

## Efficient and Final Causes: Two Perspectives on Nature

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### Introduction

In his work *On the Elements of Natural Science*<sup>1</sup>, Leibniz presents an account of the significance of physical science and some guidelines for the practice of natural experimental science. Scientists can discover the causes of natural phenomena by reasoning upon experiments or by following *a priori* methods, and these can be, according to Leibniz, “either certain or conjectural”. The conjectural *a priori* method “proceeds by hypothesis, assuming certain causes, perhaps, without proof, and showing that the things which now happen would follow from these assumptions”. As to the other *a priori* method, it is certain “if we can demonstrate from the known nature of God that structure of the world which is in agreement with the divine reasons and from this structure, [we] can finally arrive at the principles of sensible things”. This is “the most perfect method”, and involves “the discovery of the interior constitution of bodies *a priori* from a contemplation of God, the author of things”<sup>2</sup>.

This method, which consists in the contemplation of nature through the perspective of the divine reasons that guided God when he created the world, seems to be impossible simply because the human mind is finite and cannot reach to the abyss where the divine reasons are hidden. Leibniz is conscious of this and he is not proposing a method that only angels can use. Though the method he is presenting is difficult, it is not impossible.

The paragraph where Leibniz presents this *a priori* method, and the content of the *Elements*, suggest that Leibniz is thinking about a method that proceeds from the knowledge of God’s perfections to the understanding of nature. And, to see what these perfections of God are, the mind of those who want to use this method must be perfected, which can be done by studying nature carefully. For Leibniz, even if it is not possible to apprehend all of the goals of God when he created the world, we are sure at least that God followed the principle of perfection. “We know”, says Leibniz, “that God works in the

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<sup>1</sup> “On the Elements of Natural Science”, in: Leroy Loemker (trans. and ed.): G. W. Leibniz: Philosophical Papers and Letters, 2<sup>nd</sup> ed., Dordrecht 1989, pp. 277-290; A 6, 4 C, 1992-2010. In the text Loemker’s translation is followed.

<sup>2</sup> “On the Elements of Natural Science”, Loemker, p. 283; A 6, 4 C, 1998-1999.

most perfect way”. And it is not impossible to know what the perfections of God are, because, according to Leibniz, “we have a concept of perfection”. But this method is, in Leibniz’s words, “difficult” and should not be “undertaken by anyone whatever”. For him, only “superior geniuses” should use this method<sup>3</sup>.

The knowledge of God’s perfections by a careful study of natural bodies is possible because God created the world in the most perfect way and his perfections were impressed on nature. But the divine perfections are hidden in nature and it is difficult to discover them. For Leibniz, only the attempt to discover the efficient causes of natural phenomena will make it possible to access these hidden perfections. The purpose of this presentation is to understand how, by trying to determine the efficient causes of natural processes, the scientist can reach to the hidden perfections of God and be perfected by them, so that he can have a true concept of nature from the knowledge of God’s perfections.

### **The knowledge of the perfections of God through nature**

What kind of knowledge of God’s perfections is Leibniz thinking about? Of course he is not thinking about a complete knowledge of God’s perfections, because God is infinite and the human mind is finite. The limits of human minds are an obstacle to the understanding of the particular reasons that have moved God to choose this order of the universe. It surpasses the powers of finite minds to know why God allows sin to be committed, and why He dispenses his saving grace in a certain way<sup>4</sup>. These and other reasons of God’s actions could only be apprehended by a direct contact with God himself. But the beatific vision of God is a thing that human minds cannot attain in this life. Therefore, the kind of knowledge of the perfections of God that even superior geniuses can seek for cannot come from seeing God face to face. The only way is to grasp them indirectly.

One of the ways of discovering God’s attributes indirectly is through the contemplation of creatures, which bear an imperfect likeness to their creator. By reasoning from creatures, human souls can be elevated to the contemplation of God. For

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<sup>3</sup> “On the Elements of Natural Science”, Loemker, p. 283; A 6, 4 C, 1998-1999

<sup>4</sup> “Discourse on Metaphysics”, Loemker, p. 305; A 6, 4 B, 1536.

