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## The Presuppositions of Ancient and Modern Conceptions of Nature

Before turning to the systematic starting point of the philosophy of nature and seeing what light Aristotle, Kant, and Hegel shed upon its character, it is worth putting in perspective the fundamental differences between ancient and modern conceptions of nature. Michael B. Foster's<sup>1</sup> seminal essay, "Christian Theology and Modern Science of Nature",<sup>2</sup> is a key resource for understanding how modern science and modern philosophy of nature contrast with ancient thought. Thinking through Foster's argument provides us with basic divergencies that will play a crucial role in conceiving the different spheres of nature.

### 2.1 Theology, Philosophy, and the Presuppositions of Natural Science

Contrary to all those who oppose Christian theology and modern science, Foster's two part essay, "Christian Theology and Modern Science of Nature", aims to show that Christianity provides the theological preconditions for the philosophy of nature that underlies modern science. Foster begins by pointing out something that is important and obvious,

yet completely ignored by the practitioners of the philosophy of science. Namely, every science of nature depends upon presuppositions about nature that cannot be established by the methods of the science. Our inductive natural sciences, which rely upon observation, presuppose something they can never validate. To understand what they presuppose, one must remember that empirical natural science does not just observe nature. If natural science just did that, animals would be natural scientists. Natural scientists, unlike the most perceptive brutes, *think* about nature on the basis of their observations. Further, for reasons that will become clear as we think through Foster's essay, natural scientists think about their observations in search of laws of nature that apply to all things, no matter what they are. In so doing, they seek explanations in terms of efficient causality. On all these accounts, natural scientists presuppose that nature has a uniformity that is indifferent to the specific essence of natural things, a uniformity that is susceptible of being subject to laws of efficient causality.

Such uniformity cannot be established through natural science's own methods of induction, whose reliance upon particular observations can never independently verify the necessity and universality of any perceived connections.

To come up with laws based upon observations, one must presuppose the uniformity of nature with regard to space and time. What one observes repeatedly in one's sphere of observation can offer support to some universal law only if the recurring relation applies at all times before and after as well as everywhere else. Observation cannot remove that presupposition simply because no one nor everyone can observe everywhere and at all times.

Further, as Foster notes,<sup>3</sup> if one wants to pursue science as Descartes does, for whom nature is to be investigated using geometric and more general mathematical methods, one must presuppose something else that can never be established mathematically. The assumption of the mere uniformity of space and time may provide some commensurable measure, so necessary for mathematization. To be susceptible of mathematical determination, however, what is in space and time must have a homogeneous materiality. Natural things, to the extent that they can be truly known as objects of mathematization, must be devoid of any

essential qualitative character, whose incommensurability resists quantification. Qualitative difference may be acknowledged as confused and indistinct “secondary” qualities that mark the *appearance* of nature, but the true objectivity of nature must comprise a commensurable bodily nature. No mathematical investigation of nature, however, can establish that this is so, for quantitative analysis of the world takes it for granted.

In face of this inability of natural science to establish the homogeneous materiality and the uniformity of space and time that it presupposes, one could simply take a leap of faith, as many natural scientists and non-scientists do. Or one can appeal to reason and rely upon the philosophy of nature. It might well be that the philosophy of nature can do nothing more than determine that nature has a material homogeneity that allows for mathematization, as well as a spatial and temporal uniformity allowing for the establishment of laws. The philosophy of nature might have nothing more to offer than that, leaving all other knowledge of nature to empirical science. Even if that were the case, it still reflects how natural science operates with assumptions that it cannot legitimate on its own and that, if they are to be legitimated rationally, a philosophy of nature is required.

Foster makes an additional claim that appears less than self-evident and, to say the least, more controversial than the invocation of the philosophy of nature as the ground for natural science. He maintains that just as natural science depends upon the philosophy of nature to account for its fundamental presuppositions, so the philosophy of nature is dependent in its turn upon theology.<sup>4</sup> Broadly speaking, theology is the doctrine of God. Foster points out that there can be no doctrine of God that does not at the same time either contain or imply a doctrine of the world.<sup>5</sup> For example, in Christian theology God is a creator and the world is a creation. By contrast, Brahmin theology has God in one of his forms producing the world by an act of generation. The world is then an offspring with a specific character very different from that of a creation. In Plato's *Timaeus* God is not a creator or parent of nature but an artisan who imposes form upon material chaos to produce the world, just as a potter creates neither the material nor the design of a pot, but imposes a given form upon clay to make that artifact. For Aristotle, God lives apart from the world and directs his

activity not upon nature but exclusively upon himself. God is self-thinking thought and God influences nature as an unmoved mover who operates as a final cause. Celestial bodies are drawn to God by a kind of love. Unlike the Aristotelian Divine, the Gods of ancient Greek mythology are not really apart from the world, but are in it and have the same nature as the world. This identity has its consummation in pantheism, for which God is identical to the world.

As these cases indicate, affirming a certain conception of the divine at the same time affirms a certain conception of the world. In particular, whether God is in or out of nature is of capital importance in how one views nature.

One might object that Foster's claim that the philosophy of nature is based on theology ignores those theories, such as those of Kant and Hegel, which conceive nature without obvious reliance upon an antecedent doctrine of God. Foster, however, points out that conceiving nature without dependence upon God cannot escape theology. Atheism is the denial that there is anything except for nature and this implies that nature is self-contained and can be explained only in terms of itself. Accordingly, if one is to look for the sufficient cause of any natural happening, one must look to the natural world itself. As Foster notes, it is difficult to see how such an atheism can really be distinguished from pantheism. Pantheism is the notion that God is the world. What does it mean for God to be the world? Nature, as identical to God, is nothing other than a self sufficient totality not determined by anything else, the one and only substance, as Spinoza would say. Is that doctrine of God really any different than atheism?<sup>6</sup>

Whether or not the philosophy of nature depends upon theology, different conceptions of God can be seen to carry with them different conceptions of nature. This connection is fruitfully explored by Foster in showing how ancient and modern philosophies of nature fit together with very different theologies. Foster is concerned above all with laying out the connections between Christian theology and the philosophy of nature presupposed by modern natural science. What he uncovers sheds important light on the distinguishing features of ancient and modern philosophies of nature, which has important implications for conceiving the particular spheres of nature that ancient and modern theories best grasp.

In considering the relation between Christian theology and modern natural science one can hardly ignore that both derive much from ancient thought, which provides in the first place the very idea that nature can be the proper object of science. As far as the Western tradition goes, ancient Greek philosophy first establishes the idea that God can be the object of philosophical understanding, as well as the very idea of science itself. Nonetheless, there are defining elements of Christian theology that derive not from ancient Greece but from revelations in the Old and New Testaments. This involves radically distinct features that are incompatible with ancient thought. As Foster shows, the development of Christian theology largely involves a progressive assimilation of these elements and an ongoing struggle to determine to what degree they can be reconciled with the heritage of ancient Greek civilization.<sup>7</sup>

The same predicament applies to modern science. In important respects, modern science draws upon ancient science, but also fundamentally differs from it. As Foster shows, the differences in the methods of modern and ancient science are rooted in distinctly different philosophies of nature, corresponding to the differences between ancient and Christian theologies.

Let us follow Foster's account, so as to focus our bearings for systematically conceiving the different spheres of nature.

