hossenfelder, *Beauty is Truth…* p.3
256 S. Hossenfelder, *Beauty is Truth…* p.2
we currently have, ‘the standard model of particle physics and ...General Relativity’. These she agrees ‘are beautiful in specific ways’. She says that it was ‘worth a try to assume that more fundamental theories are beautiful in similar ways’...‘we tried, and it didn’t work’.257

Despite the hyperbole of her two titles, her book ends with the following quote, ‘We know that the laws of nature we presently have are incomplete. To complete them we have to understand the quantum behaviour of space and time, overhauling either gravity or quantum physics or both...the next breakthrough in physics will occur this century. It will be beautiful’.

In line with this assertion, Hossenfelder may have a point: future theories may not be beautiful in the way that General Relativity or the Dirac equation are beautiful. This is not a matter of concern for my thesis. In fact, my earlier account of the relation between aesthetics, mathematics, and instantiated structures can support such a possibility.

Mathematical equations are universal abstracts. Not all of them are instantiated in physical particulars. Just as it is perfectly possible that there are many possible beautiful paintings, books, sunsets, and symphonies that will never come into actual existence, so there are many equations which may be envisaged and manipulated, but do not, or will not ever characterise any of the actual items of physical nature. As I have asserted which ones do are a matter for empirical investigation.

If they do come into existence however and are beautiful they will share the same beauty258. It is entirely comprehensible that many different kinds of things are called beautiful because they are characterised by the universal ‘beauty’ just as many different kinds of proposition about different states of affairs can all share in the fact that they are true if they are.

In this way, it is possible to defend both McDonnell’s claim that ‘maths advances with a timeless beauty...’, quoted above, and Hossenfelder’s concerns. Put simply, there will be different forms or structures of mathematical beauty associated with different forms of mathematical truth.

Some kinds of beautiful equations are already manifested in physical events and structures. As physics advances the depth and range of the mathematical structures which emerge in conjunction with the experimental science may well show us a glimmering world which our current mathematics and physics only partially elucidates.

257 S.Hossenfelder, Beauty is Truth...p.2
258 In a forthcoming chapter on beauty, I try to show how this is possible
In sum, Hossenfelder’s critique is well accommodated within my view; whether or not she is right about particular theories in physics is a matter for future developments in branches of that discipline, not philosophical speculation.

**Causality and the Janus face of aesthetic structures**

If my contentions are correct, then the connection of aesthetic structures to the shaping of causally active entities in the physical world would no longer face the apparently intractable difficulty of answering the question how two apparently independent ontological realms can causally interact, at least in the arcane universe of mathematics and mathematical physics. The world is shaped by aesthetic properties which are accessible to us in different modes of apprehension. The world, at the base of its fundamental structures and forces could have been ugly. The evidence suggests it is not.

That judgements of this type can be made about those structures are marks of *normativity* and *value*. Both normativity and value require the metaphysical property of potentiality, the possibility that things could have been better or that they could be otherwise. Evaluative judgements logically require a set of standards exterior to what is judged against which to make the comparison that issues in the judgement. No set of any such standards are available within the world conceived through the conceptual eyes of its purely contingent physical operations and yet they express properties, like beauty open to normative evaluation. The origins and explanation of that possibility is of marked interest.

The next point of exploration in addressing this question is to note that within the world are rational creatures, ourselves, who are able to self-consciously exploit the contingent operations of nature and standards of normativity to produce artefacts that are the outcome of purposes not ‘pure’ physical operations, and artefacts that are, sometimes, intentionally beautiful themselves. How this is possible and what it might mean for the divine origins of nature, I start to address in the next chapter.
Summary: The ‘physical’ world is not the only dimension of nature in which structures, objects, and processes appear. We also construct artefacts from what nature makes available to us as creatures of nature ourselves.

What ‘nature’ makes available to us is physical regularities and causes which we are able to manipulate for our own purposes. Those ‘purposes’ are the ‘final causes’ that explain why artefacts emerge. That ‘nature’ allows for teleological interference in causal regularities cannot be accommodated within the assumptions of ontological naturalism. Teleology, one might say, is present in nature as a consequence.

Overview of the chapter
Contrary to received wisdom the teleological provenance of artefacts does not place them outside of nature because we are part of nature. As Lynne Rudder Baker has pithily described the consequences for the ontology of artefacts,

> ‘...the existence of artefacts depends not on nature-as-if-we-did-not-exist...since nature has us in it, so a distinction between nature-as-if-we-did-not-exist and nature-with-us-in-it, is no basis for an ontological inferiority of artefacts’. 259

I suggest that being structures, artefacts share a fundamental ontological principle with any other object that guarantees their equivalent status: they are subject to the same a priori mathematical constraints of any structure, and like any structure they display express aesthetic and normative properties.

Our teleological creations are as much restrained by these features as are the objects that are the outcome of ‘physical’ regularities alone. The features any physical process or item must instantiate are precisely those that our artefacts, in order to be such things, must also instantiate.

Whilst biological processes are necessary to the ability of conscious rational creatures to engage with normative concepts like those of aesthetics for example, or value, and act in accordance with them,
that does not explain the ontological provenance of teleological and intentional standards in nature. I discuss why this is so via a critique of the work of Terence Deacon who has attempted to expand the theoretical resources of biology to incorporate teleology.

Two Human artefacts

1. The Strasbourg Cathedral Rose Window: Second period of construction 13-14c

2. A Visual representation of the mathematical E8 Lie group, a perfectly symmetrical 248-dimensional object posited to explain many of the interactional relations between particles in mathematical physics

260 Creative commons
What are Human artefacts?

The previous chapter dealt with the aesthetics of the events and items of what was called the ‘base’ physical structure of the world: the province of particle physics. The chapter began with a quote from Wendy Pullan, the editor of a series of papers presented in book form entitled ‘Structure in Science and Art’. Her introduction to the book begins by reminding the reader that

‘Bridges and buildings, DNA and the periodic table, flora and fauna, machines and circuits, human beings and the societies of which they are part, even thoughts and ideas—all of these can be understood as particular structures that are part of the world and our experience of it.’

It is already apparent in this listing of ‘structures’ that what is to count as any kind of object, whether the outcome of human intention or the strictly causal processes of the physical world, share structure as a common and necessary condition of existence. I will refer to any structure that involves the purposes of rational reflective creatures such as ourselves as an ‘artefact’.

The term ‘artefact’ or what is normally taken to make up the set of such things is often used unintentionally to refer only to ‘external’ objects of human origin like knives, forks, vehicles, and dwellings, pencils, and laptops. It should not be forgotten however that such things as the physical and phonetic elements that are the vehicles of human writing and speech are also ‘artefacts’: bits of isolated physical ‘stuff’ used as the vehicles of speech, writing, music, logic, mathematics and other forms of meaning, symbolisation, reference, and communication. Without the physical items used for these purposes there could not be identifiably human and personal lives, let alone the pursuit of empirical or any other form of knowledge.

Scientific theories, to offer a further example of the point, rely on instruments that measure and investigate the properties, processes, and events of the natural world. Even the humble tape measure or abacus are artefacts as well as those instruments that can extend human faculties far beyond ordinary perception, such as the capacity of a telescope to detect the light from a far-off galaxy, or to a receiver to pick up the residual background radiation from the ‘big bang’ which is fundamental to that theory. All these artefactual measuring devices have been intentionally conformed to enhance what we cannot do with our own biological perceptual resources.

It is a matter of such ingrained familiarity in determining a human life to be what it is, that it is sometimes hard to recognise how remarkable it should be that *Homo sapiens* using rational and imaginative faculties can make the objects, substances, and processes of the external ‘objective’ world into *entirely* novel things that perform certain functions which are nowhere to be found in any listing of the items of any natural science.

**Distinguishing artefacts from the objects of science**

What distinguishes artefacts from the objects of ‘natural’ science? ‘Natural’ objects, the philosopher Lynne Rudder Baker\(^{262}\) conventionally observes, come into being without any human intervention, whilst artefacts depend *ontologically* - *not just causally*\(^{263}\) - on human purpose. They are ‘*Intention dependent*’\(^{264}\) as she calls them, and consequentially could not exist in a world without minds possessed of beliefs, desires and intentions that bestow their functions on them.

The intention-dependence of artefacts introduces the idea of ‘final cause’ into the causal explanation of their origins. Any human creator must have a preconceived item in mind (which has no existence in the ‘natural’ world) which they wish to bring to existential fruition. That item might be characterised as a ‘final cause’: it provides the intended outcome in virtue of which the materials that come to constitute the artefact are organised to bring it about. To do something in order to achieve a ‘purpose’ is a fundamental principle of teleological explanation.

Any artefact of any kind also requires some prior understanding or skilled familiarity, whether of the practical kind or the theoretical kind, of the properties and possibilities of the natural materials with which its construction is associated: a rational familiarity, in other words, with the structure and causal behaviour of the natural elements of which any artefact is to be composed, (‘If I do x with physical substance §, y will happen. I do not want y to happen so I will not do x). It is, in other words the bringing together of ‘physical’ elements to fulfil a conceived purpose.

**The degradation of artefacts in ontological naturalism**

Objects of human creation, Rudder Baker points out, have often been degraded in metaphysical and ontological thought by being denied the cherished ontological status of ‘substances.’ Without entering

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\(^{263}\) L.R. Baker, *The Shrinking difference*...p.3

\(^{264}\) L.R. Baker, *The Shrinking Difference*...p.3
into the depths of this discussion the intuitive thought behind this is that because they are the products of mind and intentional agency, they somehow lack the full ‘reality’ of natural objects.\footnote{265 The extrusion also has the rarely mentioned consequence that it is difficult to show how science itself can represent the world AND be an item of the world itself. If a theory is an epistemological artefact that falls entirely into the personal part of the world, then what the threads are that tie the theory to the world are a mystery.}

Their ‘artificiality’ regularly excludes them from any ontology of what ‘really’ exists. Without human beings around to use them, it might seem apparent that a ‘fork’, a ‘brake’ and a ‘painting’ are of no significance when it comes to listing the components of the ultimate existence and functions of physical objects and events: when the fundamental constituents of reality are described by the natural sciences, human artefacts will be excluded because of their teleological origins.

This dismissal is of a piece with the thought that any aesthetic characteristics they may have will be dependent on how they are perceived by their human creators, not on the intrinsic characteristics of their structures.

**Ontological naturalism and teleological artefacts**

These outcomes are consistent with the picture of the world as ultimately ‘physical’ and ‘impersonal’ which I have been concerned to contest: If ‘materialism’ /‘physicalism’ describes the primary or ‘real’ substances out of which everything is constituted, and to which all other entities and processes must be reduced or otherwise made dependent, then artefacts can have no proper ontological status when we come to list the components of what ultimately ‘exists’, nor can they have an intended beauty: They are ultimately dependent for their shapes, functions, and physical structures on the *projective* agency of human thought and life.

Because the division of world into ‘personal’ and ‘impersonal’ maps onto the difference between nature as ‘physical’ and ‘personal’ as teleological, expressive and normative, it is relatively straightforward from the physicalist perspective to exclude artefacts as bearing in their ‘natural’ state marks of intention, meaning and purpose: a ‘painting’ or a ‘symphony’, a ‘fork’ or ‘bed’, or even a ‘theory’,\footnote{266} is just, in the end, a collection of natural entities aggregated together in such a way that we call them an ‘x’.

That aggregation however will not delimit anything of real ontological significance other than our gathering similar aggregates under a collective name to serve our purposes. ‘Meaning’, ‘purpose’ and all the cousins of teleological life on display in the various artefacts of personal life are projections from the subjective interior of human consciousness onto brute physicality: A beautiful painting which
displays a delicate scene of human domestic interaction, for example, that captures something of the profundity of human existence in the very ordinary, is nowhere to be found in its physical construction.

Should we accept the distinction between the ‘personal’ and the ‘impersonal’ in ontological naturalist terms, or is its apparent incontestability not an outcome of scientific practice but metaphysical prejudice? I have argued that it is indeed the latter: the reunification of ‘purpose’ and the ‘natural’, I suggested, requires an overarching metaphysics that can incorporate both into a unified picture of the world. Part of that exercise is to show how the ‘artefacts’ that participate in making human life ‘personal’ and teleologically comprehensible, have an ontological significance equivalent to the ‘physical’ events and properties of the ‘natural’ sciences.

‘Real’ objects: ‘nature-with-us-in-it’ vs ‘nature-as-if-we-did-not-exist’

Lynne Rudder Baker offers us a reflection that can move the argument in the required direction. The distinction between artefact as ‘not-real’ and natural item as ‘real’ rests, as Baker points out, on the tendentious claim that what makes a ‘real’ object a substance is that the condition of membership is ‘set’ by nature and not by us.

‘Of course, the existence of artefacts depends on us: but we are part of nature...the existence of artefacts depends not on nature-as-if-we-did-not-exist...since nature has us in it, this distinction (between nature-as-if-we-did-not-exist and nature-with-us-in-it) is no basis for an ontological inferiority of artefacts’.  

The restriction of artefacts to human agency is in any case more of a distinction between different teleological capacities that various living things can have in the world, rather than a dichotomous division between artefacts and natural objects than the case for ‘material’ or ‘physical’ ontological supremacy cares to concede.

As any brief reflection on the animal world will show, all living creatures exploit their environments to create ‘artificial’ structures like nests, holes, dams, webs, and in the case of chimpanzees, elementary tools, like sticks inserted into ant heaps to extract the insect. In this very fundamental sense, they are also engaged in basic teleological activity. No-one would question, however, their full status as proper occupants of a scientifically accessible nature.

267 L.R. Baker, The Shrinking Difference... p.6
With the evolution of human rationality, *Homo sapiens* takes a step up the ladder of teleology. He is able to create novel items that emerge from his rational, inventive, and imaginative capacities and are not just thrust upon him by his animal nature\(^{268}\) as in the case of the bee’s nest or the beaver’s dam. *Homo sapiens* becomes responsive to the normative properties available to him in the world to rationally design structures of functional use and even beauty. These extend from using physical items to symbolise any number of things and relations in language and other forms of symbolisation to independent artefacts. Human beings can now even construct artificial elements that provide additions to the world of natural elements.

A nice example of this comes from an edition of the New Scientist which I quote in full,

‘Diamond, one of the hardest known materials could have a rival. A new theoretical form of carbon called pentadiamond is just as hard as the gemstone, but as light as pencil graphite, and could theoretically be used for storing gas’.\(^{269}\)

In this case we have even added to the natural world a new type of molecular structure.

Rudder Baker’s analysis of ‘nature-with-us-in-it’ has two fundamental logical consequents: firstly, if we are taken to be a part of ‘nature’, then it follows that ‘nature’ must *include* those features which are commonly taken to distinguish us from the purely physical. Secondly, if the products of our agency reflect rational teleology in their identity and any account of their functioning (‘the purpose of a chair is to sit on’), it follows that ‘nature’ must have a proper place in any account of its basic ontology for teleology and what is required for it.

Of course, one might deny that human rationality and teleological agency are themselves anything other than illusions of the neural activities of the frontal cortex.\(^{270}\) Or one might accept that teleological language has some functional utility in human behaviour. Nevertheless, it might be argued, that despite teleological concepts serving useful functions for us, they are ultimately replaceable by, or reducible to, supervenient on, or in some way to be fully determined, dependent on, the purely causal language of some science or sciences.

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\(^{268}\) The position is somewhat more nuanced than this, however. Some animal behaviours have appeared only in particular local contexts. Some octopuses carry around with them coconut half shells discarded by local fishermen in a couple of their 8 arms and can assemble them into shelters if threatened by predators. I owe this point to Dr. D. de Pomerai.

\(^{269}\) New Scientist, *News in Brief*, (taken from Physical Review Letters, 11 July 2020, p.18, [https://doi.org/d2xn](https://doi.org/d2xn)
If one does deny teleological reality however, the burden must fall on the protagonist to explain why the denial is not itself a manifestation of precisely what it is concerned to deny: a teleological and meaningful argument expressed in physical vehicles (syntax and symbol) that are purposefully organised to convey meaning. In other words, to assert the case, the protagonist of the view must precisely exploit those properties which are denied, to speak intelligibly at all, let alone formulate the hypothesis that teleology reduces to the causal regularity of physical items.

The incompatibility of ‘nature-with-us-in-it’ and ontological naturalism

The distinction that Baker illuminates between nature-as-if-we-did-not-exist and nature-with-us-in-it is taken by the ontological naturalist to discriminate between what has ontological priority and what has not. The dichotomy he evolves from it is a metaphysical judgement emerging from a productive principle of methodology not an empirical fact.

Here is the metaphysical judgement to which he thinks the method commits him:

-----The totality of anything with a physically characterisable nature, the particles and forces of physics, the structures and properties of molecules and chemical elements, the formation of rocks, seas, stars, and mountains and organic life are all dependent on the regularity of purely causal physical events. The behaviour and nature of all these constituents are fully described by ‘laws of nature’. The ‘laws of nature’ present a ‘closed’ world completely explained by their efficient causal and physical relations. ----

Or, as I quoted Robert Hanna as describing ontological naturalism, ‘

‘...the entire world including living organisms, animals, human beings, and persons-operates according to non-teleological, mathematico-physical principles alone’. 271

This metaphysical conclusion leaves unanswered the question of how the objects of human creation (or those of other creatures) are to be ontologically characterised, other than an assertion (which I have strenuously denied) that mathematico-physical principles are obviously non-teleological. Teleology is, by implication from this principle, not methodologically and metaphysically respectable.

If we do want to take the intentional causation of human artefacts seriously, then there is a real question about their identity and place in the ontology of the world which derives from two considerations which are apparently at explanatory odds with each other: firstly, written shapes, objects like tables, functioning devices like computers and trains are fully physical items, properly part

of anything that might be called ‘the physical world’. In this respect, the parts that make up any artefact are subject to the disciplines which investigate whatever physically composes them.

Secondly, on the other hand, there is no science peculiar to knives and forks, chairs and tables, heaters, thermometers, trains, the visual representations of alphabetic structures and elements, institutions, planes, and carriages, and hadron colliders: these are not the subject of any dedicated scientific discipline insofar as their identity or functions go.

These two facets of humanly derived artefacts can create a difficulty for how they are conceived if the naturalist principle outlined above is applied to their identity. We can approach the problem by recalling that the extrusion of ‘final causes’ and ‘purposes’ from explanations of natural events is part of the origin of productive scientific method. Human artefacts, however, are structures whose nature and functions are determined by the purposes for which they are made: their ultimate origin has an intentional cause, but their operations are entirely determined by the ‘closed’ causality of the physical world.

**Teleology and ontological naturalism: intention and causation**

The trouble emerges with the following thought - If everything is ontologically finally determined by the regularity of causal events as described by the laws of nature, how is it possible that human artefacts can be intentionally put together to create things which have not emerged by the operation of those laws alone? How does the ‘physical’ world submit to purposeful interference by ourselves to create that to which it has not given rise by ‘natural’ processes?

Or to put it another way, how are we able to devise and use things for our own purposes which redirect causal laws to change physical items into artefacts that fulfil those purposes? If nature is fully determined by efficient causes, where is the ontological space for the construction of artefacts within it which are the outcome of prior intent? How can an intention, a non-physical final cause, a property of mind, contribute to bits and pieces of nature becoming a ‘fork’? There are no ‘laws of nature’ that have forks amongst their theoretical components.

The ‘laws of nature’ are typically taken to describe purely ‘objective’ empirico-physical and regularly recurring events of the world conceived under one aspect of its presentation to us. It should be apparent that ‘laws of nature’ thus conceived are not sufficient to conceptualise all the properties of a natural world, what it can give rise to, and what place the laws have in relation to rational agents like ourselves who belong in it but are able to transcend its physical nature to create novel objects.

And yet it seems to be an undeniable *a posteriori* truth about our experience of the world that it has the curious property of being exploitable by reason and purpose that cannot be accommodated within
the concept of the ‘laws of nature’. I say ‘a posteriori’ because it is a truth about our experience of the physical world that this is possible, but not one garnered from the outcomes of scientific activity.

How *could* it be since the very possibility of science requires physical vehicles to communicate scientific truths like mathematical symbols, logical relations, and scientific instruments for its purposes, all of which are artefacts, and all of which have properties, purposes, and functions which transcend the regularity of physical causation.

The possibility of science, in other words is dependent on it being the case that the physical world can be shaped by our purposes into what is necessary *for* science. ‘Laws of nature’ explain and predict the operations of entities and change conceived causally and measurably, not the production of items which are intentionally produced, particularly those scientific instruments that measure and describe those very operations.

An ability to exploit the ‘laws of nature’ cannot be itself a ‘law of nature’ since if it was a law of nature, the idea that a ‘law of nature’ is being exploited’ would have no meaning. To ‘exploit’ a ‘law’ requires a self-conscious recognition of that law and what it entails, then rationally putting it to use. That we are able to unearth, understand and use laws to change the physical world about us to accord with purposes only in our minds can be understood if we are willing to accept the possibility that underpinning all of the natural world is a structure that embodies teleology and intention and displays properties amenable to teleological manipulation. It is from this vantage point that we can manipulate causal regularities to our own advantage (or disadvantage).

**Teleology and change at the structural basis of all events**

That nature can be manipulated teleologically is surprising. It is only surprising however if one begins from the premise that teleological principles have no fundamental role to play in the ontology of natural objects. But if one to the contrary supposes that all-natural processes and objects have metaphysical principles, as a prerequisite of their being what they are, matters are different.

When objects and events are brought into existence, they must fulfill certain metaphysical conditions of instantiation. I noted in an earlier chapter ‘the concept of ‘structure’ is one of those fundamental to a world that can be experienced, is contingent, and investigable. It is a further prerequisite to any physical world that structures that can and do change. Indeed ‘change’ is a concept without which the critical concept of efficient ‘causation’ has no purchase: the very idea of a dynamic ‘natural structure’ open to scientific investigation is that it instantiates regular causal changes.

There are also certain ways in which the relationships between the parts and wholes of a structure are necessary for causal processes: causal events typically are a kind of relation between the elements
of structure, those that constitute it, as for example, the field and particle relationships whose causal interactions are necessary to articulating atomic structure, or the causal relations between properties of different kinds of structure. It is these relations that are answerable to, and described by, mathematics.

Of course, human creations are subject to the same conditions: no human artefact has immunity from change, nor could the whole structure come into fulfilled being before the existence of its parts. Again, no human structure could fail to obey some law of mathematics. Creations and artefacts are, as the objects of physical nature are, dependent on the a priori principle that the structures of nature can be changed.

The capacity ‘nature’ has to be changed both by regular causal processes and teleological manipulation constrains any possible items of existence in the same way: Any functions, shapes, dimensions, aesthetics, and causal possibilities have to obey some law of mathematics to form a logically possible structure whether teleological in origin or the outcome of purely ‘physical’ causes. These modal suggestions are of a piece with the assumption that any world must instantiate certain dictates of metaphysical possibility to have any existing physical forms, whatever these might finally be agreed to be.

Nothing in those constraints however inhibits the fact that we have constructive powers of corporeal (and abstract) teleology. What it does inhibit is what can be done with our powers. One might want to think of this as an a posteriori truth: since we do construct ‘artificial’ objects out of physical materials, the materials in question must have the property of being able to be manipulated. Most critically, if it were a metaphysical truth that nature was ‘physically closed’ by the regularity of its causal processes, it is prima facie hard to conceive how human rationality and corporeal agency could intrude into that closed circle to create designed objects.
Part 2

The theoretical role of teleology in biology

The natural world allows for ‘natural’ elements to be composed into new shapes and forms by rational creatures of its own production: *Homo sapiens*. As author and designer, we are provided for by nature for the task of teleological construction, able to deploy thought and reason in pursuit of our goals and physically and cognitively equipped to manipulate what lies naturally before us. Our rational engagement with the world is also of course via our biological constitution.

As one might expect as a result, the discipline in which the idea of teleology has proved most obviously troublesome then is that of biology. The Stanford Encyclopaedia of Philosophy begins its optimistic contribution to the topic in the following way,

‘...the manifest appearance of function and purpose in living systems is responsible for the prevalence of apparently teleological explanations of organism structure and behaviour in biology. Although the attribution of function and purpose to living systems is an ancient practice, teleological notions are largely considered ineliminable from modern biological sciences, such as evolutionary biology, genetics, medicine, ethology, and psychiatry, because they play an important explanatory role’.²⁷²

The description offered by the Encyclopaedia is sanguine about the explanatory role of teleology, but how ‘teleology’ is to be understood in scientific terms is still a contentious issue. Under the rubric ‘teleonomy’ a distinct literature has built up offering naturalist attempts either to accommodate ‘teleology’ within a naturalist world view or find ways of preserving its explanatory functions but denuding it of its teleological language.²⁷³

An abiding concern of many contemporary theorists in the cognitive neurosciences, cognitive anthropology and biology is the worry that teleology may let Cartesian consciousness back into their disciplines. Since all neurobiological and cognitive neuroscientists claim to be no longer influenced by Cartesian metaphysics, the anxiety they have is comprehensible. The emphasis placed on this denial is to stress their formal identification with the naturalism which is what they consider follows from


²⁷³ Stanford, as above.
the methodological practices of the sciences. I critiqued this metaphysical conclusion in an earlier chapter.

The rejection of teleology in experimental science in the modern era evolved with the growth of the ‘mechanical’ philosophy of the Cartesians and the Epicureans in the 17c (see the discussion below). The rejection of teleology entails of course, the rejection of ‘design’. This latter concept is inseparable from the notion of a constructing and reflective mind that builds within itself an imaginative picture of the item that the person is concerned to bring into reality. The ‘designed’ picture may be thought of in Aristotelian terms as the ‘final cause’ or purpose that governs the eventual emergence of the designed object. ‘Final causes’ were rejected by Descartes and many others in the genesis of the modern sciences as I discuss shortly.

Notably, however, one of the leading scientists of his day, and a classic figure in the development of the discovery of the elemental nature of things, Robert Boyle\(^\text{274}\) (1627-1691), offered a defence of the usefulness of teleological inference. The ‘Father of Chemistry’ argued in his monograph for a place for ‘final causes’ in ‘A Disquisition About the Final Causes of Natural Things Wherein It Is Inquir’d, Whether, and (if at all) With What Cautions a Naturalist Should Admit Them’.\(^\text{275}\)

Boyle within his own emergent discipline recognised that it is indeed hard to discuss nature without teleology intruding at some point. The lesson to be drawn is that such concepts entailing design in nature did not appear to at least one of the early progenitors of scientific method, to be obviously discredited by the new developing experimental and theoretical methods.

**Descartes, ‘mechanical’ structure, and teoleogy in biology**

The denial of Cartesian Dualism insists that the division between ‘matter’/ ‘material’ and ‘consciousness’/mind is primary. The other equally important Cartesian distinction is that between the mind as rational and teleological and the ‘external’ world it engages with. The latter in opposition to the former is conceived by Descartes to operate like a ‘mechanistic’ device of his time, a clock, for example. This division is one which precedes the Cartesian dualism of mind & body and is arguably of equal metaphysical significance.\(^\text{276}\)

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\(^{275}\) R. Boyle, A Disquisition About the Final Causes of Natural Things Wherein It Is Inquir’d, Whether, And (if at all) With What Cautions a Naturalist Should Admit Them, John Taylor, London, 1688 (reproduction of the original in Cambridge University Library), *Early History of Medicine, Health & Disease Series*, early English Books online, EEBO Editions, ProQuest

Nevertheless, the intuitive reality of the role of reason and teleology in understanding behaviour in biology through terms like ‘function’, ‘in order to’, for ‘the purpose of’ and ‘the sake of’ often appear to be the only available concepts to describe certain phenomena. ‘Maturation’, for example, is a fundamental concept without which elements of a developing life span and its goals cannot be described.

An array of cognitive and behavioural structures, such as those to do with ‘working, short-term and long-term memory’, ‘social representation’ and so on, all require reference to the purposes they fulfil in the life of a creature on pain of that life being unintelligible. Any form of memory that influences a future action for example, is entirely cognitive, representing a past reality that no longer has any ‘physical’ existence but can provide a purpose that causes future behaviour. Similarly, ‘social representations’ provide goals that can determine even instinctual behaviour. Bees, for example, perform complex social movements that indicate the position of flowers and their distance to other hive bees.

The need for explanations of action based on an organism’s capacity to represent a future outcome to itself which it acts to bring about, puts pressure on a fundamental principle of physicalist naturalism. As I outlined earlier for the physicalist naturalist it is an ontological necessity that nothing in the physical world should escape the regularity of efficient causation, x preceding y as a matter of uniform occurrence.

A few biologists, neurobiologists, and philosophers of biology have laboured to gain some clarity on the acceptability or otherwise of teleological language in sentient creatures as a whole. A contemporary example is to be found in the extensive work of Terrence Deacon, a neuroscientist and biological anthropologist. He explicitly holds Descartes to account for his conception of the external physical world as ‘mechanical’. The ‘mechanical’ conception, he argues, displaces the need for a necessary space for teleological explanation in the behaviour of sentient organisms, amongst whom are included ourselves.

Deacon understands the need for ‘science’ to respond to the question of teleology and purpose directed causation at least in the biology of sentient organisms. I question however whether his restriction of teleological ontogenesis to biological organisation, whether in the form of neurological tissue or otherwise, is adequate to tackle the Cartesian ‘mechanism’ problem.

**Origins of the ‘mechanical’ world: Descartes and Aristotle**

In order to understand the basis of Deacon’s critique it is useful to take a step back and examine the origins of Descartes conception of a ‘mechanical’ world. This will also serve the useful function of
beginning to demonstrate how that picture, even with its modern updates, does not escape the basic Cartesian schema. Because of this, modern ontological naturalism is unable to articulate a proper metaphysical place for normative and expressive properties which have conceptual connections to teleology.