Leibniz, the study of natural bodies, where the divine signatures are written, leads to the knowledge of the divine attributes, and this should be the ultimate goal of natural science. These ideas were, however, contested by some thinkers who, by scrutinizing nature with the help of new scientific techniques, considered, on the contrary, that there are no signs of God in nature and that the aim of natural science should simply be the explanation of the phenomena of nature. And because these thoughts, that were growing in some circles in Leibniz's days, were leading some valuable minds to errors and to atheism, some philosophers, including Leibniz himself, felt the need to write against them.

For Leibniz, science has a practical value and enhances the control of nature. But it is also an instrument for the perfection of the human mind, because, through science, it is possible to grasp God's perfections impressed on nature. According to Leibniz, "the greatest usefulness of theoretical natural science, which deals with the causes and purposes of things, is for the perfection of the mind and the worship of God"<sup>5</sup>. The 'perfection of mind' that Leibniz is talking about in the *Elements* is not a kind of moral perfection. Of course only a virtuous man, one who every day tries to perfect his will and grow in virtue, will be able to understand what God's perfections are. He has in mind the perfection of those notions related to the perfections of 'art'. These notions can be attained by an attentive consideration of the works of the best craftsmen, by the knowledge of what materials the artist used and by understanding his mode of operation.

But, according to Leibniz, although the contemplation of the works of the best artists can give us an idea of what the perfection of an artist is, it is incomparably better to contemplate natural bodies, because these were made by divine art, and even the most insignificant work of the divine artist is infinitely superior to the works of human art. Therefore, "by understanding the laws or the mechanisms of divine invention, we shall perfect ourselves far more than by merely following the constructions invented by man". "For", asks Leibniz, "what greater master can we find than God, the author of the universe"?"<sup>6</sup>

The idea that one can perfect oneself through the study of nature was current in those authors for whom the study of nature leads to God. One of the champions of this idea was Robert Boyle, about whom Leibniz talks in very favourable terms in many places

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<sup>5</sup> "On the Elements of Natural Science", Loemker, p. 283; A 6, 4 C, 1994.

<sup>6</sup> "On the Elements of Natural Science", Loemker, p. 283; A 6, 4 C, 1994.

of his works and who, according to Loemker, influenced Leibniz's view of the significance of physical science that the author of Hannover presents in the *Elements*<sup>7</sup>. In his text, *The Usefulness of Natural Philosophy*, where Boyle shows some of the advantages of being "addicted" to experimental natural philosophy, one of the central ideas is that the detailed study of nature cherries devotion, because the scientist has a very intimate contact with nature and so he will be in a privileged position to descry "those subtle Characters and Flourishes of Omniscience"<sup>8</sup>.

Boyle considers that "the existence of God is indeed so legibly written on the Creatures" that everyone can notice it. But, in order to know God's perfections impressed on creatures, it is not enough to stay at the level of phenomena. "For", says Boyle, "the works of God are not like the Tricks of Juglers, or the Pageants that entertain Princes, where concealment is requisite to wonder". For him,

"[...] the knowledge of the Works of God proportions our admiration of them, they participating and disclosing so much of the inexhausted Perfections of their Author, that the further we contemplate them, the more Foot-steps and Impressions we discover of the Perfections of their Creator"

According to Boyle, only "an attentive and diligent surveyor" can know the real power, wisdom and goodness of God inscribed in nature<sup>9</sup>.

### **The discovery of efficient causes**

These same ideas are present in Leibniz's *Elements*. For Leibniz, too, it is necessary to dive into the hidden secrets of nature to find those most subtle perfections of God, and this is, in fact, the most important goal of natural science. It is true that natural science affords many practical advantages to society. For instance, the collection of a great number of experiments is important for human life because

"[...] most of the things [...] which are required for the effective conduct of life men have derived from experience; such are the use of fire and water; the separation of metals from their ores through melting, so that they can be shaped when hot but become firm when cold; the power of the earth to put forth plants from seeds; the hunting, taming, and breeding of animals".

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<sup>7</sup> Introduction to the "Elements of Natural Science", p. 277.

<sup>8</sup> Robert Boyle, *Usefulness of Natural Philosophy*: in Michael Hunter/Edward Davis (eds.): *The Works of Robert Boyle*, vol. 3, London 2000, p. 235.

<sup>9</sup> Boyle, "Usefulness", pp. 235- 236.

And, since “empirical physics is useful for human life”, it “should be cultivated in the state”<sup>10</sup>.