## 2.2 Ancient Theology and Ancient Science of Nature

Two elements in Greek theology are fundamentally incompatible with the revealed doctrines of Christianity. The first is the element of paganism and the other is a certain kind of rationalism.<sup>8</sup> Paganism can be understood simply as a failure to distinguish God from nature. This failure can take various forms. It does not have to involve polytheism where the Gods in their plurality are in the world themselves. Rather this failure is found wherever there is lacking the idea that God is a being separate from the world, that God is spirit, devoid of any natural character. A God that is spirit may still operate in the world, but it can only do so in a non-natural way using will and reason.

To deny paganism and conceive God as non-natural has obvious repercussions for the nature of the world. First of all, nature cannot be divine. Nature cannot share whatever it is that makes the divine what it is. Instead, there will be something fundamentally different about these two domains.

Such difference is lacking in the pagan element exhibited in Plato's *Timaeus*, which foreshadows the paganism pervading Aristotle's *Physics*. Admittedly, the pagan failure to distinguish the divine and nature might seem absent in the notion of God that Plato presents in the *Timaeus*, where a divine demiurge structures the world in a way that might appear to sever any connection between the divine and the world. After all, the divine demiurge, who produces the world as an artifact, does not directly share in the nature of its product. An artifact is the product of a craft activity where an artisan antecedently conceives a form that the artisan then imposes upon a given material. The resulting product is a composite owing its character to both the form it embodies and the material that takes on that design. The activity imposing form upon the material does not reside in the product. Rather, the formative activity comes to an end with the emergence of the product. The artisan exercises two capacities. The artisan conceives the form in distinction and prior to its embodiment as well as engages in the formative activity of imposing it upon the material. None of these capacities are shared by the product. The artifact possesses its form in a way that is not itself imbued with any kind of agency. The form of an artifact is not self-realizing in any respect. It is something imposed by an external agency upon the material.

These differences between artisan and artifact might seem to eliminate the element of paganism from the conception of nature in the *Timeaus*. There is, however, another aspect in Plato's account, according to which the divine demiurge is characterized as being related to the world as father to son. On this account, the relationship between divine and nature is one not of manufacture but of generation, which involves inextricably pagan elements.<sup>9</sup>

This is because, first of all, parent and offspring share the same form, being of the same kind. Secondly, the form they share is different from that of an artifact because of how the offspring is generated. The form does have an antecedent existence, like that of an artifact. Nonetheless, whereas

the form of an artifact exists antecedently in the mind of the artisan, the form of the offspring is already embodied in the parent. The process of generation does not depend upon the parent antecedently conceiving the form the offspring will share. The parent does not generate the child by preconceiving its design and imposing it upon some given material. Rather, the form in question is an active form animating the parent. It is a soul, whose life process the parent has and imparts to the offspring. Accordingly, if the divine relates to the world in terms of generation, the divide between God and nature is removed. Both are intimately conjoined.

As Foster notes, the presence of this account of the divine demiurge in the *Timaeus* indicates Plato's failure to distinguish two fundamental processes, making and generation, which are really not compatible with one another.<sup>10</sup> An analogous failure to distinguish making and creation is found in the ancient Greek tendency to conflate the art of artisanship with fine art. Unlike an artifact produced by craft, fine art is something created. The genuine object of fine art does not embody an antecedently given form because if it does it does not deserve respect as a creative expression, being more of a formulaic production, lacking the novel individuality that only creation can impart.

Not surprisingly, when Christian theologians make use of Plato to provide a philosophical justification of Christian dogma, they find different aspects of Plato's doctrine more suitable than others. As Foster observes, the notion of the divine as a demiurge is more employable than the notion of the divine as father, although both notions do appear in Christian doctrine.<sup>11</sup> The doctrine of the Trinity invokes generation in the birth of the son of God, whereas the doctrine of creation can invite some comparison with the notion of manufacture. Nonetheless, there are fundamental differences in how Plato employs generation and manufacture and how the latter could apply to the Trinity and creation. Whereas Plato applies generation and manufacture to the same object, nature as a whole, Christian doctrine applies generation to the birth of the son of God and creation to the world.

It is useful to keep track of these distinctions, which will prove crucial in thinking about different kinds of entities and what categories are applicable to different domains of nature, as well as to nature as a whole.

Although both generation and manufacture (*techne*) terminate in an information or organization of a given matter, this occurs in very different ways.<sup>12</sup> In the case of manufacture the active information is completed when the product is produced, which terminates the formative process. In the case of the generation of offspring, the answer is more complicated. Is the ordering of generation completed with inception or birth or when the offspring is full grown? Unlike an artifact, an offspring is self-organizing insofar as it matures and maintains itself through its own life process.

Similarly, the form that is embodied in manufacture and generation has a form antecedent to the “informing” process. In the case of manufacture, the form is present in the mind of the artificer. In the case of generation, the form is inherited from the parent, who possesses it as the very principle of life that is at work in the parent.

Moreover, in both an artifact and an offspring, the form that is embodied plays a dual role. In each it figures as both the essence and the species of the emergent factor. The form operates as the essence in that it is that which makes that product what it is. Whether the entity be a manufactured chair or a generated human being, the form that gives it its identity is antecedently realized, albeit in different ways.

On the other hand, the essence that determines what the product is is bound up with its species being. Thinking about entities in terms of genus and species distinctions is an approach privileged by both Plato and Aristotle. To what extent is this categorization appropriate for entities construed as artifacts or as offspring? The category of species has obvious application to offspring insofar as an offspring comprises a reproduction of the essence of the parent, thereby upholding the species to which they commonly belong by becoming a new member of the species.

Can the same be said of an artifact? The nature of the production of an artifact ensures that the form is separately conceivable from its particular embodiment. Therefore this form or design can be embodied in multiple products, each of which is of the same kind, as defined by the form they share. The form in no way establishes the individuality of the artifact, since it does not determine what distinguishes any product from other exemplars of the same form. All it establishes is that the artifact is one of a kind which has other potential or actual exemplars.



Nonetheless, it bears repeating that there are decisive differences in how production and generation operate and how form figures within each. The artificer possesses the form by conceiving it, not by embodying it. By contrast, the parent possesses the form that is imparted to the offspring by embodying it, by being a realization of it. The artificer is not a chair but makes a chair, but the father is of the same species, the same kind of living entity as the offspring. Precisely because the artificer does not embody the form to be realized in the product, the form must be antecedently conceived to guide the manufacture. Alternately, since the form is embodied by the parent, it does not have to be conceived for generation to occur, which is why there can be generation in organisms that lack any power of conception.

Furthermore, the form functions very differently in artifact and offspring. In the case of the offspring, the form is the cause of its spontaneous motion, as well as of its growth and of its very existence. The offspring is a living thing whose life process enables it to engage metabolically with its environment, grow, and reproduce. The form of the organism has the power to preserve the organism and resist its disintegration and destruction by external factors. None of this is present in the artifact. The artifact is completely dependent upon the artificer for the activity that embodies in it its form and sets it in any functioning in which it may become subsequently engaged. The activity of its production comes to an end with the manufacture of the product. The product does not contain or share in that process of manufacture. Nor does it repair or actively preserve itself. The offspring, on the other hand, functions as if it contains within itself its own artificer. It incorporates the power of the producer, as if somehow the craftsman could include his own agency in the product. The living organism that issues from generation has a spontaneous movement of its own, by which it is determined from within itself.