In her book length study of the contribution of Descartes (1596-1650) to the dismantling of the Aristotelian theory of substantial forms and final causes to the development of a modern empirical science, Helen Hattab writes,

‘(Descartes) justifies the replacement of substantial forms.... By denying the distinction between natural and mechanical phenomena. Automata, he insists, are also works of nature. When building them we simply apply active things to passive things as we do when we sow grain or breed a mule. The difference between machines and natural objects is simply one of degree for Descartes’. 277

As she says, Descartes view

‘in other words, (was that) since nature is just a more complex machine the same procedures that apply in mechanical demonstrations apply to natural phenomena’. 278

In the historical context Descartes was engaged in a theoretical struggle with the defenders of the Aristotelian or neo-Aristotelian explanations of natural phenomena. 279 Aristotle or his followers, made a discrimination between ‘mechanics’, the construction of human devices that involved the use of Euclidean geometry, and the theoretical four cause explanation of all natural ‘forms’ and ‘substances’, the inanimate and animate included.

The work purporting to deal with Aristotle’s discussion of elements of human mechanisms became available in Latin translation in 1519 as Quaestiones Mechanicae. In this work there are a number of comments about human constructions, but these seem not to have been brought by Aristotle within the scope of his ‘essence’, ‘substance’, and ‘four cause’ theory.

It is a question of historical interest why the Aristotelian discussion of mechanism did not incorporate his ‘four cause’ and substance theory. That question cannot be addressed here, but one possibility is

278 H. Hattab, Descartes on...,p.86
279 Aristotle’s Quaestiones Mechanicae seem to have first appeared in Latin translation in 1519. It provided a series of reflections on a variety of simple mechanical devices which are said to have their ultimate cause as the properties of a circle, (see Hattab), and see also D. Gerber, Descartes, Mechanics and Mechanical Philosophy, in, Midwest Studies in Philosophy, XXVI, 185-204, (2002).
that Aristotle’s demarcation hinged on the idea that human artefacts could not appeal to the ‘natural’ unity or ‘essence’ of a substance occurring ‘naturally’.

Hattab suggests that whilst opposing the ‘substance’ theory of Aristotle, Descartes may nevertheless have been influenced at some point by Aristotle’s discussion in the *Mechanicae* of the use of geometry in the construction of artefacts. Descartes seemed to have discarded Aristotelian forms and ‘essences’ because they could not be measured or otherwise given useful empirical form but recognised that Aristotelian mechanics and its discussion of the uses of geometry in constructing artefacts, could be usefully applied to understanding how the natural world might work.

His fundamental contribution was the extension of the idea of ‘mechanisation’ to physical objects and events in the external world as a whole. The essence of his view was that by drawing a similarity between machine and nature, it could be concluded that the material world evinces only those properties immediately susceptible to the mathematics and measurement of his time: the dimensions describable by Euclidean geometry, length, weight and so on.

The universe and its occupants he opines, is like a gigantic machine with interlocking physical shapes that transmitted causal relations via their immediate physical proximity. His picture of the world was that of a ‘plenum’: a space fully filled with objects decomposable into those shapes allowed for by Euclidean geometry; causal arrangements resulting from transmission of movement accomplished by the forces exerted when one shape came into contact with another.

‘Matter’ in Descartes conception and those of the new developing view of matter treated it as ‘lifeless and inert’.\(^\text{280}\) Recognising however that a place needed to be found for human rationality and consciousness Descartes proposed a second fundamental but different ‘substance’ in interaction with the corporeal to give a unified account of the conscious human person. The external physical world was thus composed in Descartes view of an ontologically different ‘stuff’ metaphysically and scientifically incapable of supporting consciousness and rationality.

Descartes purged the world of normativity and teleology to clear it for ‘objective’ properties (size, shape, dimension and so on; those being the properties with which the mathematics of the time could cope). Needing a place for consciousness and rationality he confined all of these phenomena to the ‘substance’ of mind. The machine-like view of the world then developed through the hands of

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philosophers like John Locke (1632-1704),\textsuperscript{281} eventually mutating into ontological naturalism with the place of consciousness, teleology, and value in broader reality a metaphysical mystery.

In his haste to remove the obstructions of Aristotelian theory from the ‘natural sciences’, however, Descartes ironically removed the very features of normativity from the physical world required for the mathematical description of the causal relations of structures that he needed for a mathematical science. I explore and develop this idea in the next section.

Descartes’ error: the mathematical structure and normativity of ‘nature’

To argue that anything which is an ontological target of empirical investigation must necessarily have certain kind of metaphysical properties, is not a claim about the contingent character of a metaphysically necessary property in any empirical case: \textit{everything} that is the subject of a scientific theory must have a structure and its associated properties.

What those structures are and how they work is the business of science. We are blind to photosynthesis, for example, before we understand the structures of solar and chemical energy transformations and the role of biological elements in that process, but that they are changeable structures is a condition of their appearance as physically investigable phenomena.

To the extent that mathematics imposes upon worldly structures logical dimensions that they must obey to qualify as a physical\textsuperscript{282} item at all, the ‘physical’ and its fundamental base already display properties that are non-physical, and normative. \textit{Contra} Descartes, to conceive of anything as a ‘mechanism’ in the terms that he does is to conceive of something which has the empirically investigable nature that it does because it \textit{meets} the prior conditions of manifesting as worldly things of a particular structural type.

Possibly because these metaphysical requirements of the existence of a physically functioning world share with Aristotle a demand for \textit{a priori} preconditions of identification and existence, Descartes failed to make the necessary distinction as indeed did Aristotle, conflating conditions of what something has to have to have \textit{any} physical form at all, with the contingent properties that anything \textit{has} as an extant physical structure.

\textsuperscript{281} P.N. Nidditch, ed. & Introduction, \textit{The Clarendon edition of the works of John Locke: An Essay Concerning Human Understanding}, O.U.P., (1979). John Locke was one of the fathers of empiricism, the idea that the only knowledge we can have is though sensory contact with the world. He also amongst those who introduced a distinction between those experiences which ‘mirrored’ the world and those properties which were constructions of the mind.

\textsuperscript{282} I mean to include here the properties of the quantum world which cannot be said to be ‘physical’ in the traditional common-sense view of the world nor in the Newtonian view. ‘Physical’ here is really a shorthand for what is taken by physics to constitute a necessary basis for all other ‘natural’ structures.
Although the word ‘structure’ is not a metonym for an Aristotelian form, understood in a similar way, it does a metaphysical job that aligns natural and human artefacts. That the world has structures with potentials to become other things, change other things, and be changed by other things is a metaphysical sine qua non of the broader picture: they are part of the very meaning of what we call the ‘contingency’ of any object at all: the possibility of their changing and even going out of existence.

It is worth repetition since it is fundamental to my case: all and any structures are constrained by the mathematics of possibility, potential, and change, that make them available not only as causally investigable but as manipulable into novel objects by imaginative and purposeful teleological agents like ourselves.

Natural and human, organic, and inorganic structures thus all share the basic necessary traits that define them as legitimate ontological inhabitants of anything making up a world: structure, aesthetics, and modal possibility, constrained by the mathematical functions they exemplify.

The overarching picture provided by this metaphysical trinity underpins the manifestation of anything that might count as part of the ‘physical’ world inclusive of that part of it which we are inclined to call ‘nature’. The tools of our epistemological engagement with nature, both abstract and concrete are attempts to develop an understanding of how the structures of ‘nature’ work. ‘Methodological’ naturalism helps define the means and which contingent properties that can yield that understanding. It does not rule out the broader picture.

Deacon’s Incomplete Nature and Descartes: opposition or similarity?

I now return to the work of Deacon. With the picture above in mind, I hope to show that even a sophisticated grasp of teleology, the biological world, and the physics of energy that Deacon displays even whilst opposing Cartesian mechanism in biology, can still unwittingly accept it for the other natural sciences.

Unlike many philosophers who hope to resolve the tension between teleology and physical causal aim by finding a suitable philosophical relation between the two domains that preserve the ontological primacy of the latter, Deacon acknowledges that any resolution of this issue must start from the assumption that as the title of his extensive book and research on the question indicates, ‘nature is incomplete’.283

The title of the book summarises his thesis which is that biological science, as a branch of nature, cannot avoid the empirical pressure placed upon it by biological data to incorporate explanations of

‘purpose’ into its theories. He thinks that what makes this a theoretically unpalatable task for some, is a prior implicit attachment to a Cartesian derived mechanistic view of nature.

Deacon proposes that it is the

‘...tacit importation of a human artefact view of the world, with its implicit design like logic into a materialist metaphysics that restricts the introduction of anything like final causal relationships...where design and purpose can only be imposed from the outside’. \(^{284}\)

By the ‘outside’, he means by ‘rational human persons’ who have mastery over the teleological concepts that ‘design’ involves.

‘Incomplete nature’ is intended to signify that rather than trying to squeeze the teleological into the physical, our conception of physical and chemical processes and the causal understanding (that of efficient causation) that accompany them, need to expand when dealing with organic life. Within the later term he wants to include sentient biological creatures of all kinds. Deacon’s essential idea for doing this is to revise the principle of ‘efficient’ and ‘mechanical’ causation in the light of the ‘fundamental requirements of life from the point of view of physics’. \(^{285}\)

Because he thinks that the terms ‘teleology’ and ‘intentionality’ have ‘mentalistic connotations’\(^{286}\) and recognising that

‘...more primitive biological counterparts...have intrinsic incompleteness and other dependence’\(^{287}\)

as necessary features of the understanding of their biological lives, he proposes a new term to separate out the intrinsic ‘mentality’ of ‘teleology’ and ‘intentionality’ which he calls ‘ententionality’. He thinks that his new term encompasses a notion of teleology that includes and explains human teleology in its full flourishing when ‘mentality’ or consciousness is ‘added’ to it.

He thinks that the idea of ‘incompleteness’ as a motif for reintroducing teleology into nature provides him with a technical opening which can help domesticate the concepts of ‘purpose’ and ‘final causation’. The problem for which he wants to find a theoretical solution within biology is one that he thinks is hindered by its roots in Cartesian Dualism,

\(^{284}\) T.W. Deacon, *Incomplete Nature...* p.37
\(^{286}\) T.W. Deacon, *Incomplete Nature...* p.25
\(^{287}\) T.W. Deacon, *Incomplete Nature...* p.25
‘The metaphysical problem of reintegrating purposiveness and subjectivity into theories of physical processes (has) led many thinkers to propose a kind of forced marriage between mental and physical modes of explanation’. 288

He extends his critique of the ‘forced marriage’, in essence, the mind-body problem bequeathed by Descartes, to include theories which address the dynamics of complex systems, including Darwinian processes. Despite the latter, for example, yielding

‘...enormous advances in our understanding of the orderliness observed in living, neurological and even social processes...dynamical systems...are often forced to explain away the end-directed and normative characteristics of organisms because they implicitly assume that all causally relevant phenomena must be instantiated by some physical substrate or energetic difference. Consequently, they are limited in their power to deal with the representational features of mind, as are simple mechanistic accounts’. 289

Similarly, he also critiques theories of mind that rely on concepts such as information, representation and function and assume these terms are

‘...shorthand proxies...for otherwise well understood, but long, clumsy and arduous mechanistic accounts; that is accounts involving only the extended physical properties of things’.

‘Ententionality’ and teleology, he argues, are phenomenon that emerge with the neurobiology and behaviour of organic structures and creatures. It is intrinsic to his case that ‘goals’, ‘purposes’ and ‘meanings’ are also emergent phenomena, nowhere present in the universe until their appearance with certain forms of evolved life.

I hope it does not do Deacon an injustice to summarise his view as the idea that we must somehow find a theoretical way of importing the language of teleology into our understanding of the behaviour of minded organisms in such a way as to not only explain the neurobiological origins of our capacity to think teleologically and normatively, but also the origins of teleological concepts and reasoning themselves.

His account of how purposeful behaviour emerges from matter is highly technical involving an attempt to develop structures based on their need for ‘energy’ as understood in the second law of

thermodynamics, particularly mechanisms for storing and generating their own energy. These structures, in the end, must develop ways of obtaining ‘sources’ of energy. It is out of these requirements that the ‘foundations for telodynamic life are laid’. The essential point is that the appearance of teleology and normativity in the world are, for Deacon, an empirical and contingent issue.

That this is his view or something close to it, is supported by a paragraph during the course of which he discusses primeval earth prior to the evolution of the hominids. I quote this in full because it is a common picture of the way that those scientists who see the need to admit teleology frame the problem.

‘It can hardly be doubted that there was a time when these phenomena (the sorts of processes and relationships that involve purposes, goals, meanings, and the like), were not in evidence on the surface of the earth, although they are everywhere in evidence at present. Certainly, none were present when the earth’s surface was still hot enough to boil water... They probably did not just drop in from anywhere, though if they did, there origin would need to be explained there. Wherever and whenever they arose, they were new, even if they are now mundanely common in our experience.’

The metaphysical conclusion to draw from this segment is that teleology, goals, and purposes could not be said to ‘exist’ in any sense of the word prior to the evolution of sentient organic life: Deacon’s position is not that, as I understand it, that sentient creatures emerge into a world where teleological concepts, final purposes and reasons become available to them as they become more complex creatures but that they construct the necessary frameworks themselves. ‘Teleology’, final ‘purposes’, and so on are entirely emergent cognitive constructions of biological tissue (or some aspect of a CNS and the behaviour it governs).

There are two essential problems with this argument. Firstly, if no other scientific discipline admits ‘purposes’ as final causes because no other discipline has any space in a conception of how things work for anything other than the progression of causes, then how the ‘purposes’ which emerge with biology gain any traction in the rest of the physical world is a problem.

What is it about the physical world so conceived in other words that can make it hospitable to rational teleological manipulation? This is the problem I have addressed at length in the earlier section. The

290 D.C. Dennett, A review of...p.88
291 T.W. Deacon, Incomplete Nature...p.38
problem is a qualitative leap from a purely physical description to ‘reason’, ‘purpose’, ‘intentionality’ and value governed agency. It is as if someone were to fully explicate all the movements and pieces on a chess board in terms that never referred to rules, and at some point in that explication declare, ‘...and those are the rules of chess’.

The second problem is that how it is possible that creatures can become responsive to normative and teleological criteria does not provide an answer to where in the world normative standards are to be found.

To explain (if he can) how an organism becomes able to recognise and respond to normative criteria is not the same thing as explaining from whence those standards derive and their proper place in the metaphysical scheme of things. To show what may be required cognitively (or neurobiologically) to play a game of chess is not the same thing as understanding the rules that define what that game is (or what a rule is for that matter).

**Normativity in the world and thinking normatively**

It is no answer to say that we can construct or invent the idea of a standard or rule since to construct a standard or use a rule presupposes that one already has an idea of what a standard is. To have an idea of what a standard is, is already to be in possession of the idea of some judgement being answerable to something other than itself. To be already in possession of the idea of standards suggests that human beings come into cognitive contact with a world of teleology and normativity, rather than build it.

It is the same mistake, for example, of conflating the ‘laws’ of logic or mathematics with what is a necessary but insufficient condition of being able to understand them. Additionally, one cannot move from any set of properties described in terms of the regularities of any set of causal relations to the realms of ‘logic’, ‘mathematics’ and ‘representation’. The move from the physical to the mathematical and logical is a conceptual one. It is a conceptual framework that describes the conditions of existence without which the physical world and its inanimate or animate structures and functions is logically impossible.

It may be, as Deacon suggests, that cognitive neurobiological attainments of varied and multiple sorts are a necessary condition of grasping logical and normative truths. But these truths are, as it were, present in the universe as metaphysical conditions on the possible existence of any rational and sentient beings.

Deacon makes the same mistake as Descartes which is to fail to recognise that there is no physical world without the logical, mathematical, structural, and hence normative truths which give existential
shape to physical structures. These aspects of the world are those we emerge into contact with given various necessary, but not sufficient, complex evolutionary and neurobiological preliminaries.

**A ‘nature’ full of aesthetically mathematical structures**

Once we have seen this point, then the connection between physical items taking some structure, mathematical descriptions as determining the possible and actual form any such physical things can take, and the aesthetic features that they thereby manifest becomes visible. They provide the constraints on the intelligibility of any structure manifesting itself as a feature of the natural world, whether the arcane world of particle physics or the biology and patterns of behaviour in which Deacon has his primary interests. In fact, the underpinnings of ‘neurobiology’ in which Deacon places his hope are themselves the outcome of the structural possibilities of any world such as we have it.

Deacon does not really either have a theory of artefacts. He recounts the traditional picture of them as projections of human interests onto blank physicality.

‘Nature’ understood through the lens of ‘structure’, ‘mathematics’, ‘aesthetics’, and the relations between them, on the other hand, has precisely the place for ontological equivalence that Baker Rudder proposes for both physical objects and processes and those that are the outcome of intentional human production.

Any ‘object’, ‘process’, ‘event’ or substance, which comes into physical being must be intelligible in virtue of these features, whether the product of non-sentient causes, ‘simple’ sentience, or fully teleological rationality such as we possess.

Once we lift the restrictive scope through which ontological naturalism views the world by a mistaken leap from the causal restrictions of methodological naturalism to the ‘personal’ ‘impersonal’ distinction it imposes on metaphysics, the enchantment of ‘nature’ is restored: Aesthetic properties are manifested in ‘impersonal’ objects, and the artefacts of ‘personal’ creation obey the same underpinning unifying principles as those of ‘natural’ objects.

Nature can thus exhibit beauty in its constructs enabled by the mathematical aesthetics of structures. We are similarly provided by ‘nature’ not only with the material for the construction of artefacts but also access to the aesthetic, mathematical and normative structures of the empirical that enable us to design many things, including things of great beauty.  

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292 It comes along with the ability to distinguish beauty and ugliness that sometimes the latter are sadly chosen.
However this is finally to be understood in the theories of the biological and zoological sciences, it contributes to the evidence that nature has teleological potential within its ontological resources. That potential is expressed in its fullest form by human persons but only because ‘nature’ can accommodate both us and the principles of purposeful behaviour.293

**Teleology in nature and divine provision**

Once we grant the necessity of normativity in deep metaphysical nature, the door is open to the idea that for the physical world to finally issue in a sentient nature, basic physical structures must have carried in their metaphysical heart the potential for conscious, rational teleological creatures to emerge.

It is a natural response to the recognition of the coherence of that intricate metaphysical structure to ask what might explain its origin. If that final existential resting place is taken to be ‘impersonal’ or natural in the ontological sense that excludes teleology and the personal, then we are faced with the problems with which this chapter has been concerned: the isolation of teleology, and human artefacts from a broader necessary picture of the world, and the inability of a biological science to answer the question of normative provenance.

An origin however that includes teleology and the personal seems better fitted for the purposes of articulating the intelligible coherence of a ‘working’ physical world, its careful apriori underpinnings, and their equally intelligible relations to teleology, aesthetics, beauty, and mathematics manifest in artefactual and ‘physical’ objects and events.

That origin I postulate is a personal, divine, and teleological one and it is the purpose of the next chapter to elucidate beauty, the nature of its transcendent power, its author and how the human capacity for artefactual construction echoes the divine artefact that is the natural world.

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293 It is worth mentioning that the very idea of ‘evidence’, the history of evidence, and the history of science is dependent on normative (and cultural) prescriptions for its existence. Is it at all intelligible, for example, that the history of science relying as it does on teleological concepts and the presence of thinking persons, and their artefacts might turn out to be nothing other than a conceptual framework reducible itself to the ‘impersonal’ causal forces of the natural sciences? The incomprehension of this possibility is, I suggest, manifested in its posing.
Chapter 4

Universal structures of beauty and their transcendental teleology

**Summary**: Having established normative properties as metaphysically fundamental in the personal and impersonal worlds, particularly aesthetics, in this chapter I discuss the universal character of 'beauty', how it contributes to arguments for god’s existence, and the relation between that beauty and the universality of divine authorship.

**Overview of chapter**

I begin by noting that since everything has an aesthetic character, it is to be expected that amongst the very different events and objects that constitute the world, many will be beautiful.

Experiences of beauty in the physical sciences, nature and human artefacts often produce existential questioning and yearnings amongst theists and atheists alike, provoked by something in its nature which has a transcendent effect.

Beauty would thus seem to constitute an important area of interest for natural theology. I offer some evidence to suggest this is surprisingly not the case. One reason may lie in the fact that the appeal to ‘beauty’ as producing transcendental urges is, or can be taken to be, entirely phenomenal as opposed to rational, or ‘subjective’ rather than ‘objective’, assuming that these modes of apprehension necessarily have ontological consequences.

Contrary to this collection of thoughts I suggest that the association of structure, artefact, nature, aesthetics, draws one intuitively to personal intent once the components of the broader framework I have developed are brought into conceptual play.

That an artefact and an object of nature share their ontological heritage weakens the idea that objects of nature cannot display as part of their identity the personal hand of divine creation. It does so, because it intimates that a way can be found to integrate teleology, the normative, and the personal into the conditions of the existence of ‘physical’ objects thereby bringing them within the scope of teleological intent. This having been accomplished it is a short step to implicate divine intentionality.

The language of divine artistry interpolates itself because it alone can encompass the presence of the personal and the presence of the purely physical and causal in the same metaphysical and ontological landscape that is our world. Given that all the objects of human life instantiate the teleological, when
we find beautiful structures fundamental to the existence of all physical being lurking in the aesthetic thickets of the natural, it is a spontaneous inclination to feel the presence of a personal creation.
Part 1

The logic of aesthetic universality and aesthetic empiricism

I have maintained that aesthetic properties are logically prior to any coming into being of the structured elements of the universe. The form of this argument is as follows: Let x = any aesthetic property, let y = any structure: if x is a necessary constituent of something being y, then, if -x then -y: no structure without an aesthetic character exists.294

It does not follow from this that any given aesthetic property must always be instantiated in the same structure. In other words, not every occasion of an instance of an aesthetic property x is identical with any instance of a structure y.

What the argument summarises in effect is the metaphysical prescription that for anything to exist it must have some aesthetic description. It does not follow from this that we can know the aesthetic character of an object prior to any encounter with an example of its type: we can only know whether something is beautiful or otherwise after we have had some experience of it. So, whilst we can know a priori that all structures have an aesthetic character what aesthetic qualities they have is an a posteriori matter.

Give that everything must have some aesthetic character it is a tolerable assumption that varieties of aesthetic qualities are to be found universally. Like other universally perceptible qualities, amongst the many forms the aesthetic can take are to be found many beautiful things; mathematical structures, poetry, painting, personality, and anything one cares to mention. Patrick Sherry in his book Spirit and Beauty, also reminds us of the scope of the term,

‘...the fact is that the word ‘beautiful’ is not used of material things alone. It is also predicated of the immaterial, of ideas, of scientific theories...’.295

But what is it we think we are talking about when ascribe beauty (or any aesthetic quality) to something?

Objectivity, structure, and aesthetic experience

It is an intellectual tradition in western analytic philosophy and analytic theology that a property or an object cannot be discussed unless it can be defined, preferably in the formal language of symbolic

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294 It might be claimed that something could be aesthetically neutral, but this is itself an aesthetic category. In any event however it is unclear what it could be for something to have no aesthetic characterisation at all.

logic. Whether or not such definitions are always attainable and whether intelligible talk about something without such a preliminary is possible, is a matter for debate. My discussion in what follows gives preference to the idea that many concepts, not just those concerning aesthetics, cannot be given rigorous identity conditions that easily sort things into one exclusionary category or another. I justify why this is so in a later section.

The British philosopher Frank Sibley noted that aesthetic terms span ‘a great range of types and could be grouped into various kinds and sub-species’.296 He drew a distinction between terms which sometimes serve an aesthetic purpose, those which have

‘...come to be pressed into service as aesthetic terms... (such as ‘dynamic’, ‘tightly knit’), and those whose primary use is aesthetic (‘lovely, pretty, beautiful, dainty, graceful and elegant’).297

There is a distinction which Sibley does not make but is important for my purposes. These I will call ‘explanatory descriptors’. Explanatory descriptors are just those structural properties that are appealed to in justifying why the structure in question has aesthetic merit: parts of the whole and characteristics that belong to the whole.

Terms like ‘simple’, ‘unifying’, ‘proportionate’, ‘harmony’ and ‘symmetry’ which apply to aspects of structural organisation are often used in partial explanation as to why something merits the accolade of ‘beauty’. They are also common to the experience of objects and events across the board, from those whose genesis is in human teleology and agency, to those which emerge without that influence in the natural world. In one way or another all attempts to explain why something is experienced as ‘beautiful’ call on these structural elements or close semantic relations to them.

In the theological and philosophical tradition there is at least one well known attempt to provide a definition of beauty, that of St. Thomas Aquinas (1225-1274)298 which incorporates all these features into a coherent metaphysical picture. Christopher Scott- Sevier299 who has written one of two recent full length works on beauty in Aquinas, (the other being Umberto Eco300) mentions that until Immanuel Kant (1724-1804) five centuries later, no other author on beauty has offered an account of it that drew

297 J. Benson, B Redfern, & J.R. Cox, Frank Sibley..., p.4
298 R.B. Bernier, After Aquinas: Restoring Hope to Beauty. In, Philosophy and Theology,28, 1, pp.91-100, (2016)
both elements into a discussion of beauty and its nature. Kant, however, was less interested in the aesthetic properties of objects or events and more in aesthetic judgement and how it is achieved.

I draw attention to the Thomistic account for two reasons. Firstly, Thomas offered an analysis of beauty which recognised that an aesthetic experience requires a perceiver or cognisor suitably equipped for its appreciation and proper judgement. Secondly, despite this he grounded ‘beauty’ in the intrinsic nature of things.

The proper characterisation of what beauty is on this view embraces two components. The first of these, the ‘objective’, constitutes the nature of the things that are beautiful. They are taken to be properties belonging to the object itself which give it the beauty it has. The second of the components is the phenomenal experience of the beauty conveyed via these structures.

It is this division that underpinned my earlier claim of two modes of access to the aesthetic structures of mathematical physics: one determined by mathematical descriptions and the results of empirical investigation, the other by a cognitive resonance with the aesthetics of the structure. This I suggested was possible because the structure manifested particular expressive aesthetics as a consequence of its objectively determinable structural properties. In so doing they open up the mathematical structures of the particle world to normative evaluation.

Hence the Thomist assertion that the structure of things and their appreciation is closely intertwined with knowledge of them. ‘Beauty’, R.B. Bernier interprets Thomas as saying,

‘...has to do with knowledge, and we call a thing beautiful when it pleases the eye of the beholder...beauty is a matter of right proportion for the senses delight in rightly proportioned things...Things that are lacking in integrity or perfection are for this reason ugly’.301

The idea of ‘right proportion’ underpins the possibility of a general position acknowledging the objectivity of beauty, the close relation between objectivity and structure, and the importance of subjective experience in any full explication of it.

301 R.B. Bernier, After Aquinas: Restoring Hope to Beauty, Philosophy and Theology, 28, 1, pp.91-100, (2016), p.96. I should note that whether or not there are exegetical problems associated with Bernier’s understanding and translation is not important here. The quote is close enough to a common understanding of a certain view of the relation of form to aesthetic perfection or beauty.
Beauty, knowledge, and the integrity of structure

Along with its association with so many different types of things, beauty has often been strongly associated with truth and the ‘rightness’ of what expresses it as I discussed in chapter 2. In most contemporary usage it carries little of these connotations. In her discussion of the cultural commentator Eric Gill’s commentary on how beauty has become understood in the wake of scientific development and cultural change since the 17th century Christian West, Cambridge philosopher and theologian Catherine Pickstock writes,

‘...the main shift upon which his (Gill’s) discourse of beauty pivots is the sundering of the so-called transcendentals of Being, Unity, Truth and Goodness and Beauty in the Middle Ages...until that date, from Plato to Aquinas, these had generally taken to be convertible one with another...’.

Classical thinking, particularly in its Platonic and neo-Platonic variants, considered ‘truth’ as the idea that everything had its ‘proper’ place in an ordered hierarchy of being. In the case of beauty, the thought is that it provides a standard of how something should be because beauty is ultimately displayed when something fits perfectly in its place within the hierarchy. Platonic thought was highly influenced by Euclidean geometry. Plato considered that the exactness of geometrical form and its various manifestations exemplified a world of abstract perfection in which the ‘sensibles’ of our world were imperfect copies.

It is not necessary however to adopt Platonic metaphysics to emphasise the empirical observation that aesthetic merit is often associated with the idea that the structure of something has come as close as possible to achieving the maximum aesthetic merit that a thing of its type may accomplish.

Stripped of its Platonic inheritance the accolade that something is beautiful is to associate it with the idea that beauty is indicative of the right ‘ordering’ of the thing concerned: A thought that it could not have been better structured; that in being structured in the way it is it has delivered a sense of finality to the best possible ordering of the structure concerned. The closer a structure is perceived to come to this desired end is often associated with some functional purpose to which the artefact is put.

No less a figure than David Hume made this connection in A Treatise of Human Nature when he noted referring to ‘every work of art’, including such diverse items as

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‘…scritoires, chimneys, coaches, and saddles’... (it is)... ‘a universal rule’... that their beauty is chiefly deriv’d from their utility, and from their fitness for that purpose, to which they are destined’.

Hume of course wanted to argue that the perception of beauty was a consequence of utility not that utility was a consequence of beauty. For Hume and later thinkers like him, the ontology of aesthetic properties and their genesis is to be sought entirely within the life of sentient rational creatures. The involvement of beauty with intellectual and sensory perception indicates to intellectual temperaments like those of Hume and his metaphysical descendants, not the conformation of the structures of the things themselves to beauty, but rather an element of the subjective life of human persons projected onto a world of bare facts, at best an interactive outcome between physical properties of a thing and human cognition. Aesthetic reactions are often analysed in philosophical arguments following these broad lines: as supervenient on, reducible to, or otherwise explained in virtue of some useful judgement or function that the response serves.

It is certainly the case that beauty is often connected to some commentary on how well the well-structured object performs a task in the case of physical things and human artwork. It is not only the utilitarian functions of physical objects that the idea of structural integrity serves in human life either: A piece of poetry or literature, or work of history, or even the character of a person is often assessed on some relation it bears to the elements that compose it, whether these are syntactic, semantic, acoustic, behavioural, or mathematical.