But natural science should not stop at the level of experiments. For Leibniz, “the utility of experiments is of two kinds: one for the varied conveniences of life” and the other “to bring to light true principles, by proceeding from effect to causes”<sup>11</sup>. The search for the causes of the effects produced by experiments is important not only by reason of the increase of power over nature, but because it helps to perfect the mind. But when Leibniz, in the *Elements*, refers to the perfection of the human mind through the knowledge of causes, he is not thinking only about the perfection of the intellectual part of the soul. He is thinking about a kind of perfection of the soul that is acquired through the direct contact with God’s perfections stamped in nature. It is true that the intellectual faculty will be perfected by a clear and distinct understanding of the causes of phenomena, but the search for these causes will make visible God’s perfections hidden in the interior of natural bodies through which the human mind will be perfected.

The perfection of mind cannot happen, however, just by the knowledge of any type of causes. It is not enough to discern the general efficient cause. According to Leibniz, it is not enough to say that there are “intelligences or angels as moving forces here and there” that are the causes of this or that natural process, or to point to some kind of “a world soul or a hylarchic principle, through whose operations heavy bodies are made to strive toward the earth and other things happen which are needed to conserve the world system”<sup>12</sup>. It is necessary to find the particular efficient causes in order to understand nature’s works and to have access to nature’s subtleties.

What kind of efficient causes should the scientist investigate? His target must be the mechanical causes of nature, because only these can tell him how natural bodies are constituted and how they work. For Leibniz, the way in which a body operates cannot be explained distinctly “unless we explain what its parts contribute”, and this cannot be understood

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<sup>10</sup> “On the Elements of Natural Science”, Loemker, p. 281; A 6, 4 C, 1995.

<sup>11</sup> “On the Elements of Natural Science”, Loemker, p. 282; A 6, 4 C, 1997.

<sup>12</sup> “On the Elements of Natural Science”, Loemker, p. 288; A 6, 4 C, 2008.

“[...] unless we understand their relation to each other and to the whole in a mechanical sense, that is, their figure and position, the change of this position or motion, their magnitude, their pores, and other things of this mechanical kind, for these always vary the operation”<sup>13</sup>.

In order to understand the hidden workings of nature, the scientist must find the mechanical causes and describe the mechanisms.

Underlying the idea that natural phenomena should be explained mechanically is the view according to which nature is a mechanism and natural bodies are machines created by God, the divine artist. These natural machines cannot be compared to watches and clocks made by human art, because the works of God are works of divine wisdom and perfection. Nevertheless, although natural machines are more complex than artificial ones, the principles used to explain natural machines should be the same as those used to explain the operations of machines, that is, mechanical principles, because these are the key to understand how machines work. The understanding of the ways of working of natural bodies by comparing them to artificial machines opens the door to the analytic understanding of the interior of bodies and this, in turn, will reveal God’s perfections hidden in nature.

One possible way to discover the efficient mechanical causes is through reflecting on experiments. In order to discover the causes by considering experiments, the scientist should use an analytic method, a method that, for Leibniz, involves long chains of reasons and a kind of “geometry or calculus and cannot be understood with much thought”. This kind of reasoning is necessary because sometimes nature’s ways of working are so hidden that the scientist cannot reach there through mere observation. For instance, in medicine it is necessary that one applies “profound and almost geometrical reasonings”, because in the human body, which is a “hydraulic-pneumatic machine”, there are “fluids which act not only by weight and in other ways manifest to the senses but also in certain hidden ways, namely through solution, precipitation, evaporation, congealment, filtration, and in many other processes in which composite things are dissolved into insensible parts”. Unless one presents explanations of phenomena based on mechanical concepts, “unless principles are advanced from geometry and mechanics”, which, according to Leibniz, can be applied with equal ease to sensible and insensible things alike, “nature in its subtlety

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<sup>13</sup> “On the Elements of Natural Science”, Loemker, p. 288; A 6, 4 C, 2008.

will escape us”<sup>14</sup>. It is only by the attempt to explain the phenomena mechanically, through efficient causes, that the scientist will have access to the subtleties of nature.