Admittedly, an animal can be caused to move by an impulse communicated from without. Such an external stimulus is, however, very far from being able to determine completely either the nature or the quantity of motion that follows. If an ocean wave surges into an iguana, how the iguana moves is very different from how a piece of drift wood is tossed about by the water. An inanimate object does not move itself in function of its species being, but rather has motion imparted to it in

function of the force communicated to it, its own mass, and anything about its shape and texture that affects the friction produced by its movement. All that matters is the inanimate object's shape and mass. Shape is different from the form that determines the essence and species being of a living entity. A dead iguana has the same shape as a living iguana but if you kick the dead iguana the force imparted to it will have a different result than if the same kick is aimed at a live iguana. The motion that the living organism undergoes will depend upon its own nature, which largely determines how it reacts. Its nature or form is not something merely material, whereas shape has to do solely with a thing's material configuration. The form or nature pertains to the organism's kind and its kind is not reducible to any sensuous property. It is something of a different sort. This is why the nature of the offspring bears upon how it moves and what results when an external force is imparted to it.

By contrast, the form of an artifact, imparted to it by the activity of the artisan, has no bearing upon what happens when motion is communicated to it. That the artifact is a chair does not add anything to what will happen to the chair when an external force acts upon it. What counts is the chair's shape, mass, and texture (if friction is involved).

As Foster points out, there are occasions when the nature of the offspring has no bearing upon what happens to it when force is imparted to it.<sup>13</sup> This is the case when the force is of such a magnitude that it completely overpowers the nature of the organism, leaving it acted upon as though it were dead natural material or an artifact. A tsunami may be powerful enough to sweep along a living iguana with the same speed and trajectory as any equivalently sized and weighted material.

In distinguishing between artifact and offspring, it is important to keep in mind that both are distinct from what is inanimate and not a product of manufacture. The latter has solely material features, which may be further qualified, as we shall see, as physical and chemical.

Although the artifact has no source of movement of its own, the form of the artifact is no more just shape than the form of a living thing. Unlike shape, the form of the artifact is something intelligible that can be represented apart from its sensuous embodiment. That sensuous embodiment does have a sensible configuration as well as a sensible mass which bears upon what motion is imparted to it because an artifact does not impart motion to itself.

Moreover, the form of the artifact involves no kind of *conatus*, no urge to preserve itself, no process that resists disintegration.<sup>14</sup> If a pot does not fall apart, this depends upon its spatial configuration and the material of which it is composed. These factors are different from the form of being a pot. The pot's function, however, depends on that form.

One way of grasping the distinctions here intimated between a form as it is present in an artifact and a form as its present in an offspring is to regard the form in what is artificial as being an embodied concept. The form of the artifact is an embodied concept insofar as it is something conceivable and must be antecedently conceived in order for it to be produced. By contrast, one can view the form of a product of generation not as an embodied concept but as an embodied soul. These two construals of form provide for two different ways of thinking about nature, in light of two different ways of regarding the divine. One considers the divine to produce nature as an artificer, as a demiurge who imposes form upon material, giving order to chaos. The other considers God to generate nature as an offspring. If God is the artificer of nature then nature lacks all participation in the power by which it was produced. If God is the parent of nature, nature must exhibit the divine nature; it must possess within itself the same spring to activity as is in the divine.

Foster suggests that regarding nature as being generated from the divine involves a theological conception that fits the Aristotelian philosophy of nature, whereas the theological notion of divine as a demiurge or artificer of nature fits the philosophy of nature presupposed by modern science.<sup>15</sup> Indeed, the distinction between the nature of an offspring of generation and a product of manufacture is identical to the distinction Aristotle employs when he is differentiating a natural from an artificial object.

Following Aristotle, one can distinguish animals from artifacts precisely insofar as how the form of one is and the form of the other is not an efficient cause of movement. Take the case of the iguana. If you want to know how an iguana will move if struck by a given force you have to know something about the nature of the iguana. If you want to know how a thimble will move if struck by a similar impact all you need to know are its material dimensions, its mass and figure. Its form as a thimble, its function as a thimble, is beside the point.

Insofar as Aristotle conceives natural objects in general in the terms that apply to an animal and not an artifact, the motion that is proper to

a natural object will be determined by its form or specific nature. This will apply both with regard to how the natural object moves itself as well as to how it resists force applied to it. So, on these terms, you only have to know the nature of fire to know that it is going to move naturally upwards or that if wind be blowing against it, it is going to resist it in a certain direction because of what it is. By contrast, if you know something to have the nature of earth, you know that it moves downwards and not upwards like fire. Or if you know the nature of a celestial object, you know that it will engage in a kind of circular motion that will not be true of terrestrial objects. By thus thinking of natural objects as offspring of generation and as thereby having an active form akin to a soul, we give natural science the task of uncovering the specific natures of things. That becomes the focal point if one wants to understand nature, having construed it as the product of generation.

By contrast, the modern science of mechanics is going to explicitly ignore the nature of a thing in order to understand its motion. The laws of motion are going to be seen to be the same for all material objects. It does not matter whether one drops a book, a feather, or a cannon ball, from the leaning tower of Pisa. So long as one takes into account how its shape determines the resistance of air to its fall, the laws of motion will apply to an object irrespective of what it is. Scientific understanding will here only be possible on the assumption that the quantity of motion of a natural object is precisely commensurate with the force communicated to it and has nothing to do with its specific nature. If you think the specific nature has something to do with it, then you are losing all touch with scientific reality and succumbing to Aristotelian fantasies.

## **2.3 Nature as Product of Making Versus Nature as Product of Generation**

Can conceiving nature as a product of generation confer sufficient intelligibility upon the objects of nature for their scientific investigation? This question is relevant not only for the viability of any Aristotelian theory of nature, which fits a theological notion of the world as

generated from the divine. It also is relevant for any investigation of that part of nature, namely, organic nature, whose objects seem to be and be thinkable as offspring.

It is quite obvious that when we deal with artifacts, their form or essence is inherently intelligible. The artifact is the embodiment of a concept that must be antecedently conceived by the artificer in order to produce the artifact.

As Foster points out, the intelligibility of an artifact is not comparable with the intelligibility of what Locke identifies as an abstract general idea.<sup>16</sup> For Locke concepts or universals are ultimately abstract general ideas, literally abstracted from sensuous ideas that are found in experience to be common to a plurality of sensuous objects.<sup>17</sup> Abstracted general ideas are just common sensible marks. Although their content is found in a plurality of instances, it remains something that is not conceivable. Rather, the content of the general idea can only be sensed and then re-presented by imagination, whereby what is abstracted from one sensation can be placed next to other abstracted marks so as to construct the general representation of the abstract idea. This general representation is not equivalent to the form that an artifact has. The form embodied in an artifact is not something that can be encountered in all the sensible perceptions of things that have that form. Indeed, it cannot be found in any of those sensible impressions. The form is intelligible and definable. It provides the answer to “what is” the object it informs, whereas no image or any duplicated element of an image can serve to define something. Sensible contents, no matter how abstracted they may be, are not sufficiently universal to serve the purpose of definition. One cannot use one’s own picture to characterize what it is to be human. Nor can any sensible feature we share in common be definitive and essential to what we are.