Using explanatory descriptors in this way however rarely serves a reductive function. More often than not they are employed in partial explanation of why an experience and the emotions accompanying it are produced by the artefact in question. Thus, the metre of a poem is analysed to answer the question as to why the rhythm it produces helps to evoke a certain emotion or sensation that helps contribute to what it is the piece is trying to communicate.

A narrative work of history, to consider another example, is often commended for the integrity of the way its weaving together a number of events into an interpretative whole illuminates some part of human affairs. One might similarly reflect on ballet, painting, or music. In the world of the natural

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sciences as I have taken some effort to suggest explanatory descriptors contribute to theory judgements, ‘symmetry’, ‘unity’, ‘harmony’ and so on.

P.A.M. Dirac as I have previously discussed, amongst other physicists, held the view that the foundations of a mathematical theory, if suitably beautiful, provide good reason to ground its theoretical efficacy. Dirac’s position seems to have rested on some idea of mathematical structure, ‘beauty’ and utility as providing secure foundations for judgement. Put another way, the representational ‘truth’ of the mathematical description was warranted for him by the mirroring of those qualities in the structural phenomena with which he was concerned. In Dirac’s case and those of others like Einstein, the perception of beauty and functional utility seem to have emerged from minds acutely tuned to the exact coincidence of theoretical truth and beauty.

The above reflections suggest that the explanatory descriptors mobilised in explanation of the aesthetic appeal of something, are elements and properties of the things themselves, part of an explanation as to why that thing produces the response or judgement that it does. No doubt were we differently constituted, the aesthetic appeal produced by the structural features would not elicit the responses they do from Homo sapiens, but this is an empty argument as it stands, since the entirety of our experience of the world is dependent on our being constituted the way we are.

If the aesthetics of structures are thought to be ‘subjective’, and essentially explained away via our affective and cognitive relations to them without objective remainder, this is an outcome of the ‘personal’/‘impersonal, ‘teleological’/‘physico-causal’ metaphysical dichotomies I have been concerned to undermine, not a carving of reality at its fundamental joints.

Since aesthetic properties as I suggested, are necessary constituents of anything being a structure, it follows that if we have any perceptual, intellectual, and imaginative grip on reality at all, then aesthetic properties will be fundamental across every domain of our experience of that reality. It will be hardly a surprise that our cognitive, behavioural, mnemonic, affective and underpinning neural structures will be strongly attuned to the manifestation of aesthetic properties across reality.

This reflection also points to an important realisation that moves aesthetic experience beyond the practical and the utilitarian: The whole point of an artefact, or even a ‘physical’ object or event may be to produce an aesthetic sensation or response that is meant to characterise something about the world which would be left out if the aesthetic response were missing. Contra Hume and his descendants, the experience of an aesthetic quality may illuminate some part of the world’s character that cannot be assessed via any other way. ‘Aesthetics’, in other words, may provide a unique mode of access to the nature of things.
One should be careful, however, not to exhaust the content of beauty as simply a constituent element of the world. It is often noticed that beauty is sought for its own sake. Also, that it is sought for its transcendent power, whether this be purely in relation to the mundane or to the spiritual. The coincidence of all these attributes is notable and I argue later, suggest intention.

**The universality of beauty and the particularity of beauty in physics**

The argument that there is an association between structure and beauty, subjectivity and knowledge may be thought to give rise to a difficulty in the assertion that beauty is universal. It may be thought of in the following way: If so many different things of different type, constitution, and origin can all be possessed of the same beauty, then how does this fit with the assertion that particular structural features (explanatory descriptors) and such general features as ‘unity’ and ‘harmony’ are strongly connected to beauty. Surely it may be argued very different things can be called ‘beautiful’ which do not share identifying features.

Secondly, if ‘beauty’ as used in mathematical physics and such things as engineered structures and mathematics is divorced from the use of that term in matters of expressive artistic creation, does this not suggest that our common use of this term when applied to human arts and creations, and our everyday experience of the natural world mean something different from the technical uses of the word?

Following on from this thought we might ask: If our judgements of the aesthetic value of human artefacts can vary so widely and seem to be relative to culture, time, place and even individual, what justifies my assertion that aesthetic responses to beauty in the sciences are linked to an accurate discrimination of their forms? Perhaps they too are just relative to culture and time. Later physicists may dispense entirely with aesthetic terms recognising them to be a penumbra of the dying of a medieval world view still glittering briefly in the 19th and 20th centuries.

This threatens to reduce the ‘aesthetics’ of mathematics and physics at best to a pallid analogy with those of human art and creation. It might also support the thesis that a strict division is to be made in understanding the use of ‘beauty’ in physics and the human world. To divorce them thus, would create difficulties for my thesis that the beauty of human artefacts shares that beauty with ‘natural artefacts’.

After all I want to argue that the presence of beauty in human artefacts is indicative of teleology and intention and because the same beauty is found in the physical world it similarly indicates intention, albeit divine. If however an argument can be made that beauty in the ‘impersonal’ physical world means something quite dissimilar to beauty in the personal world, despite the use of the same words
in the former, my suggestion looks precarious: there may be a defensible case to be made for the ‘objectivity’ of aesthetics in physics but not in the world of human persons, or in neither.

Any attempt to offer a response must begin with an acknowledgement of the differences between the use of aesthetics in mathematical physics and in the world of human creations. I have already offered an idea of what the structural features that dominate in theoretical sciences tend to be: those of ‘symmetry’, ‘unity’, and so on. As I mentioned P.A.M. Dirac agreed that beauty of the kind that features in aesthetic judgements of literature and poetry are variable, but he held that mathematical beauty is different. According to Dirac, mathematical beauty is mostly objective and epistemically accumulative. Jane McDonnell, philosopher, and physicist agrees ‘Mathematical beauty is of a completely different kind and transcends these personal factors. It is the same in all countries and at all periods of time’ Mathematics advances with a ‘timeless beauty linked to ideas of simplicity, symmetry, generality and truth’. 305

Does the fact of variability however lead to a necessary disruption of the similarity of ‘beauty’ when used in physics and when used in the human world? Perhaps the first point to make in response to this is that the fact that in human affairs certain forms of beauty may require exposure to all sorts of culturally related events or knowledge to properly appreciate them does not immediately forgo the claim to the possibility of their ‘objective’ status.

Neither does it forgo the relation of the features identified by physics, symmetry, and so on, to human creations. Complexity and variation and the depth of knowledge required to understand something is not evidence of its subjective ontology. Unfamiliarity with mathematical structures, for example, is patently not evidence of the subjective ontology of numbers or equations.

Should someone still be unhappy with this claim because the ferocious variability in aesthetic judgements across culture, time, place and individual, might indicate aesthetic contradictions between what is claimed to be ‘beautiful’ and what is not, it is worth noting that semantically, aesthetic propositions function just like fact-stating assertions. In other words when someone makes a claim that something is beautiful, they often intend it as a fact about the thing itself.

It does not require much familiarity with history, literature, or artistic creations, to note that aesthetic assertions are often attended by the uttered’s conviction that an experience of something as ‘moving’

305 J. McDonnell, The Pythagorean World...p.19
because of its beauty is intended to ascribe the source of that feeling to the object that has induced
it.

Of course, just because a domain of discourse uses ‘fact-stating’ language is not proof of the case that
what is referred to in that language has an independent existence, but it should be granted an initial
plausibility that it might be so. Aesthetic statements share with moral discourse a similar sense that
what is being discussed or commented on is of important value.

A serious judgement that something is truly beautiful or truly ugly seems to have consequences that
extend beyond the thing itself. Not to appreciate real beauty can suggest a deficiency, the sense that
someone who does not appreciate the beauty in question lacks a grasp of something important about
the world that can indicate a way in which they have failed to appreciate or understand something of
moral import, or something that gives value and enchantment to the world.

It is not a coincidence that beautiful features or things are often in moral discussion. Words like
‘disgusting’ or the facial displays sometimes viscerally produced by ugliness evidence this conceptual
overlap. It is probably for this reason that where we find beauty associated with depravity, deception
or other moral failings and behaviour, we find it particularly disturbing, as if the correct order of things
has been disrupted.

Despite the very many contemporary discussions in moral philosophy and elsewhere a case for moral
propositions as fact stating is still a well defended option. The kinds of argument sometimes made
here can be mobilised in defence of aesthetic objectivity.

Thus, one can argue with someone who says something is beautiful that it is not: They may not have
discerned beauty where it in fact lies, they may not have the knowledge that would allow a proper
judgement, they may have other beliefs that distort their experience, or they may for psychological
reasons of a personal sort be unable to respond appropriately to the presence of something really
beautiful.

The ease of a judgement that something is beautiful or not will clearly be influenced by the domain in
which it is to be exercised. It is not difficult to conclude that someone not properly or sufficiently
cognitively acquainted with a ‘beautiful’ idea or piece of mathematics, for example, may fail to
experience its particular aesthetic qualities, or that someone unfamiliar with the compositional
structures of complex music might fail to grasp its acoustic aesthetics.
All these possibilities, like those surrounding moral agreement or disagreement can be extremely difficult to resolve or untangle. Nevertheless, like moral judgements they are framed as propositional claims about something exterior to themselves and the person asserting them. This is not yet ‘proof’ but at least undermines the apparently intuitive claim that ‘beauty’ is ‘subjective’ and also ‘relative’.

The argument that beauty’s universality is testament to the lack of any core to its meaning might be turned on its head: the variability of the ways in which aesthetic creations appear in human lives and culture might in fact be testament to the remarkable depth and intricacy with which aesthetics are bound up in every aspect of the world, ‘personal’ and ‘impersonal’.

Our rich use of the term may not only be testament to the richness of human imagination and ingenuity, but as I have suggested testament to the universality of any and very structural possibility having an aesthetic character. Aesthetic ‘knowledge’ like any other knowledge might be difficult sometimes to obtain and what one knows about aesthetics might vary widely from individual to individual or society to society as in any other form of human endeavour.

Even if such arguments however do carry weight in any preliminary case for the equality of the epistemological objectivity in both the human and scientific worlds of aesthetic judgement, they do not yet account for the variability in the one (the personal) and the relative lack of variability in the physical (the impersonal). This might still suggest a substantial difference between the two that would prohibit any conclusion about a mutual origin for the beauty of aesthetic structures in the human and physical worlds: the intentionality of a mind, human in one case and divine in the other.

This bears substantially on my overall case: I assert that we can see the divine personal in mathematical physics because we directly respond to the beauty there as we do to the beauty of our own created structures; the hand of teleology is immediately apparent to us. If the ‘beauty’ in each case means something different, then I am not entitled to this conclusion.

I begin to address this problem by a discussion about what is required for the determination of what falls under a given concept and what does not. In other words, does the lack of variability in the mathematical physical case and the variability in the human case preclude the beauty identified in each as referring to the same phenomena? Only if one supposes that for something to be beautiful there must be rigid fixed criteria to successfully identify something as such. Whether or not this is the case, not only for beauty, but for concept use in general is something I briefly consider next.
The criteria of identity for concept membership

The 20c philosopher Ludwig Wittgenstein famously argued that many of our concepts are rather like a rope consisting of many small threads that are interlinked to create a continuous structure. A rope may consist of many isolated strings of different make up and lengths which nevertheless bound together produce an item identifiable as one single object with particular functions. His intention was to show that the use of a concept could not easily be reduced to rigidly specifying one unique set of features that could include certain things and exclude others.

The cognitive psychologist Eleanor Rosch introduced in 1973 the idea of a ‘prototype’ whose initial inspiration was Wittgensteinian. Her initial interest described in her seminal paper of 1975 was to

‘...investigate the nature (the structure and content) of cognitive representations of semantic categories’

in ‘internal’ cognitive structures. She based her conclusions on a number of empirical studies conducted within the methodological frameworks common to cognitive psychology, the study of ‘cognitive processing’.

In her 1975 paper she presented results based on a number of tasks that include the semantic categorisation of objects such as ‘vehicles’, ‘toys’, and ‘clothing’, and a variety of day-to-day items. These involved measuring response times to categorisation tasks. Thus, two items close to each other in terms of a categorical classification might be expected to yield faster response times when asked to categorise them as ‘same’ or ‘different’ than those further apart. Two bits of wood

306 A good introduction to Wittgenstein’s later work Philosophical Investigations in which this case is made is given by S. Schroeder, Wittgenstein: Key Thinkers Series, Polity Press (2006). Three chapters in: H.J. Glock, Wittgenstein: A Critical Reader, Blackwells Press, Oxford, (2001) look at three topics in depth which are relevant here: E. Ammereller, Chapter 4 pp.59-93, Wittgenstein on Intentionality, B. Rundle, Chapter 5, pp. 94-118, Meaning and Understanding, & R.L. Arrington, Following a Rule, Chapter 6, pp. 119-134. The literature on Wittgenstein is vast. I have simplified his point to the barest possible minimum that is acceptable.

307 E. H. Rosch has been a central figure in cognitive psychology and has attracted many papers and book chapters. I include here her three seminal papers.


309 I use the word ‘internal’ without any ontological commitment. It is used here to indicate a way of ‘representing’ the external world but does not need to suggest that those structures are composed of a curious ‘mental stuff’.
from the same species of tree, for example, may be quickly and separately identified when asked to
categorise them as a ‘stool’ rather than the same wood even when their shapes markedly differ and
vice versa.

In her conclusions she argued that the categorisation of the structure of things of the world about us
does not rely on a rigid set of criteria, but rather a prototype of the thing in question. Judgements of
whether to include something in a category or not she argued are determined by similarities and
differences to the prototype in question.

Now this is not to say this understanding of the meaning of a categorical word necessarily excludes
classes of items closely associated with particular sets of structures or even one feature. The idea of a
stereotype allows for many deviations from it that nevertheless share a dependency on it for their
classification as a certain kind of thing.

Some kinds of categorisation will demand near identity to the prototype whilst others might only
necessitate the instantiation of one feature traced through a range of objects. A Euclidean triangle for
example will demand rigid geometrical relations, whilst many things can count as ‘forms of
transportation’.

Thus, judgements of beauty in mathematical physics may call on a small number of structural features
across a range of theoretical judgements as indeed I have suggested is the case. It may even be that it
is those explanatory descriptors tend to be most associated with a fundamental relation between
empirical truth and structure that are particularly manifest in theoretical representations of the
particle world and the fundamental forces of nature. ¹³⁰

Judgements of beauty in other areas may call on widely distinct criteria, perhaps only one feature
running through otherwise very different objects and processes, like those of varying human cultures
and communities. So, variability in one domain, relatively strict criteria in another, do not preclude
that the same thing is being experienced or brought under the same classification in both cases.

¹³⁰ An empirical paper by H.de Regt, already cited, looks at criteria mathematical physicists use. These seem to
be a small number already mentioned in this work, including symmetry, simplicity, and ‘conformity with the
J.W. McAllister agrees that scientists tend to use criteria drawn from a ‘classical, formalist aesthetic (p.9). He
thinks however, that a ‘different aesthetic which values...differentiation...& complexity may better represent
the range of scientific activity’. (P.9) If my argument is followed however there is of course a space for
aesthetic values of these sorts, but I do not see these as different but issuing from the same vast space that
beauty provides under its umbrella: J.W. McAllister, Recent work on aesthetics of science, Int. Studies in the
Beauty: simplicity and the transcendence of structure

But there is another important quality to beauty: despite the relation between a structure and how it is put together, there is also a simplicity about beauty that is not just a sum of parts and not just a property of the whole. The experience of beauty everywhere seems to exemplify the commonality of that simplicity. It is its simplicity that makes for part of the difficulty in offering a comfortable inclusive and exclusive definition,\(^{311}\) but further than that it is a property whose experience seems to move one beyond the object itself.

The property of beauty’s simplicity is echoed in our grasp and experience of it. David Bentley Hart captures this acutely, ‘the apprehension of beauty is characterised by immediacy and simplicity. By this I do not mean that the beautiful is necessarily recognised by the instantaneity of the gratification it affords (some things require time to be appreciated fully) but only that, in any aesthetic experience there is no other mediating concern that determines one’s judgement of a thing’s beauty or deformity’.\(^{312}\) The experience of beauty is, in other words, desired for itself. It is this that partly separates any experience of it elicited by any particular from the object itself, despite the source of the beauty being essential to that experience.

In a rather splendid sentence, Bentley Hart\(^{313}\) says,

‘...beauty stirs us from our habitual forgetfulness of the wonder of being\(^{314}\)... ‘the beautiful is a haunting reminder of something lost and a foretaste of what is to be found beyond the limits of this ‘tragic world...and it points...up and away from the things of the earth’.

Philosopher and Anthropologist, D.C Schindler describes beauty as having an

‘...astonishingly comprehensive quality...it appeals to the whole of us... engages...our mind and senses at once... enlisting them in the common project of perceiving beauty...beauty thus involves ...our sense of transcendence...our sense of being elevated beyond ourselves...at the very same time it appeals to our flesh...our most basic natural instincts... In this way it reaches into the depths of our nature, touching what is most basic and essential’\(^{316}\).

\(^{311}\) Something in the nature of simplicity itself exercises a natural attraction for us, in works of art, clarity of thought, and nature. I have already discussed the epistemological dimension this attraction has in theory building in the sciences, sinking deeply into the aesthetic values that govern theory selection.


\(^{313}\) D.B. Hart, Beauty...p.249-251

\(^{314}\) D.B. Hart, Beauty...p.250

\(^{315}\) D.B. Hart, Beauty...p.251

This is also why an attempt to corral beauty into one of the categories of subjective experience, structure alone, or objectivity carries the risk of reducing it to the banal. It also issues a warning about confining knowledge and the experience of beauty to one or another perceptual, sensory, or intellectual faculty.

Hart is critical of the Thomist effort to provide a circumscribed set of features of the proper constituents of a beautiful thing. As Hart rightly observes, this definition carries the risk of excluding experiences of beauty that are sometimes movingly found in what might otherwise count as deformity in our worldly experience of people and things. We are sometimes moved by being brushed by experiences of for example, great tenderness, that wash over us with a sense of almost painful beauty. They are hard to adequately characterise by a superficial structural description confined to one aspect of the experience.

As Hart says, ‘whatever beauty is, it is not simply harmony, or symmetry,... which can become anodyne or vacuous’. 317 ‘Beauty’ of course is sometimes also encountered precisely where these things are deficient. ‘It is’, Hart Insists,

‘...something other than the visible or audible or conceptual agreement of parts and the experience of beauty can never be intelligibly reduced without a...significant remainder to any set of...material or conceptual constituents’. 318

Hart is right to insist that beauty cannot be reduced to ‘the visible or audible or conceptual agreement of parts’. If it were so, aesthetics in general would reduce to some set of structural or naturalist parts. The simplicity of universal beauty gives it the strange effect that any one experience of beauty escapes its emergence from any one set of structural features. One might expect this: if everything has an aesthetic character and many different things are going to be beautiful, then many different sets of structures in many different domains, times and places will be able to reflect that same beauty: it will of necessity have a character not dependent on any one given set of criterial features.

The surfeit of an experience of beauty

Reflecting on the nature of beauty, John Milbank319 begins his essay on Beauty and the Soul with the following observation, ‘beauty arises where the attraction exercised by a formed reality is ineffable and escapes analysis’. 320 He goes on to say

317 D.B. Hart, Beauty...p.248
318 D.B. Hart, Beauty...p.248
320 J. Milbank, Beauty...p.1
‘We cannot substitute an abstraction of essence for the concrete experience’. 321

This helps us understand one reason why beauty cannot be defined and why it is a ‘simple property’. It is not divisible and cannot be reduced or defined in virtue of the things or parts that contribute to its experience.

On the other hand, as Milbank says, neither

‘...does an exhaustive description of the object and the way it appears, precisely convey our sense of its specific instance...it may present a beauty of its own and “bring out” aspects of (its) beauty that reside only in this secondariness’.322

Milbank then goes on to provide what we may regard as the pivot of this entire discussion on beauty,

‘...it seems there is an excess in the experience of the beautiful that is never quite satisfied even when the object is before us.’ 323

This is the paradox of beauty: precisely that it is both of the object and not of it: on the one hand quite concrete components of what things are, but on the other ethereal. Aesthetic sensations can serve the curious sensation of a heightening of the sense of being in the world but of also of experiencing a quality which transcends it, which paradoxically requires the fact of something in the world as a requisite of the possibility of the experience.

It is this component of the experience that suggests that beauty is both of the world and not of it. Cast in these terms, it is a language unacceptable to the analytically inclined philosopher, who will see in it a contradictory proposition of the form A & -A.

For some this is simply an indication of its essentially irrational and emotive nature. For others, it is precisely the components of its reaching beyond itself and not being subject to straightforward analysis that grants it its transcendent power. That power can also carry with it a demanding desire to understand what it is that could be responsible for a property that is immanent in the world at the same time as transcends any event, object, or property of it.

If, as I have suggested, the same beauty haunts the most basic structures of the physical world that mathematical physics explores, and Milbank’s characterisation of beauty encapsulates the tenor of the discussion in this chapter, (beauty’s universalism, its metaphysical connection to the necessary aesthetic of structures, its frustratingly inaccessible definition, and its transcendentally demanding

321 J. Milbank, Beauty...p.1
322 J. Milbank, Beauty...p.1
323 J. Milbank, Beauty...p.1
quality), this should be something worth noting as a potential contributor to the relationship between structures and divinity. It is, as I noted in the Introduction an important issue for the question of theological aesthetics in Hans Urs von Balthasar’s monumental work

Catherine Pickstock in discussing aesthetics and truth in the classical world and their adoption by the Christian world reminds the reader that

‘...ontological, moral and aesthetic modes through which as finite beings, the mainline theological tradition held that we apprehend the real, are themselves tied to a more fundamental framework, our relationship with god’.324

Beauty and aesthetics thus seem well suited to enter discussions and controversies about the various hinterlands in the human attempt to grasp the nature of the world: the insistent presence of the physical, scientific theories about it, metaphysical questions about the ultimate features of any being, the capacity of beautiful things to produce experiences of sublime transcendence of world and self, our capacity to produce artefacts, and sometimes to produce beautiful artefacts, the desire for beauty itself and the existence and character of the divine.

324 C. Pickstock, Introduction: ...P.iv,
Part 2

**Beauty and natural theology**
It is perhaps surprising given these reflections that, as Philip Tallon\(^{325}\) notes in a recent paper, beauty ‘has rarely been the major theme of any major modern theologian’s or philosopher’s thought’. De Cruz et. al. supports this contention. They suggest that ‘the argument from beauty enjoys relatively little philosophical interest and discussion’\(^{326}\). They go on to note that no major anthology of natural theological arguments incorporates a substantial argument from beauty, let alone an argument from aesthetics to God from the natural sciences specifically. The formal literature is sparse.\(^{327}\)

Tallon offers a telling example of this in his paper. He writes,

‘… the most vivid instance is ‘The argument from aesthetic experience’ in Kreeft and Tacelli’s ‘Twenty arguments for the existence of God’. Though nineteen other arguments are given multi page treatments, or at least a full paragraph, the argument from beauty is only three lines long: “There is the music of J.S. Bach. Therefore, there must be a God. You either see this or you do not”’.\(^{328}\)

There is of course an amusing brevity to this, but it echoes a recurring theme in how beauty is frequently treated in the natural theology literature. There is nevertheless a certain truth to Tallon’s argument. Understanding what makes this so though, yields more of interest than what the compressed argument suggests is to be understood.

What is ‘an argument from beauty’ for God? The phrase ‘Argument from Beauty’ is described by De Cruz as indicating ‘…a family of arguments for the existence of God that takes the beauty of the natural world or works of art (e.g., Bach’s cantatas) as evidence for the existence of god’.\(^{329}\)

The ‘argument from beauty’ is different from traditional classical arguments for the existence of God which begin from some general fact about the world and deductively concludes to god’s existence. Intense beauty of both humanly derived objects and others often causes a psychological and

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\(^{327}\) A good example of what issues the place of beauty in Theology is commonly taken to concern are discussed by Richard Viladesau in his, Theological Aesthetics: God in Imagination, Beauty, and Art, O.U.P., Oxford, (1999)

\(^{328}\) P. Tallon, The Mozart Argument...p322

\(^{329}\) H.de Cruz & J.de Smedt, A Natural History...p.131
intellectual movement beyond the beautiful thing: a feeling that the object itself cannot fully contain what it provokes.

The philosopher Anthony O’Hear, explicitly acknowledges the power of beauty to apparently point beyond itself,

‘...the religious impulse might be a response to a natural object or work of art as beautiful: in which we see a thing not just as a ...fragment of nature’, but something which mediates between our own longing for perfection and some other world in which that perfection is realised’.330

O’Hear’ position is echoed by Bruno Forte,

‘Beauty’ is an event; beauty happens when the Whole offers itself in the fragment, and when this self-giving transcends infinite distance’.331

As de Cruz acknowledges

‘...unlike other arguments for the existence of God, which move from clearly stated premises to conclusions, the argument from beauty has an ineluctable phenomenological component, the experience of beauty and awe and its connection to religious experience’. ‘The connection between beauty and god’s existence is less directly obvious, even if it is convincing when one has an aesthetic experience’.332

De Cruz captures something of this sense when she writes,

‘...the books and music (and nature) in which we believe beauty is located do not contain the object of the desire. Rather it is through them that we glimpse the unreachable object we long for. The sense of the sublime that is present in our experiences of great works of art or natural beauty can be regarded as a manifestation of Sehnsucht...a sense of being overpowered by one’s aesthetic experience and one’s longing (and inability) to be part of what one is experiencing...’.333

Even those who do deny the existence of God often admit the curious effect of beauty to provoke transcendental thoughts and feelings. Tallon writes that,

332 De Cruz & de Smedt, A Natural History...p.132
333 De Cruz & de Smedt, A Natural History...p.134
‘...even among atheists the argument from beauty has a persistent persuasive power that remains when more traditional arguments for God’s existence falter...Akin to theists, who do not quite know what to do with beauty, yet remain fascinated by its ...power, atheists often seem haunted by the theistic argument from beauty’. 334

Paul Draper, an atheist, even more strongly suggests that beauty is evidence for God. Nevertheless, he thinks that on balance, ‘arguments from evil against theism are much more powerful than the argument for beauty in favour of theism’. 335

Many ‘atheist’ scientists, some of whom, like Neil DeGrasse Tyson, an astrophysicist, the Director of Hayden Planetarium, and a popular science writer, recognise a transcending existential urge provoked by their disciplines. Some, like him, have even tried to offer a ‘secular spirituality’ to provide some outlet for these feelings.336

Other non-theists have laboured to produce what they call ‘religious naturalism’, the idea that it is possible to develop religious feelings and ideas about the natural without recourse to any concept of a divine ‘ground-of-being’, the world itself being sufficient to supply that.337 The need to make sense of the urge is perhaps evidence of being in its ‘natural’ forms calling forth a desire to understand its shapes, origin, and our own nature as participants in the world.

The uncovering of the scale, intricacy, and profound intelligibility of the natural world, particularly in the field of physics, as I have discussed, produces for even non-theistic scientists’ expressions of ‘awe in the face of nature’338 that normally incorporate reference to aesthetic qualities, and often profoundly moving existential reflections on the nature of man, the splendidness of the cosmos, and the place of Homo sapiens within it whether atheist or theist.

The physicist Stephen Barr considering the property of ‘symmetry’ in Art and Physics opines

334 P. Tallon, The Mozart Argument...p.323
338 E.H. Ecklund, Science vs Religion: What Scientists Really Think, Oxford University Press, Oxford, (2010), a sociologist, provides interesting figures: Amongst ‘spiritually' engaged scientists, 22% identified as atheists, 27% as agnostic, and the of the rest, 51% said they were theists. So, it is at least clear that something about what the sciences uncover often prompt existential states amongst investigators which transcend the properties of those things they are concerned to explain, however one wishes to explain this.
‘If symmetry is found in works of art of very sort, and is an important element in what is beautiful, and if laws of nature are based on symmetries so sophisticated... that while we may study them with mathematics, they lie far above our powers to appreciate on an intuitive level, does that do not suggest the mind of a ‘divine’ artist at work?’

What Barr is trying to get at is the transcendent feeling that can be provoked by the beauty of the intelligible structures of the particle world which present themselves as bearing all the features of intentional construction. The intuition of scientific theists like Barr is that an aesthetic experience of this kind is naturally revelatory of the presence of a divine author.

St Augustine thought the perception of beauty was of unique significance in our experiences of the natural world about us in generating desire for the Creator. Augustine thought of creation as a ‘great book that is open before us’. Of the beauty of nature that moves us towards the divine he has this to say,

‘...God did not write in letters with ink, but he placed what is created itself in front of you to recognise him in; he set before your eyes all these things he has made. Why look for a louder voice? Heaven and earth cries out to you: God made me’.

There is in Augustine’s description of things of natural beauty ‘crying out’ a supremely important observation: that natural events can express personal things. ‘To cry out’ can only be done by objects whose structures have been deliberately shaped and created to elicit feelings and thoughts that something of value is being expressed. We should be careful how we understand what is meant by ‘structures’. What Augustine means is not that every object of nature is carefully crafted by God’s hand, but that it is in the very existence of contingent natural structures at all that they ‘cry out’ their creation.

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340 It is perhaps necessary to discharge another potential objection: beautiful objects can be accidentally produced in nature, but the possibility of such accidents is still dependent on their being underlying aesthetic features in natural structures, the coming together of which by chance can produce beauty. These would have to pre-exist any such occurrence, so inference to the divine would not be affected by this argument.