### **The study of nature and the perfection of mind**

It is in the interior of bodies that God’s perfections are hidden and, since the discovery of efficient causes will reveal the internal constitution of these bodies, the scientist that looks for them will be face to face with these perfections. But, in order to realize that these perfections are there, the scientist has to presuppose that the world was made by an intelligent artificer that left his signatures written in his works. On the contrary, those that are trying to find the mechanical explanations of natural phenomena but assume that whatever happens in nature is the mere product of blind chance or necessity, and that nature is, to use the expression of Ralph Cudworth, a “dead cadaverous thing”<sup>15</sup>, will never find the perfections of God. Some of the philosophers that reject that the cause of the world is an intelligent agent were led to this view, in the opinion of Leibniz, because of the success of the mechanical explanations. “Our own century”, says Leibniz in *The Confession of Nature Against Atheists*, “is fruitful alike of science and of impiety”. “For”, continues Leibniz,

“[...] through the admirable improvement of mathematics and the approaches which chemistry and anatomy have opened into the nature of things, it has become apparent that mechanical explanations – reasons from the figure and motion of bodies, as it were – can be given for most of the things which the ancients referred only to the Creator or to some kind (I know not what) of incorporeal forms”.

The result was that “truly capable men for the first time began to try to save or to explain natural phenomena [...] without assuming God or taking him into their reasoning”. The success of the mechanical explanation led some capable men of his days to the idea that they did not need God to explain nature. But, according to Leibniz, the minds of these men are blinded the light of philosophy, and he agrees with Francis Bacon when he says that “casually sampled philosophy leads away from God but that drunk more deeply, it leads back to him”<sup>16</sup>.

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<sup>14</sup> “On the Elements of Natural Science”, Loemker, p. 282-283; A 6, 4 C, 1997-1998.

<sup>15</sup> Ralph Cudworth, *The True Intellectual System of the Universe*, London 1678, p. 147.

<sup>16</sup> “The Confession of Nature Against Atheists”, Loemker, pp. 109-110; A 6, 1, 489.

Leibniz has no doubts that there is an intelligent cause of the world, and the wisdom of God is not only found in the general economy of the world, but also, as he writes in the *Discourse on Metaphysics*, “in the detail of the mechanical structure of certain particular bodies”<sup>17</sup>. When one contemplates animals and other complex living beings, anyone “who sees the wonderful structure of animals will find himself forced to recognize the wisdom of the Author of all things”<sup>18</sup>. And, in the *Tentamen Anagoticum*, he says that the structure of animals is so exquisite that “even Galen, after learning something about the function of the parts of animals, was so stirred with admiration that he held that to explain them was essentially to sing hymns to the honor of divinity”. Leibniz confesses that he has “often wished that an able physicist would undertake to prepare a special work whose title – or whose aim at least – would be *The Hymn of Galen*”<sup>19</sup>.

This admiration of Galen when he contemplated the structure and functions of animals proceeded from the real perfections and excellencies of the author of nature impressed on them. For Leibniz, when God created the world, he acted in the “most perfect way”<sup>20</sup> and according to rules of goodness and perfection, rules that were inscribed in the nature of things. Leibniz disapproves the opinion of those who think that the works of God are good “only for the formal reason that God has made them”, and that in nature the only thing one can find is the despotic power of God. There is real goodness in nature, and this was confirmed by God himself who, according to the Scriptures, after creating the world looked at it and found it good. For Leibniz, the Scriptures used this anthropological conception “only to make us understand that the excellence of God’s works may be recognized by considering them in themselves”. The works of God “carry his mark in themselves”, and so it is possible that, through a consideration of his works, we can discover the craftsman”<sup>21</sup>.

But these marks of God that natural bodies carry in them are not visible or detectable immediately. They are hidden in the interior of nature and, since those scientists that investigate the mechanical causes of phenomena must get to the interstices of the internal parts of bodies, they will be in a better position to have a direct contact

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<sup>17</sup> “Discourse on Metaphysics”, Loemker, p. 316; A 6, 4 B, 1563.

<sup>18</sup> “Discourse on Metaphysics”, Loemker, p. 316; A 6, 4 B, 1561.

<sup>19</sup> “*Tentamen Anagoticum*”, Loemker, p. 479; GP VII, 273.

<sup>20</sup> “Discourse on Metaphysics”, Loemker, p. 303; A 6, 4 B, 1531.