The same limitation applies to using sensible contents to grasp a function. An archeologist, who is concerned with comprehending artifacts recognizes that one can only understand what an artifact is by *thinking* its function. An artifact’s defining function cannot be determined by simply measuring its shape or perceiving its color, texture, or any other of its sensuous qualities. None of these sensible contents will give you its form and function, for the latter are inherently intelligible, conceivable,

and definable. As definable, form and function are subject to all the methodological operations that proceed from definition. Insofar as definition determines the genus and species of an entity, the intelligibility of an artifact allows for the various kinds of judgments and syllogisms that species being involves and upon which Aristotelian science feasts.<sup>18</sup> With the apprehension of species, differentia can be necessarily derived.

The situation is entirely different when one operates with abstracted general ideas. These empirical representations offer at best demarcations of class based on family resemblances that can always be undercut by further observations. If one draws inferences about an individual in virtue of its class membership, one is operating in circles, since the boundaries of the class are predicated upon the given features of its members. The commonality of family resemblance is based upon all the individuals that are part of it because the class or “family” has no existence apart from those individuals that are observed to resemble one another.

Aristotelian science presumes to operate with the deductive authority of a science of form and function, but it is not really concerned with artifacts or with forms that have the passivity of designs imposed by art. Rather, Aristotelian natural science is concerned with forms that have efficacy. Although such science relies upon definitions, judgments, and syllogisms that presume the intelligibility of an embodied concept or *logos*, it addresses natural things that have a form which is not of a *logos* but of a *physis*, an efficacious self-moving, self-realizing form.<sup>19</sup> Knowledge of such form can provide the key to understanding nature because it determines not just what something is but also how it moves and what end it has. All of these considerations go together precisely insofar as we are dealing with an ensouled entity whose form is self-moving and self-realizing.

Does Aristotelian science fall into an insoluble dilemma by using procedures that depend upon a kind of intelligibility possessed by artifacts to understand natural things whose form is of an entirely different character? Although Aristotle does distinguish artifacts from natural things, at many conjunctures he tends to conflate the two and in conflating the two, attempts to understand nature by appealing to aspects of manufacture. This engenders the same kind of confusion we find in Plato’s *Timaeus*, where natural entities are conceived on the one hand as products of artifice or *technē* and on the other hand as arising from love and generation.

Foster identifies the underlying challenge, writing that “the possibility of an Aristotelian science of nature thus depends upon the two-fold principle that the form of a natural object is at once superior in respect of efficacy and not inferior in respect to intelligibility to that of an artifact.”<sup>20</sup> In other words, what is natural is natural insofar as it has an efficacy of its own that allows us to understand how it functions in terms of its nature. If instead we just have artifacts, there could be no scientific understanding of the world because what happens would have no connection to what things intrinsically are. Events would be completely accidental to their nature and that would leave natural processes with no intelligibility. On the other hand, if matter is without form, it would be indeterminate and inscrutable. If, however, the science of nature depends upon things having a form with an efficacy superior to the embodied concept of an artifact, they still must retain sufficient intelligibility for scientific comprehension. How can nature then allow for any rational demonstrations?

Foster maintains that if Aristotle had properly taken note of the distinction between artifacts and natural things, he would have recognized that the efficacy that form possesses in nature is something it has at the cost of the intelligibility that artifacts possess.<sup>21</sup> The intelligibility of the artifact depends upon the manner of its production. It is a condition of the artificer’s activity of manufacture that before the artificer begins work the artificer has to conceive the form that is going to be embodied. The artificer must consciously distinguish the end that his activity is aiming to realize from the means of its realization. The means that *techné* employs to realize the end are the materials as well as whatever tools are employed in the process of embodying the form. These are all distinguished from the form being embodied, which must be consciously apprehended apart from them. The genuine artificer has to be able to say what is being made, not by assigning a name to some individual occurrence in a nominal way, but by identifying the form that is not sensuously but only verbally manifest. The same *logos* that can be presented in the words of the definition is the essence of the artifact, the end in distinction from the means, the form in distinction from the matter.

By contrast, the natural object that comes into being by generation has communicated to it the efficacious ensouled form of the parent.<sup>22</sup> This efficacious form is communicated without any conceptual grasp.

Indeed, one might ask whether there is a concept to be grasped or whether the nature of the form has a non-discursive character. Although the form has to be antecedently present, it is present not in the form of a concept that is known, not in the form of *logos*, but as possessed in the form of a nature, in the form of *physis*. In this respect, it is not something distinguishable by reason from the generator or from the matter of its embodiment.

Foster suggests that Aristotle makes natural entities more intelligible than they should be by maintaining an analogy to artifacts.<sup>23</sup> Artifacts are intelligible because they embody a concept that can be clearly distinguished from their matter and the artificer has conscious knowledge of that form. With regard to a natural thing, the question is not just, "Is its nature something that is consciously apprehended?" Rather, the question is, "is its nature something that could be apprehended conceptually?" Can one really know the concept of a natural thing if it has an efficacious form and is generated? Is it definable like an artifact or like a mathematical object, which might be considered a type of artificial entity constructed in intuition? Or does the fact that the form in question has a self-realizing aspect give the natural entity a very different character that may not allow for the natural science that Aristotle invokes? Foster maintains that if Aristotle had recognized the difference between artifact and natural thing, he would have recognized that how natural objects are distinguished from artifacts makes them incapable of both definition and treatment by the scientific methods he employs.<sup>24</sup> Foster at this juncture does not say very much to support his claim. He simply points out how manufacture differs from generation by having a conceivable form that the latter does not employ. Does that difference, however, mandate that the nature of a natural thing cannot be conceived, that it cannot be defined, that it is something about which one cannot make any necessary judgments?

Like Aristotle, Foster will admit that when we are dealing with living things and animals in particular, what they are has necessary bearing upon what they do. That, however, does not mean that there is an a priori concept of an iguana or an a priori concept of a human being. There may be an a priori concept of a rational agent, but a homo sapien is a contingent being, who may instantiate rational agency, but hardly



does so exclusively. Particular organisms may be contingent and, strictly speaking, indefinable, but can there be an *a priori* concept of what it is to be a living thing?

Foster points to a very familiar and important passage in Aristotle where Aristotle tries to make sense of what is efficaciously natural by appealing to notions of artifice, of manufacture.<sup>25</sup> Aristotle famously declares that a natural object is like a physician who treats himself, thereby being the cause of his own health.<sup>26</sup> Aristotle conceives of medicine as a craft, that is, as an art in the specific sense of technique, where the physician relates to patients in the way in which an artificer relates to materials. That is, the physician imposes form upon a given material, making the body accord with the harmonious design of health. Like any other artisan, the physician knows the form antecedently through his knowledge of medicine and imposes it upon the patient, who, in being so informed, regains health.

What is different here is that the self-curing physician is both agent and patient at once. The physician operates on his own body in light of the knowledge of the form that is to be imposed. The operation is directed upon the physician's own body but it is informed by this knowledge that is antecedently had and, in a sense, remains distinguishable from the means to which it is to be applied. So here we have something that might seem to provide both dimensions of efficacy and intelligibility. Here the object of the activity contains the power of informing itself, of imposing form upon itself. The physician acts upon himself, imposes a form that is antecedently conceivable, but here the object that is being acted upon contains the power to inform itself at the same time that it exercises the capacity to antecedently conceive the form it is going to embody. Efficacy and intelligibility thereby are combined and this might seem to remedy the situation. Through analogy to the self-curing physician, we can conceive of natural things as moving themselves and yet being intelligible in terms of the same kind of operations that allow for cognition using definition, judgments, and syllogism.