When we encounter great beauty in events of nature the effect of a personal hand behind them is intensified. Physicists like Barr draw theistic conclusions from the intricacy, scale, and aesthetic structures of physics, because they are moved not only by the intelligible coherence of those structures, but also by the thought they could have been ‘ugly’. That they are not at least supports, if it does not prove, that there lay behind this feature of the natural, an intention that it should be so.\textsuperscript{345}

A quote from the American Quaker Rufus Jones sums up the answer with a more appealing simplicity,

‘...beauty implies behind things a Spirit that enjoys beauty for its own sake and floods the world everywhere with it. Wherever it can break through, it does break through and our joy in it shows that we are in some sense kindred to the giver and revealer of it.’\textsuperscript{346}

The theme that beauty in nature elicits not only powerful feelings that are experienced as being provoked by the beauty of natural objects themselves, but also as pointing to an author who embellished them with beauty, has also been championed by the theologian and analytical philosopher Alvin Plantinga. He suggests that the beautiful and awe inspiring in nature does not serve as a premise of a deductive argument but rather are non-inferentially

‘...occasioned by the circumstances; they are not conclusions from them. The heavens declare the glory of god and the skies proclaim the work of his hands: but not by way of serving as premises for an argument’.\textsuperscript{347}

\textbf{The common language of beauty, nature, artefacts, and transcendence}

A marvellous example of a human artwork that is at one and the same time dependent on both ‘natural’ features of the geographical environment and human artistry to try and attain and communicate a sense of transcendence is the prehistoric cave paintings of Lascaux, dated to 14,000 years ago.\textsuperscript{348}

\textsuperscript{345} The argument that micro-physics (or cosmology), or the structure of the cell, for example, show evidence of beauty will have to contend with the objection that the natural world also shows evidence of ‘ugliness’. The argument will require a ‘\textit{theodicy of ugliness}'. In other words, it will have to answer the question why a good god appreciating beauty, allowed for ugliness, or created ‘ugliness’ or allowed for its possibility elsewhere in nature. I do not underestimate the importance of this observation, but my purpose here is to examine the presence of beauty in physics, not to account for ugliness.


Although it can never be entirely clear whether the cave art was constructed for pleasure, an animistic attempt to manipulate nature, an expression of the regard for the animals on which they relied so heavily for life, an attempt to assuage or contact spiritual forces, or all of these things, the mystical transcendent quality of the illustrations is immediately apparent to us. The force of the paintings to most observers seems like a poignant attempt to transcend the mundanity of the everyday whatever their ultimate purpose.

It is clear that the picture is constructed with a careful and intentional haunting beauty; it is intended to manifest the hidden in the forms and colours of the cave itself. The aesthetic appeal derives from the way the natural colours, lighting, and contours of the cave interior have been brought together with the features and movements of the animals.

It is a beauty that transcends the materiality of its composition, the artists’ intention and even the creatures themselves. The creation of the painting below the surface of the earth has an intuitively gripping sense of ‘going below’ to uncover the inner mystery of the surface. In other words, a physical embodiment of the sense of something behind or beyond the everyday.

Spiritual and religious art of all kinds and in all cultures is often the attempt to make manifest the meaningful and the ultimate using the expressive forms and structures of the natural world. In the history of the Judaeo-Christian tradition art, music, and the written word have of course been associated with attempts to convey something of the divine through beautiful composition and

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349 "Lascaux painting" by William Cromar is licensed under CC BY-NC-SA 2.0
sometimes by analogical portrayal of the divine in human shape. In one thread of a conventional Christian tradition of course, the Son of God Himself is revealed in corporeal and natural form.\textsuperscript{350}

Whatever view one wishes to take of theistic or atheist conclusions about natural sciences, the aesthetics of nature, and human creations, it is undoubtedly the case that interspersed amongst the evaluative language used to describe or judge structures in any of them are references to mutual structural features. A delightful example comes from David Stipps\textsuperscript{351} book on Leonard Euler, the mathematician. Stipps’ book is entitled, ‘A Most Elegant Equation: Euler’s Formula and the Beauty of Mathematics’.

The interior front cover of the book is awash with references to beauty, Art, and structure. Euler is described as ‘the Mozart of mathematics’, his famous equation as ‘a conceptual diamond of unsurpassed beauty’. ‘Few’, the paragraph tells us, ‘Have been left unmoved by it’. The mathematician, Keith Devlin compared it to ‘a Shakespearean sonnet that captures the very essence of love’.

It is significant that the wash of metaphors relates to one equation, with one author, whose mathematical artefact provokes an aesthetic response that embraces the human, the physical and the abstract all contained in one small structure. These metaphors express a sense of awe that the brief squiggle of shapes making up the equation could have such profound and far-reaching effects across so much of our experience of the world yet could issue from the interior of one creative and analytic mind.

Incorporated into that sense of awe is a wonder that squiggles, nature, beauty, and the descriptive and predictive power that issues from Euler’s equation should be possible at all. The reaching for metaphor is an attempt to convey perhaps a thought, implicit or explicit, that beyond the equation, that it could exist at all, and do what it does, urges by its very nature an explanation reaching beyond the mundanity of its presence.

A thought perhaps, that only something transcending the mathematics, syntax, symbol, and interpretation, and its structural applications both physical and otherwise, would be sufficient to meet the power of appreciation that it evokes: something transcendent.


Divine origins: the unity of the natural sciences, mathematical structures, art, and beauty

An interesting if perhaps unintentional revelation of the assumed closeness of the divine author, the natural sciences, mathematics, artistic creation, and beauty in the theist tradition is uncovered if one searches for ‘the argument from beauty’ in the online Oxford Handbook of Natural Theology. It takes one directly to a section entitled Aesthetics in the Arts.

Frank Burch Brown begins his contribution to that section in the following way,

‘The design of the world would seem less wondrous, less divine, if it were devoid of beauty. When Augustine and medieval Christians under his influence referred to the biblical book of Wisdom, and its assertion that God has made all things according to the measure, number, and weight (Wisdom 11:20), they partly had creation’s beauty in mind. In their thinking, number and mathematics were not divorced from the other qualities of beauty such as its harmony and luminosity’.

The use of words like ‘design’, the reference to number and mathematics, ‘harmony’ and ‘luminosity’ are all descriptions, in one way or another, that can only make sense if their objects have intrinsic structures, mathematically expressible, whether or not they refer to human creations or the structures of natural and abstract worlds.

This invites the question from whence do the standards of beauty derive if we do find mathematical structures of nature that merit the accolade of beauty? If they do, this invites the further enquiry, why should the beauty in our creations share aesthetic judgments with those of natural objects? These are questions about the origin of aesthetic normativity.

In previous chapters I have been concerned to argue that anything which comes into existence must have an intelligible structure and that anything that has a structure must, pari passu, have an aesthetic characterisation. I have also tried to present a persuasive case that the necessity for structure brings with it normative standards. Normative standards must be, on this account, necessarily present when anything of physical or (abstract) substance is present to us.

This is, I have maintained, because anything that can be judged according to some standard must make appeal to something which transcends that which is being judged: to judge something as

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353 Frank Burch Brown, Aesthetics...Introduction
‘beautiful’ or ‘ugly’ is to refer to an idea of what is to count as ‘beautiful’ and weigh the thing being judged against that standard.

In the case of the sciences, to judge something as ‘evidence’ for a hypothesis is to have some prior standard of why something is evidence and something else not. ‘Induction’, ‘deduction’ and ‘abduction’ are all epistemological methods which rely on the fact that they stand in certain kinds of epistemological relation to the world and yield under certain conditions what is to count as ‘knowledge’ of that world. Each one of them rests on the assumption that they provide standards of cognitive attainment.

Mathematical features of structures provide another normative relation; if one accepts that mathematics cannot be reduced to any description of any given set of physical properties, then the features of structures in virtue of which their mathematical description is enabled, must not themselves be ‘physical’ in the way required by the physicalist naturalist.

I adumbrated the issue in my chapter on aesthetics in physics like this: ‘Since mathematical entities, however conceived, are held to be acausal, outside space-time and non-mental, how physics can be claimed, at one and the same time as evidence for the assertion that the universe has no basic ontological space for non-physical domains is at best problematic and at worst a contradiction deriving from the argument’s own empirical base. Susan Schneider354 whom I mentioned in an earlier chapter has advanced this case in a paper called ‘Does the Mathematical Nature of Physics undermine Physicalism?’, calls this the Problem of the Base. It provides prima facie difficulties for an ontological naturalism that insists on a reductive physicalist base on which everything must rest’.

What one might enquire could provide normative standards if these are requirements for ‘structures and the standards by which they, at one and the same time can be judged? Could the provision of such standards be provided by the physical universe itself? Since the coherence of anything in the structured physical universe depends on the provision of normativity for its emergence, this is not a logical possibility. Could it emerge from physical structures, perhaps of sufficient complexity? Not only can the last argument be reprised to deny this possibility, but since complexity itself is a structured outcome of a series of events, this would be putting the explanatory cart before the horse.

‘Normativity’ implies the possibility of judgement, a comparison between what could be and what is. To this extent, it also implicates the presence of a rational mind able to grasp the abstract standard, apply it to the object or event in question, and reach a judgement as to what degree the object being

judged attains the standard and in what ways it has succeed or failed. Anything that can engage in logical thought must have features of rational mindedness. That, after all, is a precondition on making any sense of what is meant by ‘standards’: the capacity to make comparative judgements.

Likewise, and for similar reasons, structures at the base of the physical world which manifest rational beauty reveal our innate tendency to suppose that items of great beauty cannot be accidentally so but must portray intention. After all, something beautiful could have been ugly. A good explanation of this is that behind what is beautiful stands a mind that can distinguish between the two.

If, by a pari passu doubling, first, the fundamental structures on which all matter depend in one way or another are characterised by the aesthetic, and secondly, the empirical base of the physical world turns out to be beautiful and theoretically useful, then this is at least supports a rational reaction that what is being confronted is a work of imaginative intelligence.

Perhaps in these circumstances, it is possible to consider the relation between man and artefact and God and natural world as sharing the same characteristics that press for a teleological and meaningful comprehension of what the created object expresses. The shared meaning between understanding human authorship and creativity and that which is elicited by the phrase ‘proclaim the work of his hands’ is so tightly shared that it’s interpretation as ‘metaphor’ or ‘analogy’ does not seem adequate to the content which is intended. The meaning hinges on the term ‘create’, and that hinge itself suggests a participation in authorship.

**Divine creation, human creations, and beauty**

Finally, I want to end this section by making clear an important distinction between being moved by the beauty of a human artist’s creation and being moved by god’s creation in nature. In the former the object is entirely within our experience of what we count as our day-to-day world. Our experience of the author in the beauty is of something that is wholly us, Homo sapiens, another human person.

When we have a transcending experience of beauty that points to God however, we have to be careful how we understand the ‘externality’ of ‘nature’ and what the transcendentality of the experience involves. Because we ourselves are a part of God’s creation, we are at one and the same time an external ‘object’ of God’s creation as well as its observer. The appropriate word for this is perhaps ‘participation’: we are at one and the same time, individual creations but participants in

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355 I have concentrated only on ‘beauty’ and transcendence. This is not to say that there are not many other features of world and existence that can provoke such feelings.

356 The idea of ‘participation’ in God is laid out in an extremely rich book by Andrew Davison of the University of Cambridge. It would do the book a severe injustice to attempt to summarise it here, but one distinction which Davison aims at is between being ‘part of’ something and having a ‘part in’. The latter has a sense of
god’s world. As such we are privileged to share in part of God’s nature and abilities. We are made, as the traditional phrase has it, *imago dei*.

The idea of a human creator is of an artist who intentionally manipulates the material with which she is presented to create an object. These materials are all around her in the natural elements of the world and those artificially constructed from those elements. She also uses principles of structure, the geometry of perception, the artistic fashions of her time and place and so on to create what it is she wants to be seen by the observer. It is a mistake that easily follows from this to take God as someone who manipulates raw material into designed forms.

God does not replicate the human creator. The theist god does not create the world from pre-existing materials like Plato’s master craftsman of the *Timaeus* 357, the Demi-urge, but creates *ab initio*. It is important to be clear what this means, whatever other problems it involves. It is a claim that whatever exists, God brought it into existence. This is hardly a new thought. The ante-Nicene patristic father Irenaeus (130-202 A.D.) made it quite explicit,

‘Men and women cannot make anything out of nothing, only out of matter that exists; God, however, is far superior to humankind inasmuch as he himself invented the matter of his work, since previously it did not exist’. 358

In a discussion entitled, *What Does Physical Cosmology Say about Creation from Nothing?* 359 Adam Hincks makes the point this way

‘God is not just a Platonic demiurge that informs pre-existing matter; Rather he is the creator of matter and the author of the very existence of possibility itself...’ 360

The idea of *Creatio ex Nihilo* 361 in which matter and spacetime present themselves as part of a coherent and comprehensible universe issuing from the hand of divinity, has long featured as part of a unifying Theist explanation of the cosmos as the quote from Irenaeus illustrates. It is an explanation inclusiveness and can accommodate the idea of being fully participant but less than, perhaps analogous to the way that a member of a team is both fully part of the team but not its whole. See in particular his chapters on ‘Characterizing participation’, Chapter 6, and ‘Analogy: Participation in being and language’, Chapter 7, both in, A. Davison, *Participation in God: A Study in Christian Doctrine and Metaphysics*, Cambridge University Press, Cambridge, (2019)

360 A.D. Hincks, *What does physical cosmology...*p328
361 The book quoted above in which Hincks’s chapter appears (*Creatio ex Nihilo...*) contains two others on aspects of cosmology, science, and personhood
of the very possibility of ‘being’ and its various aesthetic structures of existence. The universe, on the theist account, presents itself to us as an accessible and meaningful production of a ultimate divine mind in which its presentation to us is of a unified and contingent body open to coherent articulation and investigation. The intent that should be so is displayed in the cohering beauty that the fundamental structures of the universe broadcast as part of a signature of divine authorship.
Chapter 5

God’s artefacts

**Summary:** In this chapter I aim to begin to defend and apply the notion that teleology and divine personhood lie at the uniting heart of an ultimate conception of the world as ‘God’s artefact’. Because this idea invokes the concept of intentional design it can, wrongly construed, appear as an explanatory hypothesis in competition with the assumptions of scientific methodology.

‘Intentional’ design and the personal response to it, I argue is, or should be, elicited by the *entirety* of creation. This includes the *presence* of physical structures, mathematically intelligible and aesthetically pleasing. The emphasis on the word ‘presence’ is to forgo a conflation between the metaphysical necessity that any existing thing must have *some* structure, and scientific investigation which uncovers the *kinds* of contingent structures that do exist and their causal functioning.

Because it is possible for events, particularly in mathematical physics, to be understood as objective events *and* as manifesting beauty, it is plausible to see them as ultimately an expression of divine teleological purpose. We respond to them as we might respond to any beautiful artefact constructed by human persons: with a resonating sense of the intention that is expressed through the beauty of the construction. 362

**Overview of the chapter**

This chapter turns on a central pivot: the thought that the recognition of another as a person is not dependent on first establishing unassailable criteria of personhood. The artefacts of human life similarly manifest the agency of the personal with an immediacy that confirms their teleology more persuasively than any proof could do. 363

As Riddley argued,

362 I should reiterate that we also need a theodicy of ugliness. There is much that is ugly.
363 There will be ‘grey’ areas of course where the provenance of an artefact is uncertain. The reader will however recall my distinction between ‘distinction’ and ‘dichotomy’ and the discussion in chapter 4 about concepts. In brief summation: from the observation that we are sometimes uncertain as to whether something is a ‘chair’ or another item of furniture, it does not follow that we are not able to use and identify chairs without difficulty.
‘...the artist must be seen as present in his work, much as a person must be seen as present in his behaviour, rather than as separate from it, behind it, or, above all, logically independent of it’.\footnote{364 A. Riddley, Expression in Art, in, The Oxford Handbook of Aesthetics, ed. J. Levinson, OUP, Oxford, pp.211-227, (2003), p.218}

It is in the light of the humanity the created object displays, that we can distinguish teleological artefacts from those of inanimate provenance. None of these epistemological observations reduce ‘personhood’ or artefacts to a secondary ontological status. As I have argued the position that it does is the consequence of inflating methodological naturalism to an ontological conclusion.

The distinction we make between our artefacts and those that are the outcome of non-teleological processes is a distinction we make between objects from our vantage point. Seen in divine aspect, however, we recognise that the aesthetics of the physical world, our own artefacts, and ourselves can resonate with the divine creative intent that makes them possible. In this perceptual mode we see the entirety of being as the outcome of divine intention: ultimately God’s artefacts.

Whether someone can be bought to this experience by deductive rational proof alone is moot. Beauty in objects, for example, as I have previously discussed, can move one beyond the beauty of the thing itself to the sense of something it cannot contain: the presence of the transcendental authorship which gave it life: a personal agent.

The rationality of that reaction is perhaps more persuasive of the presence of personhood than deduction alone. The sense of another person is not a matter for objective decision making but the outcome of an engagement with them and their world. Further, our own sense of being a person is dependent on our participating in the world of other persons. Our participation in God’s artefact is an echo of that relation we have with other persons.

The Cartesian picture of a consciousness separated from the world and others is a philosophical account of the relation between mind and body, not an inevitable accompaniment of the nature of consciousness itself. The experience of that separation is consequent upon recognising that there are others to feel separate from. This is a common psychological experience but not a proper conceptual basis for the concept of the person (I discuss why this is further on).

Whilst an experience of God’s person in nature is not that of an encounter with another human person, like that encounter it is manifested in and through the shape, activity, and presence of objects.
as physical structures, and of course ourselves as corporeal living entities.\textsuperscript{365} The experience of beauty in mathematical structures at the world’s base enhances and sharpens that sense, involving the thought that beauty is intended to manifest something valuable and good.

In pursuit of enhancing the plausibility of this claim, I address a number of potential objections to it. Perhaps one of the most important of these is the idea that our tendency to perceive personal agency in the forces and structures of nature, whether in the form of gods, monotheism, spiritual forces, and so on has nothing to do with the reality of any of these things but is better approached via evolutionary considerations. Once the evolutionary heritage and underlying emotive functions of ‘spiritual’ beliefs are properly understood, it is supposed, theistic urgings can be explained without reference to God. I contest this view.

I move on to show that many other arguments for God make necessary reference to teleology and the personal at some point in their exposition. The ‘fine-tuning’ version of the cosmological argument is a substantial example. The argument contends that there are features of the universe whose exact co-appearance at the emergence of the universe can only be explained by divine intention.

I also briefly examine the ontology of morality. My point here is not to engage with the extensive literature in Moral Philosophy but show that the idea of a personal god sensitive to the guidance of personal relationships and obligations can provide for the justificatory power of appeals to a personal law giver.

Very lastly, I consider the recent argument by Michael C. Rea who has written,

‘...the only way we manage to experience the presence of other minds within the material world is by way of cognitively impacted experiences whose stimuli are natural, physical phenomena’\textsuperscript{366}

\textsuperscript{365} M.C. Rea, \textit{The Hiddenness of God}, Oxford University Press, Oxford, (2018), presents an argument for the idea that the physical is the vehicle of the expression of mindedness. This is not the same claim that features of mindedness are identical to, dependent on, reducible to, or a property of neurological tissue. P.M.S. Hacker & M.R. Bennett in their book, \textit{Philosophical Foundations of Neuroscience}, Blackwell, Oxford, (2003), present a sustained critique of how the brain-mind relation is understood in contemporary neuroscientific and psychological theories and identify conceptual confusions. In crude essence the critique turns on the view that much modern philosophy of mind and neuroscience is simply based on a recoil from one side of the Cartesian split (consciousness and mind) to the other, (the physical). The philosophers and neuroscientist they engage include eminent figures like the neurophysiologist Colin Blakemore, the cognitive neuroscientists Antonia Damasio and Michael Gazzaniga, and the biologist Francis Crick. The book was widely reviewed in the philosophical and neuroscience literature gaining plaudits and severe criticism alike. An accessible debate between the authors, the philosopher John Searle, and the philosopher and cognitive neuroscientist, Daniel Dennett is available in the book, ed.& Introduction, D. Robinson, \textit{Neuroscience and Philosophy: Mind, Brain, and Language}, Columbia University Press, USA, (2007)

Rea contests the long-standing idea that this yields an insurmountable logical and empirical gap between ‘person’ and the ‘physical’ as I have been concerned to do. His quote ends with the conclusion

‘...that reflection on other minds points to the conclusion that we would experience god’s presence in much the same way as we experience the presence of created persons...’ 367

I discuss his argument and go on to show how my conception of teleology in artefacts and nature, particularly that of beauty, provide ways in which that personal encountering can take place.

367 M.C. Rea, *Divine Presence* ...p.132
Part 1

The basic concept of the ‘person’

The idea that the aesthetic structures of sub-particle physics cause us to have the same affective responses as our experiences of the artefacts of human agency, and that they express divine intention will be a source of considerable scepticism for some. For the atheist and the naturalist who disavows that the impersonal could be penetrated by the personal in the way this suggests, it will be confirmation of the essential ‘irrationality’ of religious belief. The existence or otherwise of God it will be mooted is not a matter for decision on the basis of non-rationally explicative experience.

John Cottingham captures the essence of philosophical critiques of religious belief as turning on this point. ‘They construe’, he says,

‘...acceptance of a religious outlook ...mainly in terms of intellectual assent to a set of theses or doctrines. And what the critic tries to do...is extract the juice, as it were, -the relevant set of theses-from what is taken to be a largely irrelevant background “pulp”...of emotive, poetic, narrative, and symbolic elements’.368

There is an analogy between philosophical attempts to provide deductive proofs for the existence of minds and persons other than oneself. Proofs of God’s existence can be regarded as needing a similar justification to the perception of the hand of the divine personal in ‘nature’ as ‘proofs’ of other minds have in our relations to other persons: requiring deductive proof before one can be sure the other is indeed a person.

If, however, the conviction of encountering the divine in the world about us (and in ourselves as natural creatures) is akin to the interpersonal engagements we have with others, then ‘intellectual assent’ to a set of rationally defensible ‘theses or doctrines’ whilst not beside the point, is not the basis from which mutual recognition begins or, for that matter, from which self-identification as a person begins.

The recognition of another as a ‘person’ is not a matter of drawing rationally watertight proofs from unassailable observational premisses before that recognition can legitimately occur. Few people, if any, need rational proof to be certain that their loved ones are persons. Similarly, the distinction between ‘physically’ created objects and personally created artefacts is often immediately apparent.

The ‘Lascaux’ caves mentioned in the last chapter did not give rise to the slightest doubt as to their human provenance. The cave art makes itself manifestly apparent as the work of reflective personal hands.

As Stephen R.L. Clark has written,

‘it is often assumed, without much argument, that all words originally have corporeal referents and are thereafter used to speak of non-corporeal experience...why ...should we suppose our ancestors...had any notion of the ‘merely corporeal’? ‘Corporeality’ is a piece of theory; our first words are subjective, human, and meaningful’. 369

The ‘impersonal’ conception of exterior things and its ultimate explanatory achievements in the ‘natural sciences’, is rather an outcome of how self-conscious and rational creatures negotiate a partial understanding of a part of the world in which they participate. Similarly, our familiarity with personal creation in the form of the artefacts from which our identity as corporeal actors in the world cannot be dissociated, precedes our understanding of an ‘impersonal’ causally and internally regulating nature.

The philosopher P.F. Strawson370, argued that the basic conceptual structure through which we grasp (or interact) with aspects of the world must have basic concepts around which they hinge. He characterised these concepts as ‘sortals’, those that provide the means required to ‘sort’ the material into basic categories which any conceptual schema must have: ‘external events’ is perhaps one of these, whilst ‘person’ is another.

Without our experience of the world beginning from that division, there is no experience of a ‘world’. The idea of a ‘person’ or another rational consciousness to whom an external world appears, is fundamental to any thought, speech, imagination, perception, and behaviour: it is a basic sortal through which our ordinary conception of the world organises the fundamental categories of existence: it enables the primary distinction in virtue of which we are enabled to distinguish between

and refer to the external world, ourselves, and others. It worth noting as a subsidiary point, that without this rock bottom distinction the idea of a ‘science’ of natural events is incomprehensible.

One may even suppose that our ancient ancestors got it right: there is an epistemological integrity to the initial human experience of the world and nature as indissolubly expressive of personal life in all its structures and forms, including their own corporeality. They could not of course have been expected to develop the marvels of scientific thought and practice within a few short years. If the history of science shows anything it shows the enormous complexity of thought, social order, and technical accomplishment involved in the emergence of the natural sciences.

The understanding of the world as the expressive outcome of divine presence, may even be a necessary intellectual preliminary to being able to understand the natural world through mathematically-empirical principles. Once one understands the world as the outcome of creative agency, a path is open to conceiving it as we understand our own artefacts: intelligible structures in virtue of the purposeful and rational manipulations that bring them into being. Once we do this, we can develop the idea of ‘nature’ and the natural sciences to go along with it.

It does not follow from that realisation, as naturalists suppose that we need to evacuate teleology and meaning from any structure by assigning ontological privilege to elements composing the structure. However much we come to know about the materials and composition of van Gogh’s ‘Starry Night’, what it expresses is not thereby ontologically diminished or reduced to those composing features and substances: in fact, its analysis as a purely physical object its posterior to its identification as a painting; a teleological artefact which the various material and compositional analyses have as their focus.

I return to Riddley’s observation,

‘...the artist must be seen as present in his work, much as a person must be seen as present in his behaviour, rather than as separate from it, behind it, or, above all, logically independent of it.’

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371 Strawson’s work has given rise to a large literature. A recent publication gives a good history of the concept of a person and devotes a chapter to a comparison between Strawson and Thomas Nagel, the contemporary American philosopher who has argued that individual experiences cannot be re-described in objective scientific terms without leaving a first-person subjective remainder: J.M. Rist, What is a Person? Realities, Constructs, Illusions, Cambridge University Press, Cambridge, (2020). Rist’s book also contains discussions of many of the traditional positions taken in philosophy on this issue over the centuries.


If he is right, then a substantial consequence follows: *no reduction of a painting to its naturalist properties will ever be sufficient to express the personhood in it. That grasp of the object as what it is, cannot be divorced from the personhood in it. Any identification of the object as an artistic display will be dependent for that categorisation on the prior recognition of it as embodying the personhood of another.*

Similarly, there is nothing in the natural sciences that dismisses our experience of the personal in the light of their being causally intelligible structures in nature. To the contrary, as I have tried to show, the presence of beauty in its innermost forces is expressive of the intent and value one might expect to find in an intentionally constructed work of art.

It is in this way that we can see ourselves and the nature of which we are part as expressing the world’s coming to be as an ‘artefact’ from the hand of the divine. To perceive the world in this manner is to experience its fullness as an expression of creation. The experience shares a conceptual link with the concept of the ‘person’ and their objects in human life: a fundamental starting point through which we organise a world.

Of course, there will be no more basic concept than that of God. In our thought about the ultimacy of the world God would be the final resting place upon which all conceptual divisions rest and from which they flow. Questions of vast theological, philosophical, and scientific significance, I appreciate, are raised by this assertion. I cannot clearly begin to approach these within the remit of this work.374

David Bentley Hart, discussing the Christian God draws what is probably a critical distinction between human persons and divine personhood in the following manner. ‘We’, he begins, referring to human persons,

*‘We belong of necessity to an indissoluble coinherence of souls. In the end, a person cannot begin or continue to be a person at all except in and by way of all other persons’.*

Speaking specifically about the Christian trinitarian God, he says,

‘...we are not simple in that way’. In fact, he asserts, ‘only God is ‘personal’ in the full sense because in the simplicity of his coinhering life of love he comprises every modality of personal being’. 375 376

For the theist, as Bentley Hart’s discussion implicates, the divine concept of the person sits at the very apogee of Strawson’s sortal arrangements. It will be the basic end point of all and every possible thought about the origins of the cosmos and all that is extant and possible within and without it. Every conceptual division thereafter will flow from that primary source.

Like any certainty we have about the personhood of another, any certainty we have about God’s person will emerge from an encounter with some manifestation of that personhood. Whilst we might recognise the hand of divine intent in the presence of the world, to describe the divine nature is a considerably more difficult, perhaps impossible task.

Because we participate in the attributes of God’s person, we may hope for some illumination from that participation by reflecting on ourselves as persons. It is, of course, one thing to refer correctly to persons and another to specify what any person might be. What determines personal identity, and the metaphysics of personhood are the subjects of many different answers, from the suggestion that there is no such identity but a constantly changing set of features (David Hume) to the idea that consciousness of memories is where identity resides (John Locke) or that consciousness itself spreads out as a unique substance across a person’s life. 377

I cannot begin to address these complex philosophical issues here. However, C. Stephen Evans offers a description of features commonly associated with the use of the term ‘personhood’ and justifies his choice with the observation that,

‘In ordinary life the term is used with at least some measure of understanding, and it is possible to single out some of the concepts that are crucial to the notion of personhood’. 378

It is upon this broadly accepted account I will rely on when referring to aspects of the personal. As importantly, I will largely assume that discussion of one aspect of personhood will, by and large, entail

376 D.B.Hart, That all...p.56
reference to the others. Thus, reference to ‘intentional’ will presuppose ‘purpose’ and ‘rationality’ for example.

‘Persons’, Evans suggests,

‘...are first of all agents. They are beings who make choices and then act on those decisions...Persons are... (not)...mere (purely rational) thinking machines... Persons desire, love, want, wish, dislike, abhor and generally adopt a multitude of...attitudes towards a...variety of things. Despite this complexity, persons are nevertheless thought of as possessing an essential unity and continuity. Not only is a person considered to be unified at any one moment; a person is usually thought to be in some sense essentially the same person that he was in the past and will be in the future...These key concepts-actions, choices, consciousness, values, freedom, reasons, purposes, responsibility, sociality, unity- define for us a conceptual...word-picture...that we shall call the image of the personal’.379

It is of course possible to point to a strong thread in the theist Judeo-Christian tradition, that any conception of the divine as personal draws on aspects of this conception if not all of them. Meister and Drew, for example, have this to say,

‘God is generally understood to be personal (or at least, not less than a person: one who possesses mind and will, has goals and plans and purposes and so on), ultimate reality (the source and ground of all things), distinct from the world yet actively involved in the world (creator and sustainer), and worthy of worship (wholly good, having inherent moral perfection and excelling in power)’.380

This definition echoes those of the human person offered by Evans. The theologian John Hick says,

‘Theism...is strictly a belief in a deity but is generally used to mean belief in a personal deity’.381

Richard Swinburne states that, ‘God is a person...the creator and sustainer of the universe’.382

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379 C. Stephen Evans, Preserving the Person... pp. 10-11
380 C.Meister & J.K Drew, Good and Evil: The case for God in a world filled with pain, IVP, USA, (2013), p.1
The ontological naturalist of course will deny any content to the idea of a personal divinity however conceived, certainly not as ultimate, let alone the Trinitarian God of Christian tradition. I suggest that one fundamental difference between naturalists/atheists and theists can be argued to often turn on the question of the presence of the personal and teleological in an overall conception of the nature of existence, the question of divine ‘design’ being an instance.