<sup>21</sup> “Discourse on Metaphysics”, Loemker, p. 304; A 6, 4 B, 1532.



with God's perfections and be perfected by them. This is why Leibniz says that "by understanding the laws or the mechanisms of divine invention we shall perfect ourselves"<sup>22</sup>. And, even if it is not possible to explain clearly and distinctly, with mechanical concepts, the phenomena of nature, the mere search for this explanation will perfect the mind of the scientist, just because he will be face to face with the perfections of God.

But how can these perfections of God that are inscribed in nature be impressed in the human soul simply by being in contact with them? Leibniz writes, in a paper about 'wisdom', that pleasure is caused by the feeling of perfections or excellencies in other beings, and perfections "such as understanding, courage, and especially beauty in another human being, or in an animal or even in a lifeless creation, a painting or a work of craftsmanship, as well", cause pleasure in us. And the image of such perfection in others, being impressed upon us, causes some of this perfection to be implanted and aroused within ourselves. One example of this impression of the perfections is what happens when one consorts much with excellent people or things: he who does this "becomes himself more excellent"<sup>23</sup>. The same can be said about those scientists who consort much with nature. The several entirely different perfections in nature, all of them possessed by God and in a supreme degree<sup>24</sup>, are impressed on the soul of the scientist who is contemplating them. And, even if the scientist does not understand what this perfection is, his feelings will perceive it, and he will understand that there is something at the bottom that, though unnoticed, really appeals to him and causes pleasure<sup>25</sup>.

By being in close contact with nature, the scientist will perfect himself and will know God's perfect ways of acting. But it is a difficult task to understand and to express what God's perfections are and his perfect mode of action. Leibniz uses comparisons to express the divine mode of action:

"[...] he who acts perfectly is like an excellent geometrician who knows how to find the best constructions of a problem; or a good architect who makes the most advantageous use of the space and the capital intended for a building, leaving nothing which offends or which lacks the beauty of which it is capable; or a good family head who makes such use of his holdings that there is nothing uncultivated and barren; or a skilled machinist who produces his work by the

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<sup>22</sup> "On the Elements of Natural Science", Loemker, p. 280; A 6, 4 C, 1994.

<sup>23</sup> "On Wisdom", Loemker, p. 425; GP VII, 86.

<sup>24</sup> "Discourse on Metaphysics", Loemker, p. 303; A 6, 4 B, 1531.

<sup>25</sup> "On Wisdom", Loemker, p. 425; GP VII, 86.

easiest process that can be chosen; or a learned author who includes the greatest number of subjects in the smallest possible volume”.

These and other comparisons that Leibniz uses to express divine wisdom and perfection are an “imperfect semblance of the divine wisdom” and serve the purpose of saying that “which can at least lift our spirit to some conception of what cannot well be expressed”<sup>26</sup>. The more the scientist scrutinizes nature, the better he will know what the divine perfections are.

## Conclusion

According to Leibniz, the study of nature from the perspective of efficient causes is not a consequence of a materialistic and atheistic vision of the universe and does not lead to it. On the contrary, it opens the door to God’s perfections hidden in nature, and the more the scientist investigates the mechanical causes of natural phenomena, the better will he know what God’s perfections are and, consequently, the more will he get closer to the status of those superior geniuses that are able to use the *a priori* method in science. But the discovery of efficient causes is a difficult undertaking and, as a consequence, so is the discovery of God’s perfections. But if those who study nature are conscious of the benefits that the discovery of the mechanical causes will bring to their lives, they will be better prepared to suffer the inconveniences that such a hard task brings with it.

The highest benefit that, for Leibniz, the discovery of the mechanisms of nature will bring is felicity, which is the supreme degree of happiness. He who finds the perfections of God inscribed in nature will not only find pleasure and joy. He will have reasons to love God, the most perfect being and, by loving God, he will enjoy felicity. For Leibniz, “the highest function of our mind is the knowledge or, what is here the same thing, the love of the most perfect being, and it is from this that the maximum or the most enduring joy, that is, felicity, must arise”<sup>27</sup>. The more the scientist is conscious that the study of nature will make him happy, the more will he work to discover the secrets of nature and those perfections of God scattered in nature.

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<sup>26</sup> “Discourse on Metaphysics”, Loemker, p. 305-306; A 6, 4 B, 1536.

<sup>27</sup> “On the Elements of Natural Science”, Loemker, p. 280; A 6, 4 C, 1994-1995.