Clearly the self-curing physician is more than an artifact. The self-curing physician is an object that has taken on a form, but it equally wields the power to impose that form upon itself.

At the same time, the self-curing physician is not just a natural object on Aristotle's understanding of what it is to be by nature. The process by which the physician cures and preserves himself involves the mediation of medical knowledge, of knowing the form of health. Knowledge of the form is thus here a precondition for the production of health. In the natural object, however, the *physis* that is the active form preserves and sustains itself independently of any intervening knowledge. The organism maintains itself and reproduces without having to know its own form.

Moreover, the healthy individual does not involve the activity of a physician curing himself of disease. The condition of health is arrived at with the completion of the intervention of the doctor, even when it is a self-intervention. The process of health that has been reinstated by medical treatment now proceeds independently of any knowledge of or meddling by medical science. Consequently, Aristotle's example of the self-curing physician does not really work as an account of nature. The efficacious form of a natural thing realizes itself without any intervention of knowledge, without the articulation of that form as a separable concept that can be imposed upon the natural entity as if it were passive material awaiting the imposition of some design. There is something fundamentally incoherent about Aristotle's appeal to a reflexive craft. This incoherence is equally on display in such other notorious examples as where Aristotle claims that if a house could build itself it would be just like a living thing.<sup>27</sup> Once more, Aristotle presumes that one can make sense of the self-activity of the living thing as if it were an exercise of craft involving the signature artifact distinctions between form and matter and an antecedently conceivable form that is separable from its embodiment.

The efficacious form of the life process is something else. The living organism is continually reaffirming itself and in that respect it is the maker of itself. Yet this *auto-poesis* is not an exercise of *techne* or manufacture. As Kant will point out, every part of the organism is both means and end because every aspect of the organism functions for the perpetuation of a whole that includes itself.<sup>28</sup> So it not only serves as the means to the upholding of a whole but also it is an end because

it thereby reaffirms itself. This inability to distinguish means and ends is fundamentally absent in artifacts. The distinct character of the living thing is directly on display in reproduction. The generation of the living organism does not occur by imposing form upon some inanimate material. Rather, generation involves what is already alive from which is engendered a separate living individual. Moreover, the generated living individual exhibits the power of enlivening material by assimilating inanimate and dead things, making them part of its own living metabolism. Further, the material of the organism is engendered together with its form, both of which undergo transformations in growth and metamorphosis.

All these features of the life process suggest that the conceptual resources required to comprehend an artifact will not be sufficient to conceive life. This problem would be generic to nature, if nature as a whole were to be thought of as something generated. If, however, we consider generation and efficacious form to apply only to the particular natural sphere of life, then one must address several additional questions. One must consider what is the relationship between this type of nature and inanimate nature? One must also consider how inanimate nature is to be conceived in distinction from both artifacts and life.

This latter question comes to the fore in examining the modern approach to nature that is crystallized by Kant. Foster's discussion of modern science's philosophical and theological underpinnings will help us focus on what is involved in the reduction of nature to mechanism and where in nature mechanism has its proper place. With that accomplished, we will be ready to tackle the universe in all its manifold complexity.

## 2.4 Theological and Philosophical Presuppositions of Modern Science

Before addressing with what the philosophy of nature must begin, it is helpful to comprehend what distinguishes the ancient and modern conceptions of nature, which each privilege categories that have legitimate application to different natural domains. To this end, we will draw upon

the second half of Foster's essay, which sets in relief the distinctive philosophical and theological underpinnings of modern science. Thereby Foster provides a key handle on Kant's philosophy of nature and paves the way for understanding how Hegel recasts the ancient and modern paradigms into elements of a viable comprehensive concept of nature.

We have followed Foster's analysis of how Aristotle develops a philosophy of nature that fits the pagan conception wherein the divine is not radically distinguished from nature. Even though Aristotle conceives the divine as a self-thinking unmoved mover that is anything but natural, he ends up conceiving nature in terms of an active form that best suits the theological doctrine construing nature as the offspring of the divine rather than as the product of a divine demiurge. Although Aristotle conceives natural things to have an active form, as most evident in living organisms, he still wants to allow for a rational science of nature, in which natural things are definable and susceptible to necessary judgments and syllogisms. As Foster has shown, such intelligibility may be had by artifacts, which embody the inactive form of a concept. Can this intelligibility be retained by things that have an active form like a soul?

Can the philosophy of nature underlying modern science avoid this difficulty? Foster sets the stage for answering this question by turning to the theology that fits the modern philosophy of nature. Whether or not modern science depends upon a theological grounding, the theological understanding that corresponds to the presuppositions of modern science clarifies what these are.

Foster begins by identifying rationalism in theology. Rationalism in theology thinks the activity of God to be preeminently an activity of reason.<sup>29</sup> This view has as its corollary that when we humans engage in reasoning we are approaching what it is to be divine. We are able to think the thoughts of God to the extent that we can somehow restrict our activity to reasoning, ignoring the competing drives of our sensuous being that may lead us astray from thinking in a fully rational way.

Rationalism in theology might seem to have its most extreme advocate in Aristotle, who conceives the divine as thought thinking itself. Such thinking thinks about nothing extraneous to thought. It is a completely pure thinking and one might wonder how this could have any connection with nature. Can rationalism in the philosophy of nature offer a bridge?

Rationalism in the philosophy of nature consists in the doctrine that nature is essentially intelligible, that nature is conceptually transparent, that it is open to reason. This implies that even if we must use sensory experience to acquaint ourselves with nature, this is only a preliminary to guide us to the intelligible essence of nature, which is something very different from the contents that our senses and experience deliver to us. If we accept rationalism in nature, we acknowledge that there can be an a priori science of nature. We can conceive independently of experience what nature is universally and necessarily.

Aristotle is a rationalist in both his philosophy of nature and his theology. Accordingly, he presents his account of nature as something to be developed in the same way in which metaphysics is to be developed. Aristotle seeks to obtain knowledge of nature by uncovering its first principles and then determining what can be derived from them. In so proceeding, Aristotle thinks of natural things as having natures which are determinative of how they function.

Aristotle, however, conceives of the divine as rational in such a way as to provide no bridge between the divine and the natural world. The divine as highest being is thought to owe its entire actuality to itself. It has no potentiality which would allow it to be open to determination from without. The divine, as completely self-actualizing, can have no matter, which would burden it with potentiality awaiting the external imposition of form. Rather, the divine must be entirely immaterial, which leaves it nothing but a thinking being. Moreover, to be completely independent, its thinking must be about nothing but itself. Further, this self-thinking must always already be what the divine is in full. To be purely actual and devoid of potentiality, the divine cannot change and can only think itself in an eternal unalterable self-conception. The rationality exhibited by the divine accordingly seems to have no application to nature for what the divine thinks in no way includes nature. The completely self-directed thinking of the divine thus seems to leave in question how reason can lay hold of nature.<sup>30</sup>

First of all, the self-thinking divine cannot determine the form of nature. The divine cannot exhibit formal causality with regard to nature because its activity provides nothing but the form of the divine itself. If nature has any form, it must be found somewhere else than in the divine.