Divine teleology in the Cosmos: naturalism vs. theism

David Hume’s contemporary and interlocutor, the Scottish philosopher, Thomas Reid (1710-1796) responded to Hume’s critique of the design argument in his *The Dialogues Concerning Natural Religion* in a lecture shortly after the posthumous publication of that work (1779). Hume had argued that induction could have no place in justifying God’s designing nature since we have no experience of God in Nature.

Hume’s argument was based on his assumption that anything that was to count as knowledge of the external world could only have resulted from the habitual observation of two kinds of thing occurring regularly, one before the other. On the basis of such an ‘inductive observation’, Hume suggested the idea that ‘design’ could be perceived in things could not be supported.

Reid argued, in reply, that “induction was irrelevant to the design argument, contending instead that we reliably infer design by identifying the “marks of intelligence and wisdom in effects”. 384

What Reid put his finger on was our strong tendency to suppose that certain features of the world around us seem to be the outcome of purposeful organisation, and we perceive this ‘design’ immediately through its effects. It is a tendency that seems to be widely shared (see below).

Can the urge to perceive God the ‘person’ in the provenance of the necessary structures of existence and the contingent beauty of mathematical physics be better explained by a naturalist ‘theory’, something that conforms epistemologically to the methods of science and the assumptions of ontological naturalism? A theory of that kind will have to account, amongst other things, why it is that the language of teleology appears to have an intuitively indispensable role to play in our conception and explanation of personhood, and personal agency.


Teleological explanations of behaviour are a fundamental mode of understanding ourselves and each other. They are of such central importance for us to our lives, identity, goals, values, and wellbeing, that it comes spontaneously to us to deploy teleology as a method of explanation across a variety of different types of event.

There seems to be an overwhelming tendency (see below), amongst *Homo sapiens* to extend teleological explanations way beyond their immediate application to other humans to try and make sense of the world and its happenings in meaningful and purposeful terms. Attempts at comprehension often implicate ‘supernatural’ agency to explain the behaviour of animate and inanimate events of the natural world. The Greek and Roman pantheon of gods of the pre-Christian classical era is the obvious example.

The presence of supernatural powers and deities have naturally been strongly associated with health, happiness, existential anxiety, and the explanation of events that would otherwise remain random, frightening, and unpredictable. When it comes to questions surrounding the ultimacy of being and the structures of nature, we thus appear to be psychologically predisposed to teleological explanations involving the *intentions* and *purposes* of divine beings.

The atheist, biologist, and co-discoverer of the structure of the DNA Helix, Francis Crick was very alert to this tendency. In his scientific biography, *What Mad Pursuit: A Personal View of Scientific Discovery*, he wrote,

‘Biologists must constantly keep in mind that what they see was not designed, but rather evolved’. 387

A clear difference between physicalist naturalism and theism thus rests on whether or not the perception of the world at any point in its comprehension manifests a personal divinity. The physicalist and ontological naturalist denies this is possible. Nothing personal or teleological is to be rationally admitted into any final account of the world: reason and science are the final determinants of that possibility and a ‘subjective’ response to the world as manifesting personhood is an illegitimate epistemological warrant for the case. If this diagnosis is at least part of the explanation of the

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385 De Cruz & de Smedt in their chapter 4, Teleology, the Design Stance, and the Argument from Design, of *A Natural History of Natural Theology*, provide extensive empirical evidence drawn from experimental psychology, including developmental psychology, cognitive psychology and cross-cultural studies that confirm the tendency of human beings to discern teleology in nature as well as how they judge probabilities. I consider later whether this work provides support for a reductive analysis of our theological instincts.

386 R.L. Hutton, *Pagan Britain*, Yale University Press, (2013) is an extensive book length review of the evidence from archaeological artefacts in the British Isles suggesting perceived supernatural presence that covers the Palaeolithic, Mesolithic, and Neolithic periods up to and including the arrival of Christianity across Britain.

differences between them, then the motivational conflict between the atheist naturalist and theist becomes clearer.\(^{388}\)

How teleology and personhood is to be understood in relation to cosmic origin will markedly differ as a consequence: the theist attributes its creation to a divine author and assumes that its structures are a consequence of His intention. In harmony with his biblical sources, revelation, and personal experience of the world as thus perceived, the theist takes it that God is not only the creator of all that is, possessed of the qualities of omnipotence, omniscience, and perfection but also a ‘loving god’. His intelligence and personal characteristics are inextricably ‘one’ in his nature.\(^{389}\)

The atheist or naturalist dubious about the explanatory value of such attributions and bearing in mind their demonstrated empirical failures in the natural world, will seek an explanation for the human tendency to see intention and the personal in nature and its origins elsewhere.

Firm in his conviction that the successes of the sciences, formally bracketed by methodological naturalism, provide support for his metaphysical naturalism, the atheist insists that the cosmos is blank. No evidence of the personal or intentional activity is to be found or perceived within it. No meaning, symbol, sign, argument, or anything expressive of mind or life has been excavated by the sciences in its explanatory innards he insists. One consequence of this is rather nicely expressed by Mark Vernon. Discussing the scientific enlightenment of \textit{circa} 500 years ago, he writes,

\begin{quote}
‘Immanuel Kant declared “dare to know” as the clarion call for the scientific age. However, this daring has led to many troubles taking hold of the Western soul. A key one is the so called “death of god”, the widespread sense that, in truth, we may be drifting through empty meaningless space, both literally across the cosmos, and metaphorically in our minds.’\(^{390}\)
\end{quote}

\textbf{Naturalism: explaining the illusion of divine teleology?}

The atheist naturalist must accommodate the strong impulse we have to see design or supernatural forces at work all about us. Since it cannot be for him a perception of \textit{actual} design it must be a consequence of our internal cognitive workings. A projection perhaps of our strong inbuilt cognitive

\(^{388}\) Note that the reference to ‘Conflict’ here is not suggesting that the relation between science and religion need be cast in these terms. The ‘conflict’ as I understand it is between ontological naturalism and theism, as \textit{understood} by the former. See A. Plantinga, \textit{Where the Conflict Really Lies: Science, Religion, and Naturalism}, O.U.P., USA, (2012)

\(^{389}\) I express it this way for the sake of brevity and acknowledge the theological and philosophical complexities and difficulties associated with it.

inclination to interpret non-animate behaviour via the categories of the personal, or the consequence, perhaps, of deep psychological yearnings projected onto an empty physical canvas.

An atheist naturalist, like the philosopher and cognitive neuroscientist Daniel Dennett, might even acknowledge that the inclination to discern the hand of design emerges from its predictive usefulness in negotiating not only ourselves but the world around us. Dennett calls this taking up the ‘Intentional Stance’.  

Combined with some evolutionary story about the usefulness of the Intentional Stance in self-preservation, Dennett’s argument, or something like it, is useful to the naturalist in several possible ways: Firstly, it seems to explain why we feel so strongly drawn to intentional explanations of phenomena even when we have confirmed non-intentional explanations of how they work and came to look designed: Our cognitive and affective structures embody a tendency that is a component of our ‘deep’ evolutionary heritage. Secondly, it can be mobilised to provide an alternative and well warranted explanation for why we are so strongly attracted to supernatural explanations.

Explanations of this sort generally run something like the following: our inherited tendency to attribute rational purpose to nature around us, leads us to ascribe rational personhood as an ultimate explanation for the presence of the natural world around us, even when we are familiar with the scientific explanations. In this sense our ‘intentional tendencies’ are irrational.

This reductive account explains our ‘irrational attachment’ to supernatural belief: the naturalist might be persuaded that our perceptual and experiential intuitions of supernatural teleology are a neurological outcome of evolutionary events: the subjective authority of that emergent experience might even endow it with a compelling force urged upon us by evolutionary cognitive and affective neuro-structures beyond our rational control. That instinctive force might engage one even whilst it is recognised that it lacks any epistemological warrant.

‘Science and reason’ of course provide the bulwark against the apparent epistemological power of our intuitions. We ‘perceive’ divine personhood when it is not, in fact, there. Consequently, intelligent forethought, love, or beauty are not present in any aspect of the universe’s construction, in the reality of its appearance to us, and certainly there could not be any purpose in its progress through space-time.

The theistic attachment to a God given eschaton is an illusion. If we make the attempt to find traction for the concepts of the personal anywhere in the universe, we will be guilty of a primitive usurpation.

of the truth detecting functions of the sciences by an equally primitive supernatural animism. For the ontological naturalist and the atheist this represents a reprehensible ‘prescientific’ apprehension of the universe, a non-explanatory and unnecessary ontological extravagance.

In the next section I enquire how the scientific disciplines can help with deciding between the options of a personal designing god responsible for nature and the skeleton case I have laid out above in support of the reductive naturalist claim proposal. The essence of the question I ask is, ‘can it help at all?’

The explanatory limits of the human sciences in questions of divine attribution

Why do we spontaneously and intuitively suppose that complex items display order and design that requires a designer or designers? The discipline of the cognitive science of religion, drawing on the experimental techniques of psychology and the social sciences, has attempted to answer this question. Amongst its experimental findings much evidence appears suggesting that aspects of belief in the supernatural are common to all human populations. The most common of explanations for the suggestion that features of belief are invariant amongst Homo sapiens are those that take their stance from evolutionary theories of origin and development.

This latter stance has given rise to much debate. Paul Bloom offers a succinct summary of the belief that ‘religious’ belief is an outcome of the evolutionary development of human cognition. In his essay, ‘Religious Belief as an Evolutionary Accident’, he hypothesises that

‘Religion is a non-adaptive by-product of ‘universal cognitive biases, including hypersensitivity to agency, a natural propensity to see non-random design as caused by an intelligent designer, and body-soul dualism’.392 393

Daniel Dennett’s picture of the ‘intentional stance’ is an instance of the view that we have ‘universal cognitive biases’ to teleological explanations.

De Cruz et.al. divide the capacities of cognitive systems that are presumed to emerge from evolutionary pressure into two categories; adoptions, ‘which deal with specific adaptive problems and

393 Bloom’s Chapter occurs in the collection of essays in the book immediately above both for and against the hypothesis that belief in a deity or deities is a spandrel of human evolution. Several ways this might be the case are considered, from D. Johnson and J. Berings’ contention that human systems of intentionality and the threat of supernatural punishment interact to force mutual benefits in social systems (Hand of God, Mind of Man: Punishment and Cognition in the Evolution of Co-Operation), to J. Barrett’s discussion of the ontogeny of cognitive mechanism pre-disposing to religious Belief.
byproducts’, ‘which do not fulfil adaptive functions but emerge as byproducts from adaptions’. Bloom, for example, suggests that religious beliefs whilst not being directly adaptive, nevertheless result from the normal operations of the cognitive system. In this sense they are ‘natural’.

De Cruz suggests that certain possible explanations follow from this.

‘Religion may be a product of our tendency to discern agents in the environment, it may be a product of our tendency to see teleology and design in the natural world, or it may emerge from the intuitive distinction we draw between minds and physical objects’. De Cruz, Natural History ...

There is of course a third option, that is that ‘religion is natural’ because there is a God to be encountered in nature. Can the cognitive literature help us to finally decide which of all these hypotheses are the likely ones? There is a reason for scepticism about the possibility that the findings of the cognitive science of religion can offer a final verdict.

What I mean is this: If all the literature from the cognitive psychological investigation of religious belief showed without question that Homo sapiens tended to perceive the supernatural in some form, what would this mean? Both theist and naturalist would claim it as proof of their respective positions: the theist because scientific support for universal intuition would support an epistemologically secured response to the theistic design of the world. In other words, we tend to perceive god (or gods) in the world because God is present there.

Examples of the compelling power of intentional rationality offering resources for the explanation of natural and answering questions of ultimate existence can be found in the ancient ‘Western’ world and other cultures prior to what we now call the ‘natural’ sciences. The design argument, drawing an analogy from design in artefacts to natural design goes back in the Western tradition to Plato’s Timaeus, Socrates, and the Roman lawyer, philosopher, and thinker Cicero (146B.C. to 46). A version of this argument appears in De Natura Deorum. Versions also appear outside the Western canon, the Hindu writer Sankara, for example, embracing the concept of a designed world. De Cruz and de Smedt consider the argument as being at its most popular from the 17th to the 19th centuries with William Paley’s (1743-1805) Natural Theology being amongst the foremost of the genre.

Not all ‘religious’ beliefs entail a transcendent deity. Chinese religious scholar, Livia Kohn, for example, concludes her essay by emphasizing differences between Western monotheism and a Chinese belief that ‘the ultimate in Chinese religion is a process of realisation and experience, part of the world yet not accessible to worldly means and thus the opposite of the Western concept of God’, L. Kohn, p.32, Ultimate Reality: Chinese Religion, in, Ultimate Realities, ed. By R.C. Neville, 9-35. State University Press of New York, Albany, USA, (2001)

Variance in understanding that presence could be easily explained by the proposal that like any intellectual endeavour, understanding the divine nature of what is before us is a long hard process. Even our knowledge of what constitutes a human person and their workings, including oneself, remains a task which can often appear dauntingly unattainable, so understanding divine presence in relation to the world could hardly be supposed to be any easier.  

The ontological naturalist or atheist on the other hand, would interpret any evidence from cognitive mechanisms, social psychology, and a plausible evolutionary theory, as indicating the human origins of the idea of a God. As in the case of Dennett, the ontological naturalist would no doubt maintain that the persistent perception of intentional design is an outcome of other adaptive capacities. From the ontological naturalist’s perspective, the step forward in knowledge has already been taken anyway, leaving behind the theist thesis as a hypothesis refuted.  

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400 I should note I am not asserting that the disciplines investigating the cognition of religious belief have nothing to offer in pursuit of how we are cognitively and neurobiologically structured such as to be inclined to perceive divinity in the world, but this would no more prove that God does not exist any the more than those suffering from dyscalculia, an unfortunate neuropsychological disorder that makes basic arithmetic hard, prove that mathematics is a product of the brain areas concerned.
Part 2

**The divine teleology of metaphysical structure**

The classical 19c Argument for design⁴⁰¹, that of William Paley⁴⁰² (see footnote below) is perhaps classically and typically associated with the final failure of intimations of perceived design in nature. Paley provided a now iconic example to illustrate his argument, the picture of someone coming across a watch amongst the flora of a heath.

The most natural of inclinations, he proposes, is that it should be taken to be the product of design. The intuitive pull of this explanation of the complexity and functioning of the biological organisms of the natural world was, of course, displaced by Darwin’s theory⁴⁰³ of natural evolution which (apparently) dispensed with the need for purposes and final causes in biology.⁴⁰⁴

The displacement of teleology and ‘design’ does not however, subtract from the attraction of the idea that ‘design’ has an appropriate sense-making contribution to our overall comprehension of reality. I have already argued in previous chapters that, in any event, teleology has a role to play in understanding the artefact and behaviour of natural creatures including ourselves (see footnote). I also argued that teleology lies at the heart of the possibilities of the natural world.

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⁴⁰¹ The ‘father of chemistry’, as I noted earlier, offered a defence or at least left open the possibility that ‘final causes’ might still have some role to play in the experimental sciences. I mention this again to indicate that the ‘failure’ of the design argument was not a straightforward deduction from the early successes of empirical science, R. Boyle, A Disquisition About the Final Causes of Natural Things Wherein It Is Inquir’d, Whether, And (if at all) With What Cautions a Naturalist Should Admit Them, John Taylor, London, 1688 (reproduction of the original in Cambridge University Library), Early History of Medicine, Health & Disease Series, early English Books online, EEBO Editions, ProQuest.


⁴⁰⁴ I have already discussed T. Deacon’s argument for the incorporation of teleology into biology. Another biologist who has made the case is F.J. Ayala. Professor in the Department of Ecology and Evolutionary Biology at the University of California he has argued in an article entitled *Darwin and Teleology*, that teleological explanations are necessary in biology. However, he presents an argument that this is entirely consistent with the physicalist explanations of the behaviour and structure of organisms and involves no recourse to Intelligent Design which offers a theory that aspects of the complexity of organisms cannot be accommodated within the framework of any evolutionary theory. See, F. Ayala, Darwin, and Teleology, in *Science and Religion in Search of Cosmic Purpose*, ed., J. Haught, Georgetown University Press, Washington, DC., USA, (2001)

E. Feser, has argued in a comprehensive work entitled, *Aristotle’s Revenge: The Metaphysical Foundations of Physical and Biological Science, Editiones Scholasticae, (2019)*, that the fundamental categories of the Aristotelian philosophy of Nature, including such concepts as final causation, actuality, and potentiality and so on are implicitly *supposed* by modern science.
Since teleology is closely conceptually tied to design, one non-reductive possibility is that the intuition that design is found around us is well founded.\textsuperscript{405}

The perception of design it might be argued is not illegitimate but \textit{wrongly sought} in the domains properly belonging to the sciences. It should be noted here that divine ‘design’, as I use it here, is but a shorthand for the idea that \textit{however} nature functions, it is the outcome of divine activity. Of course, this raises questions about God’s intentions for the universe and how they are to be realised (if for example, many processes are random or outcomes only possible rather than determined) not for the question that their operation was ‘designed’ to be such in the first place.

To recognise that design has a referential and meaningful arena of application is not necessarily, as might be thought, an attempt to save a concept displaced by empirical advances in understanding the natural world. It might represent an appropriate intellectual and theological shift in our overall comprehension of reality to which the natural sciences have contributed.

The contribution of natural science to ‘design’ is to help shift us to the understanding that the \textit{perception of design is a response to the metaphysical structure of things that we develop in coming to understand the world through our empirical and philosophical engagement with it}.\textsuperscript{406}

I have already offered reasons, for example, to suppose it might be plausible that that structure involves elements congenial to the very idea of a lawfully accessible nature as involving design.

Any ‘law of nature’ must describe and predict what happens. This is much the same as saying that any law of nature must have the potential to describe the changes that regularly occur in the phenomena in which it has an interest. It is to say of any law of nature used in explanation that it \textit{must} yield outcomes appropriate to these tasks if it is to serve theoretically useful functions.

A ‘law of nature’ presumably has the descriptive and predictive capacities it has because the principle on which it is based derives from metaphysical assumptions, that, for example, nature is ‘uniform’\textsuperscript{407} or

\textsuperscript{405} M. Augros, \textit{Who Designed the Designer? A rediscovered path to God’s existence}, Ignatius Press, San Francisco, USA, (2015), offers a highly accessible Thomist refutation of the idea that since a designed universe would require the designer himself to be designed thereby initiating an infinite regression, the best place to draw an end to that possibility is the universe itself. Whilst his book is not strictly academic in intention his presentation of the argument and the Thomist replies to it are clear.

\textsuperscript{406} I put it this way, because the traditional idea that we ‘abstract’ metaphysical principles from our sensory and cognitive engagements with the world does not quite capture the picture I want to elucidate; that our very experience of that world as yielding physical objects and sensory creatures to perceive them is a function of the metaphysical principle that make possible that experience as one containing an ‘external world’ and ‘experience’.

\textsuperscript{407} By ‘uniform’ I refer to a metaphysical pre-condition not physical occurrences: if our understanding of biology yields local differentiation even within local populations then the fact of our being able to articulate it as an occurrence which occurs and reoccurs is a mark of uniformity.
‘causal processes are regular’, or ‘all objects come in structural forms with general properties that flow from that necessary principle’. As I discussed, for example in the case of mathematical physics, the equations that describe the fundamental forces (e.g., electromagnetism), are themselves constrained by the aesthetic principle of symmetry.

The personal agency behind the metaphysical principles and conditions that determine the contingent nature of any physical structure and the consequent concept of ‘laws of nature’ is where design may be located free from the threat of attempting to displace empirical theory. Inasmuch as evolutionary theory is about one aspect of one contingent structural process of the natural world, it shares the same metaphysical determinants and presuppositions. This thought is not one that emerges in ignorance of a scientific solution but comes out of reflection on the conceptual prerequisites of such solutions.

The thought is that ‘design’ might lie behind the metaphysical tapestry which provides for the discernment of the idea of an ‘empirical nature’. As I argued in the first chapter, and reiterated at the beginning of this one, the concept of an empirically approachable independent ‘nature’ is not a given of a perceptual encounter with things around us, but an intellectual achievement of human persons who are part of the world. In that achievement we uncover something of the ‘design’ of natural reality.

The aesthetic manifestations of natural structures, for example, is not comprehensible out with the broader picture, and serve expressive purposes. The perception of beauty exemplifies this: rich in provoking desire and hope, it is intrinsically evocative of ‘meaning’, whether in physics, in other aspects of ‘nature’, and in human artefacts.

It is plausible to offer the thought that behind the provenance of aesthetic structures at the heart of matter lies the divine personal. The understanding of metaphysical structures, inclusive of those providing for the laws of nature and the teleological, seems to be one that can engage a cause beyond both. In the Judaeo-Christian tradition this is of course a personal God.

No less a figure than Charles Darwin acknowledged this. After reflections on the infamous case of the Ichneumonidae, a wasp which places its eggs in the living body of a caterpillar to provide its offspring with living flesh to feast upon, he wrote to his friend Asa Gray, a prominent biologist of his day with his ethical reflections on evolution.

Darwin, quite reasonably, argues in the letter that the apparent intrinsic cruelty manifested in the Ichneumonidae’s behaviour could not be the plan of a ‘beneficent creator’. Despite this thought, he conceded to another of equal conviction,
‘...I cannot anyhow be contended to view this wonderful universe & especially the
nature of man, & to conclude that everything is the nature of brute force. I am
inclined to look at everything as resulting from designed laws, with the details,
whether good or bad, left to the working out of what we may call chance’.408

‘Beauty’, like good comes with bad, comes with ugliness. This apparently necessary combination of
evaluative opposites is a perennial source of theological concern. It should not be a surprise that
Darwin struggled with the two thoughts: the necessity to attribute design behind the very presence
of evolution and the disregard of evolutionary processes to suffering.

Despite his struggle to reconcile what seems to be a blatant cruelty with a good god, this was clearly
not enough to inhibit the intrusion of the concept of design into Darwin’s thinking about the place of
evolution in the broad scheme of things.409 Curiously, this comment is often overlooked but is rich in
exegetical possibility. What he presents is, in effect, a *metaphysical* reflection on how the mechanisms
of evolution that work via what he says is ‘chance’, ever came to be.

It is of similar interest that he precedes the use of this word with the phrase ‘what we call’. The first
of these reflections suggests that he was aware that evolution should be placed in a broader context
in which the *fact* that the slow coming into being of forms of life works the way it does, via natural
selection, survival and ‘chance’ is something that itself requires an explanation410. What or who
enabled the laws and mechanisms that underpin the principles of evolution? The answer he is
compelled towards is that behind the coming into being of natural ‘law’ and evolution of creatures is
design.

This interpretation receives further support from the second point. The use of the phrase ‘what we
call’ leaves the door open to precisely this metaphysical supposition. In other words, whilst correctly
showing that evolutionary mechanisms do not predict the kinds of creatures that will evolve by
chance, *that creatures can* potentially evolve might be designed *into* the universe *ab initio*.

This point is emphatically not the claim that if we pursue the explication of natural structures and
events halted by physicalist strictures, we will inevitably encounter designed elements *in the

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408 Letter to Asa Gray, May 22, 1860. Quoted in M. Ruse, p.23, The Argument from Design: A Brief History, in,
Debating Design: From Darwin to DNA, (pp.13-31), ed. W. Dembski & M. Ruse, Cambridge University Press,
Cambridge. (2004). For a fuller discussion of the correspondence between Darwin and Gray, see, J. Lennox,
The Darwin/Gray Correspondence 1857-1869: An Intelligent Discussion About Chance and Design, in,
Perspectives on Science, Vol. 18, no.4. (2010). See also, J.L. Gray, ed., The Letters of Asa Gray, 2 Vols. Boston,
universe whose complexity cannot yield to the materialist causes assumed by the natural sciences⁴¹¹. This is the claim propagated by Intelligent Design Theory that complexity is to be found in certain natural objects, perhaps cells for example, or other biological functions and structures that cannot be explained by the vagaries of natural selection. Design is however already present in the universe before the identification of entities that are claimed not to have originated by natural processes. It is a condition of there being anything at all.
Creation, design, and the natural sciences

The more careful claim draws on the distinction between Creation and Universe. The whole panoply of laws of nature, principles of development, mathematics, the potential for sentient creatures to evolve, space-time, regularity and so on are one might say, ‘created’ or brought into their various forms of ‘being’. The functioning of that universe and ‘how it goes’ as Cardinal Baronious (1583-1687) is reputed to have said of the heavens in the Galileo case, is a matter for the sciences. This does not of course mean that there are no conceptual connections between the coming into existence of the universe and its functioning.

Physicist and theologian, Stephen M. Barr articulates this in an essay entitled *The End of Intelligent Design*. Discussing his opposition to Intelligent Design theory, he writes

‘The older (and wiser) form of the design argument for the existence of God— one found implicitly in Scripture and many early Christian writings— did not point to the naturally inexplicable or to effects outside nature, but to nature itself and its ordinary operations— operations whose power and working were seen as reflecting the power and wisdom of God’.  

In another article by Barr entitled *Chance, by Design*, he fleshes this out. His argument there, is directed at the question of ‘chance’ as understood technically within probability statistics and its use within natural sciences concerned with biology and evolution. Barr writes,

‘When biologists start making statements about processes being unsupervised, undirected, unguided, and unplanned, they are not speaking scientifically. No measurement, observation, or mathematical analysis can test whether God planned a development like a genetic mutation. What apparatus would one employ? ’Being unplanned by God’ is simply not a concept the fits within empirical science. Being ‘statistically random’ on the other hand, is, because it can be tested for.

And suppose we did define Neo-Darwinism to include the belief that the world is ‘unguided and unplanned’ by God. Then Neo-Darwinism would be atheistic simply by definition. Only if Neo-Darwinism is defined in terms of its strictly scientific

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413 E. Sober, *The Design Argument*, Cambridge University Press, Cambridge, (2018), provides a technical discussion of Intelligent Design and the Fine-Tuning Argument. He usefully incorporates a discussion of probability theory which is required to analyse these arguments when presented with reference to mathematical probabilities. See more references on a later page.
content does how well it comports with a religious view of the world become and interesting and debatable question. This is the question I shall now examine, particularly how the kind of randomness posited by Neo-Darwinism theories can be consistent with divine providence. But first we must understand what providence and randomness are.

Most traditional forms of biblical religion agree as to what providence is. They may dispute how providence relates to human freedom, but their differences don’t affect their understanding of merely physical processes such as evolution. The traditional doctrine is that God, the transcendent source of being, wills by one timeless act that all things exist, wherever in space and time they do exist. He is the creator of all finite beings in every aspect of their being, and hence he creates them with all their nature potentialities, powers, and relationships, including their causal relationships to each other'.

In the last paragraph, Barr locates the proper domain where questions about design properly belong. The astronomer and historian of science at the Harvard Smithsonian Centre for Astrophysics, Owen Gingerich, in the book based on his 2006 Noble Lectures, ‘God’s Universe’ has a chapter with the pointed question, ‘Dare a Scientist Believe in Design?’ which develops the same point.

‘Is the universe designed?’, he writes,

‘...is not a scientific question...the reason is simple. The answer is one without an answer in the scientific sense. It is a metaphysical one whose answer will come out of metaphysical reasoning’.

Later, when answering the question underpinning his chapter, he acknowledges,

...‘that to believe in a designed universe requires accepting teleology and purpose. And if that purpose includes contemplative intelligent life that can admire the universe and search out its secrets, then the cosmos must have properties congenial to life. For me, part of the coherency of the universe is that it is purposeful...’

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414 S.M. Barr, Chance, By Design: The Scientific Concept of Randomness is Consistent with Divine Design. https://www.firstthings.com/article/2012/12/chance-by-design
The invocation of design clearly implies the presence of a ‘designer’, and the implication of that is the presence of the personal. Behind the distinction Barr makes, and Gingerich’s quoted comments are all words, ‘Planned’, ‘creator’, ‘unsupervised’, ‘wills’, ‘purpose’ that encompass the mindedness of personal agency.

Whatever we are to make of the personhood of God, and whether or not we can successfully refer to Him and the extent to which our conversations about his attributes are captured by the common languages of our own human personhood, are questions that I cannot fully address here. What I can insist on, nevertheless, is that any theist account of God’s nature or argument for God’s existence, and his bringing about of our world will embrace somewhere in its construction reference to the personal as we roughly understand it and make use of it in the ordinariness of human life.

Since this being cannot itself be caused by the physical world it creates, and since that world cannot be the cause of itself, the term ‘creation’ can only gain any sense here from its semantic relation to the idea of a being who intended it to come about. The genesis options are binary; either personal or impersonal. I discuss these observations in greater depth in the next chapter.

It is sometimes suggested that this limits what any such argument from the existence of the cosmos can show is the outcome of the actions of an abstract ‘superintelligence’. ‘Superintelligence’ in this context suggests an abstract rationality lacking the kind of motivations that move persons, those of value and feelings.

‘Reflective rational intention’, however, is a teleological attribute of persons. And what any intention is, must be spelt out by reference to the reasons for having it, the desiring of its outcome, perhaps because it is good, and acting to bring it about. Hence, my minimal claim that whatever brought the universe into existence must have the property of sharing the agency of the personal. However, the reference of that term is to be understood when applied to the divine, it must on pain of meaninglessness have this minimal content.