Secondly, Aristotle's divine cannot provide any material basis for nature because self-thinking thought has no matter to offer at all. The matter of nature must either be independently given or derive from something other than the divine.

By the same token, the divine cannot wield any efficient causality with regard to nature or anything else. Efficient causality requires the capacity to change something else, but the self-informing activity of the divine is directed exclusively upon itself and operates in an unchanging eternal way.

Aristotle is left with only one other avenue for any connection between the divine and nature, and this is final causality. Aristotle does invoke the divine as the final cause of nature, but it is very questionable whether this makes any sense. After all, how can Aristotle's divine possibly be the final end for nature? Given how the divine is characterized, how can anything serve either as a means or as an embodiment of it? Since the divine is pure actuality, consisting in the wholly independent activity of self-thinking thought, there is no way in which anything else can contribute to its realization. Moreover, there is no way that anything different from the divine can take on the constitution of self-thinking thought. Since thought that thinks itself has no singular character that could individuate one self-thinking thought from any other, it can have no plural embodiments.

Consequently, self-thinking thought seems bereft of any bearing upon nature. It would rather appear that Aristotle's conception of the divine repudiates Plato's notion that nature can be in some respect an offspring of the divine. This Platonic notion would at least provide an intelligibility to nature comparable to that of artifacts. A demiurge imposing form upon chaos to produce nature as an artifact would give natural things essences that are conceivable prior to and apart from their embodiment. Nonetheless, as Foster points out, nature, as produced by a demiurge, retains an element that is not properly rational.<sup>31</sup>

The activity of the demiurge does not just consist of thinking. It engages in an activity of making. Admittedly, this making is subordinate to the demiurge's prior thinking of the form it is going to impose upon a given material. Still, imposing form upon matter is something distinct from an activity that is completely intelligent. The divine demiurge

engages in both theory and practice, where the practice of making is dominated by and governed by theory. Nature that is a product of such rational making has a sensuous or material element which serves as a means to the end of embodying the form. Experience is thereby left with a role very different from the one it enjoys with a modern science that considers itself to be essentially guided by an empirical element. This is because the end to be realized through the means of matter is not something that can be found in anything merely sensuous. It is something that can be preconceived in a completely intelligible way prior to any involvement with matter. Accordingly, it is not equivalent to the kind of general representation that empiricists offer us as the only type of universal that has any bearing upon existence. Such a general representation is what results when one abstracts commonly contained sensuous contents from a plurality of observations. As we have seen, when one deals with an artifact, the form common to a plurality of products is not sensuous but intelligible. This difference is exhibited in how archaeologists cannot know what they are dealing with simply by examining the sensuous properties of an object. The sensuous features of an entity do not provide an understanding of its function and form. One must know what the entity is to be used for and knowledge of its function depends on conceiving its form, which is intelligible prior to and independently of its embodiment.

Admittedly, when an artifact is produced, some given material gets shaped in the sense of having its physical configuration altered. Still, shape and form remain distinct. Shape pertains to the physical boundary or the physical contour of an object. Changes of such physical configuration can be identified by spatial-temporal measurement, just as physical composition can be identified by chemical analysis. In making an artifact, the artificer indeed employs physical and chemical processes to make it what it is supposed to be. Nonetheless, the object cannot be fully identified as an artifact by the physical and chemical alterations that enable the material of production to embody its defining form and function. The latter must still be thought of apart from these physical and chemical features. There remains an extra leap of understanding beyond sensuous observation that must be taken to get at what the thing is. Consequently, if the natural sciences were to operate

in a manner appropriate for grasping things as if they were artifacts of a divine demiurge, observations would be used in a fundamentally different way from how science will proceed according to the canons of empiricism and its reliance upon induction from sensuous data. If nature is thought of as an artifact, one must move beyond the sensuous data and employ a cognitive activity different in kind from what one uses to take in the sensuous being of things.

Modern science can thus be characterized as breaking with rationalism in theology, ceasing to regard the divine as either strictly rational in the Aristotelian sense or as less strictly rational in the sense of an artificer. Instead, as Foster suggests, modern science can be thought of as operating on the basis of or at least in conformity with a view of the divine as having a voluntarist relation to nature.<sup>32</sup> Instead of regarding the divine to produce nature in an exercise of thinking or in an exercise of willing that is guided by thinking, this theological view regards the divine to engage in a willing of nature that is not guided by any preconceived forms or concepts. In this case, one cannot regard the physical presence of the world as the realization of something that is intelligible. The world is no longer the embodiment of any antecedently conceived ideas or the product of a making that is guided by such preconceptions. It might appear then that nature has become completely contingent upon a willing that is itself completely arbitrary because it is not guided by any rational element. Such would seem to be the case if nature were the result of an act of creating rather than an act of making, that is, if nature were a creation rather than an artifact.

If nature were such a creation, one would have to experience its sensuous being in order to come know it. With nature created by a divine will that is completely unfettered by reason, the science of nature would have no *a priori* element. It would have to rely entirely upon observation and be purely empirical. Natural science would depend entirely upon induction and therefore never be able to establish any universal or necessary determinations of nature unless scientists surreptitiously take for granted the uniformity of nature.

Although Judeo-Christian and Islamic theology conceive of the divine as a creator and provide the general theological heritage from which modern science arises, it would be a mistake to think that



modern science is devoid of any rational element, as empiricism might judge it to be. Rather, as Foster notes, there is a rational element in modern science that is set in relief by Kant.<sup>33</sup> Whether one turns to *The Critique of Pure Reason* or the *Prolegomena to any Future Metaphysics*, Kant unflinchingly maintains that modern physics, like mathematics, confronts us with a body of knowledge that exhibits universality and necessity, while providing us with “ampliative”, “synthetic” comprehension. Neither of these sciences gives us just analytic truisms about what is to be found within certain given terms. Both instead connect different terms in ways that are still necessary and universally valid. This may be most obviously evident in the case of mathematics and geometry. Kant, however, does not hesitate to maintain that natural science confronts us with a body of synthetic a priori knowledge, ampliative yet universal and necessary. This might appear mysterious on Kant’s own terms because he emphasizes over and over again that when we deal with things that appear to us in experience and rely only upon observation, we can never obtain any knowledge that is necessary or universally valid. Experience can never provide knowledge that can count as truly scientific, for observations are always contingent and particular, whereas science proper offers knowledge that is necessary and universal. Yet, as Kant affirms, in physics we have a natural science that does provide truths that have the same necessity and universality as those of mathematics. Not surprisingly, physics is the science that applies mathematics in a thoroughgoing way. Kant does not question *that* there is such an a priori natural science. Instead he questions, “*How* can there be such a science?” How can there be a science, be it natural or mathematical, which provides us with knowledge that is universal and necessary and yet is not merely analytic?

Foster lays bare the understanding of the divine that provides the theological underpinnings for such a science, and although we may be able to separate modern science from any theological moorings, the latter help define what the philosophy of nature contributes to such a science. Foster does not want to deny that modern science has an empirical side, but he insists that it also has an a priori side to it and we want to try to make sense of this, above and beyond Kant’s own explanation.