In the following sections I offer examples to illustrate and support the point. The first of these is drawn from questions about the origins of the universe: since these reflections involve mathematical physics.

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416 What has been called ‘Hume’s Objection’ insists that if we have a series of causes, such that A causes B, B causes C.....then, if we can explain the causal relations between each 2 elements across the series, there are no further explanations to offer i.e., of the Series considered, if it can be, as a Whole. This argument relies on the analogy between ‘The Series’ as an object and the ‘Universe’ as an object. It is not clear however that the coming into being of The Series consisting of the chain of causes does not require some account of how it came into being, and that that series does not require a final cause to support it.

417 A further argument that cannot be made here, might suggest that ‘intentions’ are ineluctably bound with what is a ‘good’ or ‘bad’ intention’ hence introducing at least the possibility that intentions are open to moral assessment.
and early cosmology, they are strongly related to questions of ultimacy, creation, aesthetics, and personhood. The second example comes from the ontology of morality. I choose this because of its particular normative resonance for personal choice, agency and free will.

**Cosmological and Design arguments and evidence of the personal**

Modern cosmology appears to point to a universe ‘fine-tuned’ for life\(^{418}\) within a remarkably short time of its coming into existence. This is the ‘anthropic fine-tuning argument’\(^{415}\), the view that several conditions had to be present together at the ‘Big Bang’, the birth of the universe, for life to emerge. The probability of their co-occurrence by ‘chance’, the argument runs, is so vanishingly small that the Best Explanation is that they evidence the prior intentions of divine intelligence.

It is the observation of the co-occurrence of these features at an inconceivably early stage of the universe, as well as the lauded extra-ordinarily low probability of various physical constants that is important in suggesting design. Put at its simplest, if the universe were designed, it is at the point of creation where one might expect to find precisely those features that would yield the potentiality for the full flowering of the universe and *all* its inhabitants at some point in its future.

The early laying of the foundations for a house are a function of the architect’s overall conception of the building, and clearly restrain and provide foundations suited to what will later emerge. The dwelling has in other words been designed. The difference here, of course being that god gives being *and* essence to those elemental components that bear cosmic and life-developing potential.

That the universe must have consisted of structures and forces which had the *potential* for flowering into nature and life, including ourselves with our capacities for reason and thought, follows from the fact that the universe *now* contains nature and life. The application of the logical rules of *modus ponens* (method of affirming), *If A, then B, A, so B* and *modus tollens* (method of denying), *If A then B, -B, so -A* can describe this argument formally.

Let T\(_{n+1}\) = some given time after the birth of the universe, T\(_n\)

\(^{418}\) Design arguments take many forms, ranging from comparisons of the probability that certain features arose by chance to the probability they were designed, to arguments of an apriori nature. A good selection of technical articles related to this issue is to be found in ed. N. Manson, ed., *God and Design: The Teleological Argument and Modern Science*, Routledge, Oxon. England, 2003. Also see, Part 1, Cosmological Argument, part 1, Teleological Argument, in, eds., J.P. Moreland, C. Meister, & K. Sweis, *Debating Christian Theism*, Oxford University Press, Oxford, (2013). Each section contains arguments for and against the two classical positions.

Let A= There exist properties conferring potential for life and nature at Tn+1

Let B= Any and all properties of life and nature which exist at Tn+1 have properties whose emergence a(Bodies have water, water consists of H2O, hydrogen is formed in the stars and so on)

It follows logically that if A is true and if B is true, then, if we deny B, then we must deny A. It is conceivable that someone may wish to deny B, but then they deny a cardinal tenet on which every physical science relies. Put at its broadest, this is the principle that everything in nature has a preceding set of natural events that explains its physical origins and its current causal functioning.

Note, en passant, that with a denial in place, the very assumption of evolutionary theory, that animate life develops from the relation between the physical environment and the physical organism, would be thrown into potential doubt.

The argument of course does not and cannot establish the physical nature and mechanisms by which the physical universe emerges, develops, and functions. Like the architect and the building, however, it can provide support for an argument that for there to be any such thing as a physical thing, event, or structure a metaphysical designer provides the terminus for an explanation that cannot be provided from within the physical world.

**Design and scientific progress**

To elucidate the idea that the understanding of the right place to assign design in our ultimate comprehension of the world is part of a greater intellectual progression to which our advances in science contribute rather than detract, as much current orthodoxy (at least naturalist orthodoxy) insists, I want to introduce the idea of ‘epistemological progressivism’. By this I mean the idea that as knowledge of the cosmos advances so any questions which seem at present to fall without its scope are often incrementally degraded. Evolutionary theory is an example here, and so is physics.

Theists might often consider themselves on the epistemological back foot in this regard. The cautionary tale for the theist is to be careful of a ‘god-of-the gaps’ argument: using God to fill some

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420 So, for the existence of any property x which does not exist at the time of creation, the universe at creation must have had the potential for that property to emerge prior to its emergence, (If A, then B). If we deny that the universe at creation had the potential for that property to emerge, (¬B), then, by modus tollens we must deny the presence of that property now (¬A). But that property does exist (A), so the universe must have had the potential for its emergence at creation (B). Our only other option is to suppose that new properties or substances, or even extant properties or substances, can emerge that are entirely unrelated to what already exists. This cannot be a happy conclusion for the physicalist or the naturalist. It supposes the possibility that an entirely novel physical object might suddenly appear before me without any derivable physical causes.

421 ‘Terminus’ refers here to logical not physical or temporal terminus.
explanatory gap in the sciences. There is another way of conceiving scientific advances, however, that can contribute to a greater comprehension of the divine personal in relation to the natural sciences.

Some scientific advances seem to enhance our aptitude to perceive more precisely where evidence of intention is to be found without posing it as an alternative ‘scientific’ explanation. Consider, for example, how someone unacquainted with the very idea of a combustion engine, from a pre-scientific culture might approach an explanation of a moving vehicle seen for the first time. They are likely to draw on explanations that involve perhaps ‘hidden horses’, or concealed people who intentionally provide the moving power.

Suppose the explanatory climate of that culture gradually shifts as it comes to the idea of contemporary science (as indeed Western culture did). Coming to understand the various engineering and scientific principles behind the engine, for example, does not obviate the entire framework of application of teleological explanations, but refines the domain of application of that understanding.

Increasingly its use becomes more refined and precise, being confined to explanations of agency involving human movements of objects for some purpose, and, more generally, refined to explanations of personal life and behaviour. How we come to understand the place of divine teleology in relation to the existence of the ‘physical world’ may involve similar progressions in intellectual comprehension.

Here, as a contemporary example, is an opinion expressed by Robin Collins⁴²², the Oxford philosopher, on the theistic explanation of the birth of the universe, its creation. He points to several features of the very early explosion of matter/energy, and space-time coming into existence at the ‘big bang’. Collins points to the degree of fine tuning necessary for the ‘cosmological constant’, and the initial distribution of mass-energy in the universe. In the former case the figure is one part in $10^{120}$ – that is, one followed by 120 zeroes. In the case of the latter example, the figure is even larger.

The inexpressible size of these improbabilities⁴²³ gives rise to the suggestion that they must have arisen by intentional manipulation, the ‘fine tuning’ to which I previously alluded. The physicist John Leslie attempted to enunciate why the personal explanation seems such a powerful alternative. He asks us to consider a firing squad composed of many men that misses its unfortunate target, despite

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⁴²³ One popular alternative is the ‘multi-universe hypothesis’. Expressed very briefly it argues that since there are any number of universes that come (or can come) into existence, the probability of one being ‘fine-tuned’ as ours is, at least probable, thereby diminishing the force of the design argument. As mentioned in my chapter on mathematics and physics, one objection is that the hypothesis that there are other universes cannot be tested. I noted in this chapter that this objection has been raised by S. Hossenfelder, herself a physicist.
it being observably a near impossibility. The most reasonable assumption, he suggests, is that the
members of the squad intended to miss their target. All other explanations fail to rise to the plausibility
of this one.

Considering the enormous improbability of the figures he quotes occurring by chance, Collins says,
‘Speaking for myself, almost anything is more believable than this degree of fine tuning is just a brute
fact.’

He says this because he finds the inference to a designing mind behind these physical and structural
improbabilities an almost irresistible resting point for making their appearance intelligible. One can
understand why Collins says this.

One interpretation of Collins’ conviction is to argue that there are such things as scientific facts at all
requires understanding. That understanding is comprehensively and intelligibly explained by a
different kind of explanation, appealing to the intention that the world should be such as to contain
scientific facts. Scientific facts must bottom out somewhere.

An explanation for the existence of scientific facts, if there is to be such a thing, and whatsoever they
may turn out to be, cannot itself be composed of scientific facts. The ‘fine-tuning’ argument may be
the place that ‘scientific facts’ in respect of the origins of cosmology come to a particular kind of end.

This is of a piece with the frequently repeated contention of this work that the natural world as we
have it requires a metaphysical context to give it its physical nature. The very concept of a ‘scientific
fact’ is not itself the production of any scientific activity. It is rather a piece of the metaphysical glue
that holds together what is meant by the achievement of a supported knowledge claim resulting from
experimental and theoretical activity.

So, one may think of expressing Collins point this way: That there should be scientific facts quite as
extraordinary as those of ‘fine-tuning’ suggests a metaphysical architect. That they should be beautiful
facts puts the final theistic icing on the metaphysical cake.

424 Notice that the argument they may not bottom out, does not invalidate the asking of the question ‘Why?’
To which one answer may be, ‘God intended it to be so’. The intentional explanation would not disappear but
find its correct place elsewhere.
Collins makes his own case this way,

‘Even if physicists found a theory that entailed the initial conditions of the universe and the constants of physics fall into ...the permitting range, that would still involve extreme fine-tuning at the level of the laws themselves’. 425

This point has an echo of that made by Gingerich above. It is different from a ‘scientific’ vs. a theistic explanation for natural phenomena. It could turn out that certain empirical theories of physical origins find an end at this point. Even the naturalist might be willing to concede the concept of an ‘end point’ whilst denying on philosophical principle an end to the possibility of empirical endeavour. After all, for all naturalists the material structure of things is the end point of all that there is or could be. If this should be so, the ‘fine-tuning argument’ would be considerably enhanced.

Whether or not Collins has placed the metaphysical explanation at the right place is a matter for ongoing interdisciplinary debate. Should there be a suitable explanation from physics, then Collins is wrong, but, if this is the case, then, those mechanisms would be the first point of designed origin.

The argument is a metaphysical not a physical one, so this is not an argument that can dictate conclusion to the cosmological sciences. Whether it has any defendable traction, my point in exemplifying it is to note that the pull of a teleological explanation located at the metaphysical level, is hardly undercut when faced with sophisticated physics and cosmology but may be exacerbated by it.

We may be cognitively simply unequipped to ever approach the perfections of divine design in its manifestations in cosmology or other sciences, but ‘signs’ that can be understood as manifesting teleology in nature may be available to us in the sciences as elsewhere. But perhaps I may conclude with a final reiteration: the very idea of the sciences assume teleology; that science has a purpose which can be fulfilled, that of acquiring empirical explanations.

That such a possibility exists is no surprise to the theist since purpose lies at the heart of the concept of metaphysical creation. The world was constructed ab initio with the purpose of providing for the functioning natural structures and the potential for the emergence of creatures who could reason their way to understanding its structure and the provision of a world uniquely fitted to be thus understood.

425 Debating Christian Theism...p.44
Ethics and the personal

Another point to be drawn from the Darwinian morsel originally quoted is his use of the phrase ‘wonder’ and the intended or accidental admission that ‘good’ and ‘bad’ might be found in the very nature of the physical world. It is the apparent presence of such events as the behaviour of the parasitic ichneumonid that seems to force this judgement from him.

Darwin cannot, his naturalistic explanation notwithstanding, inhibit the desire to ethically reflect on the consequences of evolved behaviour. Not only that, but he is clearly repulsed by the activities of the ichneumonid and cannot inhibit his moral repulsion to it. The question is why this should be so. There are many potential explanations of this commonly shared reaction to the cruelty displayed by most creatures including ourselves.

Natural evil, that which emanates from purely physical objects, draws similar ejaculations of judgement even with the knowledge that intention cannot be involved. Consider responses to natural disasters, for example. There is often a sense of the unfairness of random and inexplicable death and injury, coupled with an inchoate revulsion at the physical events themselves, even whilst acknowledging a simple ‘occurrence of nature’.

Now whilst the question of why a good god would allow for or create evil is one of supreme importance for theistic traditions, there is a question that precedes it. The question is from whence our knowledge of and capacity to identify and condemn evil derives.

These are questions that involve Theodicy and Moral Philosophy. They have ranged from the denial of the coherency of any objective moral realm that determines value in favour of subjectivism, to the positing of an abstract Platonic realm of ethical forms, to the suggestion that moral propositions whilst sharing the form of a factual claim such as ‘eating people is wrong’, is nothing but a disguised attitude of distaste with no content, sometimes abbreviated as ‘boo to eating people’: the use of the word ‘boo’ indicating that no moral proposition has any rational or assessable content despite appearances.

None of these questions can be properly engaged with in this work, beyond noting that for the theist anyway an inarticulable disapproval, when pertinently delivered, may nevertheless carve god’s moral intentions at their correct joints.

Rather, I should rather like to draw attention to why it is that the Moral argument for God as the giver of moral law to be found in the Universe, has had a powerful appeal for many. I suggest it shares with the other classical arguments a similarly powerful attraction to elements of the personal. This is not to defend the position, but to indicate the source of the power of its psychological appeal.
Moral assertions are, taken a face value, concerned with the rightness or wrongness of actions or thoughts that concern the sentient and the animate. A proposal that it would be wrong to chop up a wooden table that located its force as something to do with the physical properties of the table would not be taken to be a matter for debate, it would simply be recognised that a wooden table is not an appropriate entity at which moral concern should be directed because no sentient properties are attributable to it. Human persons, sentient creatures, and more contentiously, at the boundaries of what is to count as sentient life, insects, and plants, provide the categories of being which provoke moral emotions and debate.

Now whilst this observation is not enough to necessitate the need for a personal lawgiver, the association of morality with the inter-personal and the sentient strongly implicates a provider with sensibilities attuned to self-other behaviour and involving mutual concerns such as fairness, justice, harm and so on.

In the case of Darwin noted above, his concerns about the morality of a god, are clearly premised upon the implicit association of a ‘good god’ with a ‘good person’. No kind and thoughtful person, governed by the principle that one should not cause pain without good reason, would intentionally design a system, the necessary workings of which entailed suffering. The ‘problem of evil’ one might say is premised on the assumption of a personal deity concerned to bring about the good in his creation.

Without the idea of a world created by God we may acknowledge that bad things are to be found in it, but without the idea that the world has been created for the good, but simply physically exists without purpose, intentionality, or agency, the question of whether or not the world should contain bad loses any traction at all. Good and evil are just present in the way sand and rain are.

Without the presence of sentient intention there can be no preceding question as to whether it was intended to be one or the other or both. The problem of evil only arises in the way it does for the theist.

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426 The argument here is that ‘being wooden’ is not itself sufficient for being an object of moral concern. What would have to turn something wooden into an object of moral attribution is a property that derives from outside its ‘woodenness’. Thus, it may be an object of cultural or personal significance. Environmentally of course, the threat that wood might disappear is an object of concern, but this is not because it is ‘wood ‘per se’ but because of value attached to it as an item of environmental value.

427 It may be argued that environmental concerns obviate this argument. However, environmental arguments do not suppose that cruelty or suffering is being imposed on insentient matter, but rather that it is a good-in-itself, that the environment be preserved. Quite why this should be so, if the world is blind and dark to itself and has no intrinsic interests which could be the subject of moral concern, is not clear. The theist, on the other hand, might argue we need to treasure the physical world because it belongs, as it were, to God, and is constructed from teleological principles of value. Alternatively, or at the same time, it may be argued that damage to the environment causes potential harm to come to sentient creatures, and this is a bad thing. In any event it will be clear that the central force of ethics derives from their person-regulating functions, or their sentient creature regulating functions.
because believers acknowledge that there is a *prima facie* conflict between the claim of a *personal* god acting for the good of those things that he brought into existence and the presence of harm and suffering in his created order.\(^{428}\)

To acknowledge this is, also of course, to begin from the intuitive assumption that the person or persons of God are intimately involved not only with us, but all the creatures and elements of the created world.

So, I conclude that the content of the classical arguments whilst resting on ‘what can be known or rationally believed about God on the basis of human reason, without recourse to any special or supposedly supernatural revelation’, \(^{429}\) also rest on the perception of some relation of god’s persons or persons to the natural that may be perceived in the natural.

### Finding God, the person, in nature and its objects

That the naturalist, as well as his antagonist, the theist, both continue to experience nature, as expressing characteristics of the personal, prescinding from the experience only with cognitive effort, should suggest we take seriously that *nature* might, fact, present us with such experiences because they actually\(^430\) manifest them. If nature can manifest mindedness and agency in us, *might* the natural world express similar manifestations of the divine in its explanatory structures? At least, we should be prepared to consider that it might.\(^431\)

In his work based on his St. Andrews Gifford lectures of 2017, *The Hiddenness of God*, Michael C. Rea has a chapter entitled *Divine Presence in a Material World*.\(^432\) His concerns differ from mine since he is interested in offering some insight into how *any* divine encounter is possible. He highlights the ‘traditional view, that if nature or the material world has properties pertinent to ‘meaning’ and ‘value’,

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\(^{428}\) See, Moral Argument, Part 1, *Debating Christian Theism*... eds. J.P. Moreland et.al., for an example of discussion in this area. See also, J.D. Hunter & P. Nedelisky, *Science and the Good: The Tragic Quest for the Foundations of Morality*, Yale University Press, (2018). They trace attempts to find a naturalist (scientific) foundation for morality covering amongst others, the efforts of eminent evolutionary biologist E.O. Wilson, the Neurophilosopher, Patricia Churchland, and Sam Harris. Concluding that all these efforts have been unsuccessful, they raise the idea that for this reason ‘moral science’ has turned to a denial that ‘right’ and ‘wrong’ exist changing the idea of ‘morality’ into a project of socially engineering happiness. They argue that this is an implicit moral nihilism.


\(^{430}\) I use the word ‘actually’ in its strict Aristotelian sense to suggest that an ‘act’ is a coming into being of a potentially of a substance.

\(^{431}\) I note that we might here be talking about not only many different conceptions of ‘nature’, but experiences of the personal in nature as differing in character, extent and so on, from different science to different science, and from culture to culture. Nevertheless, I claim that *all* human persons make some distinction between what is and is not them. Even in the case of an animistic society that detects the hands of spirits and gods in the natural, the nature of those spirits and gods will be such as to enable distinctions between them and the homo sapiens who claim to detect or experience them.

that are characteristic of sentient life of persons, then they do not fall within the scope of the natural world as characterised by the sciences. However, as he writes, reflecting on ‘a broad strand of thought in contemporary philosophy and theology’⁴³³, there is a trend to

‘...buck against the modern conception of the world as “disenchanted” or entirely free of properties that fall outside the scope of what is investigated by the natural sciences’.⁴³⁴

I have already drawn attention to this movement in previous chapters.⁴³⁵

What is meant and entailed by this distinction is crucial. As I noted in the discussion earlier on Gregory Dawes, the presentation of the world to us as ‘natural’, i.e., devoid of the personal, is a pragmatic one that can exclude the necessary metaphysical structures that allow for its investigable isolated ‘physical’ appearance to us in this manner.

As I pointed out, the metaphysical background is taken for granted by the modern scientist. As I further argued, matters are not that simple. Theoretical evaluation often does include what might be classed as ‘normative’ properties. As the reader will be aware, I have maintained that, in the realm of mathematical physics at least, nature displays properties that are precisely those of an aesthetically appealing character. Whatever else they are, they seem to fall within the scope of mathematical physics and are precisely characteristics, I suspect most would agree that are essential to the perception of anything as ‘enchanted’.

Now Rea’s primary interest is in showing that

‘...how coming to be able to experience divine communication in the material world might require a certain skill that will be in principle learnable by anyone who has the concept of god’.⁴³⁶

To be possible however, the nature of things must be such as to allow for divine encounters in the context of the development of the appropriate skills. And here Rea agrees with me.

To introduce the view towards which he wants to move, he begins by highlighting a thesis he suggests is presupposed by all attempts to respond to the mind-body problem. He intends to include analogical reasoning, inductive reasoning, and Inference to the Best Explanation. If I have not misunderstood

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⁴³³ M.C. Rea, The Hiddenness of God...p.128
⁴³⁴ M.C. Rea, The Hiddenness of God...p.128
⁴³⁶ M.C. Rea, The Hiddenness of God...p.129
him, he argues that all these traditional attempts at solving the mind-body problem rest on the premise that the mind is ‘hidden’ behind behaviour.

He goes on to argue that the problem of other minds rests on the idea that we have no ‘special causal contact with other people’s minds’.\(^{437}\) He goes on to say,

‘...the problem of other minds is serious only on the assumption that we have no such contact, so that every physical event we are aware of is at least adequately explained ...without appeal to other people’s minds’.\(^{438}\)

His next paragraph contains the critical remark,

‘...the only way we manage to experience the presence of other minds within the material world is by way of cognitively impacted experiences whose stimuli are natural, physical phenomena\(^{439}\) (Rea’s italics)...reflection on other minds points to the conclusion that we would experience god’s presence in much the same way as we experience the presence of created persons...’\(^{440}\)

Rea’s continuing argument is long, but for my purposes may be adequately summed by his idea that it is in the recognition ‘that there exists another subject for whom I am the object of perception’\(^{441}\) that constitutes my becoming aware of another person. What he wants from this is a model of how our perceptual confrontation with nature provokes a similar awareness of the divine personhood behind it.\(^{442}\) He uses Sartre’s example of feeling shame which is intrinsically related to my responding to another as a person. To feel shame is to recognise that I am perceived by another.

This is an acute analysis of the psychology of the recognition of another. It may not however explain how matter which is not uniquely associated with the behavioural expressions of others successfully communicates to me personhood. To ‘feel shame’ I must already be responding to the other as a person. My response cannot therefore be the cause of my acknowledging the personhood of the other, but a consequence of my acknowledgement that it is a person whom I observe.

The trouble is that although he acutely observes that my recognition of myself as a subject entails my recognition that I am experienced as a subject by another, it is not entirely clear that Rea is free of the traditional mind-body problem. What he has advanced is a psychological theory of how we recognise

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\(^{437}\) M.C. Rea, *The Hiddenness of God*...p.131

\(^{438}\) M.C. Rea, *The Hiddenness of God*...p.132

\(^{439}\) M.C. Rea, *The Hiddenness of God*...p.132

\(^{440}\) M.C. Rea, *The Hiddenness of God*...p.132

\(^{441}\) M.C. Rea, *The Hiddenness of God*...p.132

\(^{442}\) As I noted before however, he hopes to extract a general account of what experience of God involves.
each other once the epistemological channels to do so are open, not how our ‘restricted’ perceptions of bodily movement allow for this possibility, at least in the mind-body dualism set up by Descartes.

He wants to rest his account of our encounter with God on a logical parity between the subjectivity of the interpersonal and our recognition of the person of god’s subjectivity in nature. If he has not succeeded in the former, then whilst he may be entitled to a psychological account of our response to perceiving God in the universe once we perceive him in nature, he is not entitled to claim that his theory accounts for that perception.

How do we get to that perception? The whole idea of this thesis has been to argue that in recognising design in the world through metaphysical spectacles, we approach a teleological explanation for its coming to be and for its structures. That we find some of them to be beautiful enhances our proclivity towards perceiving intention behind them and in them. Finding something beautiful can bring with it a strong sensation of the creator, what they might value, and a deep sense that creating real beauty is not simply a technical skill, but the outcome of deeply felt values and appreciation for which the beautiful thing is a vehicle of expression: for an object to express these things is for it to have been ‘designed’ in such a manner that the structure of the thing embodies that Beauty and what it entails.

Once our capacities for reacting, understanding, and engaging with an artefact as the product of something personal are mobilised so are our sensory, emotive, and imaginative responses. In beauty, we are, or can be, commonly transported to those things associated with it. ‘Beauty’ is a good. Being a good it enhances and promotes those values associated with it such as love and affection and a desire to get closer to the beautiful thing.

Consider then, the power of the acknowledgement of the absorption of the fact that a part of nature, the part of it at the heart of its origin and emergence turns out to be ‘designed’. If we take the full power of this seriously, we are in the position I outlined by D.C. Schindler,

‘(Beauty has) an astonishingly comprehensive quality…it appeals to the whole of us… engages…our mind and senses at once… enlisting them in the common project of perceiving beauty…beauty thus involves …our sense of transcendence…our sense of being elevated beyond ourselves…at the very same time it appeals to our flesh…our most basic natural instincts… In this way it reaches into the depths of our nature, touching what is most basic and essential’.

We touch real personhood when we confront an object which we immediately take as an artefact because it communicates teleology to us. In so doing it can communicate something of the creator and his intentions. That experience is to become aware that a real personal life lies inside it.

To be aware of the teleological activities of God, as expressed in our world, through the structures of its creation, is also to be reflectively aware that we ourselves are an outcome of the metaphysical possibilities of that world, and ipso facto of our own natural incarnation as an outcome of god’s authorship. In this sense, a proper awareness of myself, via the presence of others, and our shared artefactual existence is already a personal engagement with God’s artefactual world.
Ultimate questions: meaningless, personal, or impersonal?

Summary: In what follows I argue that any concept of the ‘natural’ that does not include teleology and ‘personhood’ cannot provide an ultimate explanation of what exists or why it exists or explain the beauty at its physical heart.

Overview of the chapter

No conception of the origins of the world restricted to impersonal physical events, I argue, can provide an ‘ultimate’ explanation for the fact of anything existing at all, its coming into being in aesthetic structural form, or, indeed its having that form. I also contend that abstract entities, such as Platonic universals, or numbers, if they qualify as such things, cannot be sufficient for that purpose since they are causally inert.

For any concept of impersonal physical causation to be operative, a physically functioning ‘natural’ world of structures must already be in existence: it cannot not therefore contain the idea of ‘creation’, the bringing into being from nothing. However incomplete our understanding of the word must remain, it has at least partial conceptual links to our own agency in bringing new objects purposefully into the world, and hence a shared link to the idea of an ultimate divine agent.

Recourse to the ‘personal’ as well as offering an understanding of creative agency also fulfils the metaphysical need to understand the normative and expressive aspects of the universe including its mathematico-physical character and the beauty of its ultimate constituents. The ‘divine’ and personal ultimacy of all things coheres naturally with the case I have made for the ‘world’ coming to be in varied structures, intelligibly accessible, and aesthetically organised to be functionally beautiful in its most basic physical forms: the intentional outcome of artifex pulcherrimus: the ‘most beautiful’ designer.

I devote a section of this chapter to discussing the nature of ‘natural theology’ in the light of understanding ultimacy in the way just described above. I suggest that if ‘Natural theology’ begins from the premise of accepting the ‘personal’ and ‘impersonal’ metaphysical duality of the world that devolves from ontological naturalism, then it faces problems that are predetermined by that position: primarily a commitment to the primacy of the ‘impersonal’, including ‘abstract’ reason and the ‘causally closed’ physical world as providing the foundational certainties from which the task of proving god’s existence must begin.
I look at one theistic example of this that suggests that ‘God’ is a ‘theory’ which explains all the ‘data’ of existence that no ‘physical’ theory could. The general critique of this position is that it assumes what the ontological naturalist assumes: that there is a metaphysical position ‘outside’ of the world and God that human persons can occupy to determine the ultimate origin and nature of the world and ourselves in it.

In other words, the general position assumes that the ‘objective’ stance available to the subject within the world to investigate its causal aspects, is one that can be transferred to a position ‘outside’ that world from which to theoretically investigate its ultimate origins. For the same reason I offered in the paragraph above, I suggest that there is no epistemologically neutral viewpoint from which to examine the proposition ‘does God exist?’, and I look at all the alternative ways in which the ontological naturalist might try to secure such a vantage point.
Part 1

Ultimate reality

‘Ultimate reality’, Wesley Wildman begins a paper by writing,

‘...is the final word we can utter concerning reality as such in all its fullness, its general features held together with its concrete determinations. Such speaking is the heart of theology, which then radiates outwards to the vital tasks of interpreting nature, history, life, and humanity in the light of what is said about ultimate reality’.

Is it feasible to suppose that the ‘ultimate’ origins of the cosmos could be incorporated into a final explanation of everything which excluded the personal and the teleological? Might the urge for ultimacy not rest, if not in purely physical elements, then in the finality of a developed naturalist metaphysics that can incorporate an explanation as to why no such recourse to teleology or the divine is necessary?

Once the naturalist ‘structure’ and all its ontological and epistemological relations to the sciences has been articulated, assuming that project could ever reach completion, would the finality of the understanding of everything be exhausted? Would our need for meaning and purpose be finally assuaged? Would the place and nature of personhood, teleology, structure, aesthetics, and value and free will finally become explanatorily transparent?

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445 Although I make use of philosophical arguments in what follows, I am treading a thin semantic line between invoking a personal deity as making sense of the world once perceived in things, and the idea of ‘explanation’. My reason for this is that the very idea of things in the world being available for explanation is part of what is to be made sense of. Even in strictly human affairs the answer, ‘it was done by a person’ is in one way a complete teleological explanation, in another way it has an inexhaustible semantic depth. The presence of novels, literature, history, poetry, painting, archaeology, psychiatry, philosophy, are all witnesses to this effect.

In the case of a divine personage, we should perhaps be even more wary of seeking ‘explanatory’ finality. An approach that has been debated from a thoroughly philosophical point of view in which the question of ultimacy is assumed to have a final explanation is via the question, ‘Is there a foundation for existence?’. The answer to this when it is in the affirmative includes reference to the necessity of that foundation. I am assuming in what follows that whatever is taken to be ultimate, if it is, is necessarily necessary. If it is not, then I assume it cannot be ultimate.

The puzzlement about ultimacy is not simply about the operations and function of physical items, or indeed, abstract items, such as the ontology of numbers, but embraces everything which may be reasonably supposed to underpin the existence of anything at all. It will be super ordinate to the most general of questions which encompass metaphysics, science, subjectivity, and anything under the sun, including that venerable orb itself. In other words, questions of the ultimate nature and origin of everything.

This is a quest that has occupied human civilisations throughout the ages. In a book length study entitled The Divine Quest: East and West: A comparative study of Ultimate Realities, James L. Ford discusses a multiplicity of different versions, ranging over different cultures, times, and conceptions of supernatural or divine ultimacy. Of course, answers to the question what ultimate reality is need not incorporate a divine element into their conception of that order. All, nevertheless, in some way or another, attempt to meet the sometimes-inchoate human need, not just to know how things work, but to answer the puzzling question as to why there are things at all and the meaning of their presence.

The Illusion of ultimacy

One response to the questions above is to deny that the very idea of an ultimate reality is coherent, let alone ultimate reality itself. This is the position argued for by philosopher Stephen Maitzen. His argument is spelled out in a work entitled appropriately ‘Against Ultimacy’. 447

He begins his chapter with the suggestion that

‘Much religion, as well as much philosophy of religion ...concerns itself with what its practitioners take to be ‘ultimate’ in one or more senses...the kind of concern with (this)...characteristic of religion presupposes that the ultimate is possible (Maitzen’s italics)’. 448

446 J.L. Ford, The Divine Quest: A comparative study of ultimate realities, SUNY (State University Press of New York, Albany, New York, (2016). His first chapter is devoted to outlining the many ways in which the term ‘ultimate reality’ may be understood and the different domains of its apprehension.

G.E.R. Lloyd, Emeritus Professor of Ancient Philosophy and Science at Cambridge University examines the cultural variations that have underpinned the significant topics that involve the nexus between human understanding and world in his illuminating book looking at different ancient societies: G.E.R. Lloyd, Being, Humanity, & Understanding, Cambridge O.U.P., Oxford, (2012)


448 S. Maitzen, Against Ultimacy...p.48
He analyses the idea that there might exist what he calls an ontologically ultimate ‘concrete being’ that brings into existence all other forms of being and concludes that the concept of ‘ultimacy’ is not logically tenable.

He ends his discussion with the observation that ‘the admittedly seductive notion of an ultimate reality is an…illusion, something it’s also time we humans outgrew’. Intellectual progress, particularly in the sciences has rendered all such questions obsolete he maintains. He certainly thinks that contemporary metaphysics and logic are sufficient to rule out the idea tout court, offering ‘philosophy’ as an alternative means of ‘transcendence’.

‘Philosophy achieves …transcendence by digging below the superficial commerce of life and asking the most basic questions we can ask about reality’.

I discuss further on whether or not philosophical discussion is adequate to the kind of absolute refutation of theism that he espouses. It is curious however that he suggests philosophy can ask the most ‘basic questions we can about reality’ but rules out the most basic question one can ask about reality as logically impossible. One cannot help the thought that the only kind of transcendence that he is talking about is one that is already shaped by a particular view of what the world is like.

He cannot escape the question however, since his exclusion of an explanatory deity or separate ‘ontological being’ simply implies another kind of ultimate answer: ultimately the nature of reality is that it is itself ultimate: it has no reason or cause. Neither does he seem concerned that he himself has assumed that there is an ultimate philosophical method of determining whether the question of ultimacy has any sense before the question itself is ever addressed.

Maitzen’s assumption is that reason, formal logic, and certain metaphysical essentials about the ‘property of being’ are sufficient for him to offer an ‘ultimate answer’ to the question of the possibility of even postulating divine ultimacy: The analytic method provides the logical technology which can adjudicate the meaningful content or otherwise of the claim. The illusory content of the idea of ultimacy having been demonstrated by logical analysis, it must follow that the desire for a divine answer to the question is one that logically cannot be satisfied.

‘Ultimate being’ in Maitzen’s conception is a strictly metaphysical concept, logically encompassable within any scheme that explains the world, despite its nature as an ontologically independent ‘concrete’ being on which the existence of all other concrete beings is causally dependent.

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449 S. Maitzen, *Against Ultimacy*...pp.51-53
450 S. Maitzen, *Against Ultimacy*...p.59
451 S. Maitzen, *Against Ultimacy*...p.60
Now there is certainly a way of hearing this with which the theist might have some sympathy, but the bloodless, isolated, causal object, akin to a natural ‘superpower’, separated by logical necessity from the objects of its productive capacities, is not the ‘ultimate being’ of theism. ‘Ultimate being’ in theist terms has a sense and meaning which cannot be confined to the simple and rigid identity of content which Maitzen requires to adjudicate whether it has any logical coherency.

What I mean by that can be understood if we try to understand what the theistic desire for God represents. It is one that is felt from every aspect of one’s being, rational, emotive, imaginative, spiritual, psychological, and even corporeally, as a visceral hungriness. All these features of what it is to be a human person form an inseparable unity with a unique emergent property of desire not reducible to any one of them and certainly not semantically divisible into the separate logical propositions required for traditional analysis. It is this desire that an experience of beauty at the heart of physical existence can motivate.

It is a desire one might describe as reflecting a question about the totality of being as it emerges self-consciously through one’s own experience as participating in the existence of the world. It is a sui generis desire which can only be satisfied by a sui generis transcendental unity equal to the task: this is the ‘ultimacy’ the theist aims at, not the pallid ‘concrete’ stolidity of Maitzen’s analytic reduction.

It is a philosophical presumption that the difficulty in extracting a semantic core for rigorous logical analysis, even the impossibility of that task, demonstrates the lack of any content to the desire or attempts to articulate it.452 Maitzen’s conception of the task he thinks he has to meet is too conceptually suffocating to grasp the ‘ultimacy’ expressed by theistic desire.453

The sense of transcendence the theist wants, straddles the boundaries of our language in ways which it may not be able to finally meet semantically.454 Whether or not this is sufficient to condemn it in

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452 Wildman defends a view he calls a ‘radically apophatic conception of reality’. ‘Really ultimate reality’, he says...whatever it is, is beyond being, and thus beyond the putative gods that are held to be beings’. W.J. Wildman, Really Ultimate Reality...Abstract

453 Wilczek, F. When words fail. Nature 410, 149 (2001). https://doi.org/10.1038/35065756. The Nobel physicist in a brief article in the prestigious journal Nature discusses the difficulties that even physicists working at the base level of mathematical physics have in developing, using and finding words and concepts to encompass new thoughts, discoveries, and mathematical descriptions. It is perhaps worth quoting his quote of the eminent 20c physicist, Herman Weyl, ‘ Weyl stated in his Philosophy of Mathematics and Natural Science, (1949), “…only to the gaze of my consciousness...does a section of this world as a fleeting image in space (appear) which continuously changes in time” ’, p.410. The expressive difficulties associated with physics might, one imagines, fall victim to logical analysis with similar ease. In any event, it is not clear why divine reference should be any the less semantically simple than the language of mathematical physics.

analytic terms in which only contents decomposable into definitional form, suitable for symbolic representation and deduction have any final legitimacy over our ultimate experience of what the world represents, is itself debatable. As John Cottingham has asserted,

‘The philosophical temptation is always to classify the transcendent. If this means to give a positive characterisation in literal language, such an undertaking is impossible...That which is dimly apprehended...is, as mainstream theology has always asserted, beyond human comprehension’.\(^{455}\)

Given the restrictions on semantic clarity when talking about the ‘ultimate’, what we have to aim at is in the epistemological spirit of Wildman’s observation about the possibility of rational knowledge of ultimacy derived from analysis of the ‘natural’ world.

‘Traction between ontology of nature and ultimacy metaphysics is...neither extremely strong nor entirely absent, but rather such as to have the effect of making some views of ultimacy less plausible and others more plausible’.\(^{456}\)

**Naturalism and ultimacy**

Naturalism accepts in some of its versions that there is a question about ultimacy to answer. The answer is argued to end with the presence of the ‘natural’ itself in some form, and sometimes with a metaphysics to accompany it. This answer, if it accepts a naturalist metaphysics at all, locates the origin of ultimacy in the structures of any metaphysics it espouses. Thought cannot proceed beyond those structures because from this perspective ‘beyond’ can mean nothing.

Many atheist naturalists of considerable philosophical agility contend that the question of ultimacy is not one that has an answer not because the answer remains mysterious, but because the posing of the question itself already presupposes that a certain sense can be made of it. That they deny. It is an

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illegitimate extension of the ordinary sense of the word into an arena of metaphysical vacuity sharing a seductive syntactic structure with the mundane sense.

There are different versions that this might take. Maitzen’s case may be thought as an example, although he concentrates on the logic of ultimacy rather than ruling the question out *tout court* on the grounds of empty content.

The most powerful of the naturalist arguments associate their position, not unsurprisingly, with the achievements of the sciences, or particularly physics, which they take as the epistemic gold standard for ontological decision making. Rather than present the variety of these I offer a particular example which appears as a chapter entitled ‘Naturalism without metaphysics’ by John Collins, a philosopher. Collins is interesting because he attempts to combine naturalism with an ontological empiricism whilst denying a commitment to ultimacy.

Collins maintains that

> ‘On a standard view, naturalism is foremost an ontological or metaphysical doctrine about what there ultimately is as specified by some notion of “basic science”’.

However, he resiles from claiming this position for himself whilst asserting his naturalist credentials.

Here is how he motivates that claim:

> “To be a naturalist on my favoured conception is simply to take one’s lead from the relevant ongoing empirical enquiry. No metaphysical quandaries arise here or animate the naturalism save for those that arise in the interpretation of the relevant theories’.

He defends he tells us,

> ‘a version of methodological naturalism which stands against any brand of metaphysical naturalism worthy the name...in my sense of the term naturalism is an anti-metaphysical doctrine’.

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Collins, if I have understood him correctly, takes it that any ontological question can only be deferred to what is empirically extant in some domain of scientific practice. If empirical practice should have no end, then so be it. The nature of physical things would simply have this character.

Whilst there is much to be said about his thesis which he works out in detail, it is hard to see how he avoids the force of Nicholas Maxwell’s observation which I gave in an earlier chapter,

‘If science is to be possible at all, some kind of assumption must be made about that of which we are most ignorant: the ultimate nature of the universe...it is above all here that it is vital that we make as good an assumption as possible, one which does the best justice to the nature of things. For it is this basic cosmological assumption that will determine our methodology, what kinds of theory we are prepared to consider (Maxwell’s italics).

If, for example we believe a society of gods governs the natural world according to whim, then in seeking to improve knowledge and control over natural processes, it will be entirely rational (relative to this belief) to adopt such methods as ...sacrifice, oracles, omens (and so on). If we believe a pattern of physical law governs natural processes, quite different methods will be adopted, namely those of putting forward precise hypotheses concerning possible laws governing phenomena to be tested against observation and experiment. Metaphysics determines methodology.... A bad basic metaphysical conjecture, hopelessly at odds with the basic nature of the universe, will lead to the adoption of an entirely inappropriate set of methods’.\footnote{N.Maxwell...The Comprehensibility of ... pp.2-6}

If Maxwell is right and I argued that he is, then the empirical world on which Collins relies will be dependent on the metaphysics from which method emerges, despite his denial that he is committed to any metaphysical position. Empirical conjectures involve the range of normative concepts I have discussed, the role of evidence, theoretical virtues that extend beyond measurement, acceptance of teleological demands that one ‘ought to aim at the theoretical truth’, the understanding of the concept of ‘evidence’ as a normative relation to the that ‘truth’, and some accurate conception of the most general characteristics of existence.

Collins’s position thus undermines itself: Firstly, it is itself a metaphysical picture of how things ultimately are: they are ultimately such that all that can be said to be ‘known’ about ‘reality’ is the current state of empirical play. In one sense, Collins is perfectly entitled to his metaphysical story, but
in another he cannot claim for it the same epistemological status as the empiricism he rests his case on. His convictions are not themselves empirically founded, but a metaphysical interpretation of what empiricism means about the ultimate nature of things.

**The normative requirement of evaluating ultimacy**

Let us even suppose that Collins is right about the future empirical state of play; there will be no possibility of sensibly developing an overall picture from naturalism or elsewhere; simply a never-ending following of the empirical trail. A question would still remain: why should this be so? Why should it be that the empirical nature of the world is like *that*?

Whatever argument is presented by any version of naturalism a similar question always remains open: why should the world be that way? Whatever attempt the naturalist makes to close that gap in his own terms, the final resort must be that some ‘physical’ or ‘natural’ entity, \( x \), or some physical entity plus some abstract, \( y \), has the last word.

To have ‘the last word’ however is always to step outside the physical and the empirical and make an evaluative judgement about what is to *count* as a completed picture of the ending of questions of intelligibility and ultimacy. That task requires the setting of criteria of ‘evaluation’, *to wit*, ‘when \( x \) is achieved, then questions of a certain metaphysical kind concerning ultimacy lose semantic traction.’ But it should be clear that this is an attempted definition which cannot derive from within the naturalist schema since there is no way of ‘standing outside it’. Yet its presumption is to offer a view from outside of it in virtue of which ‘completion’ could be successfully announced.

Even supposing the naturalist were right, he would still be engaged in a metaphysical question: that of limning the outer edges of reality. The question of ‘*ultimacy*’ is still one which motivates this naturalism. It just places the *end* of ontology and being in the existence of natural things themselves and denies a divine and personal cause beyond them.

Is this a sufficient termination point for ultimate questions? One kind of answer if one is unhappy with this but does not wish to invoke personal agency is to propose, in the Platonic style, an abstract, unchanging infinite world, to which our world owes its genesis.
Non-physical causes and ultimacy

In his discussion of the creation which he subtitles *Event causation or Personal causation*, Douglas Groothuis\(^{461}\), mentions that D. Willard\(^{462}\) and others have suggested that an argument might be made for the existence of a non-physical, originating cause outside the physical universe. One may deny the existence of God, or any divine personhood however conceived, but accept that the ultimate picture of the world requires abstract items to explain its existence.

Both Plato and Aristotle, for example, in their distinctly different ways thought that world and its abstract and concrete particulars entailed some final entity, but neither ascribed to that entity properties of human personhood. Plato wanted that entity to be the final concatenation of ‘good’, ‘beauty’ and ‘truth’ but the form embodying these qualities would be fully abstract and non-personal in his vision. Aristotle wanted a ‘prime mover’ to stop an infinite regress of changes, impersonal and passive, the necessary logical terminus of a sequence involving his four causal principles.\(^{463}\)

The major criticism of positions that postulate unchanging impersonal entities as originating source for the world is that whilst such entities are eternal and unchanging, they lack causal powers. Groothuis gives an example from mathematics,

‘The number seven taken platonically, causes nothing...(it) may be instantiated in beliefs, utterances, or sentences, but... does not originate anything. Therefore, (abstract entities) ... seem to make poor candidates for causal support of the entire universe’.\(^{464}\)

Infinite existence and ultimacy

Another kind of answer is that the world and everything ontologically necessary to it, has no terminus outside of itself. Elements that emerge or disappear will ultimately be causally dependent on those whose existence in the world have an infinite guarantee. This modification gives ontological space to the evolution of natural events, wherever and in whatever shape they occur, including the emergence of sentient and rational creatures. The scientific and philosophical aim within this context will be to


\(^{464}\) D. Groothuis, *Metaphysical Implications*...p.110
finally grasp the nature of the relations within the ultimate natural structure that explain the various emergent features of the universe as we now have it.\textsuperscript{465}

The infinite existence of something, however, does not foreclose the question of its origin. We have to distinguish between causal explanations of things whose coherence involves temporal relations, \( x \) occurs before \( y \), for example, and logical priority. How something came into infinite existence is a question of the latter form, not one involving temporal relations. From the logical point of view, it is a perfectly sensible question.

It cannot be answered by reference to any natural physical phenomena however these are conceived, because any natural phenomenon is distinguished by its necessary relations to other natural phenomena in space-time. Since any physical object or event comes into existence and is ultimately dependent for its contingent status on the basic forces of particle physics (or any other postulated physical structure), no other physical object in the period following its coming into existence could be the cause of space-time.

Neither could space-time itself be the cause of its own existence. This is because it would have to have had the potential to come into existence. But nothing can have a potential before it exists. Potential implies that a change can occur from one thing to another: from having property \( y \), for example, to losing property \( y \) or vice versa. By definition before there is space-time, there is no space-time, so there is nothing with any potential to bring about space-time.

This argument is not answered as for example, the physicist Laurence Krauss\textsuperscript{466} and others suppose it to be by the hypothesis that something else caused space-time: the emergence of space-time is then considered to be the emergence of the world as we have it out of ‘nothing’. Krauss tells us that ‘nothing’ is a concept that should now be left to the physicists. The objection to this is straightforward: to argue that ‘something’ exists prior to space-time is not equivalent to the claim that ‘nothing’ exists prior to space-time. Krauss is proposing to substitute ‘something’ for ‘nothing’ and claim an equivalence.

Krauss mistakes an existential category for an identifying one: in whatever way we are to describe or theorise about the antecedents of space-time, if it is to involve a proposition derived from physics, then it necessarily entails the assertion that ‘there is a least one thing (something) that exists’. ‘Nothing’ is the negation of that assertion: it has no referent and no content. ‘Nothing’ and ‘something’ are references to existential descriptors that are logically prior to any discussion and investigation of

\textsuperscript{465} J. Rasmussen & F. Leon, \textit{Is God the Best Explanation...} Part 1
the world conceived under its physical aspects. The moment it is asserted that ‘x’ precedes ‘y’, an implicit assertion is also made that ‘x’ and ‘y’ are something(s), that is, that they exist.

The Personal and ultimacy

Groothuis’s third option is the personal. Why though should the postulation of a personal creator make any additive difference to solving the problems raised above?

‘Groothuis’ answers by asking the reader to consider what he calls ‘event causation’. By this he means that, if creation is not a result of personal agency, then it must be the result of an ‘impersonal process or mechanism of some sort’.467 This is the series of causal possibilities that I have been considering above. The trouble with this he suggests is that ‘…examples of event causation always involve antecedent and contingent causal conditions, whereas ex nihilo creation does not’. I have asserted that just this is the case.

We take it, passé Hume, that explanatory relations between things should yield an outcome that makes it intelligible why x caused y. What makes it intelligible that the world as ultimately structured, contains both subject and object, both natural and artefactual objects, is aesthetically decorated and has a discoverable place for beauty in its physical heart?

Groothuis offers an answer:

‘Instances of personal agency always grant the person some vital and determinative role in the actions it brings about…given our understanding of personal agents as unique initiators, viewing the (creating) being as a personal agent better comports with our experience of finite beings bringing about states of affairs through their personal understanding, will and power’.468

If one accepts this thesis, then it inclines towards my position in something like the following way: like artefacts, the world is an outcome of personal and transcendent creation. If not, then from whence are the origins of ‘beautiful structures’, and ‘teleological artefacts’ to be derived if that final existential resting place is taken to be impersonal? Of course, it cannot be immediately deduced from this question that divine personal agency must be ultimate, but it may have more plausible support.469

There are two reasons that contribute to the plausibility of this option. The first is based on the proposal that where two things have properties and events in common then a relation between them

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467 D.Groothuis, *Metaphysical Implications*…p.111
468 D.Groothuis, *Metaphysical Implications*…p.111
469 J. Rasmussen & F.Leon, *Is God the best explanation*…offer a comprehensive argumentative exchange on the issue in Part II, Is the Foundation Personal?
is more likely than not. An appeal to the personal increases the intelligibility of understanding the world because within the world are found personal life and agency and much else necessary for it, teleology, intelligible structures, normative standards, and beauty, for example, built into its fundamental mathematical structures.

The world, considered on the other hand, as devoid ultimately of any such features in its essential origins and ultimately nothing but brute physicality, might be thought a lesser option. The question really is whether it is an option at all. If I have been correct in asserting the basic normative and teleological structure of things, particularly the aesthetic, as necessary for any contingent physical and natural world, then it is a logical impossibility that any natural world lacking these features could explain them, since its very existence depends on them.

Whilst this is not on its own sufficient to invoke the personal, such an invocation better enhances the intelligibility of these properties, their presence and origins. Persons are intrinsically normative creatures, responsive to reasons, truth, and value. Theists have always held that these are properties shared by at least human creatures with God.

A perspective that includes the divine also participates in an understanding of how the world is organised such that it could be accessible to scientific intelligibility by creatures like us and offer ways of comprehending it under the rubrics ‘causal explanation’, ‘teleology’ and so on.

Secondly, the nature of our own experience contributes to the plausibility of an ultimate personal origin for the world. If we can create things that are separately beautiful from those that occur impersonally, and if beauty (or whatever aesthetic principle is pertinent to that part of the natural in question), cannot be explained by the purely physical or the impersonal, then whatever can explain the origins of our capacity to create beauty and beauty itself composing nature, must be something in which both of these co-occur and is the origin of them together. The ontogenesis of beauty could not be derived from the basic causal and physical elements of nature because aesthetics contributes to composing them as the physical elements they are.

If, in the end, wherever it is to be found, beauty requires the hand of the personal, do not these propositions taken together plausibly intimate a plausible defence of a creating designer who built

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470 I have already made the case that structure and aesthetics are metaphysically indissoluble. As to composition, I assume this principle of organisation has a face value logical integrity: If x is required to compose A, then, unless some complicated backward causation argument can be derived, it seems to follow that x has an ontological existence independent of that of A, but A does not have an existence independent of being composed by x. I put it that way, because I do not want to claim that x is temporally prior to A. It seems clear that both could logically come into existence at the same time, but the ontological relation of A’s dependency on x could still hold.
aesthetics into the metaphysical fundamentals of the world and beauty into the physical fundamentals of that world?

**God as an ultimate ‘super theory’**

It is all too easy to elide the understanding of God as the ultimate ‘person’ with a scientistic approach to what is meant by God as creator. In this section I concentrate on how the word ‘theory’ can slip into discussions about the relations between God, world, metaphysics and science, and bring with them a vulnerability to opening up the idea that ‘god’ is an hypothesis.

This is the argument of Dawes which I presented in chapter one: the hypothesis that God exists is an empirical ‘theory’ to be tested against the evidence: It is simply a matter for methodological naturalism. Should the theistic ‘theory’ succeed in explaining ‘everything’ then the existence of God would be a matter of conceding to its explanatory empirical power: a ‘scientific’ proof. Is this not what the theist should aim for?

This is not just a tendency that inhabits the world of the reductive physicalist and naturalist. It can find its way with equal facility into the theistic world. It is what has been called ‘religious scientism’. David Alcalde, an astrophysicist and theologian has recently dissected the consequences of what he suggests is a foundational conception of science as being free of metaphysical and theological presuppositions.471 It is this foundational substrate which provides the illusion of a standalone world of physical causes and items which I have been concerned to contest.

His work has a different focus from mine being largely concerned with a deeper exploration of the philosophy and history of philosophy of science that underwrites many positions in the understanding of the relation of God to science. Nevertheless, I essentially share the same general understanding of the fundamental misconception. His position is sympathetic to my expressed view that the picture of the relation of science to metaphysics is one of order and composition, although he is more concerned to trace out the consequences for theology than I have been. The back cover of Alcalde’s book accurately summarises his position,

> ‘...despite its self-proclaimed neutrality regarding metaphysics and theology, modern science is full of metaphysical and theological presuppositions...a mechanised understanding of nature...(and) a reduction of God to an external agent in competition with natural processes, and creation to a worldly

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mechanism... they remain unconscious for the most part in the dialogue between science and theology’.

A good example of how the delicate understanding of divine creation can collapse into the world of scientific understanding is contained in an exchange between the very distinguished Christian philosopher Richard Swinburne and A. Grunbaum who achieved fame with his critique of Psychoanalysis as a science.

The details of that exchange need not concern us here, but in his reply to Grunbaum, Swinburne\textsuperscript{472} writes this,

‘...when we come to theories of everything agreed to exist by theist and atheist alike (the Universe, its initial conditions, the laws of nature, mental life, etc.), there could be no scientific theories which make equally good predictions-it's theism or nothing. No scientific theory could predict that there would be a universe—that is, some physical objects—and that they would be governed by laws of nature; for scientific theories consist of purported laws of nature and they predict in virtue of the consequences thereof for initial states of physical objects, and so the theory could only restate and not predict its data. We need a theory of a quite different kind and of such theories my claim is that theism is the simplest and predicts the data well, sufficiently well to be made probable by the data’.

**Swinburne’s argument from theory: the vice of its many virtues**

Swinburne is happy to assign to the divine hand the creation of everything science requires, physical objects, laws of nature, in fact ‘everything agreed to exist by theist and atheist alike’. On the other hand, he takes it that theism is a ‘theory’ that does a good job in predicting that everything that does exist, will exist.

The odd lacuna seems to be the missing of any idea of *creatio ex nihilo*. I say ‘seems’ because the fault appears too obvious for such a distinguished theist philosopher to make. Nevertheless, if I am mistaken about Swinburne, it is certainly a commonly recognised feature of the debate about God and science. What is the error?

It lies in the failure to grasp that the very possibility of there being such things as ‘scientific theories’ depend on the deep metaphysics allowing for ‘persons’, ‘objects’, ‘nature’ and the relations amongst them. A ‘super theory’ of all theories would itself be subject to metaphysical conditions.

So, the final understanding of ‘being’ and ‘existence’ cannot be a ‘theory’, since what a theory is and how the world facilitates the presence of subjectivity, objectivity, and epistemological access to its physical aspects are conditions of the word ‘theory’ having a comprehensible content. In other words, the semantics of the word ‘theory’ are confined to the epistemological relation between the personal and impersonal within the world mutually occupied by both.

Even if we suppose there is any sense in which there could be such a ‘meta theory’, how could the truth or otherwise of such a theory be tested? Is there a mathematical description into which it could absorbed? How could the theory be experimentally examined? How is it possible to test Swinburne’s ‘Theory’? Did the theory ‘exist’ before anything? Is the coming into existence of the universe a fulfilment of that pre-existent theory? Did God hold that theory which he then put into practice? At this point the conditions of the ‘super-theory’ become incoherent.

What we are aiming for must be something that can supersede metaphysical conditions, something that transcends them. It must transcend the entire apparatus of world, nature, person, mathematics, logic, feelings and so on ad infinitum. This is after all what ‘transcendence’ means. So, the realisation that God created everything, and God shares with us, however attenuated and however humble, an ability to comprehend that fact and see something of the world through his eyes, is not the outcome of a theoretical evaluation, whatever else it is.

What transcendence means in this context and what it carries us to, is not incorporable within any one particular mode of understanding, interpretation, explanation, or causal theory available to us. It is *sui generis*. Is this a problem? No, it is precisely a *sui generis* terminus we are seeking, one perhaps that is the perfect sum of the above epistemological modes. This claim is akin to the traditional ascendancy to God through causation. The answer to the question of ultimate once given as ‘god’ allows all else, because it is God who enables the various modes of comprehension of reality that we can aspire to, however humble and infinitely incomplete.

The best and closest we can come to understanding this is derived from our own capacities to create new items from nature. It cannot encompass *creatio ex nihilo*, but it participates in the idea of creation. The world god has given us is characterised, amongst its other metaphysical properties, by the intrinsic aestheticism of its structures, which are teleologically available to us, and whose properties we exploit to create beautiful artefacts if not *ex nihilo*, then at least *de novo* with respect.
to the physical world that, in their beauty (if we wish), reflect its divine origins through their 
metaphysical heritage.

All too often the theist concedes that the human observer can occupy an ontological and 
epistemological viewpoint from the other side of the transcendental horizon. It is an impossible task 
formed within the fear and attraction of the scientific image. For the theist there is no metaphysical 
territory beyond God. The only position we can occupy is a vantage point provided for us within god’s 
world of which we are part and from which we are permitted to extract some partial understanding 
of it as created and how it works.⁴⁷³

mathematician who argues that there is no ‘objectivist position’ partly because he thinks that the absolutist 
idea of the objectivity of science is an illusion. He argues that a multi-layered view of the universe is inevitable 
because it is constrained by our human natures. Whilst he might be sympathetic to my view about the richness 
of what is involved in conceiving nature and the universe, he would not accept the unitary objectivist picture 
of the world that my thesis entails.
Ultimacy, Natural Theology, science, and proof

What consequences does this have for natural theology? If the idea of an ultimate viewpoint from which to secure an argument for the existence of God from ‘natural premisses’ alone is not sustainable, how is natural theology to be understood? This question might be thought pertinent to my project since the presence of contingent aesthetic structures in science has formed a part of my case. The answer depends in part how the phrase ‘natural theology’ is to be understood.

Alister McGrath in his 2009 Gifford Lectures, says that the term ‘natural theology’ has been widely used in Western philosophy since about 1750

‘...to designate what can be known or rationally believed about God on the basis of human reason, without recourse to any special or supposedly supernatural revelation.’ 474

Christian theologian and philosopher, John Frame, for example, describes the phrase as traditionally denoting the attempt to ‘learn about God through revelation outside the Bible’. 475

The term ‘Natural Theology’, as de Cruz and de Smedt point out, can cover

‘...several fields of enquiry, including the formulation of natural theological arguments, the search for the natural knowledge of God that humans possess, and the conceptualisation of nature, including an interpretation of the natural sciences, within a theistic framework’. 476

‘Natural Theology’ in the sense defined by C. Stephen Evans, is the attempt to show that

‘...there is a “natural” knowledge of God’s existence...that does not suppose any special religious authority or revelation’. 477

He also notes that the term does not just encompass arguments for the Existence of God but any attempts to deduce aspects of God’s nature from what is available to human perception and reason alone, unaided by divinely inspired textual revelation.