A purely empirical natural science can easily be seen to issue from a completely voluntarist theology according to which the act of creation is an exercise of sheer will completely unguided by reason. Such creation issues in a nature that is completely contingent and natural science will accordingly have to rely upon induction and nothing more than induction.

There is, however, a different path specific to Judeo-Christian-Islamic theology, that makes theologically intelligible how there can be a modern science that has both a priori and empirical elements. In addressing this option, we need to consider the distinction between natural science and the philosophy of nature, for when natural science has an a priori element, one must ask to what degree is the science of nature something other than the philosophy of nature.

Certainly one can wonder whether the Aristotelian approach to nature allows for a natural science different from the philosophy of nature. Does modern philosophy, as epitomized by Kant, introduce a divide between the philosophy of nature and natural science, even while securing an a priori element to modern science? When we consider Kant, we must ask what difference is there between the philosophical foundation of modern science and the natural science it purportedly grounds.

As we have seen, one way of providing for rationalism in natural science is by invoking a divine demiurge that makes nature as an artifact. The activity of the demiurge, however, has two limitations that circumscribe the resulting rationalism in natural science. As Foster points out, the demiurge, unlike a creator, must act upon a given material.<sup>34</sup> This condition imposes a limitation upon the intelligibility of the product, which is highlighted in Plato's doctrine of the forms. Namely, because the form is embodied in a given material, it can never be perfectly realized. As Plato insists, sensuous things can never completely exhibit the intelligible idea that informs them and makes them what they are. They remain imperfect reflections, imperfect replicas of their form. So, for example, we may have the intelligible idea of a triangle, but when it gets embodied, the edges of the real triangle are no more real lines than the triangle's figure is without depth. Whatever the intelligible form may be, its imposition upon a given material always involves an aspect of defective, imperfect realization.

There is a further limitation to the activity of the demiurge, which is that the idea, the end or plan to be embodied, is given independently of the demiurge's imposing of form upon its given material. The form is just as antecedently given as the material. As Foster points out, these two aspects of givenness go against the idea of an omnipotent divine, such as Judeo-Christian-Islamic theology embraces.<sup>35</sup> How then can nature be made by a divinity that retains omnipotence, yet is still able to fashion a nature that has something intelligible about it?

The resolution to this problem has two sides. On the one hand, the omnipotent divine must somehow realize what it puts into nature in a way that is completely perfect. On the other hand, what it puts into nature must be something that it has come up with on its own, not something that it finds independently given. These two requirements are met in the activity that has been characterized as intellectual intuition or intuitive understanding.<sup>36</sup> Here the theoretical activity of the divine is such that it constitutes its object of thought without any deficiency. This does not mean, however, that everything about nature is going to owe its being to the theorizing of the divine. We must keep in mind that Foster is here thinking through the kind of theological account that will make sense of what otherwise could appear to be incomprehensible—that modern science involves both an *a priori* element and an empirical element. By following the twists and turns in Christian theology, he helps us get a handle on the principal forms of modern science and the kind of philosophies of nature that underlie them.

Now to begin with, the omnipotence of the divine can be redeemed by thinking creation to involve this kind of intuitive understanding or intellectual intuition whereby nature is generated in the divine's purely spiritual activity. To the extent that this way in which the divine engages in its thinking could also be exhibited in our thinking, we could attain the same complete rational activity. As Foster points out, this parallelism is found in Descartes, whose appeal to meditation involves the self-producing ideas through its own self-reflection as opposed to finding them through a contemplation of ideas simply given to it.<sup>37</sup> If nature is structured entirely by such ideas, the Cartesian can comprehend nature to be completely intelligible and susceptible of an *a priori* treatment for which any observations only serve as illustrations.

Now there is one other difference that Foster points to, which has to do with how the products of an intuitive intelligence do not embody forms, like the artifacts made by a demiurge. Instead, the nature issuing from intuitive intelligence is subject to law. The divine as intuitive intelligence produces a law-governed nature, not a nature comprising the embodiment of form. This outcome reflects the notion of the divine as an omnipotent law-giver, whose law rules nature in a way that is both perfectly extensive and perfectly intensive.<sup>38</sup>

The divine law of nature will be perfectly extensive insofar as the law will have no exceptions. There will be no phenomena in nature that do not exhibit the law. Moreover the divine law of nature will have an intensive perfection whereby it will not be realized to a certain degree in natural things. Rather, it will be perfectly realized in nature, unlike forms that are exhibited only in defective resemblances. Here law will completely penetrate nature without exception. This conception thus accords with the kind of philosophy of nature that regards lawfulness to be exhibited in material reality without fail, allowing nature to be knowable a priori with the same kind of certainty and exhaustive knowledge as the objects of mathematics.<sup>39</sup>

As Foster points out, this conception of nature is basically akin to the kind of science that Descartes develops.<sup>40</sup> Although one might be tempted to think that this kind of science would have no empirical element, the corresponding theological conception insures that there be an empirical element, side by side with an a priori element. There are three grounds for this, which are reflected in three different philosophical approaches characterizing early modern philosophy up through Kant.<sup>41</sup>

To begin with, if one regards an omnipotent divine as a creator of nature who imposes law on nature, the law will be intelligible and allow for a science of nature that can think such law and find it confirmed without exception. Observation will not be the basis for the science but will supply illustrations of what reason determines. Nonetheless, even though the resulting law-governed nature is thereby rational and intelligible, there is still something that is not determined by law. Namely, the law imposed by the divine is itself contingent upon the decision of the divine to make law for nature. That decision is not itself dictated by any law. Rather, the enactment of the law of nature by the divine is

an act of will. As Foster observes, this element of decision also applies to the demiurge who imposes form upon the chaos of unformed matter.<sup>42</sup> A demiurge may think the given ideas that are then going to be embodied, but that embodiment is still contingent upon a decision to impose those forms upon matter, a decision that is not necessitated by conceiving those forms. Although God here produces the world rationally by rendering it a lawful creation, the will to create it remains arbitrary. This arbitrary aspect of divine will is exhibited in the two sides of Cartesian philosophy, which acknowledges that God creates a world that is lawfully rational by an act of will. This entails that one can think the rational form or the rational law to which extended matter will be subject but that creation will contain something that one can only know by observation rather than reason. What observation can provide evidence for is that indeed *there is* a world, even though reason can determine thoroughly the lawfulness that will be exhibited ruling over all natural things to a perfect degree. Observation alone can confirm not why, but that there is a world governed by law. There is no why, because the being of creation is arbitrary, depending upon God's free decision to create.