Alister McGrath offers a category which he identifies as ‘theologia naturalis’. His description incorporates the distinction between religious authority, revelation and the natural, but expands Evans’s definition in a useful way. The term he proposes,

‘...denotes both physics and metaphysics—the philosophical exploration of nature, inferring the existence and at least some characteristics of the divine by contemplating...the forces of nature’. 478

Much will depend here on what is meant by ‘forces of nature’. The task of natural theology, at least one which hopes to open the door to a rationally accessible personal deity, cannot be met if the existence of the ‘forces of nature’ as stand-alone physical entities separate from the *a priori* conditions of their intelligible existence, as structures for example, is taken to be the foundation from which natural theology must do its work. The implication of this is the same as restricting the personal by definitional fiat.

To conceive of the ‘natural’ as confined to the physical aspects of nature is to move within the conception of the world as a Cartesian ‘Machine’, albeit a modern one in which the forces and elements of the natural world are not understood as isomorphic with ‘mechanical’ devices like pistons and cranes.

One cannot *define* a ‘machine’ as an impersonal device and then attempt to *extract* personhood, teleology, and rational consciousness from it. Descartes understood this and had to propose another form of existence, the ‘conscious mind’ to accommodate personal reality. It is of course precisely this problem that I noted the neurobiologist Terrence Deacon recognises in bringing teleological concepts to bear in explanations of sentient life, and the problems associated with it that McDowell is concerned to undermine (see chapter 1).

Because we are *part* of nature, we cannot elevate a metaphysical distinction that we can make between different kinds of objects inside the world, which are part of the world, then elevate one kind of object, the ‘impersonal’, into a transcendent platform from which can serve as the basis for a ‘proof’ of god’s existential authority. This would be like trying to ‘prove’ that artists exist by examining the molecular structures of the basic chemicals of paintings.

478 A.E. McGrath, *A finely tuned universe*... p.25
There can be no more ‘proving’ of god’s existence from isolating one aspect of existence, that of physical causation, than there could be a deduction from the causal relations of the kinetic activity of water molecules to the existence of a kettle. Or for that matter, from the physical forces exerted on the buttresses of a medieval cathedral to the existence of something called a ‘cathedral’.

It would be a very different exercise to begin with the artist and then examine how he used and mixed chemicals and how he manipulated them to create the effects he wanted. Here we might indeed learn many things about him, what he knew, what he intended, how well he understood geometric principles of perception, his mastery of paint mixing, his perceptual acuity and so on.

It is in this sense that our examination of the different physical disciplines of nature might perhaps help advance our appreciation of the divine nature. Because we too participate in the components of creation, create artefacts ourselves, and are also an outcome of creation, we are allowed a glimpse of that creative nature.

If one already accepts the picture of a personal god embracing the totality of things, then this task is different. It will involve the development of a Christian Theology of nature. This is what de Cruz explains as a

‘...conceptualisation of nature, including an interpretation of the natural sciences, within a theistic framework’.\(^{479}\)

**The accessibility of God in nature**

This raises the question why God is not as easily accessible in nature to us as the personhood of other human beings is via their corporeality: bodily appearance, movements, and speech. Our certainty of the personhood of others is immediate. Whilst the theist might suppose he perceives with equal facility God’s person in nature, others clearly have no such experience.

C.Stephen Evans makes a case for two principles which are highly relevant here. In a section of his book, *Natural signs and knowledge of God*, entitled, *Why would God employ natural signs to make his reality known?*\(^{480}\) He asks the question ‘what would follow from God’s existence if it were true?’\(^{481}\) he postulates that ‘one thing we might expect...is that knowledge of god would be widely available and not difficult to gain...’. He calls this the ‘Wide Accessibility Principle’.\(^{482}\)

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\(^{479}\)H. De Cruz & J. De Smedt, *A Natural History...* p.111


\(^{481}\)C.Stephen Evans, *Natural Signs...* p.13

\(^{482}\)C.Stephen Evans, *Natural Signs...* p.14
The second principle is derived from the thought that although knowledge of God would be widely available, it should also be easily resistible. He calls this unsurprisingly, the ‘Easily Resistible Principle’\textsuperscript{483}. His justification is offered in the following quote,

‘Though knowledge of God is widely available, it is not forced on humans...to allow...people this option, it is necessary for God to make the evidence he provides for himself to be less than fully compelling. It might, for instance, be the kind of evidence that requires interpretation, and include enough ambiguity that it can be interpreted in more than one way’.\textsuperscript{484}

It is perhaps worth observing that as history brutally teaches us, even the recognition of the personhood of other human beings is not as obvious as it seems it should be.

**The purpose of intended proofs of God**

Arguments for God’s existence, whatever their origins in reason or nature are as Evans’ argument implies in any case rarely persuasive on their own account in persuading Theists to become Atheists because they find one or more of the arguments to be logically flawed, or Atheists to become Theists because they find the arguments logically compelling. They are a continuous source of unresolved dissension. As Stephen Evans observes,

‘...(they) are frequently criticised and declared to be comprehensively refuted, and yet...continue to be presented. Some people, including...philosophers and scientists...find the arguments convincing, others...equally well trained...find them to be without merit’.\textsuperscript{485}

There is no unity amongst those who suppose that the classical arguments, for example, can or cannot provide evidence or rational support for a deity. There are also debates about what the arguments achieve even if they are successful. So, for example, James Sennett points out that a common response to classical arguments is to argue that even if they are sound the deity of their conclusions,

‘...is a far cry from the elaborate deity envisioned by traditional theism...one does not need to postulate a full-blown omnipotent, omniscient, morally perfect

\textsuperscript{483} C.Stephen Evans, *Natural Signs*...p.15
\textsuperscript{484} C.Stephen Evans, *Natural Signs*...p.15
\textsuperscript{485} C.Stephen Evans, *Natural Signs*...p.2
creator, and sustainer of the universe in order to satisfy the requirements of (the
given) argument (a first cause, a designer etc.).

Both theologians and atheist may denounce the very idea of a natural theology for entirely different reasons. Notoriously, or appropriately, the great protestant theologian Karl Barth argued that knowledge of God was via scripture and revelation alone in the divine person of Jesus Christ, and natural theology an abomination. As McGrath interprets the substance of Barth’s objection, natural theology can represent the ‘human desire to assert itself and take control over things’, seen by Barth as an ‘attempt on the part of humanity to understand itself apart from and in isolation from revelation’.

Some atheists denounce natural theology because in their eyes it is a subject without a subject matter: Arguments derived from the natural are empty of content and their logical analysis is pointless, an exercise in trying to prove by reason alone that very small teapots circle the earth, undetectable by vision, telescopes, or any scientific instrument. This analogy was originally proposed by the English philosopher Bertrand Russell (1872-1970) to support his claim that the burden of proof rested on those who made such assertions not on those sceptical of them. Theistic propositions, he said, were of this kind.

Some arguments might be more persuasive than others for different people. Thus, someone maybe persuaded that the moral argument, the idea that without a god there can be no ontological grounding for morality, provides strong conviction for belief whilst inferences from the natural order of things, cosmological arguments, and the like, are unpersuasive and trespassing on the territory of the sciences.

Asymmetrically, someone who wishes to believe might be persuaded that the world bears clear evidence of god’s existence and find no empirical and logical contraindications to holding the belief.

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486 J. Sennett, Hume’s Stopper and the Natural Theology Project, pp.82-104, in, eds., J. Sennett & D. Groothuis, (2005), In Defense of Natural Theology: A post- Humean Assessment, IVP, Downers Grove, Ill, p.82
488 A.E. McGrath, ... p.19, McGrath also points out that Barth’s ‘critique was directed against a very specific understanding of an attempt to prove God’s existence or gain knowledge of God under conditions of humanity’s own choosing’. There are also suggestions that Barth was motivated by the political and cultural circumstances of the early to mid 20c particularly the rise of fascism, to restrict knowledge of God to revelation and religious texts, and thereby protect theology from corruption by political ideology.
Yet again, another person might find any one argument persuasive but be unable to reconcile the presence of natural evil in the world with that of the concept of a good god.

These reflections prompt the question as what to purpose the classical arguments and natural theology serve. Are they simply about proof? Perhaps no philosophical positions have available to them watertight refutational proofs. If this is so, should it entail an abandonment of traditional arguments by the theist, a retreat to faith and revelation alone, or an abandonment of his theological convictions, or the dismissal of natural theology? Not at all.

It is hard to see how anyone might cleave to any philosophical, theological or cultural position across a range of issues if rationally watertight proofs accepted by every protagonist in a debate were required. Should the absence, for example, of an irrefutable argument for the objectivity of morality require that one no longer make universal moral claims with any conviction? Does the lack of an agreed deductive solution to the problem of ‘other minds’ engender severe doubts about those around and closest to me? Do I seriously doubt the presence of a world outside my own consciousness because of Descartes’ methodological doubt that I may be being deceived by a Demon that it is so? Similarly, does the absence of any agreed account of what criteria distinguish a science from a non-science mean that the practice of science should cease?

In an interesting chapter entitled *Quam Dilecta* which appears as part of a book in which distinguished thinkers discuss their own relation to faith and reason, Peter van Inwagen, an influential analytic philosopher who became a Christian, addresses this issue directly. I can do no better than offer a couple of quotes from him that are useful in elucidating the issue. Van Inwagen begins by saying,

> ‘Philosophers do not agree on anything to speak of. And why not? How can it be that equally intelligent and well-trained philosophers can disagree about freedom of the will or nominalism or the covering-law model of scientific explanation when each is aware of all the arguments and distinctions ...that the others are aware of? How can we philosophers regard ourselves as justified in believing anything under these conditions?’.

He goes on to offer a specific example, ‘How’, he somewhat plaintively asks,

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492 P. van Inwagen, *God and the philosophers*...p.42
‘...can I believe...that unrealised possibilities are not physical objects...or that human beings are not 4 dimensional objects extending in time and space...when David Lewis...of truly formidable intelligence...rejects the things I believe and understands every argument I could bring in their defence’. 493

Considering the various options that leaves him with, van Inwagen suggests that the question must have some good answer. If it does not, he opines, the only other alternative is scepticism about every possible answer. There are good reasons though for supposing that no-one is a real-life sceptic about everything even with respect to deep questions, perhaps, especially with respect to such questions. van Inwagen suggests that,

‘...the religious believer is often held to a widespread double standard in writings about the relation of religious belief to evidence and argument. This double standard consists in setting religious belief a standard it could not possibly pass, and in studiously ignoring the fact that none of our beliefs on any subject could possibly pass that test’. 494

If we assume with some charity that both naturalism and theism are in the same position here, the question becomes what we are to make of the attempted proofs, counter proofs, and arguments that surround god’s existence. A useful way of placing these in an interesting context, if not specifying how the sceptical question raised by van Inwagen is to be resolved, comes from James Sennett.

Sennett draws a distinction between what he calls a logical evaluation of an argument, and an alethic evaluation of an argument. To brutalise his position for the sake of brevity, it is a disjunction that draws attention to the difference between rigidly examining a given argument for logical consistency and considering the argument in the context of a variety of other epistemological possibilities, including the elucidation of the broader goals towards which it contributes.

This distinction is not unfamiliar in the practice of science in which the result of any one given experiment often depends on the strength of other experimental work, theoretical considerations and so on. In a previous chapter, examples were given of mathematical results whose predictions were only fulfilled later, sometimes after considerable initial scepticism.

493 P. van Inwagen, God and the philosophers... p.42
494 P. van Inwagen, chapter 3 God and the philosophers... for full argument
Finality in the proofs of God’s existence

Belief in God draws on many facets of human life and thought, from hope, love, need, scriptural familiarity, yearnings for personal and existential meaning, and perceptual and rational encounters with nature. It is doubtful whether, in the light of all these elements, deductive reason or nature could suffice to provide final answers, although undoubtedly providing powerful tools in the quest.

Whether someone comes to a belief in God has a complex aetiology drawing on every facet of a person’s experience, thought, imagination, reason, theological exposure, spiritual development, and history. The outcome of all these factors when they issue in a position of faith, may be thought of as a sense of the ‘ordering’ of all things in the light of an understanding of their created origin. At least, the question of ‘ultimacy’ as I am attempting to argue here, is answered, for the theist, by the rational, psychological, and imaginative satisfaction of the comprehended order of things in virtue of divine teleology.

It is not clear in any event whether the classical arguments show easily discernible logical flaws or not, so whether they fail the test of logical evaluation as straightforwardly as has been sometimes held after Hume (1711-1776)⁴⁹⁵ is, to say the least, contentious. In the light of this, the idea that they fail to illuminate or contribute to the illumination of our understanding of God derived from the natural world as part of a wider alethic goal is premature⁴⁹⁶ ⁴⁹⁷. If this is so, what should the theist hope from them?

It is worth repeating that the question of the role that logical arguments for God can play that are derived from the perception of natural properties, from a priori reflection on them, or from scientific evidence, is more subtle than is first apparent. If God is the Creator of all that exists, and all and everything that could possibly exist, then God is also the creator of the possibility that natural knowledge of his existence is cognitively available to creatures such as ourselves. It perhaps an underpinning worry of the absolutist appeal of ultimate deductive proof that the classical arguments might convey that concerned Barth; the idea that human beings can stand apart from God and exercise themselves a godlike capacity for reason.

⁴⁹⁶ A recent collection of essays on Alvin Plantinga entitled The Plantinga Project: Two Dozen (or so) Arguments for God, (2018), ed. J.L. Walls & T. Dougherty, O.U.P., Oxford), contains examples of highly technical debate over such issues as the ontology and origin of Sets and their members and the implication of collections of things into sets for the existence of God, which exemplify the point that determination of the purely logical status of the validity and soundness of such issues in relation to God is highly complex if determinable at all.
⁴⁹⁷ J. Sennett & D. Groothuis, eds. (2005), In Defense of Natural Theology: A post-Humean Assessment, IVP, Downers Grove, Ill. In this book a series of essays contests the assumption that the Humean criticism of classical arguments have the refutatory finality they are often quoted as having.
The quest for natural arguments in support of ultimate existential questions and dilemmas should, as I have noted, perhaps be more sympathetically located as part of a broader alethic desire shared by all persons to understand, and find meaning or purpose in the world in which they find themselves.

The natural theologian, understood as a part of this exercise will be motivated by a deep desire to find in the satisfaction of an argument a rational resting place for his desire for God and a unification of his belief with other understandings of the world including the empirical findings of the sciences. St. Augustine’s famous prayer, ‘You have made us for yourself and or hearts are restless until they find their rest in you’ beautifully expresses the final desire which motivates the theist.

C.S. Lewis’s contention that humans have a natural desire for God because there exists something that will satisfy that desire, which is why it is the desire it is articulates an argument which develops Augustine’s heartfelt thought. The classical arguments contribute to excavating part of what the theist means when he talks about ‘god ‘and ‘world’, and in the course of doing so give more shape to what it is that he desires.

The various natural arguments for His existence, conceived in these lights, are less proofs of his existence than akin to searches for articulating the ways in which reason, perception and existence are intertwined with the encounter with His presence in the Cosmos. Their rigorous analysis is therefore not to be deprecated but applauded. The naturalist will embrace a different starting point. How then is he likely to conceive of classical arguments for god’s existence.

Naturalists, ultimacy and proofs of God’s existence

All naturalists hold that the nature of anything and everything is ultimately devoid of the divine personal in any form. They are necessarily atheists. Naturalists are at sea in a different existential boat from theists and will resist all the classical arguments. They might attempt to approach them with a fair-minded objective vigour on the grounds of epistemological principle. One might suspect however that their efforts will be directed towards an effort to provide watertight refutations. If van Inwagen’s contention accurately discerns the boundaries of what can be attained via pure logical endeavour, the naturalist will necessarily locate his analysis within a broader alethic struggle, that of showing that God does not, indeed cannot exist.

This is an entirely honourable endeavour and one which should be welcomed by theists promising to show them where more work needs to be done. It might even be contended that pushing naturalist

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499 F. Ellis, *New Models of Religious Understanding*, O.U.P., Oxford, (2018) as the title suggests is concerned with questions such as how to distinguish religious from scientific understanding, religious practice and so on.
arguments to the very limits of their existential application is a necessary contribution to the theological exercise since it can contribute to the elucidative potential of natural theology to our understanding of God and world.

It can sometime seem that it is the theist that is on the back foot with respect to the classical arguments, but it is more rarely acknowledged that this rests on a presumption that they have been comprehensively refuted.\textsuperscript{500} A conclusion which itself is to say the least contestable. The atheist and the naturalist have their own motivations, a desire that God not be found, and even a fear that he will be discovered.

A clear statement of this position comes from the American philosopher Thomas Nagel. He writes,

\begin{quote}
‘I speak from experience, being strongly subject to this fear myself: I want atheism to be true and am made uneasy by the fact that some of the most intelligent and well-informed people I know are religious believers. It is not just that I don’t believe in God and, naturally, hope that I’m right in my belief. It is that I hope there is no God! I do not want there to be a God; I do not want the universe to be like that. …. [I]t is just as irrational to be influenced in one’s beliefs by the hope that God does not exist as by the hope that God does exist.’\textsuperscript{501}
\end{quote}

Nagel places the believer and the non-believer in the same queasy epistemological hinterland. In his book, \textit{The Last Word} from which the above quote is taken he acknowledges that the naturalist faces a problem of ‘cosmic authority’ which he conceives of as a need for something like the divine for any sort of knowledge to be possible. ‘My guess’, he writes immediately after the quote above,

\begin{quote}
‘is that this cosmic authority problem is not a rare condition and is responsible for much of the scientism and reductionism of our time.’\textsuperscript{502}
\end{quote}

This is a reluctant acknowledgement of the naturalist atheist’s predicament of rationality operating within the bounds of naturalism to answer every question surrounding the nature and origin of the

\textsuperscript{500} The widespread view that they have been \textit{refuted} seems to rest on an assumption that David Hume comprehensively refuted the classical arguments, and Kant showed the limitations of reason which included the possible deduction of gods existence from natural premises. The book of essays which I have previously cited, edited by J. Sennett & D. Groothuis in (2005), \textit{In Defense of Natural Theology: A Post-Humean Assessment}, presents several arguments on Humean themes which, in their turn, offer comprehensive arguments against Humean style refutations. The book also offers some detail on the historical evolution of the perception of refutation. Also see David Conway, \textit{The Rediscovery of Wisdom: From Here to Antiquity in Search of Sophia}, Palgrave MacMillan, London, (2000) for a refutation of Kant’s argument. Edward Feser’s, \textit{Five Proofs for the Existence of God}, Ignatius Press, San Francisco, (2017), similarly provides robust defences of various proofs for god’s existence.


\textsuperscript{502} T. Nagel, \textit{The Last Word}...pp130-131
natural. We cannot as it were, take up The View from Nowhere503 without taking up a view from
somewhere.
Many atheists rather differently might envisage a position that they can take ‘above the fray’, a neutral
viewpoint from which can be employed the tools of reason and evidence to adjudicate the classical
arguments.
As I have already argued in a previous chapter however, the atheist when considering what ultimately
exists, is whether he likes or not equally committed to an a priori vantage point from which to view
the Universe. He assumes that the universe offers an objective viewpoint free of any conceptual
content from which god’s existence can be considered or one whose content can be designated as
epistemologically neutral.
This is not so. Logicians typically make a distinction between the validity of an argument and its
soundness. One might display the syntactic form of any argument, for example, ‘If everything that is
an x is a y, then if A is an x, A is a y’. This a valid form of an argument and is a well-formed theorem of
predicate logic. In this sense it might be called objective.
It cannot be assessed for soundness however, since it has no content. The provision of an
interpretation in the form of assignable appropriate content to the symbols provides for an
assessment of soundness. Thus, ‘If everything that is an ox is also a fish, then if Bob is an ox, Bob is a
fish’ is valid, but not sound. One cannot thus reason from syntactic form to a conclusion about
ontology, metaphysics, or God without beginning from a proposition or propositions that have some
content. The question is from whence the content is drawn.
The naturalist might suppose that there is a standing point he can occupy which both contains content
but is ‘neutral’ with respect to that content. It should be clear however that that content cannot be
neutral. It assumes that the world is able to provide a neutral viewpoint from within itself to examine
itself from the outside. The conception of this possibility is incoherent.
The idea of a viewpoint bereft of content derives what meaning it has from ontological naturalism.
That is; it assumes that the objectivity we can take up within the world to aspects of it can
metaphysically expand to a perspective outside of the world. The theist might object that it assumes
there is a point of view from which the very nature of being may be examined outside god’s world
including his creation and god’s self. This is part of what is at issue though, not independent of it.

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This phrase is drawn from the title of Nagel’s seminal work. T. Nagel, The View from Nowhere, O.U.P.,
(1989)

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The explanatory possibility that makes the naturalist’s position seductive is that he begins with the assumption that Cosmic Authority is derivable from the physicalist universe out of which the conditions of its own existence or coming into existence can be extracted. Within the naturalist framework he believes he can find an objective stance which contains within itself the authority to answer questions about ultimate being. The achievements of the sciences bolster his confidence in this supposition.

These assumptions represent a confusion between the objectivity required for the sciences of the natural world and what is required to understand something of the coming-to-be-of the existence of a world in which it is possible to take up a position of knowledge-yielding objectivity at all.

The problem of the existence of a world structured so that one part or parts of can be characterised as having a ‘nature’ able to be empirically and objectively discerned is I have already argued, is metaphysical and theological. The objectivity required for the natural sciences is a discovery by conscious reasoning creatures within the universe as they find it, of how to reason and explore part of it. Whilst that discovery might offer assurance about knowledge of things within the universe gained via those validated methods, it is no guarantee that they have cosmological authority over the final discernment of the ultimate origins of the universe.

The upshot of this conclusion is that the naturalist cannot claim a ‘natural’ advantage over the theist when considering the view from which the classical arguments are to be assessed.

The naturalist might still insist that the propositions ‘God does not exist’ and ‘God does exist’ cannot both be true even if he concedes the above. If these are both propositions each of which has a claim to be true, then there must be something or nothing answerable to fill the referent of ‘god’.

This being so, a resolution of the truth or otherwise of these contradictory propositions should offer a position from which reason can be used to adjudicate the truth. Therefore, he will claim that whatever his own belief, logic and reason provide an objective position of ‘no position’ from which the truth or falsity of each proposition and its accompanying supportive arguments can be assessed. The trouble with this is that ‘not having a position’ is precisely to assume that the nature of things is such that it is possible ‘not to have a position’.

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504 As I argued in an earlier chapter the modern conception of nature as a value free field of physical objects with properties suitable for measurement and free of teleological properties is an achievement of modern science, philosophical reflection, and theology, not simply a ‘given’ of perceptual or rational experience. Issues pertinent to this attainment are discussed in a series of essays in the book edited by Peter Harrison and Jon Roberts, Science without God? Re-Thinking the History of Scientific Naturalism, O.U.P., Oxford, (2019)
Now this might well be a useful, and comprehensible strategy in all kinds of situations from the personal to the cultural to the scientific to the political. If what we are looking for, however is a vantage point ‘outwith’ the world, then this position is not neutral with respect to content. It says that ‘the nature of things is such that they provide a position outside of themselves from which they can be examined’. This is however the conclusion that the naturalist wants to reach, but it cannot be assumed to be true to begin with.

Another tack he might then try is to argue that the belief that God does not exist has the same claim to be ‘basic’ as Plantinga’s offering ‘that god does exist’ is ‘basic’. That all that there is the natural, is as basic a place from which to start as the supernatural premise. This places him in an awkward situation. He demands that reason be the final judge, but since he, like his theist opponent begins from a position which he accepts is prior to any reasoned warrant, he must be convicted by his own lights of unreasonable faith.

The atheist who has all his eggs in the ontological naturalist basket will most likely wish to avoid this assertion and argue that the proposition that God does not exist is a conclusion, warranted by the exercise of reason and evidence. In the contemporary world he thinks that these tools are wielded by the sciences to yield the ineluctable conclusion that there is no god. This is the strategy pursued by Gregory Dawes discussed in an earlier chapter. Here the difference between the theist and atheist’s epistemological boats are clearly marked. The theist is happy to acknowledge that he finds himself afloat in a sea, aspects of which might permanently, indeed are likely to, exceed his cognitive grasp. He can only lunge at them as best he can.

The atheist naturalist cannot afford such an acknowledgement. His premises rest on an assumption of evidential and logical supremacy whose illuminating lights can stretch into the deepest recesses of existence and its accounting.

He must explain how they have the decisive relation to ultimate questions of existence and being that he says they have. This task requires him to show how they fit into a metaphysical scheme of things that provides the warrants of supremacy he claims for them. That scheme cannot be a product of science since it must explain the possibility of scientific truth and the world it investigates. This demand by itself is not disarming. He might happily admit that the question is a philosophical and not a scientific one.

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505 An atheist might not, of course deploy science, but his arguments will nevertheless suppose it to be true that a clear-minded examination of our day-to-day empirical world will yield the same conclusion. Lucretius’ (1st century Roman thinker and poet), famous work de Rerum Natura (On the Nature of Things) has this structure: Lucretius, On the Nature of the Universe, trans. R. Melville, Oxford World Classics, O.U.P., (1999)
He will of course have to engage in an epistemological defence of how knowledge outwith scientific endeavour is possible and widen the scope of his ontological claims. Since he denies any appeal to a Creator as a warrant for the truth-fulfilling efficacy of his epistemological tools, his options will be limited to whatever he argues constitutes the Natural.

This places him squarely, but not conclusively, in danger of irrational circularity. Since he will only allow certain kinds of entities, relations, and causes to enter the sphere of his supporting metaphysical arguments, those he deems properly ‘natural’, he ensures the outcome which he aims to prove.

This position will eventually necessitate points at which some beliefs become basic, since premises and axioms must rest somewhere, and where they do will have to be in the realm of the ‘natural’. However this is to be understood it will have to exclude the ‘supernatural’ understood minimally as an intentional actor external to the broadest characterisation of the ‘physical’ and what is needed for it available to the naturalist.

This resting place will be a matter of intuition and conviction from which his reasoning begins. Such a starting point is one from which reason is exercised, not one which is warranted by reason. Modern logic stands on the ground of contradiction and non-contradiction, A=A, and – (A &A). There are no proofs of them as a consequence, they are the foundations of all logical theorems and reason.

The naturalist thus finally stands in the same position as the theist as far as the classical arguments go. He must not only consider them from the narrow view of logical consistency, but their place in the overall alethic goals they serve. From this perspective he is likely to never rest easy with any conclusions drawn from the classical arguments and will be concerned to uncover the logical flaws he supposes must be there. Since his preliminary commitment to naturalist premises is a matter of non-rational conviction it might be predicted that the resolution of the classical arguments will never find satiation as a matter of formal logic.

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506 These questions have been addressed by a variety of thinkers with Naturalist sympathies. David Papineau defends the view that reason is a part of the natural world and addresses several associated issues in a series of essays entitled *The Roots of Reason: Philosophical Essays on Rationality, Evolution and Probability*, Oxford University Press, (2006).

507 It is worth commenting that this does not depend on a ‘linear’ series which terminates in a physical item. Were the naturalist to offer a picture in which there was no terminus but a ‘circular’ structure in which everything depended on everything else, the question of the existence of the circle itself would arise.
Conclusion

This outcome is not surprising. If, as I have suggested, faith and belief in God are the outcome of a growing relation and experience of God through the world, then no argument for his existence one way or the other could be indifferently rationally persuasive, any the more than reason could successfully induce in me the conviction that my loved ones were bereft of consciousness, thought and feeling because no comprehensive refutation or proof of the Cartesian split between mind and matter was available. Should someone make one or another such claim, it would, one might think, be inhuman and impersonal to ground my love and affection on that proof, or deny it, in preference to my certainty that whom I have come to love is a person.

A theistic view on the origins of atheism suggests with some nuance that a naturalist metaphysics absenting the divine has surprising theistic roots. This point is made with clarity by Thomas Broman in his chapter, Matter, Force and Christianity in the Enlightenment. A theistic view on the origins of atheism suggests with some nuance that a naturalist metaphysics absenting the divine has surprising theistic roots. This point is made with clarity by Thomas Broman in his chapter, Matter, Force and Christianity in the Enlightenment. Broman asks us to consider that the ‘disenchantment of nature’ associated with secularism and the rise of the empirical sciences in Europe c.18-19 centuries, did not ‘suddenly begin’ in the 18c.

In fact, he notes,

‘...its origin might be found as far back as ...the moment when ...God gave Adam dominion over the earth. A world subject to human dominion was not just...to be venerated as God’s dominion, but also to be understood and turned to human use’.

Broman then goes on to observe that,

‘...enchantment and disenchantment ...appear to have been built into our perceptions of the world...from the moment our remote ancestors began reflecting about their place in it’.

It is, however, remarkable, that that reflection reveals a world necessarily filled with structures characterised by aesthetic features that can be perceived as ultimately personal in origin. It is strange that within the structures that constitute its fundamental physical base, exactly where the naturalist is most certain no enchantment is to be found, we find beauty serving not only rational purposes, but glowing with beauty for its own sake.

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509 T. Broman, Matter, Force...p.87
510 T. Broman, Matter, Force...p.87
If we add to this list of the extraordinary features of our world, the observation that those beautiful structures at the base of all of what is physically describable also seem to obey the commands of logical and mathematical order, and that those mathematical structures have, at the very least, a profound association with our phenomenal experience of beauty, then the coincidences multiply close to impossibility. One might wish to call this a ‘metaphysical fine-tuning’.

If we also acknowledge the extraordinary effects of beautiful things to move us beyond themselves, and consider how our own creations, when they move us in a similar fashion, palpably display the human heart which gave rise to them in their compositional form, it is not unreasonable that that coincidence should move us to perceiving our world, and us in it, as the outcome of a personhood greater than we can fully conceive, but whose personhood is on display in the artefact of his profound creation.

Perhaps, in the end, if the hand of the personal cannot be experienced by someone through the beauty that shines through the basic structures of the world, there is no argument or evidence that could persuade them. Like the Psychologist Edwin Boring’s (1886-1968) famous ambiguous illustration that can be perceived as either a young or an old woman without a physical change to the drawing, seeing the world as God’s artefact or not, is not finally a matter for reason, but is not irrational.

**Edwin Boring’s Ambiguous Picture**

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