Secondly, as Foster points out, there is a further element of voluntarism which affects how one regards nature and how science will operate.<sup>43</sup> Acknowledgment of this further element entails a departure from the Cartesian view, manifest in the distinction that Leibniz draws between possibility in general and compossibility. Compossibility brings into to play something that sheer possibility does not. What is possible, given that God creates a nature that is rational, intelligible, or lawful, is what is logically consistent, according with the law of non-contradiction. Possibility corresponds to what is thinkable, but not everything that is thinkable can coexist. There may be certain things that are thinkable that exclude other things that are thinkable. For that reason what can possibly coexist, what is compossible, is distinct from what is possible in general. Consequently, there is a voluntarist element concerning not just whether there will be a nature that is lawful, but concerning what laws are going to be enacted, what intelligible determinations are to be part and parcel of nature. Although one could use reason to think through what are the possible forms of law that could govern nature,

or, in other words, think through what are the worlds that are possible, knowing which possible world is actual will depend upon observation. Observation does not establish what the possible forms of law are. Rather, observation confirms which one of the possible lawful configurations that the world might have is actual. Thinking law does not establish that it is actual, precisely because there can be a plurality of possible laws, and only the arbitrary decision of the creator determines which gets actualized. Nevertheless, the theological notion of a lawful creator allows us to still retain the conviction that what is natural will have a lawful form, a form that will be determinative of everything in nature without exception and to a perfect degree. We will have to depend upon experience, however, for two things. First, only observation can confirm that there is a nature. Secondly, only observation can confirm which possible world is actual.

Admittedly, as Foster notes, Leibniz himself violates the very distinction between possibility and compossibility with his notion of theodicy, according to which the world is necessarily the best of all possible worlds.<sup>44</sup> Leibniz maintains that the divine cannot help but will the best of all possible worlds. Due to the perfection of God, the divine will must be guided by the idea of the good. If that is the case, however, the distinction between possibility and compossibility is destroyed for, in effect, nothing is really possible except what is best. The notion of theodicy thereby eliminates the voluntarist element on which the plurality of possible worlds depends.

Without theodicy, both voluntarist elements remain in effect and their presence is exemplified in the scientific practice of Kepler. As Foster points out, Kepler worked out different mathematically possible *a priori* schemes for planetary motion and then relied on observation to find which one was operative in our solar system.<sup>45</sup> He was certain it had to be one or another, so once observations proved to fit one such scheme, its scientific validity was assured.

Now there is one further element of contingency in created nature where voluntarism enters in and this element brings us to Kant.<sup>46</sup> This third voluntarist factor provides an important insight into how Kant conceives nature as well as into how natural science can have both a *a priori* and empirical elements. Not only is there a contingency regarding

the existence of nature and what law governs the universe. There is an additional aspect to nature that escapes the grasp of reason and this concerns how the universality of law cannot take hold of all that is. What is at stake here is something that applies to universals in general, whether they be expressed as law or as form. There is no way a universal can take hold of everything that is because everything that is has individuality. This means that there is going to be an additional element in nature that is not going to be determined by reason or, theologically speaking, by a divine rationality that would be governing creation. Accordingly, observation will be required not just to confirm that there is a nature and, secondly, that nature has the type of law it has. Even though nature will have a lawfulness, that lawfulness will not determine the particularity that nature will also have, insofar as natural things are individuals. To get at that individual aspect of natural things requires observations. Science may get at the lawful configuration of nature in an a priori way, but the individual realization of that law will not be accessible without recourse to observation. This does not make an a priori science impossible. It rather indicates that an a priori science will be restricted to the lawful form of nature.

This understanding is, as Foster notes, exemplified in Kant's approach to nature.<sup>47</sup> What operates like a divine intuitive understanding, with the three voluntarist limitations sketched out above, is what Kant identifies as "transcendental understanding", namely the structure of knowing that is determinative of knowable objectivity or nature. It will determine the lawfulness of objectivity. It can only determine the lawfulness of objectivity because the structure of knowing in question is "transcendental" insofar as it is determinative of what is knowable about any object whatsoever. It mandates the necessary and universal aspects of objectivity or nature, which apply equally to all objects. As such, it is a lawful necessity, which applies to every natural thing no matter what it is. It is thus a law that applies to natural entities with respect to their matter rather than to their form or specific "nature". That does not mean that natural things are merely matter. As Berkeley showed, things cannot be experienced just as matter, for one cannot experience tasteless, invisible, inaudible, odorless matter. One cannot encounter any of the so-called primary qualities, the purely material spatio-temporal

determination of natural objects that early modern philosophers take to be what alone is truly objective and truly objectively knowable. None of these primary properties can be encountered except through the sensuous qualities of so called secondary properties. In other words, the nature we encounter cannot be just matter in motion. Nature has to be further determined and this requirement is endemic to the very framework of mechanism.

In mechanism, factors are determined solely by efficient causality, a causality indifferent to the form and import of those factors. The framework of mechanism presupposes that there are a plurality of objects, of individual bodies. What provides for their individuation? The laws of matter cannot do that since they apply to all things equally, without distinguishing them as individuals. So there must be in principle further kinds of determining in nature. Are all aspects of that further specification only determinable by observation or does that specification involve necessary features that reason can uncover? Will the philosophy of nature have more to say about nature than what is merely material and subject to the laws of motion?

The preceding considerations provide a road map of the chief approaches of the modern way of addressing the divine and nature. We will see that the distinguishing features of these approaches will be instructive as we move on to tackle how the various aspects of nature are determinable.

## Notes

1. Michael B. Foster's work has been unduly neglected. His book, *The Political Philosophies of Plato and Hegel* (Oxford: Oxford University Press, 1935), provides remarkable examinations of Plato's *Republic* and Hegel's *Philosophy of Right*. His hard to find short book, *Mystery and Philosophy* (London: SCM Press, 1957), complements his essays of the 1930's on theology, science, and the philosophy of nature.
2. Michael B. Foster, "Christian Theology and the Modern Science of Nature", Part I, *Mind*, Vol. XLIV, No. 176, October 1935, pp. 439–466; Part II, *Mind*, Vol. XLV, No. 177, January 1936, pp. 1–27.



3. Foster, "Christian Theology and Modern Science of Nature", Part I, p. 439.
4. Foster, "Christian Theology and Modern Science of Nature", Part I, p. 440.
5. Foster, "Christian Theology and Modern Science of Nature", Part I, p. 440.
6. Foster, "Christian Theology and Modern Science of Nature", Part I, p. 440.
7. Foster, "Christian Theology and Modern Science of Nature", Part I, p. 441.
8. Foster, "Christian Theology and Modern Science of Nature", Part I, p. 442.
9. Foster, "Christian Theology and Modern Science of Nature", Part I, p. 444.
10. Foster, "Christian Theology and Modern Science of Nature", Part I, p. 445.
11. Foster, "Christian Theology and Modern Science of Nature", Part I, p. 445.
12. Foster draws and develops the following distinctions. See Foster, "Christian Theology and Modern Science of Nature", Part I, pp. 446–449.
13. Foster, "Christian Theology and Modern Science of Nature", Part I, p. 447.
14. Foster, "Christian Theology and Modern Science of Nature", Part I, p. 449.
15. Foster, "Christian Theology and Modern Science of Nature", Part I, p. 449.
16. Foster, "Christian Theology and Modern Science of Nature", Part I, p. 460.
17. This will prove to be important for modern science and its reduction of nature to a mechanism.
18. Foster, "Christian Theology and Modern Science of Nature", Part I, p. 461.
19. Foster, "Christian Theology and Modern Science of Nature", Part I, p. 461.
20. Foster, "Christian Theology and Modern Science of Nature", Part I, p. 462.
21. Foster, "Christian Theology and Modern Science of Nature", Part I, p. 462.

22. Foster, "Christian Theology and Modern Science of Nature", Part I, p. 463.
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Winfield, R.D.

2017, X, 410 p., Hardcover

ISBN: 978-3-319-66280-0